

Test Booklet Code

ANKHA

No. :

**E2**

This Booklet contains 24 pages.

**Do not open this Test Booklet until you are asked to do so.****Important Instructions :**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **E2**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : \_\_\_\_\_

Roll Number : in figures \_\_\_\_\_

: in words \_\_\_\_\_

Centre of Examination (in Capitals) : \_\_\_\_\_

Candidate's Signature : \_\_\_\_\_ Invigilator's Signature : \_\_\_\_\_

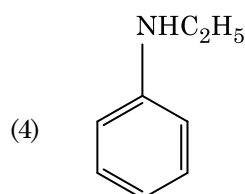
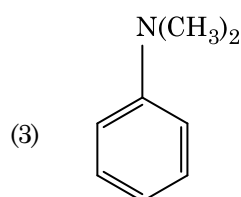
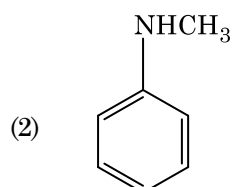
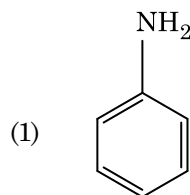
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Centre Superintendent : \_\_\_\_\_

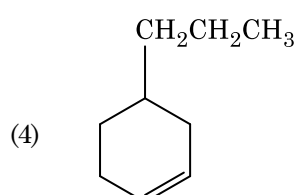
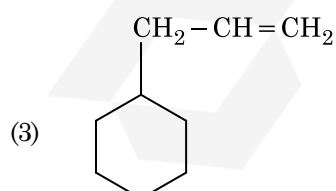
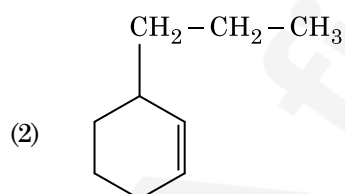
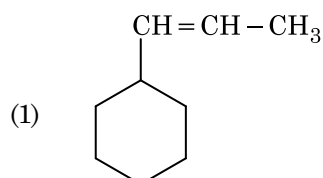
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1. Which of the following amine will give the carbylamine test ?



2. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



3. Match the following and identify the correct option.

|     |                                       |       |                                           |
|-----|---------------------------------------|-------|-------------------------------------------|
| (a) | $\text{CO(g)} + \text{H}_2\text{(g)}$ | (i)   | $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$ |
| (b) | Temporary hardness of water           | (ii)  | An electron deficient hydride             |
| (c) | $\text{B}_2\text{H}_6$                | (iii) | Synthesis gas                             |
| (d) | $\text{H}_2\text{O}_2$                | (iv)  | Non-planar structure                      |

|     | (a)   | (b)   | (c)  | (d)  |
|-----|-------|-------|------|------|
| (1) | (iii) | (i)   | (ii) | (iv) |
| (2) | (iii) | (ii)  | (i)  | (iv) |
| (3) | (iii) | (iv)  | (ii) | (i)  |
| (4) | (i)   | (iii) | (ii) | (iv) |

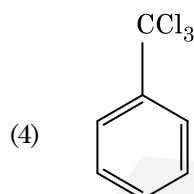
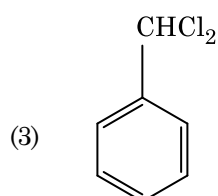
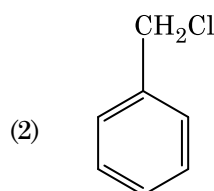
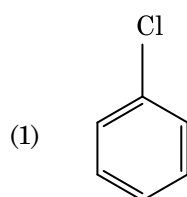
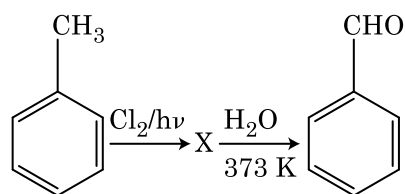
4. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12 \text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality  $0.078 \text{ m}$  containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

- (1)  $0.20 \text{ K}$   
 (2)  $0.80 \text{ K}$   
 (3)  $0.40 \text{ K}$   
 (4)  $0.60 \text{ K}$

5. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

- (1) Hydrogen gas  
 (2) Oxygen gas  
 (3)  $\text{H}_2\text{S}$  gas  
 (4)  $\text{SO}_2$  gas

6. Identify compound X in the following sequence of reactions :



7. Which one of the followings has maximum number of atoms ?

- (1) 1 g of Ag(s) [Atomic mass of Ag = 108]
- (2) 1 g of Mg(s) [Atomic mass of Mg = 24]
- (3) 1 g of O<sub>2</sub>(g) [Atomic mass of O = 16]
- (4) 1 g of Li(s) [Atomic mass of Li = 7]

8. Identify the **correct** statement from the following :

- (1) Wrought iron is impure iron with 4% carbon.
- (2) Blister copper has blistered appearance due to evolution of CO<sub>2</sub>.
- (3) Vapour phase refining is carried out for Nickel by Van Arkel method.
- (4) Pig iron can be moulded into a variety of shapes.

9. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

- (1) – I effect of – CH<sub>3</sub> groups
- (2) + R effect of – CH<sub>3</sub> groups
- (3) – R effect of – CH<sub>3</sub> groups
- (4) Hyperconjugation

10. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through Cu<sup>2+</sup> (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

- (1) CuSO<sub>4</sub>
- (2) [Cu(NH<sub>3</sub>)<sub>4</sub>]<sup>2+</sup>
- (3) Cu(OH)<sub>2</sub>
- (4) CuCO<sub>3</sub>·Cu(OH)<sub>2</sub>

11. A mixture of N<sub>2</sub> and Ar gases in a cylinder contains 7 g of N<sub>2</sub> and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of N<sub>2</sub> is :

[Use atomic masses (in g mol<sup>-1</sup>) : N = 14, Ar = 40]

- (1) 9 bar
- (2) 12 bar
- (3) 15 bar
- (4) 18 bar

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12. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :
- $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
  - $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$
  - $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$
  - $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
13. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce 2.0 g of the reactant to 0.2 g is :
- 100 s
  - 200 s
  - 500 s
  - 1000 s
14. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :
- Isopropyl alcohol
  - Sec. butyl alcohol
  - Tert. butyl alcohol
  - Isobutyl alcohol
15. Which of the following set of molecules will have zero dipole moment ?
- Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
  - Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
  - Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
  - Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
16. What is the change in oxidation number of carbon in the following reaction ?
- $$\text{CH}_4(\text{g}) + 4\text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l}) + 4\text{HCl}(\text{g})$$
- + 4 to + 4
  - 0 to + 4
  - 4 to + 4
  - 0 to - 4
17. Match the following :
- |     | Oxide                   | Nature          |
|-----|-------------------------|-----------------|
| (a) | CO                      | (i) Basic       |
| (b) | BaO                     | (ii) Neutral    |
| (c) | $\text{Al}_2\text{O}_3$ | (iii) Acidic    |
| (d) | $\text{Cl}_2\text{O}_7$ | (iv) Amphoteric |
- Which of the following is **correct** option ?
- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (i)   | (ii)  | (iii) | (iv)  |
| (2) | (ii)  | (i)   | (iv)  | (iii) |
| (3) | (iii) | (iv)  | (i)   | (ii)  |
| (4) | (iv)  | (iii) | (ii)  | (i)   |
18. Which of the following is **not** correct about carbon monoxide ?
- It forms carboxyhaemoglobin.
  - It reduces oxygen carrying ability of blood.
  - The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
  - It is produced due to incomplete combustion.
19. Measuring Zeta potential is useful in determining which property of colloidal solution ?
- Viscosity
  - Solubility
  - Stability of the colloidal particles
  - Size of the colloidal particles
20. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
- $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
  - $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$

21. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

- $\beta$ -Elimination reaction
  - Follows Zaitsev rule
  - Dehydrohalogenation reaction
  - Dehydration reaction
- (a), (b), (c)
  - (a), (c), (d)
  - (b), (c), (d)
  - (a), (b), (d)

22. The correct option for free expansion of an ideal gas under adiabatic condition is :

- $q = 0$ ,  $\Delta T = 0$  and  $w = 0$
- $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
- $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
- $q > 0$ ,  $\Delta T > 0$  and  $w > 0$

23. Identify the **incorrect** statement.

- $\text{Cr}^{2+}(\text{d}^4)$  is a stronger reducing agent than  $\text{Fe}^{2+}(\text{d}^6)$  in water.
- The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
- Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- The oxidation states of chromium in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are not the same.

24. Identify the **incorrect** match.

| Name            | IUPAC Official Name |
|-----------------|---------------------|
| (a) Unnilunium  | (i) Mendelevium     |
| (b) Unniltrium  | (ii) Lawrencium     |
| (c) Unnilhexium | (iii) Seaborgium    |
| (d) Unununnium  | (iv) Darmstadtium   |

- (a), (i)
- (b), (ii)
- (c), (iii)
- (d), (iv)

25. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

- Aldol condensation
- Cannizzaro's reaction
- Cross Cannizzaro's reaction
- Cross Aldol condensation

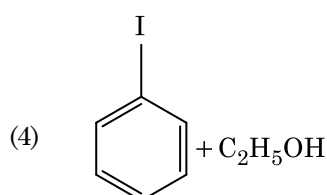
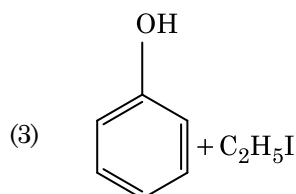
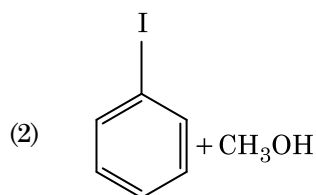
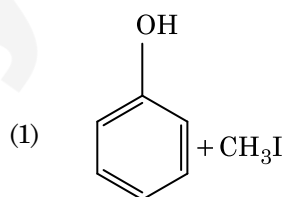
26. Which of the following oxoacid of sulphur has  $-\text{O}-\text{O}-$  linkage ?

- $\text{H}_2\text{SO}_3$ , sulphurous acid
- $\text{H}_2\text{SO}_4$ , sulphuric acid
- $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid
- $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid

27. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and NaCl. Which of the following compound(s) crystallise(s) ?

- Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$
- Only NaCl
- Only  $\text{MgCl}_2$
- NaCl,  $\text{MgCl}_2$  and  $\text{CaCl}_2$

28. Anisole on cleavage with HI gives :



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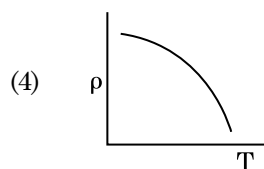
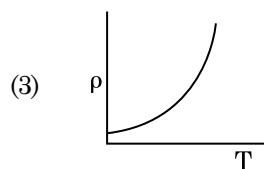
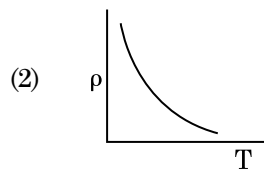
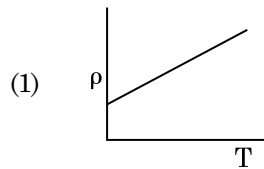
29. Identify the **correct** statements from the following :
- $\text{CO}_2(\text{g})$  is used as refrigerant for ice-cream and frozen food.
  - The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.
  - ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
  - $\text{CO}$  is colorless and odourless gas.
- (a), (b) and (c) only
  - (a) and (c) only
  - (b) and (c) only
  - (c) and (d) only
30. For the reaction,  $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$ , the **correct** option is :
- $\Delta_r H > 0$  and  $\Delta_r S > 0$
  - $\Delta_r H > 0$  and  $\Delta_r S < 0$
  - $\Delta_r H < 0$  and  $\Delta_r S > 0$
  - $\Delta_r H < 0$  and  $\Delta_r S < 0$
31. Paper chromatography is an example of :
- Adsorption chromatography
  - Partition chromatography
  - Thin layer chromatography
  - Column chromatography
32. Which of the following alkane cannot be made in good yield by Wurtz reaction ?
- n-Hexane
  - 2,3-Dimethylbutane
  - n-Heptane
  - n-Butane
33. An increase in the concentration of the reactants of a reaction leads to change in :
- activation energy
  - heat of reaction
  - threshold energy
  - collision frequency
34. The number of Faradays(F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of  $\text{Ca} = 40 \text{ g mol}^{-1}$ ) is :
- 1
  - 2
  - 3
  - 4
35. The mixture which shows positive deviation from Raoult's law is :
- Ethanol + Acetone
  - Benzene + Toluene
  - Acetone + Chloroform
  - Chloroethane + Bromoethane
36. Hydrolysis of sucrose is given by the following reaction.
- $$\text{Sucrose} + \text{H}_2\text{O} \rightleftharpoons \text{Glucose} + \text{Fructose}$$
- If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\ominus$  at the same temperature will be :
- $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
  - $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
  - $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
  - $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
37. Sucrose on hydrolysis gives :
- $\beta\text{-D-Glucose} + \alpha\text{-D-Fructose}$
  - $\alpha\text{-D-Glucose} + \beta\text{-D-Glucose}$
  - $\alpha\text{-D-Glucose} + \beta\text{-D-Fructose}$
  - $\alpha\text{-D-Fructose} + \beta\text{-D-Fructose}$

38. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is :
- (1) 3.87 BM
  - (2) 4.90 BM
  - (3) 5.92 BM
  - (4) 2.84 BM
39. Which of the following is a natural polymer ?
- (1) *cis*-1,4-polyisoprene
  - (2) poly (Butadiene-styrene)
  - (3) polybutadiene
  - (4) poly (Butadiene-acrylonitrile)
40. Which of the following is a basic amino acid ?
- (1) Serine
  - (2) Alanine
  - (3) Tyrosine
  - (4) Lysine
41. Which of the following is a cationic detergent ?
- (1) Sodium lauryl sulphate
  - (2) Sodium stearate
  - (3) Cetyltrimethyl ammonium bromide
  - (4) Sodium dodecylbenzene sulphonate
42. Find out the solubility of  $\text{Ni}(\text{OH})_2$  in 0.1 M NaOH. Given that the ionic product of  $\text{Ni}(\text{OH})_2$  is  $2 \times 10^{-15}$ .
- (1)  $2 \times 10^{-13}$  M
  - (2)  $2 \times 10^{-8}$  M
  - (3)  $1 \times 10^{-13}$  M
  - (4)  $1 \times 10^8$  M
43. Identify a molecule which does **not** exist.
- (1)  $\text{He}_2$
  - (2)  $\text{Li}_2$
  - (3)  $\text{C}_2$
  - (4)  $\text{O}_2$
44. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.
- (1) Iron
  - (2) Copper
  - (3) Calcium
  - (4) Potassium
45. The number of protons, neutrons and electrons in  $^{175}_{71}\text{Lu}$ , respectively, are :
- (1) 71, 104 and 71
  - (2) 104, 71 and 71
  - (3) 71, 71 and 104
  - (4) 175, 104 and 71
46. Light with an average flux of  $20 \text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :
- (1)  $10 \times 10^3 \text{ J}$
  - (2)  $12 \times 10^3 \text{ J}$
  - (3)  $24 \times 10^3 \text{ J}$
  - (4)  $48 \times 10^3 \text{ J}$
47. For transistor action, which of the following statements is **correct** ?
- (1) Base, emitter and collector regions should have same doping concentrations.
  - (2) Base, emitter and collector regions should have same size.
  - (3) Both emitter junction as well as the collector junction are forward biased.
  - (4) The base region must be very thin and lightly doped.

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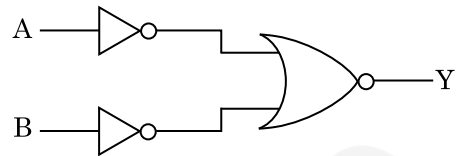
48. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature (T) for copper ?



49. In a certain region of space with volume  $0.2 \text{ m}^3$ , the electric potential is found to be  $5 \text{ V}$  throughout. The magnitude of electric field in this region is :

- (1) zero  
(2)  $0.5 \text{ N/C}$   
(3)  $1 \text{ N/C}$   
(4)  $5 \text{ N/C}$

50. For the logic circuit shown, the truth table is :



(1)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

(2)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

(3)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

(4)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

51. A  $40 \mu\text{F}$  capacitor is connected to a  $200 \text{ V}$ ,  $50 \text{ Hz}$  ac supply. The rms value of the current in the circuit is, nearly :

- (1)  $1.7 \text{ A}$   
(2)  $2.05 \text{ A}$   
(3)  $2.5 \text{ A}$   
(4)  $25.1 \text{ A}$

52. A cylinder contains hydrogen gas at pressure of  $249 \text{ kPa}$  and temperature  $27^\circ\text{C}$ .

Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )

- (1)  $0.5 \text{ kg/m}^3$   
(2)  $0.2 \text{ kg/m}^3$   
(3)  $0.1 \text{ kg/m}^3$   
(4)  $0.02 \text{ kg/m}^3$

53. Taking into account of the significant figures, what is the value of  $9.99 \text{ m} - 0.0099 \text{ m}$  ?
- 9.9801 m
  - 9.98 m
  - 9.980 m
  - 9.9 m
54. The mean free path for a gas, with molecular diameter  $d$  and number density  $n$  can be expressed as :
- $\frac{1}{\sqrt{2} n \pi d}$
  - $\frac{1}{\sqrt{2} n \pi d^2}$
  - $\frac{1}{\sqrt{2} n^2 \pi d^2}$
  - $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
55. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :  
 $(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$
- $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
  - $8.0 \times 10^{-5} \text{ T m A}^{-1}$
  - $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
  - $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
56. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ C m}$ . The electric potential due to the dipole at a point at a distance of  $0.6 \text{ m}$  from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :
- $$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
- 50 V
  - 200 V
  - 400 V
  - zero
57. A body weighs  $72 \text{ N}$  on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?
- 48 N
  - 32 N
  - 30 N
  - 24 N
58. The solids which have the negative temperature coefficient of resistance are :
- metals
  - insulators only
  - semiconductors only
  - insulators and semiconductors
59. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?
- doubled
  - four times
  - one-fourth
  - zero
60. A series LCR circuit is connected to an ac voltage source. When  $L$  is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead  $C$  is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is :
- zero
  - 0.5
  - 1.0
  - 1.0
61. A spherical conductor of radius  $10 \text{ cm}$  has a charge of  $3.2 \times 10^{-7} \text{ C}$  distributed uniformly. What is the magnitude of electric field at a point  $15 \text{ cm}$  from the centre of the sphere ?
- $$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
- $1.28 \times 10^4 \text{ N/C}$
  - $1.28 \times 10^5 \text{ N/C}$
  - $1.28 \times 10^6 \text{ N/C}$
  - $1.28 \times 10^7 \text{ N/C}$

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62. Find the torque about the origin when a force of  $3\hat{j}$  N acts on a particle whose position vector is  $2\hat{k}$  m.
- $6\hat{i}$  N m
  - $6\hat{j}$  N m
  - $-6\hat{i}$  N m
  - $6\hat{k}$  N m
63. A charged particle having drift velocity of  $7.5 \times 10^{-4}$  m s<sup>-1</sup> in an electric field of  $3 \times 10^{-10}$  Vm<sup>-1</sup>, has a mobility in m<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup> of:
- $2.25 \times 10^{15}$
  - $2.5 \times 10^6$
  - $2.5 \times 10^{-6}$
  - $2.25 \times 10^{-15}$
64. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to:
- $\frac{A}{2\mu}$
  - $\frac{2A}{\mu}$
  - $\mu A$
  - $\frac{\mu A}{2}$
65. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio:
- $\frac{27}{8}$
  - $\frac{9}{4}$
  - $\frac{3}{2}$
  - $\frac{5}{3}$
66. When a uranium isotope  ${}^{235}_{92}\text{U}$  is bombarded with a neutron, it generates  ${}^{89}_{36}\text{Kr}$ , three neutrons and:
- ${}^{144}_{56}\text{Ba}$
  - ${}^{91}_{40}\text{Zr}$
  - ${}^{101}_{36}\text{Kr}$
  - ${}^{103}_{36}\text{Kr}$
67. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is:
- $\pi$  rad
  - $\frac{3\pi}{2}$  rad
  - $\frac{\pi}{2}$  rad
  - zero
68. A resistance wire connected in the left gap of a metre bridge balances a  $10 \Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of  $1 \Omega$  of the resistance wire is:
- $1.0 \times 10^{-2}$  m
  - $1.0 \times 10^{-1}$  m
  - $1.5 \times 10^{-1}$  m
  - $1.5 \times 10^{-2}$  m
69. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is:
- 2.5 g
  - 5.0 g
  - 10.0 g
  - 20.0 g
70. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : ( $c$  = speed of electromagnetic waves)
- $c : 1$
  - $1 : 1$
  - $1 : c$
  - $1 : c^2$

71. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :
- double
  - half
  - four times
  - one-fourth
72. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
- ( $\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$ )
- $6.28 \times 10^{-4} \text{ T}$
  - $3.14 \times 10^{-4} \text{ T}$
  - $6.28 \times 10^{-5} \text{ T}$
  - $3.14 \times 10^{-5} \text{ T}$
73. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ )
- 360 m
  - 340 m
  - 320 m
  - 300 m
74. For which one of the following, Bohr model is **not** valid ?
- Hydrogen atom
  - Singly ionised helium atom ( $\text{He}^+$ )
  - Deuteron atom
  - Singly ionised neon atom ( $\text{Ne}^+$ )
75. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and T, absolute temperature)
- $\frac{1}{2} k_B T$
  - $\frac{3}{2} k_B T$
  - $\frac{5}{2} k_B T$
  - $\frac{7}{2} k_B T$
76. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.
- The centre of mass of the system from the 5 kg particle is nearly at a distance of :
- 33 cm
  - 50 cm
  - 67 cm
  - 80 cm
77. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :
- 523 Hz
  - 524 Hz
  - 536 Hz
  - 537 Hz
78. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- isothermal
  - adiabatic
  - isochoric
  - isobaric
79. The capacitance of a parallel plate capacitor with air as medium is  $6 \mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes  $30 \mu\text{F}$ . The permittivity of the medium is :
- ( $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ )
- $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

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80. An electron is accelerated from rest through a potential difference of  $V$  volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2}$  nm, the potential difference is :

(1) 10 V  
(2)  $10^2$  V  
(3)  $10^3$  V  
(4)  $10^4$  V

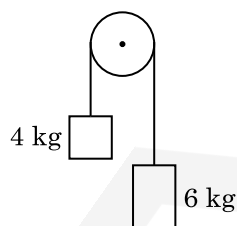
81. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is :

(1)  $\frac{MgL_1}{AL}$   
(2)  $\frac{Mg(L_1 - L)}{AL}$   
(3)  $\frac{MgL}{AL_1}$   
(4)  $\frac{MgL}{A(L_1 - L)}$

82. The Brewsters angle  $i_b$  for an interface should be :

(1)  $0^\circ < i_b < 30^\circ$   
(2)  $30^\circ < i_b < 45^\circ$   
(3)  $45^\circ < i_b < 90^\circ$   
(4)  $i_b = 90^\circ$

83. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity ( $g$ ) is :



(1)  $g$   
(2)  $g/2$   
(3)  $g/5$   
(4)  $g/10$

84. Dimensions of stress are :

(1)  $[MLT^{-2}]$   
(2)  $[ML^2T^{-2}]$   
(3)  $[ML^0T^{-2}]$   
(4)  $[ML^{-1}T^{-2}]$

85. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

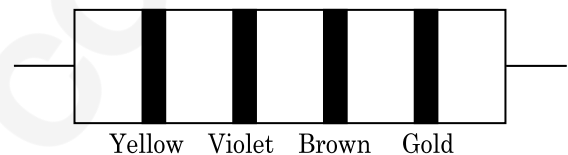
The pitch of the screw gauge is :

(1) 0.01 mm  
(2) 0.25 mm  
(3) 0.5 mm  
(4) 1.0 mm

86. The energy required to break one bond in DNA is  $10^{-20}$  J. This value in eV is nearly :

(1) 6  
(2) 0.6  
(3) 0.06  
(4) 0.006

87. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 470 k $\Omega$ , 5%  
(2) 47 k $\Omega$ , 10%  
(3) 4.7 k $\Omega$ , 5%  
(4) 470  $\Omega$ , 5%

88. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1)  $3.66 \times 10^{-7}$  rad  
(2)  $1.83 \times 10^{-7}$  rad  
(3)  $7.32 \times 10^{-7}$  rad  
(4)  $6.00 \times 10^{-7}$  rad

89. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) forward bias only  
(2) reverse bias only  
(3) both forward bias and reverse bias  
(4) increase in forward current

90. The energy equivalent of 0.5 g of a substance is :

(1)  $4.5 \times 10^{16}$  J  
(2)  $4.5 \times 10^{13}$  J  
(3)  $1.5 \times 10^{13}$  J  
(4)  $0.5 \times 10^{13}$  J

91. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

- (a) Darwin's Finches of Galapagos islands.
- (b) Herbicide resistant weeds.
- (c) Drug resistant eukaryotes.
- (d) Man-created breeds of domesticated animals like dogs.

- (1) only (a)
- (2) (a) and (c)
- (3) (b), (c) and (d)
- (4) only (d)

92. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                                 |
|------------|-----------------|-------------|---------------------------------|
| (a)        | Organ of Corti  | (i)         | Connects middle ear and pharynx |
| (b)        | Cochlea         | (ii)        | Coiled part of the labyrinth    |
| (c)        | Eustachian tube | (iii)       | Attached to the oval window     |
| (d)        | Stapes          | (iv)        | Located on the basilar membrane |

- |     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (ii)  | (iii) | (i)  | (iv)  |
| (2) | (iii) | (i)   | (iv) | (ii)  |
| (3) | (iv)  | (ii)  | (i)  | (iii) |
| (4) | (i)   | (ii)  | (iv) | (iii) |

93. Identify the **wrong** statement with reference to immunity.

- (1) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
- (2) When ready-made antibodies are directly given, it is called "Passive immunity".
- (3) Active immunity is quick and gives full response.
- (4) Foetus receives some antibodies from mother, it is an example for passive immunity.

94. Select the **correct** events that occur during inspiration.

- (a) Contraction of diaphragm
- (b) Contraction of external inter-costal muscles
- (c) Pulmonary volume decreases
- (d) Intra pulmonary pressure increases
- (1) (a) and (b)
- (2) (c) and (d)
- (3) (a), (b) and (d)
- (4) only (d)

95. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :

- (1) 2 molecules of 3-C compound
- (2) 1 molecule of 3-C compound
- (3) 1 molecule of 6-C compound
- (4) 1 molecule of 4-C compound and 1 molecule of 2-C compound

96. The infectious stage of *Plasmodium* that enters the human body is :

- (1) Trophozoites
- (2) Sporozoites
- (3) Female gametocytes
- (4) Male gametocytes

97. Which of the following statements about inclusion bodies is **incorrect** ?

- (1) They are not bound by any membrane.
- (2) These are involved in ingestion of food particles.
- (3) They lie free in the cytoplasm.
- (4) These represent reserve material in cytoplasm.

98. Dissolution of the synaptonemal complex occurs during :

- (1) Pachytene
- (2) Zygotene
- (3) Diplotene
- (4) Leptotene

99. Ray florets have :

- (1) Inferior ovary
- (2) Superior ovary
- (3) Hypogynous ovary
- (4) Half inferior ovary

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- 100.** In gel electrophoresis, separated DNA fragments can be visualized with the help of :
- (1) Acetocarmine in bright blue light
  - (2) Ethidium bromide in UV radiation
  - (3) Acetocarmine in UV radiation
  - (4) Ethidium bromide in infrared radiation
- 101.** In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?
- (1) ZIFT and IUT
  - (2) GIFT and ZIFT
  - (3) ICSI and ZIFT
  - (4) GIFT and ICSI
- 102.** Select the option including all sexually transmitted diseases.
- (1) Gonorrhoea, Syphilis, Genital herpes
  - (2) Gonorrhoea, Malaria, Genital herpes
  - (3) AIDS, Malaria, Filariasis
  - (4) Cancer, AIDS, Syphilis
- 103.** Identify the **wrong** statement with reference to transport of oxygen.
- (1) Binding of oxygen with haemoglobin is mainly related to partial pressure of  $O_2$ .
  - (2) Partial pressure of  $CO_2$  can interfere with  $O_2$  binding with haemoglobin.
  - (3) Higher  $H^+$  conc. in alveoli favours the formation of oxyhaemoglobin.
  - (4) Low  $pCO_2$  in alveoli favours the formation of oxyhaemoglobin.
- 104.** Identify the **incorrect** statement.
- (1) Heart wood does not conduct water but gives mechanical support.
  - (2) Sapwood is involved in conduction of water and minerals from root to leaf.
  - (3) Sapwood is the innermost secondary xylem and is lighter in colour.
  - (4) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
- 105.** Identify the **wrong** statement with regard to Restriction Enzymes.
- (1) Each restriction enzyme functions by inspecting the length of a DNA sequence.
  - (2) They cut the strand of DNA at palindromic sites.
  - (3) They are useful in genetic engineering.
  - (4) Sticky ends can be joined by using DNA ligases.
- 106.** Floridean starch has structure similar to :
- (1) Starch and cellulose
  - (2) Amylopectin and glycogen
  - (3) Mannitol and algin
  - (4) Laminarin and cellulose
- 107.** Choose the **correct** pair from the following :
- |     |              |   |                                            |
|-----|--------------|---|--------------------------------------------|
| (1) | Ligases      | - | Join the two DNA molecules                 |
| (2) | Polymerases  | - | Break the DNA into fragments               |
| (3) | Nucleases    | - | Separate the two strands of DNA            |
| (4) | Exonucleases | - | Make cuts at specific positions within DNA |
- 108.** Embryological support for evolution was disapproved by :
- (1) Karl Ernst von Baer
  - (2) Alfred Wallace
  - (3) Charles Darwin
  - (4) Oparin
- 109.** The first phase of translation is :
- (1) Binding of mRNA to ribosome
  - (2) Recognition of DNA molecule
  - (3) Aminoacylation of tRNA
  - (4) Recognition of an anti-codon

110. The plant parts which consist of two generations - one within the other :

- Pollen grains inside the anther
  - Germinated pollen grain with two male gametes
  - Seed inside the fruit
  - Embryo sac inside the ovule
- (a) only
  - (a), (b) and (c)
  - (c) and (d)
  - (a) and (d)

111. The number of substrate level phosphorylations in one turn of citric acid cycle is :

- Zero
- One
- Two
- Three

112. Match the following columns and select the correct option.

| Column - I         |       | Column - II                             |  |
|--------------------|-------|-----------------------------------------|--|
| (a) Floating Ribs  | (i)   | Located between second and seventh ribs |  |
| (b) Acromion       | (ii)  | Head of the Humerus                     |  |
| (c) Scapula        | (iii) | Clavicle                                |  |
| (d) Glenoid cavity | (iv)  | Do not connect with the sternum         |  |

| (a)       | (b)   | (c)  | (d)   |
|-----------|-------|------|-------|
| (1) (ii)  | (iv)  | (i)  | (iii) |
| (2) (i)   | (iii) | (ii) | (iv)  |
| (3) (iii) | (ii)  | (iv) | (i)   |
| (4) (iv)  | (iii) | (i)  | (ii)  |

113. Match the following diseases with the causative organism and select the correct option.

| Column - I     |       | Column - II        |  |
|----------------|-------|--------------------|--|
| (a) Typhoid    | (i)   | <i>Wuchereria</i>  |  |
| (b) Pneumonia  | (ii)  | <i>Plasmodium</i>  |  |
| (c) Filariasis | (iii) | <i>Salmonella</i>  |  |
| (d) Malaria    | (iv)  | <i>Haemophilus</i> |  |

| (a)       | (b)   | (c)   | (d)   |
|-----------|-------|-------|-------|
| (1) (i)   | (iii) | (ii)  | (iv)  |
| (2) (iii) | (iv)  | (i)   | (ii)  |
| (3) (ii)  | (i)   | (iii) | (iv)  |
| (4) (iv)  | (i)   | (ii)  | (iii) |

114. Montreal protocol was signed in 1987 for control of :

- Transport of Genetically modified organisms from one country to another
- Emission of ozone depleting substances
- Release of Green House gases
- Disposal of e-wastes

115. The QRS complex in a standard ECG represents :

- Repolarisation of auricles
- Depolarisation of auricles
- Depolarisation of ventricles
- Repolarisation of ventricles

116. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

- Cytokinin
- Gibberellin
- Ethylene
- Absciscic acid

117. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

- 4
- 2
- 14
- 8

118. Bilaterally symmetrical and acoelomate animals are exemplified by :

- Ctenophora
- Platyhelminthes
- Aschelminthes
- Annelida

119. Cuboidal epithelium with brush border of microvilli is found in :

- lining of intestine
- ducts of salivary glands
- proximal convoluted tubule of nephron
- eustachian tube

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- 120.** Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
- (1) Endoplasmic reticulum
  - (2) Peroxisomes
  - (3) Golgi bodies
  - (4) Polysomes
- 121.** In light reaction, plastoquinone facilitates the transfer of electrons from :
- (1) PS-II to Cytb<sub>6</sub>f complex
  - (2) Cytb<sub>6</sub>f complex to PS-I
  - (3) PS-I to NADP<sup>+</sup>
  - (4) PS-I to ATP synthase
- 122.** Match the following concerning essential elements and their functions in plants :
- |               |                                             |
|---------------|---------------------------------------------|
| (a) Iron      | (i) Photolysis of water                     |
| (b) Zinc      | (ii) Pollen germination                     |
| (c) Boron     | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis                       |
- Select the **correct** option :
- |     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (ii)  | (i)   | (iv) | (iii) |
| (2) | (iv)  | (iii) | (ii) | (i)   |
| (3) | (iii) | (iv)  | (ii) | (i)   |
| (4) | (iv)  | (i)   | (ii) | (iii) |
- 123.** The roots that originate from the base of the stem are :
- (1) Fibrous roots
  - (2) Primary roots
  - (3) Prop roots
  - (4) Lateral roots
- 124.** From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1) CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 800°C
  - (2) CH<sub>3</sub>, H<sub>2</sub>, NH<sub>4</sub> and water vapor at 800°C
  - (3) CH<sub>4</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 600°C
  - (4) CH<sub>3</sub>, H<sub>2</sub>, NH<sub>3</sub> and water vapor at 600°C
- 125.** Identify the basic amino acid from the following.
- (1) Tyrosine
  - (2) Glutamic Acid
  - (3) Lysine
  - (4) Valine
- 126.** The process of growth is maximum during :
- (1) Log phase
  - (2) Lag phase
  - (3) Senescence
  - (4) Dormancy
- 127.** Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- (1) Uremia and Ketonuria
  - (2) Uremia and Renal Calculi
  - (3) Ketonuria and Glycosuria
  - (4) Renal calculi and Hyperglycaemia
- 128.** Select the **correct** match.
- |                         |   |                                          |
|-------------------------|---|------------------------------------------|
| (1) Haemophilia         | - | Y linked                                 |
| (2) Phenylketonuria     | - | Autosomal dominant trait                 |
| (3) Sickle cell anaemia | - | Autosomal recessive trait, chromosome-11 |
| (4) Thalassemia         | - | X linked                                 |
- 129.** Strobili or cones are found in :
- (1) *Salvinia*
  - (2) *Pteris*
  - (3) *Marchantia*
  - (4) *Equisetum*
- 130.** Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.
- (1) The gene (I) has three alleles.
  - (2) A person will have only two of the three alleles.
  - (3) When I<sup>A</sup> and I<sup>B</sup> are present together, they express same type of sugar.
  - (4) Allele 'i' does not produce any sugar.
- 131.** Identify the **correct** statement with reference to human digestive system.
- (1) Ileum opens into small intestine.
  - (2) Serosa is the innermost layer of the alimentary canal.
  - (3) Ileum is a highly coiled part.
  - (4) Vermiform appendix arises from duodenum.

132. Which of the following would help in prevention of diuresis ?

- (1) More water reabsorption due to undersecretion of ADH
- (2) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone
- (3) Atrial natriuretic factor causes vasoconstriction
- (4) Decrease in secretion of renin by JG cells

133. Match the following with respect to meiosis :

- |                |                     |
|----------------|---------------------|
| (a) Zygotene   | (i) Terminalization |
| (b) Pachytene  | (ii) Chiasmata      |
| (c) Diplotene  | (iii) Crossing over |
| (d) Diakinesis | (iv) Synapsis       |

Select the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iii) | (iv)  | (i)   | (ii)  |
| (2) | (iv)  | (iii) | (ii)  | (i)   |
| (3) | (i)   | (ii)  | (iv)  | (iii) |
| (4) | (ii)  | (iv)  | (iii) | (i)   |

134. Which of the following is **not** an inhibitory substance governing seed dormancy ?

- (1) Gibberellic acid
- (2) Abscissic acid
- (3) Phenolic acid
- (4) Para-ascorbic acid

135. Match the following columns and select the **correct** option.

- | Column - I                         | Column - II                        |
|------------------------------------|------------------------------------|
| (a) Bt cotton                      | (i) Gene therapy                   |
| (b) Adenosine deaminase deficiency | (ii) Cellular defence              |
| (c) RNAi                           | (iii) Detection of HIV infection   |
| (d) PCR                            | (iv) <i>Bacillus thuringiensis</i> |

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iv)  | (i)   | (ii)  | (iii) |
| (2) | (iii) | (ii)  | (i)   | (iv)  |
| (3) | (ii)  | (iii) | (iv)  | (i)   |
| (4) | (i)   | (ii)  | (iii) | (iv)  |

136. Match the following :

- |                                     |               |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (i) Ricin     |
| (b) Possess peptide bonds           | (ii) Malonate |
| (c) Cell wall material in fungi     | (iii) Chitin  |
| (d) Secondary metabolite            | (iv) Collagen |

Choose the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (ii)  | (iv)  | (iii) | (i)  |
| (2) | (iii) | (i)   | (iv)  | (ii) |
| (3) | (iii) | (iv)  | (i)   | (ii) |
| (4) | (ii)  | (iii) | (i)   | (iv) |

137. The sequence that controls the copy number of the linked DNA in the vector, is termed :

- (1) Selectable marker
- (2) Ori site
- (3) Palindromic sequence
- (4) Recognition site

138. Snow-blindness in Antarctic region is due to :

- (1) Freezing of fluids in the eye by low temperature
- (2) Inflammation of cornea due to high dose of UV-B radiation
- (3) High reflection of light from snow
- (4) Damage to retina caused by infra-red rays

139. According to Robert May, the global species diversity is about :

- (1) 1.5 million
- (2) 20 million
- (3) 50 million
- (4) 7 million

140. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

- (1) Out crossing
- (2) Mutational breeding
- (3) Cross breeding
- (4) Inbreeding

141. Which of the following regions of the globe exhibits highest species diversity ?

- (1) Western Ghats of India
- (2) Madagascar
- (3) Himalayas
- (4) Amazon forests

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142. Match the following columns and select the **correct** option.

| Column - I |                            | Column - II |                |
|------------|----------------------------|-------------|----------------|
| (a)        | 6 - 15 pairs of gill slits | (i)         | <i>Trygon</i>  |
| (b)        | Heterocercal caudal fin    | (ii)        | Cyclostomes    |
| (c)        | Air Bladder                | (iii)       | Chondrichthyes |
| (d)        | Poison sting               | (iv)        | Osteichthyes   |
| (a)        | (b)                        | (c)         | (d)            |
| (1)        | (ii)                       | (iii)       | (iv)           |
| (2)        | (iii)                      | (iv)        | (i)            |
| (3)        | (iv)                       | (ii)        | (iii)          |
| (4)        | (i)                        | (iv)        | (iii)          |

143. Which of the following statements is **not correct** ?

- (1) In man insulin is synthesised as a proinsulin.
- (2) The proinsulin has an extra peptide called C-peptide.
- (3) The functional insulin has A and B chains linked together by hydrogen bonds.
- (4) Genetically engineered insulin is produced in *E-Coli*.

144. Match the organism with its use in biotechnology.

|     |                                  |       |                                     |
|-----|----------------------------------|-------|-------------------------------------|
| (a) | <i>Bacillus thuringiensis</i>    | (i)   | Cloning vector                      |
| (b) | <i>Thermus aquaticus</i>         | (ii)  | Construction of first rDNA molecule |
| (c) | <i>Agrobacterium tumefaciens</i> | (iii) | DNA polymerase                      |
| (d) | <i>Salmonella typhimurium</i>    | (iv)  | Cry proteins                        |

Select the **correct** option from the following :

|     |       |       |       |
|-----|-------|-------|-------|
| (a) | (b)   | (c)   | (d)   |
| (1) | (ii)  | (iv)  | (iii) |
| (2) | (iv)  | (iii) | (i)   |
| (3) | (iii) | (ii)  | (iv)  |
| (4) | (iii) | (iv)  | (i)   |

145. Which of the following pairs is of unicellular algae ?

- (1) *Laminaria* and *Sargassum*
- (2) *Gelidium* and *Gracilaria*
- (3) *Anabaena* and *Volvox*
- (4) *Chlorella* and *Spirulina*

146. Meiotic division of the secondary oocyte is completed :

- (1) Prior to ovulation
- (2) At the time of copulation
- (3) After zygote formation
- (4) At the time of fusion of a sperm with an ovum

147. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

- (1) Nutritive value
- (2) Growth response
- (3) Defence action
- (4) Effect on reproduction

148. Which of the following statements are **true** for the phylum-Chordata ?

- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
- (b) In Vertebrata notochord is present during the embryonic period only.
- (c) Central nervous system is dorsal and hollow.
- (d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

- (1) (d) and (c)
- (2) (c) and (a)
- (3) (a) and (b)
- (4) (b) and (c)

149. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

- (1) Insect pests
- (2) Fungal diseases
- (3) Plant nematodes
- (4) Insect predators

150. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :

- (1) Ammonia alone
- (2) Nitrate alone
- (3) Ammonia and oxygen
- (4) Ammonia and hydrogen

151. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                    |
|------------|-----------------|-------------|--------------------|
| (a)        | Pituitary gland | (i)         | Grave's disease    |
| (b)        | Thyroid gland   | (ii)        | Diabetes mellitus  |
| (c)        | Adrenal gland   | (iii)       | Diabetes insipidus |
| (d)        | Pancreas        | (iv)        | Addison's disease  |
| (a)        | (b)             | (c)         | (d)                |
| (1)        | (iv)            | (iii)       | (i)                |
| (2)        | (iii)           | (ii)        | (i)                |
| (3)        | (iii)           | (i)         | (iv)               |
| (4)        | (ii)            | (i)         | (iv)               |

152. Which one of the following is the most abundant protein in the animals ?  
 (1) Haemoglobin  
 (2) Collagen  
 (3) Lectin  
 (4) Insulin
153. Identify the **correct** statement with regard to  $G_1$  phase (Gap 1) of interphase.  
 (1) DNA synthesis or replication takes place.  
 (2) Reorganisation of all cell components takes place.  
 (3) Cell is metabolically active, grows but does not replicate its DNA.  
 (4) Nuclear Division takes place.
154. Match the trophic levels with their **correct** species examples in grassland ecosystem.
- |                          |              |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow     |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level  | (iii) Rabbit |
| (d) Third trophic level  | (iv) Grass   |
- Select the **correct** option :
- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (ii)  | (iii) | (iv)  | (i)  |
| (2) | (iii) | (ii)  | (i)   | (iv) |
| (3) | (iv)  | (iii) | (ii)  | (i)  |
| (4) | (i)   | (ii)  | (iii) | (iv) |
155. The ovary is half inferior in :  
 (1) Brinjal  
 (2) Mustard  
 (3) Sunflower  
 (4) Plum
156. The body of the ovule is fused within the funicle at :  
 (1) Hilum  
 (2) Micropyle  
 (3) Nucellus  
 (4) Chalaza
157. The specific palindromic sequence which is recognized by EcoRI is :  
 (1) 5' - GAATTC - 3'  
 3' - CTTAAG - 5'  
 (2) 5' - GGAACC - 3'  
 3' - CCTTGG - 5'  
 (3) 5' - CTTAAG - 3'  
 3' - GAATTC - 5'  
 (4) 5' - GGATCC - 3'  
 3' - CCTAGG - 5'
158. Which of the following is **correct** about viroids ?  
 (1) They have RNA with protein coat.  
 (2) They have free RNA without protein coat.  
 (3) They have DNA with protein coat.  
 (4) They have free DNA without protein coat.
159. In water hyacinth and water lily, pollination takes place by :  
 (1) insects or wind  
 (2) water currents only  
 (3) wind and water  
 (4) insects and water
160. The transverse section of a plant shows following anatomical features :  
 (a) Large number of scattered vascular bundles surrounded by bundle sheath.  
 (b) Large conspicuous parenchymatous ground tissue.  
 (c) Vascular bundles conjoint and closed.  
 (d) Phloem parenchyma absent.
- Identify the category of plant and its part :  
 (1) Monocotyledonous stem  
 (2) Monocotyledonous root  
 (3) Dicotyledonous stem  
 (4) Dicotyledonous root
161. Which of the following statements is **correct** ?  
 (1) Adenine pairs with thymine through two H-bonds.  
 (2) Adenine pairs with thymine through one H-bond.  
 (3) Adenine pairs with thymine through three H-bonds.  
 (4) Adenine does not pair with thymine.
162. Select the **correct** statement.  
 (1) Glucocorticoids stimulate gluconeogenesis.  
 (2) Glucagon is associated with hypoglycemia.  
 (3) Insulin acts on pancreatic cells and adipocytes.  
 (4) Insulin is associated with hyperglycemia.

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163. Match the following columns and select the correct option.

| Column - I |                                                              | Column - II |                   |
|------------|--------------------------------------------------------------|-------------|-------------------|
| (a)        | Gregarious, polyphagous pest                                 | (i)         | <i>Asterias</i>   |
| (b)        | Adult with radial symmetry and larva with bilateral symmetry | (ii)        | Scorpion          |
| (c)        | Book lungs                                                   | (iii)       | <i>Ctenoplane</i> |
| (d)        | Bioluminescence                                              | (iv)        | <i>Locusta</i>    |
|            |                                                              |             |                   |
|            | (a)                                                          | (b)         | (c)               |
| (1)        | (i)                                                          | (iii)       | (ii)              |
| (2)        | (iv)                                                         | (i)         | (ii)              |
| (3)        | (iii)                                                        | (ii)        | (i)               |
| (4)        | (ii)                                                         | (i)         | (iii)             |

164. Match the following columns and select the correct option.

| Column - I |             | Column - II |                                          |
|------------|-------------|-------------|------------------------------------------|
| (a)        | Eosinophils | (i)         | Immune response                          |
| (b)        | Basophils   | (ii)        | Phagocytosis                             |
| (c)        | Neutrophils | (iii)       | Release histaminase, destructive enzymes |
| (d)        | Lymphocytes | (iv)        | Release granules containing histamine    |
|            |             |             |                                          |
|            | (a)         | (b)         | (c)                                      |
| (1)        | (iii)       | (iv)        | (ii)                                     |
| (2)        | (iv)        | (i)         | (ii)                                     |
| (3)        | (i)         | (ii)        | (iv)                                     |
| (4)        | (ii)        | (i)         | (iii)                                    |

165. If the head of cockroach is removed, it may live for few days because :

- the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
- the cockroach does not have nervous system.
- the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- the head holds a  $\frac{1}{3}$ rd of a nervous system while the rest is situated along the dorsal part of its body.

166. Name the enzyme that facilitates opening of DNA helix during transcription.

- DNA ligase
- DNA helicase
- DNA polymerase
- RNA polymerase

167. Flippers of Penguins and Dolphins are examples of :

- Adaptive radiation
- Convergent evolution
- Industrial melanism
- Natural selection

168. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

- High concentration of Estrogen
- High concentration of Progesterone
- Low concentration of LH
- Low concentration of FSH

169. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9$  bp, then the length of the DNA is approximately :

- 2.0 meters
- 2.5 meters
- 2.2 meters
- 2.7 meters

170. Match the following columns and select the correct option.

| Column - I |                       | Column - II |                                    |
|------------|-----------------------|-------------|------------------------------------|
| (a)        | Placenta              | (i)         | Androgens                          |
| (b)        | Zona pellucida        | (ii)        | Human Chorionic Gonadotropin (hCG) |
| (c)        | Bulbo-urethral glands | (iii)       | Layer of the ovum                  |
| (d)        | Leydig cells          | (iv)        | Lubrication of the Penis           |

- |     |       |       |      |       |
|-----|-------|-------|------|-------|
|     | (a)   | (b)   | (c)  | (d)   |
| (1) | (iv)  | (iii) | (i)  | (ii)  |
| (2) | (i)   | (iv)  | (ii) | (iii) |
| (3) | (iii) | (ii)  | (iv) | (i)   |
| (4) | (ii)  | (iii) | (iv) | (i)   |

171. Match the following columns and select the correct option.

| Column - I |                               | Column - II |                                  |
|------------|-------------------------------|-------------|----------------------------------|
| (a)        | <i>Clostridium butylicum</i>  | (i)         | Cyclosporin-A                    |
| (b)        | <i>Trichoderma polysporum</i> | (ii)        | Butyric Acid                     |
| (c)        | <i>Monascus purpureus</i>     | (iii)       | Citric Acid                      |
| (d)        | <i>Aspergillus niger</i>      | (iv)        | Blood cholesterol lowering agent |

- |     |       |       |      |       |
|-----|-------|-------|------|-------|
|     | (a)   | (b)   | (c)  | (d)   |
| (1) | (iii) | (iv)  | (ii) | (i)   |
| (2) | (ii)  | (i)   | (iv) | (iii) |
| (3) | (i)   | (ii)  | (iv) | (iii) |
| (4) | (iv)  | (iii) | (ii) | (i)   |

172. Goblet cells of alimentary canal are modified from :
- (1) Squamous epithelial cells
  - (2) Columnar epithelial cells
  - (3) Chondrocytes
  - (4) Compound epithelial cells
173. Experimental verification of the chromosomal theory of inheritance was done by :
- (1) Mendel
  - (2) Sutton
  - (3) Boveri
  - (4) Morgan
174. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :
- (1) Transpiration
  - (2) Root pressure
  - (3) Imbibition
  - (4) Plasmolysis
175. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :
- (1) Chitin, cholesterol
  - (2) Glycerol, trypsin
  - (3) Cellulose, lecithin
  - (4) Inulin, insulin
176. Which of the following is **not** an attribute of a population ?
- (1) Sex ratio
  - (2) Natality
  - (3) Mortality
  - (4) Species interaction
177. The enzyme enterokinase helps in conversion of :
- (1) protein into polypeptides
  - (2) trypsinogen into trypsin
  - (3) caseinogen into casein
  - (4) pepsinogen into pepsin
178. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of :
- (1) M phase
  - (2)  $G_1$  phase
  - (3) S phase
  - (4)  $G_2$  phase
179. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?
- (1) Gross primary productivity is always less than net primary productivity.
  - (2) Gross primary productivity is always more than net primary productivity.
  - (3) Gross primary productivity and Net primary productivity are one and same.
  - (4) There is no relationship between Gross primary productivity and Net primary productivity.
180. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?
- (1) Primary sludge
  - (2) Floating debris
  - (3) Effluents of primary treatment
  - (4) Activated sludge

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E2

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Space For Rough Work



**Space For Rough Work**

E2

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Space For Rough Work



Test Booklet Code

ANKHA

No. :

**F2**

This Booklet contains 24 pages.

**Do not open this Test Booklet until you are asked to do so.****Important Instructions :**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
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7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : \_\_\_\_\_

Roll Number : in figures \_\_\_\_\_

: in words \_\_\_\_\_

Centre of Examination (in Capitals) : \_\_\_\_\_

Candidate's Signature : \_\_\_\_\_ Invigilator's Signature : \_\_\_\_\_

Facsimile signature stamp of

Centre Superintendent : \_\_\_\_\_

**F2**

**2**

1. Name the enzyme that facilitates opening of DNA helix during transcription.
  - (1) DNA polymerase
  - (2) RNA polymerase
  - (3) DNA ligase
  - (4) DNA helicase
2. Which of the following would help in prevention of diuresis ?
  - (1) Atrial natriuretic factor causes vasoconstriction
  - (2) Decrease in secretion of renin by JG cells
  - (3) More water reabsorption due to undersecretion of ADH
  - (4) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone
3. Meiotic division of the secondary oocyte is completed :
  - (1) After zygote formation
  - (2) At the time of fusion of a sperm with an ovum
  - (3) Prior to ovulation
  - (4) At the time of copulation
4. Match the following concerning essential elements and their functions in plants :
 

|               |                                             |
|---------------|---------------------------------------------|
| (a) Iron      | (i) Photolysis of water                     |
| (b) Zinc      | (ii) Pollen germination                     |
| (c) Boron     | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis                       |

 Select the **correct** option :
 

|            |            |            |            |
|------------|------------|------------|------------|
| <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| (1) (iii)  | (iv)       | (ii)       | (i)        |
| (2) (iv)   | (i)        | (ii)       | (iii)      |
| (3) (ii)   | (i)        | (iv)       | (iii)      |
| (4) (iv)   | (iii)      | (ii)       | (i)        |
5. Which of the following pairs is of unicellular algae ?
  - (1) *Anabaena* and *Volvox*
  - (2) *Chlorella* and *Spirulina*
  - (3) *Laminaria* and *Sargassum*
  - (4) *Gelidium* and *Gracilaria*
6. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :
  - (1) 1 molecule of 6-C compound
  - (2) 1 molecule of 4-C compound and 1 molecule of 2-C compound
  - (3) 2 molecules of 3-C compound
  - (4) 1 molecule of 3-C compound

7. Match the following columns and select the **correct** option.

| Column - I |             | Column - II |                                          |
|------------|-------------|-------------|------------------------------------------|
| (a)        | Eosinophils | (i)         | Immune response                          |
| (b)        | Basophils   | (ii)        | Phagocytosis                             |
| (c)        | Neutrophils | (iii)       | Release histaminase, destructive enzymes |
| (d)        | Lymphocytes | (iv)        | Release granules containing histamine    |

| (a)       | (b)  | (c)   | (d)   |
|-----------|------|-------|-------|
| (1) (i)   | (ii) | (iv)  | (iii) |
| (2) (ii)  | (i)  | (iii) | (iv)  |
| (3) (iii) | (iv) | (ii)  | (i)   |
| (4) (iv)  | (i)  | (ii)  | (iii) |

8. Match the following columns and select the **correct** option.

| Column - I |                       | Column - II |                                    |
|------------|-----------------------|-------------|------------------------------------|
| (a)        | Placenta              | (i)         | Androgens                          |
| (b)        | Zona pellucida        | (ii)        | Human Chorionic Gonadotropin (hCG) |
| (c)        | Bulbo-urethral glands | (iii)       | Layer of the ovum                  |
| (d)        | Leydig cells          | (iv)        | Lubrication of the Penis           |

| (a)       | (b)   | (c)  | (d)   |
|-----------|-------|------|-------|
| (1) (iii) | (ii)  | (iv) | (i)   |
| (2) (ii)  | (iii) | (iv) | (i)   |
| (3) (iv)  | (iii) | (i)  | (ii)  |
| (4) (i)   | (iv)  | (ii) | (iii) |

9. The plant parts which consist of two generations - one within the other :

- (a) Pollen grains inside the anther
  - (b) Germinated pollen grain with two male gametes
  - (c) Seed inside the fruit
  - (d) Embryo sac inside the ovule
- (1) (c) and (d)
  - (2) (a) and (d)
  - (3) (a) only
  - (4) (a), (b) and (c)

10. Which of the following statements about inclusion bodies is **incorrect** ?
- (1) They lie free in the cytoplasm.
  - (2) These represent reserve material in cytoplasm.
  - (3) They are not bound by any membrane.
  - (4) These are involved in ingestion of food particles.
11. Strobili or cones are found in :
- (1) *Marchantia*
  - (2) *Equisetum*
  - (3) *Salvinia*
  - (4) *Pteris*
12. Montreal protocol was signed in 1987 for control of :
- (1) Release of Green House gases
  - (2) Disposal of e-wastes
  - (3) Transport of Genetically modified organisms from one country to another
  - (4) Emission of ozone depleting substances
13. Which of the following statements is **correct** ?
- (1) Adenine pairs with thymine through three H-bonds.
  - (2) Adenine does not pair with thymine.
  - (3) Adenine pairs with thymine through two H-bonds.
  - (4) Adenine pairs with thymine through one H-bond.
14. The body of the ovule is fused within the funicle at :
- (1) Nucellus
  - (2) Chalaza
  - (3) Hilum
  - (4) Micropyle
15. The sequence that controls the copy number of the linked DNA in the vector, is termed :
- (1) Palindromic sequence
  - (2) Recognition site
  - (3) Selectable marker
  - (4) Ori site
16. Identify the **wrong** statement with regard to Restriction Enzymes.
- (1) They are useful in genetic engineering.
  - (2) Sticky ends can be joined by using DNA ligases.
  - (3) Each restriction enzyme functions by inspecting the length of a DNA sequence.
  - (4) They cut the strand of DNA at palindromic sites.
17. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :
- (1) Ammonia and oxygen
  - (2) Ammonia and hydrogen
  - (3) Ammonia alone
  - (4) Nitrate alone
18. In light reaction, plastoquinone facilitates the transfer of electrons from :
- (1) PS-I to  $\text{NADP}^+$
  - (2) PS-I to ATP synthase
  - (3) PS-II to  $\text{Cytb}_6\text{f}$  complex
  - (4)  $\text{Cytb}_6\text{f}$  complex to PS-I
19. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?
- (1) Low concentration of LH
  - (2) Low concentration of FSH
  - (3) High concentration of Estrogen
  - (4) High concentration of Progesterone
20. The first phase of translation is :
- (1) Aminoacylation of tRNA
  - (2) Recognition of an anti-codon
  - (3) Binding of mRNA to ribosome
  - (4) Recognition of DNA molecule
21. The roots that originate from the base of the stem are :
- (1) Prop roots
  - (2) Lateral roots
  - (3) Fibrous roots
  - (4) Primary roots

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22. Identify the **wrong** statement with reference to transport of oxygen.

- (1) Higher  $H^+$  conc. in alveoli favours the formation of oxyhaemoglobin.
- (2) Low  $pCO_2$  in alveoli favours the formation of oxyhaemoglobin.
- (3) Binding of oxygen with haemoglobin is mainly related to partial pressure of  $O_2$ .
- (4) Partial pressure of  $CO_2$  can interfere with  $O_2$  binding with haemoglobin.

23. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

- (1) Acetocarmine in UV radiation
- (2) Ethidium bromide in infrared radiation
- (3) Acetocarmine in bright blue light
- (4) Ethidium bromide in UV radiation

24. The enzyme enterokinase helps in conversion of :

- (1) caseinogen into casein
- (2) pepsinogen into pepsin
- (3) protein into polypeptides
- (4) trypsinogen into trypsin

25. Experimental verification of the chromosomal theory of inheritance was done by :

- (1) Boveri
- (2) Morgan
- (3) Mendel
- (4) Sutton

26. According to Robert May, the global species diversity is about :

- (1) 50 million
- (2) 7 million
- (3) 1.5 million
- (4) 20 million

27. Match the organism with its use in biotechnology.

- |                                      |                                          |
|--------------------------------------|------------------------------------------|
| (a) <i>Bacillus thuringiensis</i>    | (i) Cloning vector                       |
| (b) <i>Thermus aquaticus</i>         | (ii) Construction of first rDNA molecule |
| (c) <i>Agrobacterium tumefaciens</i> | (iii) DNA polymerase                     |
| (d) <i>Salmonella typhimurium</i>    | (iv) Cry proteins                        |

Select the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iii) | (ii)  | (iv)  | (i)  |
| (2) | (iii) | (iv)  | (i)   | (ii) |
| (3) | (ii)  | (iv)  | (iii) | (i)  |
| (4) | (iv)  | (iii) | (i)   | (ii) |

28. Identify the **correct** statement with regard to  $G_1$  phase (Gap 1) of interphase.

- (1) Cell is metabolically active, grows but does not replicate its DNA.
- (2) Nuclear Division takes place.
- (3) DNA synthesis or replication takes place.
- (4) Reorganisation of all cell components takes place.

29. Which of the following is **correct** about viroids ?

- (1) They have DNA with protein coat.
- (2) They have free DNA without protein coat.
- (3) They have RNA with protein coat.
- (4) They have free RNA without protein coat.

30. The transverse section of a plant shows following anatomical features :

- (a) Large number of scattered vascular bundles surrounded by bundle sheath.
- (b) Large conspicuous parenchymatous ground tissue.
- (c) Vascular bundles conjoint and closed.
- (d) Phloem parenchyma absent.

Identify the category of plant and its part :

- (1) Dicotyledonous stem
- (2) Dicotyledonous root
- (3) Monocotyledonous stem
- (4) Monocotyledonous root

31. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
  - (2)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
  - (3)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $800^\circ\text{C}$
  - (4)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_4$  and water vapor at  $800^\circ\text{C}$
32. Identify the basic amino acid from the following.
- (1) Lysine
  - (2) Valine
  - (3) Tyrosine
  - (4) Glutamic Acid
33. Snow-blindness in Antarctic region is due to :
- (1) High reflection of light from snow
  - (2) Damage to retina caused by infra-red rays
  - (3) Freezing of fluids in the eye by low temperature
  - (4) Inflammation of cornea due to high dose of UV-B radiation
34. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of :
- (1) S phase
  - (2)  $G_2$  phase
  - (3) M phase
  - (4)  $G_1$  phase
35. Which of the following regions of the globe exhibits highest species diversity ?
- (1) Himalayas
  - (2) Amazon forests
  - (3) Western Ghats of India
  - (4) Madagascar
36. Identify the **incorrect** statement.
- (1) Sapwood is the innermost secondary xylem and is lighter in colour.
  - (2) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
  - (3) Heart wood does not conduct water but gives mechanical support.
  - (4) Sapwood is involved in conduction of water and minerals from root to leaf.
37. Floridean starch has structure similar to :
- (1) Mannitol and algin
  - (2) Laminarin and cellulose
  - (3) Starch and cellulose
  - (4) Amylopectin and glycogen
38. Which of the following is **not** an attribute of a population ?
- (1) Mortality
  - (2) Species interaction
  - (3) Sex ratio
  - (4) Natality
39. The number of substrate level phosphorylations in one turn of citric acid cycle is :
- (1) Two
  - (2) Three
  - (3) Zero
  - (4) One
40. Identify the **correct** statement with reference to human digestive system.
- (1) Ileum is a highly coiled part.
  - (2) Vermiform appendix arises from duodenum.
  - (3) Ileum opens into small intestine.
  - (4) Serosa is the innermost layer of the alimentary canal.
41. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?
- (1) ICSI and ZIFT
  - (2) GIFT and ICSI
  - (3) ZIFT and IUT
  - (4) GIFT and ZIFT

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42. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?
- (1) Gross primary productivity and Net primary productivity are one and same.
  - (2) There is no relationship between Gross primary productivity and Net primary productivity.
  - (3) Gross primary productivity is always less than net primary productivity.
  - (4) Gross primary productivity is always more than net primary productivity.
43. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- (1) Ethylene
  - (2) Absciscic acid
  - (3) Cytokinin
  - (4) Gibberellin
44. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :
- (1) Defence action
  - (2) Effect on reproduction
  - (3) Nutritive value
  - (4) Growth response
45. Select the **correct** match.
- |                         |   |                                          |
|-------------------------|---|------------------------------------------|
| (1) Sickle cell anaemia | - | Autosomal recessive trait, chromosome-11 |
| (2) Thalassemia         | - | X linked                                 |
| (3) Haemophilia         | - | Y linked                                 |
| (4) Phenylketonuria     | - | Autosomal dominant trait                 |
46. Select the **correct** statement.
- (1) Insulin acts on pancreatic cells and adipocytes.
  - (2) Insulin is associated with hyperglycemia.
  - (3) Glucocorticoids stimulate gluconeogenesis.
  - (4) Glucagon is associated with hypoglycemia.

47. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?
- (a) Darwin's Finches of Galapagos islands.
  - (b) Herbicide resistant weeds.
  - (c) Drug resistant eukaryotes.
  - (d) Man-created breeds of domesticated animals like dogs.
- (1) (b), (c) and (d)
  - (2) only (d)
  - (3) only (a)
  - (4) (a) and (c)
48. Choose the **correct** pair from the following :
- |                  |   |                                            |
|------------------|---|--------------------------------------------|
| (1) Nucleases    | - | Separate the two strands of DNA            |
| (2) Exonucleases | - | Make cuts at specific positions within DNA |
| (3) Ligases      | - | Join the two DNA molecules                 |
| (4) Polymerases  | - | Break the DNA into fragments               |
49. Embryological support for evolution was disapproved by :
- (1) Charles Darwin
  - (2) Oparin
  - (3) Karl Ernst von Baer
  - (4) Alfred Wallace
50. Goblet cells of alimentary canal are modified from :
- (1) Chondrocytes
  - (2) Compound epithelial cells
  - (3) Squamous epithelial cells
  - (4) Columnar epithelial cells
51. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :
- (1) Plant nematodes
  - (2) Insect predators
  - (3) Insect pests
  - (4) Fungal diseases

52. Which of the following statements are **true** for the phylum-Chordata ?

- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
- (b) In Vertebrata notochord is present during the embryonic period only.
- (c) Central nervous system is dorsal and hollow.
- (d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.
- (1) (a) and (b)
- (2) (b) and (c)
- (3) (d) and (c)
- (4) (c) and (a)

53. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?

- (1) Effluents of primary treatment
- (2) Activated sludge
- (3) Primary sludge
- (4) Floating debris

54. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

- (1) Cellulose, lecithin
- (2) Inulin, insulin
- (3) Chitin, cholesterol
- (4) Glycerol, trypsin

55. Match the following diseases with the causative organism and select the **correct** option.

| Column - I     |       | Column - II        |       |
|----------------|-------|--------------------|-------|
| (a) Typhoid    | (i)   | <i>Wuchereria</i>  |       |
| (b) Pneumonia  | (ii)  | <i>Plasmodium</i>  |       |
| (c) Filariasis | (iii) | <i>Salmonella</i>  |       |
| (d) Malaria    | (iv)  | <i>Haemophilus</i> |       |
| (a)            | (b)   | (c)                | (d)   |
| (1) (ii)       | (i)   | (iii)              | (iv)  |
| (2) (iv)       | (i)   | (ii)               | (iii) |
| (3) (i)        | (iii) | (ii)               | (iv)  |
| (4) (iii)      | (iv)  | (i)                | (ii)  |

56. Match the following columns and select the **correct** option.

| Column - I                        |       | Column - II                      |       |
|-----------------------------------|-------|----------------------------------|-------|
| (a) <i>Clostridium butylicum</i>  | (i)   | Cyclosporin-A                    |       |
| (b) <i>Trichoderma polysporum</i> | (ii)  | Butyric Acid                     |       |
| (c) <i>Monascus purpureus</i>     | (iii) | Citric Acid                      |       |
| (d) <i>Aspergillus niger</i>      | (iv)  | Blood cholesterol lowering agent |       |
| (a)                               | (b)   | (c)                              | (d)   |
| (1) (i)                           | (ii)  | (iv)                             | (iii) |
| (2) (iv)                          | (iii) | (ii)                             | (i)   |
| (3) (iii)                         | (iv)  | (ii)                             | (i)   |
| (4) (ii)                          | (i)   | (iv)                             | (iii) |

57. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?

- (1) Cross breeding
- (2) Inbreeding
- (3) Out crossing
- (4) Mutational breeding

58. Select the **correct** events that occur during inspiration.

- (a) Contraction of diaphragm
- (b) Contraction of external inter-costal muscles
- (c) Pulmonary volume decreases
- (d) Intra pulmonary pressure increases
- (1) (a), (b) and (d)
- (2) only (d)
- (3) (a) and (b)
- (4) (c) and (d)

59. Match the following columns and select the **correct** option.

| Column - I                                                       |       | Column - II       |       |
|------------------------------------------------------------------|-------|-------------------|-------|
| (a) Gregarious, polyphagous pest                                 | (i)   | <i>Asterias</i>   |       |
| (b) Adult with radial symmetry and larva with bilateral symmetry | (ii)  | Scorpion          |       |
| (c) Book lungs                                                   | (iii) | <i>Ctenoplane</i> |       |
| (d) Bioluminescence                                              | (iv)  | <i>Locusta</i>    |       |
| (a)                                                              | (b)   | (c)               | (d)   |
| (1) (iii)                                                        | (ii)  | (i)               | (iv)  |
| (2) (ii)                                                         | (i)   | (iii)             | (iv)  |
| (3) (i)                                                          | (iii) | (ii)              | (iv)  |
| (4) (iv)                                                         | (i)   | (ii)              | (iii) |

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60. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

- (1) Golgi bodies
- (2) Polysomes
- (3) Endoplasmic reticulum
- (4) Peroxisomes

61. The specific palindromic sequence which is recognized by EcoRI is :

- (1) 5' - CTTAAG - 3'  
3' - GAATTC - 5'
- (2) 5' - GGATCC - 3'  
3' - CCTAGG - 5'
- (3) 5' - GAATTC - 3'  
3' - CTTAAG - 5'
- (4) 5' - GGAACC - 3'  
3' - CCTTGG - 5'

62. Dissolution of the synaptonemal complex occurs during :

- (1) Diplotene
- (2) Leptotene
- (3) Pachytene
- (4) Zygotene

63. Match the trophic levels with their **correct** species examples in grassland ecosystem.

- |                          |              |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow     |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level  | (iii) Rabbit |
| (d) Third trophic level  | (iv) Grass   |

Select the **correct** option :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iv)  | (iii) | (ii)  | (i)  |
| (2) | (i)   | (ii)  | (iii) | (iv) |
| (3) | (ii)  | (iii) | (iv)  | (i)  |
| (4) | (iii) | (ii)  | (i)   | (iv) |

64. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

- (1) 14
- (2) 8
- (3) 4
- (4) 2

65. Match the following columns and select the **correct** option.

- | Column - I                         | Column - II                        |
|------------------------------------|------------------------------------|
| (a) Bt cotton                      | (i) Gene therapy                   |
| (b) Adenosine deaminase deficiency | (ii) Cellular defence              |
| (c) RNAi                           | (iii) Detection of HIV infection   |
| (d) PCR                            | (iv) <i>Bacillus thuringiensis</i> |

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (ii)  | (iii) | (iv)  | (i)   |
| (2) | (i)   | (ii)  | (iii) | (iv)  |
| (3) | (iv)  | (i)   | (ii)  | (iii) |
| (4) | (iii) | (ii)  | (i)   | (iv)  |

66. Match the following columns and select the **correct** option.

- | Column - I                     | Column - II          |
|--------------------------------|----------------------|
| (a) 6 - 15 pairs of gill slits | (i) <i>Trygon</i>    |
| (b) Heterocercal caudal fin    | (ii) Cyclostomes     |
| (c) Air Bladder                | (iii) Chondrichthyes |
| (d) Poison sting               | (iv) Osteichthyes    |

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iv)  | (ii)  | (iii) | (i)  |
| (2) | (i)   | (iv)  | (iii) | (ii) |
| (3) | (ii)  | (iii) | (iv)  | (i)  |
| (4) | (iii) | (iv)  | (i)   | (ii) |

67. The process of growth is maximum during :

- (1) Senescence
- (2) Dormancy
- (3) Log phase
- (4) Lag phase

68. Identify the **wrong** statement with reference to immunity.

- (1) Active immunity is quick and gives full response.
- (2) Foetus receives some antibodies from mother, it is an example for passive immunity.
- (3) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
- (4) When ready-made antibodies are directly given, it is called "Passive immunity".

69. Match the following columns and select the correct option.

| Column - I |                | Column - II |                                         |
|------------|----------------|-------------|-----------------------------------------|
| (a)        | Floating Ribs  | (i)         | Located between second and seventh ribs |
| (b)        | Acromion       | (ii)        | Head of the Humerus                     |
| (c)        | Scapula        | (iii)       | Clavicle                                |
| (d)        | Glenoid cavity | (iv)        | Do not connect with the sternum         |

| (a) | (b)   | (c)   | (d)  |
|-----|-------|-------|------|
| (1) | (iii) | (ii)  | (iv) |
| (2) | (iv)  | (iii) | (i)  |
| (3) | (ii)  | (iv)  | (i)  |
| (4) | (i)   | (iii) | (ii) |

70. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9$  bp, then the length of the DNA is approximately :
- 2.2 meters
  - 2.7 meters
  - 2.0 meters
  - 2.5 meters

71. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- Ketonuria and Glycosuria
  - Renal calculi and Hyperglycaemia
  - Uremia and Ketonuria
  - Uremia and Renal Calculi

72. Bilaterally symmetrical and acoelomate animals are exemplified by :
- Aschelminthes
  - Annelida
  - Ctenophora
  - Platyhelminthes

73. Ray florets have :
- Hypogynous ovary
  - Half inferior ovary
  - Inferior ovary
  - Superior ovary

74. The infectious stage of *Plasmodium* that enters the human body is :

- Female gametocytes
- Male gametocytes
- Trophozoites
- Sporozoites

75. Which of the following statements is **not** correct ?

- The functional insulin has A and B chains linked together by hydrogen bonds.
- Genetically engineered insulin is produced in *E-Coli*.
- In man insulin is synthesised as a proinsulin.
- The proinsulin has an extra peptide called C-peptide.

76. In water hyacinth and water lily, pollination takes place by :

- wind and water
- insects and water
- insects or wind
- water currents only

77. Cuboidal epithelium with brush border of microvilli is found in :

- proximal convoluted tubule of nephron
- eustachian tube
- lining of intestine
- ducts of salivary glands

78. Match the following columns and select the correct option.

| Column - I |                 | Column - II |                    |
|------------|-----------------|-------------|--------------------|
| (a)        | Pituitary gland | (i)         | Grave's disease    |
| (b)        | Thyroid gland   | (ii)        | Diabetes mellitus  |
| (c)        | Adrenal gland   | (iii)       | Diabetes insipidus |
| (d)        | Pancreas        | (iv)        | Addison's disease  |

| (a) | (b)   | (c)   | (d)  |
|-----|-------|-------|------|
| (1) | (iii) | (i)   | (iv) |
| (2) | (ii)  | (i)   | (iv) |
| (3) | (iv)  | (iii) | (i)  |
| (4) | (iii) | (ii)  | (i)  |

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79. Which one of the following is the most abundant protein in the animals ?

- (1) Lectin
- (2) Insulin
- (3) Haemoglobin
- (4) Collagen

80. If the head of cockroach is removed, it may live for few days because :

- (1) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- (2) the head holds a  $\frac{1}{3}$ <sup>rd</sup> of a nervous system while the rest is situated along the dorsal part of its body.
- (3) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
- (4) the cockroach does not have nervous system.

81. Flippers of Penguins and Dolphins are examples of :

- (1) Industrial melanism
- (2) Natural selection
- (3) Adaptive radiation
- (4) Convergent evolution

82. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :

- (1) Imbibition
- (2) Plasmolysis
- (3) Transpiration
- (4) Root pressure

83. Match the following with respect to meiosis :

- |                |                     |
|----------------|---------------------|
| (a) Zygotene   | (i) Terminalization |
| (b) Pachytene  | (ii) Chiasmata      |
| (c) Diplotene  | (iii) Crossing over |
| (d) Diakinesis | (iv) Synapsis       |

Select the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (i)   | (ii)  | (iv)  | (iii) |
| (2) | (ii)  | (iv)  | (iii) | (i)   |
| (3) | (iii) | (iv)  | (i)   | (ii)  |
| (4) | (iv)  | (iii) | (ii)  | (i)   |

84. The QRS complex in a standard ECG represents :

- (1) Depolarisation of ventricles
- (2) Repolarisation of ventricles
- (3) Repolarisation of auricles
- (4) Depolarisation of auricles

85. Select the option including all sexually transmitted diseases.

- (1) AIDS, Malaria, Filariasis
- (2) Cancer, AIDS, Syphilis
- (3) Gonorrhoea, Syphilis, Genital herpes
- (4) Gonorrhoea, Malaria, Genital herpes

86. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

- (1) When  $I^A$  and  $I^B$  are present together, they express same type of sugar.
- (2) Allele 'i' does not produce any sugar.
- (3) The gene (I) has three alleles.
- (4) A person will have only two of the three alleles.

87. Which of the following is **not** an inhibitory substance governing seed dormancy ?

- (1) Phenolic acid
- (2) Para-ascorbic acid
- (3) Gibberellic acid
- (4) Abscissic acid

88. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                                 |
|------------|-----------------|-------------|---------------------------------|
| (a)        | Organ of Corti  | (i)         | Connects middle ear and pharynx |
| (b)        | Cochlea         | (ii)        | Coiled part of the labyrinth    |
| (c)        | Eustachian tube | (iii)       | Attached to the oval window     |
| (d)        | Stapes          | (iv)        | Located on the basilar membrane |

|     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iv)  | (ii)  | (i)  | (iii) |
| (2) | (i)   | (ii)  | (iv) | (iii) |
| (3) | (ii)  | (iii) | (i)  | (iv)  |
| (4) | (iii) | (i)   | (iv) | (ii)  |

89. The ovary is half inferior in :

- (1) Sunflower
- (2) Plum
- (3) Brinjal
- (4) Mustard

90. Match the following :

|     |                                 |       |          |
|-----|---------------------------------|-------|----------|
| (a) | Inhibitor of catalytic activity | (i)   | Ricin    |
| (b) | Possess peptide bonds           | (ii)  | Malonate |
| (c) | Cell wall material in fungi     | (iii) | Chitin   |
| (d) | Secondary metabolite            | (iv)  | Collagen |

Choose the **correct** option from the following :

|     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iii) | (iv)  | (i)   | (ii) |
| (2) | (ii)  | (iii) | (i)   | (iv) |
| (3) | (ii)  | (iv)  | (iii) | (i)  |
| (4) | (iii) | (i)   | (iv)  | (ii) |

91. Which of the following oxoacid of sulphur has –O–O– linkage ?

- (1)  $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid
- (2)  $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid
- (3)  $\text{H}_2\text{SO}_3$ , sulphurous acid
- (4)  $\text{H}_2\text{SO}_4$ , sulphuric acid

92. An increase in the concentration of the reactants of a reaction leads to change in :

- (1) threshold energy
- (2) collision frequency
- (3) activation energy
- (4) heat of reaction

93. Identify the **incorrect** match.

| Name            | IUPAC Official Name |              |
|-----------------|---------------------|--------------|
| (a) Unnilunium  | (i)                 | Mendelevium  |
| (b) Unniltrium  | (ii)                | Lawrencium   |
| (c) Unnilhexium | (iii)               | Seaborgium   |
| (d) Unununnium  | (iv)                | Darmstadtium |
| (1)             | (c), (iii)          |              |
| (2)             | (d), (iv)           |              |
| (3)             | (a), (i)            |              |
| (4)             | (b), (ii)           |              |

94. A mixture of  $\text{N}_2$  and Ar gases in a cylinder contains 7 g of  $\text{N}_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $\text{N}_2$  is :

[Use atomic masses (in  $\text{g mol}^{-1}$ ) : N = 14, Ar = 40]

- (1) 15 bar
- (2) 18 bar
- (3) 9 bar
- (4) 12 bar

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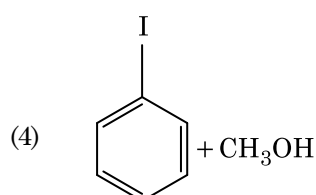
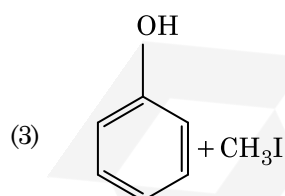
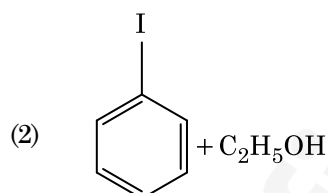
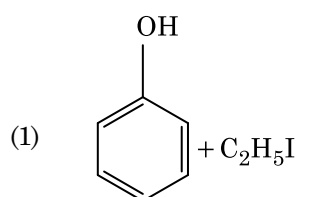
95. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

- (1) Cross Cannizzaro's reaction
- (2) Cross Aldol condensation
- (3) Aldol condensation
- (4) Cannizzaro's reaction

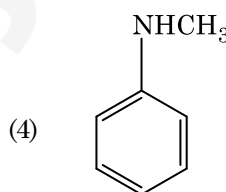
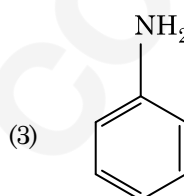
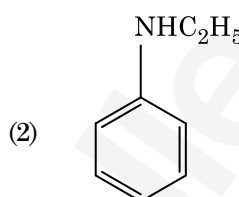
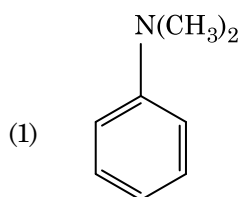
96. Which one of the followings has maximum number of atoms ?

- (1) 1 g of  $O_2(g)$  [Atomic mass of O = 16]
- (2) 1 g of  $Li(s)$  [Atomic mass of Li = 7]
- (3) 1 g of  $Ag(s)$  [Atomic mass of Ag = 108]
- (4) 1 g of  $Mg(s)$  [Atomic mass of Mg = 24]

97. Anisole on cleavage with HI gives :



98. Which of the following amine will give the carbylamine test ?



99. Identify the **incorrect** statement.

- (1) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- (2) The oxidation states of chromium in  $CrO_4^{2-}$  and  $Cr_2O_7^{2-}$  are not the same.
- (3)  $Cr^{2+}(d^4)$  is a stronger reducing agent than  $Fe^{2+}(d^6)$  in water.
- (4) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

100. Which of the following is a basic amino acid ?

- (1) Tyrosine
- (2) Lysine
- (3) Serine
- (4) Alanine

101. Which of the following is a natural polymer ?

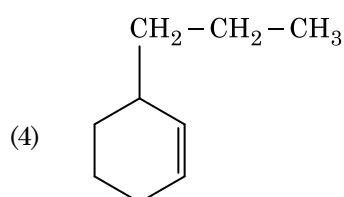
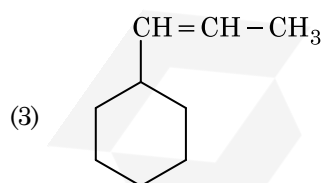
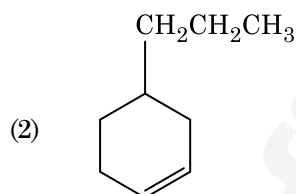
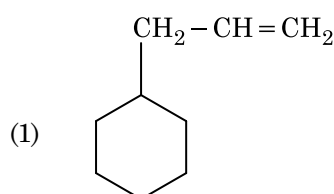
- (1) polybutadiene
- (2) poly (Butadiene-acrylonitrile)
- (3) *cis*-1,4-polyisoprene
- (4) poly (Butadiene-styrene)

102. Match the following and identify the **correct** option.

- |     |                               |       |                                                                         |
|-----|-------------------------------|-------|-------------------------------------------------------------------------|
| (a) | CO(g) + H <sub>2</sub> (g)    | (i)   | Mg(HCO <sub>3</sub> ) <sub>2</sub> + Ca(HCO <sub>3</sub> ) <sub>2</sub> |
| (b) | Temporary hardness of water   | (ii)  | An electron deficient hydride                                           |
| (c) | B <sub>2</sub> H <sub>6</sub> | (iii) | Synthesis gas                                                           |
| (d) | H <sub>2</sub> O <sub>2</sub> | (iv)  | Non-planar structure                                                    |

- |     | (a)   | (b)   | (c)  | (d)  |
|-----|-------|-------|------|------|
| (1) | (iii) | (iv)  | (ii) | (i)  |
| (2) | (i)   | (iii) | (ii) | (iv) |
| (3) | (iii) | (i)   | (ii) | (iv) |
| (4) | (iii) | (ii)  | (i)  | (iv) |

103. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



104. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce 2.0 g of the reactant to 0.2 g is :

- (1) 500 s
- (2) 1000 s
- (3) 100 s
- (4) 200 s

105. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

- (1) H<sub>2</sub>S gas
- (2) SO<sub>2</sub> gas
- (3) Hydrogen gas
- (4) Oxygen gas

106. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

- (1)  $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$
- (2)  $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
- (3)  $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
- (4)  $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$

107. Sucrose on hydrolysis gives :

- (1)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose
- (2)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose
- (3)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose
- (4)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose

108. Which of the following is **not** correct about carbon monoxide ?

- (1) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
- (2) It is produced due to incomplete combustion.
- (3) It forms carboxyhaemoglobin.
- (4) It reduces oxygen carrying ability of blood.

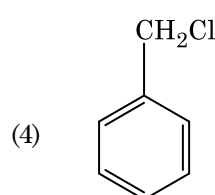
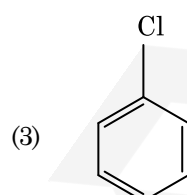
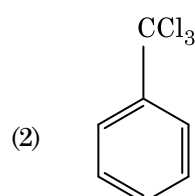
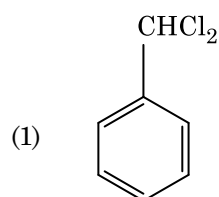
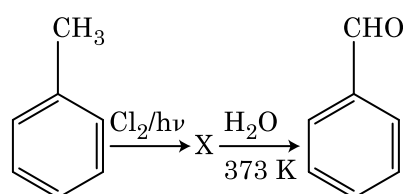
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109. The mixture which shows positive deviation from Raoult's law is :

- (1) Acetone + Chloroform
- (2) Chloroethane + Bromoethane
- (3) Ethanol + Acetone
- (4) Benzene + Toluene

110. Identify compound X in the following sequence of reactions :



111. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12\text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality  $0.078\text{ m}$  containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

- (1)  $0.40\text{ K}$
- (2)  $0.60\text{ K}$
- (3)  $0.20\text{ K}$
- (4)  $0.80\text{ K}$

112. Which of the following is a cationic detergent ?

- (1) Cetyltrimethyl ammonium bromide
- (2) Sodium dodecylbenzene sulphonate
- (3) Sodium lauryl sulphate
- (4) Sodium stearate

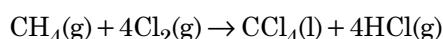
113. Paper chromatography is an example of :

- (1) Thin layer chromatography
- (2) Column chromatography
- (3) Adsorption chromatography
- (4) Partition chromatography

114. Identify the **correct** statement from the following :

- (1) Vapour phase refining is carried out for Nickel by Van Arkel method.
- (2) Pig iron can be moulded into a variety of shapes.
- (3) Wrought iron is impure iron with 4% carbon.
- (4) Blister copper has blistered appearance due to evolution of  $\text{CO}_2$ .

115. What is the change in oxidation number of carbon in the following reaction ?

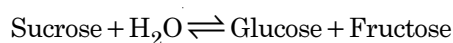


- (1)  $-4$  to  $+4$
- (2)  $0$  to  $-4$
- (3)  $+4$  to  $+4$
- (4)  $0$  to  $+4$

116. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

- $\beta$ -Elimination reaction
  - Follows Zaitsev rule
  - Dehydrohalogenation reaction
  - Dehydration reaction
- (b), (c), (d)
  - (a), (b), (d)
  - (a), (b), (c)
  - (a), (c), (d)

117. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\ominus$  at the same temperature will be :

- $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
- $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$

118. Match the following :

| Oxide                       | Nature          |
|-----------------------------|-----------------|
| (a) CO                      | (i) Basic       |
| (b) BaO                     | (ii) Neutral    |
| (c) $\text{Al}_2\text{O}_3$ | (iii) Acidic    |
| (d) $\text{Cl}_2\text{O}_7$ | (iv) Amphoteric |

Which of the following is **correct** option ?

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iii) | (iv)  | (i)   | (ii)  |
| (2) | (iv)  | (iii) | (ii)  | (i)   |
| (3) | (i)   | (ii)  | (iii) | (iv)  |
| (4) | (ii)  | (i)   | (iv)  | (iii) |

119. Identify a molecule which does **not** exist.

- $\text{C}_2$
- $\text{O}_2$
- $\text{He}_2$
- $\text{Li}_2$

120. The number of Faradays(F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of Ca =  $40 \text{ g mol}^{-1}$ ) is :

- 3
- 4
- 1
- 2

121. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through  $\text{Cu}^{2+}$  (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

- $\text{Cu}(\text{OH})_2$
- $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
- $\text{CuSO}_4$
- $[\text{Cu}(\text{NH}_3)_4]^{2+}$

122. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

- Tert. butyl alcohol
- Isobutyl alcohol
- Isopropyl alcohol
- Sec. butyl alcohol

123. The number of protons, neutrons and electrons in  $^{175}_{71}\text{Lu}$ , respectively, are :

- 71, 71 and 104
- 175, 104 and 71
- 71, 104 and 71
- 104, 71 and 71

124. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

- n-Heptane
- n-Butane
- n-Hexane
- 2,3-Dimethylbutane

125. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and NaCl. Which of the following compound(s) crystallise(s) ?

- Only  $\text{MgCl}_2$
- NaCl,  $\text{MgCl}_2$  and  $\text{CaCl}_2$
- Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$
- Only NaCl

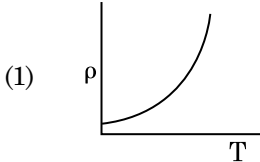
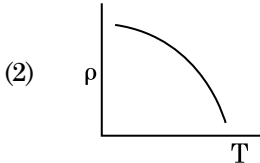
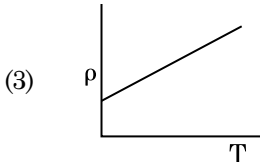
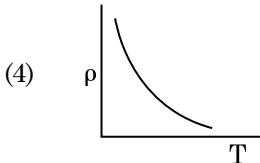
126. Measuring Zeta potential is useful in determining which property of colloidal solution ?

- Stability of the colloidal particles
- Size of the colloidal particles
- Viscosity
- Solubility

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127. Find out the solubility of  $\text{Ni}(\text{OH})_2$  in 0.1 M NaOH. Given that the ionic product of  $\text{Ni}(\text{OH})_2$  is  $2 \times 10^{-15}$ .
- $1 \times 10^{-13} \text{ M}$
  - $1 \times 10^8 \text{ M}$
  - $2 \times 10^{-13} \text{ M}$
  - $2 \times 10^{-8} \text{ M}$
128. For the reaction,  $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$ , the **correct** option is :
- $\Delta_r H < 0$  and  $\Delta_r S > 0$
  - $\Delta_r H < 0$  and  $\Delta_r S < 0$
  - $\Delta_r H > 0$  and  $\Delta_r S > 0$
  - $\Delta_r H > 0$  and  $\Delta_r S < 0$
129. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is :
- 5.92 BM
  - 2.84 BM
  - 3.87 BM
  - 4.90 BM
130. Identify the **correct** statements from the following :
- $\text{CO}_2(\text{g})$  is used as refrigerant for ice-cream and frozen food.
  - The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.
  - ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
  - CO is colorless and odourless gas.
- (b) and (c) only
  - (c) and (d) only
  - (a), (b) and (c) only
  - (a) and (c) only
131. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.
- Calcium
  - Potassium
  - Iron
  - Copper
132. Which of the following set of molecules will have zero dipole moment ?
- Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
  - Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
  - Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
  - Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
133. The correct option for free expansion of an ideal gas under adiabatic condition is :
- $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
  - $q > 0$ ,  $\Delta T > 0$  and  $w > 0$
  - $q = 0$ ,  $\Delta T = 0$  and  $w = 0$
  - $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
134. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
- $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
  - $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
  - $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
135. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?
- R effect of –  $\text{CH}_3$  groups
  - Hyperconjugation
  - I effect of –  $\text{CH}_3$  groups
  - + R effect of –  $\text{CH}_3$  groups

136. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :
- 536 Hz
  - 537 Hz
  - 523 Hz
  - 524 Hz
137. The increase in the width of the depletion region in a p-n junction diode is due to :
- both forward bias and reverse bias
  - increase in forward current
  - forward bias only
  - reverse bias only
138. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio :
- $\frac{3}{2}$
  - $\frac{5}{3}$
  - $\frac{27}{8}$
  - $\frac{9}{4}$
139. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead C is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is :
- 1.0
  - 1.0
  - zero
  - 0.5
140. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ )
- 320 m
  - 300 m
  - 360 m
  - 340 m
141. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :
- four times
  - one-fourth
  - double
  - half
142. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature (T) for copper ?
- 
  - 
  - 
  - 

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143. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1)  $6.28 \times 10^{-5} \text{ T}$
- (2)  $3.14 \times 10^{-5} \text{ T}$
- (3)  $6.28 \times 10^{-4} \text{ T}$
- (4)  $3.14 \times 10^{-4} \text{ T}$

144. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

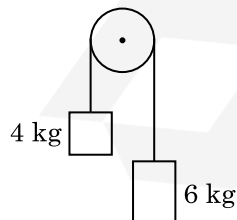
- (1) one-fourth
- (2) zero
- (3) doubled
- (4) four times

145. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

- (1) 0.5 mm
- (2) 1.0 mm
- (3) 0.01 mm
- (4) 0.25 mm

146. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



- (1)  $g/5$
- (2)  $g/10$
- (3)  $g$
- (4)  $g/2$

147. For transistor action, which of the following statements is **correct** ?

- (1) Both emitter junction as well as the collector junction are forward biased.
- (2) The base region must be very thin and lightly doped.
- (3) Base, emitter and collector regions should have same doping concentrations.
- (4) Base, emitter and collector regions should have same size.

148. For which one of the following, Bohr model is **not** valid ?

- (1) Deuteron atom
- (2) Singly ionised neon atom ( $\text{Ne}^+$ )
- (3) Hydrogen atom
- (4) Singly ionised helium atom ( $\text{He}^+$ )

149. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :

- (1) 10.0 g
- (2) 20.0 g
- (3) 2.5 g
- (4) 5.0 g

150. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : ( $c$  = speed of electromagnetic waves)

- (1)  $1 : c$
- (2)  $1 : c^2$
- (3)  $c : 1$
- (4)  $1 : 1$

151. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1)  $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
- (2)  $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
- (3)  $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
- (4)  $8.0 \times 10^{-5} \text{ T m A}^{-1}$

152. The Brewsters angle  $i_b$  for an interface should be :

- (1)  $45^\circ < i_b < 90^\circ$
- (2)  $i_b = 90^\circ$
- (3)  $0^\circ < i_b < 30^\circ$
- (4)  $30^\circ < i_b < 45^\circ$

153. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :
- $\frac{\pi}{2}$  rad
  - zero
  - $\pi$  rad
  - $\frac{3\pi}{2}$  rad
154. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.  
The centre of mass of the system from the 5 kg particle is nearly at a distance of :
- 67 cm
  - 80 cm
  - 33 cm
  - 50 cm
155. A spherical conductor of radius 10 cm has a charge of  $3.2 \times 10^{-7}$  C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?
- $$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
- $1.28 \times 10^6$  N/C
  - $1.28 \times 10^7$  N/C
  - $1.28 \times 10^4$  N/C
  - $1.28 \times 10^5$  N/C
156. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :
- $7.32 \times 10^{-7}$  rad
  - $6.00 \times 10^{-7}$  rad
  - $3.66 \times 10^{-7}$  rad
  - $1.83 \times 10^{-7}$  rad
157. A charged particle having drift velocity of  $7.5 \times 10^{-4}$  m s<sup>-1</sup> in an electric field of  $3 \times 10^{-10}$  Vm<sup>-1</sup>, has a mobility in m<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup> of :
- $2.5 \times 10^{-6}$
  - $2.25 \times 10^{-15}$
  - $2.25 \times 10^{15}$
  - $2.5 \times 10^6$
158. Taking into account of the significant figures, what is the value of  $9.99 \text{ m} - 0.0099 \text{ m}$  ?
- 9.980 m
  - 9.9 m
  - 9.9801 m
  - 9.98 m
159. The energy equivalent of 0.5 g of a substance is :
- $1.5 \times 10^{13}$  J
  - $0.5 \times 10^{13}$  J
  - $4.5 \times 10^{16}$  J
  - $4.5 \times 10^{13}$  J
160. When a uranium isotope  ${}^{235}_{92}\text{U}$  is bombarded with a neutron, it generates  ${}^{89}_{36}\text{Kr}$ , three neutrons and :
- ${}^{101}_{36}\text{Kr}$
  - ${}^{103}_{36}\text{Kr}$
  - ${}^{144}_{56}\text{Ba}$
  - ${}^{91}_{40}\text{Zr}$
161. A short electric dipole has a dipole moment of  $16 \times 10^{-9}$  C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :
- $$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
- 400 V
  - zero
  - 50 V
  - 200 V
162. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature  $27^\circ\text{C}$ .  
Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )
- 0.1 kg/m<sup>3</sup>
  - 0.02 kg/m<sup>3</sup>
  - 0.5 kg/m<sup>3</sup>
  - 0.2 kg/m<sup>3</sup>

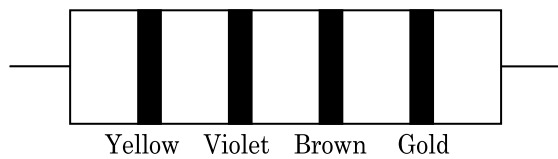
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163. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and  $T$ , absolute temperature)

- (1)  $\frac{5}{2} k_B T$
- (2)  $\frac{7}{2} k_B T$
- (3)  $\frac{1}{2} k_B T$
- (4)  $\frac{3}{2} k_B T$

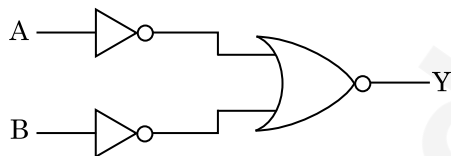
164. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

- (1) 4.7 k $\Omega$ , 5%
- (2) 470  $\Omega$ , 5%
- (3) 470 k $\Omega$ , 5%
- (4) 47 k $\Omega$ , 10%

165. For the logic circuit shown, the truth table is :



- (1)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |
- (2)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |
- (3)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |
- (4)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

166. A resistance wire connected in the left gap of a metre bridge balances a 10  $\Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1  $\Omega$  of the resistance wire is :

- (1)  $1.5 \times 10^{-1}$  m
- (2)  $1.5 \times 10^{-2}$  m
- (3)  $1.0 \times 10^{-2}$  m
- (4)  $1.0 \times 10^{-1}$  m

167. Find the torque about the origin when a force of  $3\hat{j}$  N acts on a particle whose position vector is  $2\hat{k}$  m.

- (1)  $-6\hat{i}$  N m
- (2)  $6\hat{k}$  N m
- (3)  $6\hat{i}$  N m
- (4)  $6\hat{j}$  N m

168. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is :

- (1)  $\frac{MgL}{AL_1}$
- (2)  $\frac{MgL}{A(L_1 - L)}$
- (3)  $\frac{MgL_1}{AL}$
- (4)  $\frac{Mg(L_1 - L)}{AL}$

169. A 40  $\mu$ F capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

- (1) 2.5 A
- (2) 25.1 A
- (3) 1.7 A
- (4) 2.05 A

170. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

- (1) 30 N
- (2) 24 N
- (3) 48 N
- (4) 32 N

171. An electron is accelerated from rest through a potential difference of  $V$  volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2}$  nm, the potential difference is :
- $10^3$  V
  - $10^4$  V
  - 10 V
  - $10^2$  V
172. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to :
- $\mu A$
  - $\frac{\mu A}{2}$
  - $\frac{A}{2\mu}$
  - $\frac{2A}{\mu}$
173. The solids which have the negative temperature coefficient of resistance are :
- semiconductors only
  - insulators and semiconductors
  - metals
  - insulators only
174. In a certain region of space with volume  $0.2 \text{ m}^3$ , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :
- 1 N/C
  - 5 N/C
  - zero
  - 0.5 N/C
175. Light with an average flux of  $20 \text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :
- $24 \times 10^3$  J
  - $48 \times 10^3$  J
  - $10 \times 10^3$  J
  - $12 \times 10^3$  J
176. The capacitance of a parallel plate capacitor with air as medium is  $6 \mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes  $30 \mu\text{F}$ . The permittivity of the medium is :
- $(\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2})$
- $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
177. The energy required to break one bond in DNA is  $10^{-20} \text{ J}$ . This value in eV is nearly :
- 0.06
  - 0.006
  - 6
  - 0.6
178. Dimensions of stress are :
- $[\text{ML}^0\text{T}^{-2}]$
  - $[\text{ML}^{-1}\text{T}^{-2}]$
  - $[\text{MLT}^{-2}]$
  - $[\text{ML}^2\text{T}^{-2}]$
179. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- isochoric
  - isobaric
  - isothermal
  - adiabatic
180. The mean free path for a gas, with molecular diameter  $d$  and number density  $n$  can be expressed as :
- $\frac{1}{\sqrt{2} n^2 \pi d^2}$
  - $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
  - $\frac{1}{\sqrt{2} n \pi d}$
  - $\frac{1}{\sqrt{2} n \pi d^2}$

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Space For Rough Work



**Space For Rough Work**

F2

24

Space For Rough Work



Test Booklet Code

ANKHA

No. :

**G2**

This Booklet contains 24 pages.

**Do not open this Test Booklet until you are asked to do so.****Important Instructions :**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **G2**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : \_\_\_\_\_

Roll Number : in figures \_\_\_\_\_

: in words \_\_\_\_\_

Centre of Examination (in Capitals) : \_\_\_\_\_

Candidate's Signature : \_\_\_\_\_ Invigilator's Signature : \_\_\_\_\_

Facsimile signature stamp of

Centre Superintendent : \_\_\_\_\_

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1. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?
  - (a) Darwin's Finches of Galapagos islands.
  - (b) Herbicide resistant weeds.
  - (c) Drug resistant eukaryotes.
  - (d) Man-created breeds of domesticated animals like dogs.
  - (1) (a) and (c)
  - (2) (b), (c) and (d)
  - (3) only (d)
  - (4) only (a)
2. Meiotic division of the secondary oocyte is completed :
  - (1) At the time of copulation
  - (2) After zygote formation
  - (3) At the time of fusion of a sperm with an ovum
  - (4) Prior to ovulation
3. Which of the following is **correct** about viroids ?
  - (1) They have free RNA without protein coat.
  - (2) They have DNA with protein coat.
  - (3) They have free DNA without protein coat.
  - (4) They have RNA with protein coat.
4. The plant parts which consist of two generations - one within the other :
  - (a) Pollen grains inside the anther
  - (b) Germinated pollen grain with two male gametes
  - (c) Seed inside the fruit
  - (d) Embryo sac inside the ovule
  - (1) (a), (b) and (c)
  - (2) (c) and (d)
  - (3) (a) and (d)
  - (4) (a) only
5. Experimental verification of the chromosomal theory of inheritance was done by :
  - (1) Sutton
  - (2) Boveri
  - (3) Morgan
  - (4) Mendel
6. Which of the following pairs is of unicellular algae ?
  - (1) *Gelidium* and *Gracilaria*
  - (2) *Anabaena* and *Volvox*
  - (3) *Chlorella* and *Spirulina*
  - (4) *Laminaria* and *Sargassum*
7. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :
  - (1) Growth response
  - (2) Defence action
  - (3) Effect on reproduction
  - (4) Nutritive value
8. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?
  - (1) Mutational breeding
  - (2) Cross breeding
  - (3) Inbreeding
  - (4) Out crossing
9. The infectious stage of *Plasmodium* that enters the human body is :
  - (1) Sporozoites
  - (2) Female gametocytes
  - (3) Male gametocytes
  - (4) Trophozoites
10. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :
  - (1) Root pressure
  - (2) Imbibition
  - (3) Plasmolysis
  - (4) Transpiration

11. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :

- (1)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_4$  and water vapor at  $800^\circ\text{C}$
- (2)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
- (3)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
- (4)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $800^\circ\text{C}$

12. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

- (1) Gross primary productivity is always more than net primary productivity.
- (2) Gross primary productivity and Net primary productivity are one and same.
- (3) There is no relationship between Gross primary productivity and Net primary productivity.
- (4) Gross primary productivity is always less than net primary productivity.

13. The sequence that controls the copy number of the linked DNA in the vector, is termed :

- (1) Ori site
- (2) Palindromic sequence
- (3) Recognition site
- (4) Selectable marker

14. Cuboidal epithelium with brush border of microvilli is found in :

- (1) ducts of salivary glands
- (2) proximal convoluted tubule of nephron
- (3) eustachian tube
- (4) lining of intestine

15. The body of the ovule is fused within the funicle at :

- (1) Micropyle
- (2) Nucellus
- (3) Chalaza
- (4) Hilum

16. In light reaction, plastoquinone facilitates the transfer of electrons from :

- (1)  $\text{Cytb}_6\text{f}$  complex to PS-I
- (2) PS-I to  $\text{NADP}^+$
- (3) PS-I to ATP synthase
- (4) PS-II to  $\text{Cytb}_6\text{f}$  complex

17. Match the following diseases with the causative organism and select the **correct** option.

| Column - I |            | Column - II |                    |
|------------|------------|-------------|--------------------|
| (a)        | Typhoid    | (i)         | <i>Wuchereria</i>  |
| (b)        | Pneumonia  | (ii)        | <i>Plasmodium</i>  |
| (c)        | Filariasis | (iii)       | <i>Salmonella</i>  |
| (d)        | Malaria    | (iv)        | <i>Haemophilus</i> |
| (a)        | (b)        | (c)         | (d)                |
| (1)        | (iii)      | (iv)        | (i)                |
| (2)        | (ii)       | (i)         | (iii)              |
| (3)        | (iv)       | (i)         | (ii)               |
| (4)        | (i)        | (iii)       | (ii)               |

18. Match the following columns and select the **correct** option.

| Column - I |                               | Column - II |                                  |
|------------|-------------------------------|-------------|----------------------------------|
| (a)        | <i>Clostridium butylicum</i>  | (i)         | Cyclosporin-A                    |
| (b)        | <i>Trichoderma polysporum</i> | (ii)        | Butyric Acid                     |
| (c)        | <i>Monascus purpureus</i>     | (iii)       | Citric Acid                      |
| (d)        | <i>Aspergillus niger</i>      | (iv)        | Blood cholesterol lowering agent |
| (a)        | (b)                           | (c)         | (d)                              |
| (1)        | (ii)                          | (i)         | (iv)                             |
| (2)        | (i)                           | (ii)        | (iv)                             |
| (3)        | (iv)                          | (iii)       | (ii)                             |
| (4)        | (iii)                         | (iv)        | (ii)                             |

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19. Which of the following statements are **true** for the phylum-Chordata ?

- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
- (b) In Vertebrata notochord is present during the embryonic period only.
- (c) Central nervous system is dorsal and hollow.
- (d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.

- (1) (c) and (a)
- (2) (a) and (b)
- (3) (b) and (c)
- (4) (d) and (c)

20. Goblet cells of alimentary canal are modified from :

- (1) Columnar epithelial cells
- (2) Chondrocytes
- (3) Compound epithelial cells
- (4) Squamous epithelial cells

21. Which of the following is **not** an inhibitory substance governing seed dormancy ?

- (1) Abscissic acid
- (2) Phenolic acid
- (3) Para-ascorbic acid
- (4) Gibberellic acid

22. Name the enzyme that facilitates opening of DNA helix during transcription.

- (1) DNA helicase
- (2) DNA polymerase
- (3) RNA polymerase
- (4) DNA ligase

23. Match the following :

- |                                     |               |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (i) Ricin     |
| (b) Possess peptide bonds           | (ii) Malonate |
| (c) Cell wall material in fungi     | (iii) Chitin  |
| (d) Secondary metabolite            | (iv) Collagen |

Choose the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iii) | (i)   | (iv)  | (ii) |
| (2) | (iii) | (iv)  | (i)   | (ii) |
| (3) | (ii)  | (iii) | (i)   | (iv) |
| (4) | (ii)  | (iv)  | (iii) | (i)  |

24. Bilaterally symmetrical and acoelomate animals are exemplified by :

- (1) Platyhelminthes
- (2) Aschelminthes
- (3) Annelida
- (4) Ctenophora

25. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?

- (1) Uremia and Renal Calculi
- (2) Ketonuria and Glycosuria
- (3) Renal calculi and Hyperglycaemia
- (4) Uremia and Ketonuria

26. Ray florets have :

- (1) Superior ovary
- (2) Hypogynous ovary
- (3) Half inferior ovary
- (4) Inferior ovary

27. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

- (1) Glycerol, trypsin
- (2) Cellulose, lecithin
- (3) Inulin, insulin
- (4) Chitin, cholesterol

28. Which of the following statements is **not correct** ?
- (1) The proinsulin has an extra peptide called C-peptide.
  - (2) The functional insulin has A and B chains linked together by hydrogen bonds.
  - (3) Genetically engineered insulin is produced in *E-Coli*.
  - (4) In man insulin is synthesised as a proinsulin.
29. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of :
- (1)  $G_1$  phase
  - (2) S phase
  - (3)  $G_2$  phase
  - (4) M phase
30. Identify the **correct** statement with regard to  $G_1$  phase (Gap 1) of interphase.
- (1) Reorganisation of all cell components takes place.
  - (2) Cell is metabolically active, grows but does not replicate its DNA.
  - (3) Nuclear Division takes place.
  - (4) DNA synthesis or replication takes place.
31. The QRS complex in a standard ECG represents :
- (1) Depolarisation of auricles
  - (2) Depolarisation of ventricles
  - (3) Repolarisation of ventricles
  - (4) Repolarisation of auricles
32. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9$  bp, then the length of the DNA is approximately :
- (1) 2.5 meters
  - (2) 2.2 meters
  - (3) 2.7 meters
  - (4) 2.0 meters
33. Which of the following regions of the globe exhibits highest species diversity ?
- (1) Madagascar
  - (2) Himalayas
  - (3) Amazon forests
  - (4) Western Ghats of India
34. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?
- (1) Floating debris
  - (2) Effluents of primary treatment
  - (3) Activated sludge
  - (4) Primary sludge
35. Dissolution of the synaptonemal complex occurs during :
- (1) Zygotene
  - (2) Diplotene
  - (3) Leptotene
  - (4) Pachytene
36. Select the option including all sexually transmitted diseases.
- (1) Gonorrhoea, Malaria, Genital herpes
  - (2) AIDS, Malaria, Filariasis
  - (3) Cancer, AIDS, Syphilis
  - (4) Gonorrhoea, Syphilis, Genital herpes
37. Select the **correct** statement.
- (1) Glucagon is associated with hypoglycemia.
  - (2) Insulin acts on pancreatic cells and adipocytes.
  - (3) Insulin is associated with hyperglycemia.
  - (4) Glucocorticoids stimulate gluconeogenesis.
38. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :
- (1) Nitrate alone
  - (2) Ammonia and oxygen
  - (3) Ammonia and hydrogen
  - (4) Ammonia alone

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39. In gel electrophoresis, separated DNA fragments can be visualized with the help of :
- (1) Ethidium bromide in UV radiation
  - (2) Acetocarmine in UV radiation
  - (3) Ethidium bromide in infrared radiation
  - (4) Acetocarmine in bright blue light
40. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?
- (1) GIFT and ZIFT
  - (2) ICSI and ZIFT
  - (3) GIFT and ICSI
  - (4) ZIFT and IUT
41. Select the **correct** match.
- |                         |   |                                          |
|-------------------------|---|------------------------------------------|
| (1) Phenylketonuria     | - | Autosomal dominant trait                 |
| (2) Sickle cell anaemia | - | Autosomal recessive trait, chromosome-11 |
| (3) Thalassaemia        | - | X linked                                 |
| (4) Haemophilia         | - | Y linked                                 |
42. Which of the following is **not** an attribute of a population ?
- (1) Natality
  - (2) Mortality
  - (3) Species interaction
  - (4) Sex ratio
43. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :
- (1) 1 molecule of 3-C compound
  - (2) 1 molecule of 6-C compound
  - (3) 1 molecule of 4-C compound and 1 molecule of 2-C compound
  - (4) 2 molecules of 3-C compound

44. Match the following concerning essential elements and their functions in plants :
- |               |                                             |
|---------------|---------------------------------------------|
| (a) Iron      | (i) Photolysis of water                     |
| (b) Zinc      | (ii) Pollen germination                     |
| (c) Boron     | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis                       |
- Select the **correct** option :
- |     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iv)  | (iii) | (ii) | (i)   |
| (2) | (iii) | (iv)  | (ii) | (i)   |
| (3) | (iv)  | (i)   | (ii) | (iii) |
| (4) | (ii)  | (i)   | (iv) | (iii) |
45. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
- (1) Peroxisomes
  - (2) Golgi bodies
  - (3) Polysomes
  - (4) Endoplasmic reticulum
46. Select the **correct** events that occur during inspiration.
- (a) Contraction of diaphragm
  - (b) Contraction of external inter-costal muscles
  - (c) Pulmonary volume decreases
  - (d) Intra pulmonary pressure increases
- (1) (c) and (d)
  - (2) (a), (b) and (d)
  - (3) only (d)
  - (4) (a) and (b)
47. The roots that originate from the base of the stem are :
- (1) Primary roots
  - (2) Prop roots
  - (3) Lateral roots
  - (4) Fibrous roots
48. The ovary is half inferior in :
- (1) Mustard
  - (2) Sunflower
  - (3) Plum
  - (4) Brinjal

49. Match the following columns and select the **correct** option.

| Column - I |                | Column - II |                                         |
|------------|----------------|-------------|-----------------------------------------|
| (a)        | Floating Ribs  | (i)         | Located between second and seventh ribs |
| (b)        | Acromion       | (ii)        | Head of the Humerus                     |
| (c)        | Scapula        | (iii)       | Clavicle                                |
| (d)        | Glenoid cavity | (iv)        | Do not connect with the sternum         |

| (a) | (b)   | (c)   | (d)  |
|-----|-------|-------|------|
| (1) | (i)   | (iii) | (ii) |
| (2) | (iii) | (ii)  | (iv) |
| (3) | (iv)  | (iii) | (i)  |
| (4) | (ii)  | (iv)  | (i)  |

50. If the head of cockroach is removed, it may live for few days because :

- (1) the cockroach does not have nervous system.
- (2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- (3) the head holds a  $1/3^{\text{rd}}$  of a nervous system while the rest is situated along the dorsal part of its body.
- (4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

51. Identify the **incorrect** statement.

- (1) Sapwood is involved in conduction of water and minerals from root to leaf.
- (2) Sapwood is the innermost secondary xylem and is lighter in colour.
- (3) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
- (4) Heart wood does not conduct water but gives mechanical support.

52. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

- (1) Fungal diseases
- (2) Plant nematodes
- (3) Insect predators
- (4) Insect pests

53. The number of substrate level phosphorylations in one turn of citric acid cycle is :

- (1) One
- (2) Two
- (3) Three
- (4) Zero

54. Identify the **wrong** statement with regard to Restriction Enzymes.

- (1) They cut the strand of DNA at palindromic sites.
- (2) They are useful in genetic engineering.
- (3) Sticky ends can be joined by using DNA ligases.
- (4) Each restriction enzyme functions by inspecting the length of a DNA sequence.

55. Flippers of Penguins and Dolphins are examples of :

- (1) Convergent evolution
- (2) Industrial melanism
- (3) Natural selection
- (4) Adaptive radiation

56. Identify the **wrong** statement with reference to transport of oxygen.

- (1) Partial pressure of  $\text{CO}_2$  can interfere with  $\text{O}_2$  binding with haemoglobin.
- (2) Higher  $\text{H}^+$  conc. in alveoli favours the formation of oxyhaemoglobin.
- (3) Low  $\text{pCO}_2$  in alveoli favours the formation of oxyhaemoglobin.
- (4) Binding of oxygen with haemoglobin is mainly related to partial pressure of  $\text{O}_2$ .

57. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.

- (1) A person will have only two of the three alleles.
- (2) When  $I^A$  and  $I^B$  are present together, they express same type of sugar.
- (3) Allele 'i' does not produce any sugar.
- (4) The gene (I) has three alleles.

58. Identify the basic amino acid from the following.

- (1) Glutamic Acid
- (2) Lysine
- (3) Valine
- (4) Tyrosine

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59. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- (1) Gibberellin
  - (2) Ethylene
  - (3) Absciscic acid
  - (4) Cytokinin

60. Match the organism with its use in biotechnology.
- |                                      |                                          |
|--------------------------------------|------------------------------------------|
| (a) <i>Bacillus thuringiensis</i>    | (i) Cloning vector                       |
| (b) <i>Thermus aquaticus</i>         | (ii) Construction of first rDNA molecule |
| (c) <i>Agrobacterium tumefaciens</i> | (iii) DNA polymerase                     |
| (d) <i>Salmonella typhimurium</i>    | (iv) Cry proteins                        |

Select the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iv)  | (iii) | (i)   | (ii) |
| (2) | (iii) | (ii)  | (iv)  | (i)  |
| (3) | (iii) | (iv)  | (i)   | (ii) |
| (4) | (ii)  | (iv)  | (iii) | (i)  |

61. Which of the following statements is **correct** ?
- (1) Adenine pairs with thymine through one H-bond.
  - (2) Adenine pairs with thymine through three H-bonds.
  - (3) Adenine does not pair with thymine.
  - (4) Adenine pairs with thymine through two H-bonds.

62. Match the following columns and select the **correct** option.

- |     | Column - I                                                   | Column - II             |
|-----|--------------------------------------------------------------|-------------------------|
| (a) | Gregarious, polyphagous pest                                 | (i) <i>Asterias</i>     |
| (b) | Adult with radial symmetry and larva with bilateral symmetry | (ii) Scorpion           |
| (c) | Book lungs                                                   | (iii) <i>Ctenoplane</i> |
| (d) | Bioluminescence                                              | (iv) <i>Locusta</i>     |

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iv)  | (i)   | (ii)  | (iii) |
| (2) | (iii) | (ii)  | (i)   | (iv)  |
| (3) | (ii)  | (i)   | (iii) | (iv)  |
| (4) | (i)   | (iii) | (ii)  | (iv)  |

63. Which of the following would help in prevention of diuresis ?

- (1) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone
- (2) Atrial natriuretic factor causes vasoconstriction
- (3) Decrease in secretion of renin by JG cells
- (4) More water reabsorption due to undersecretion of ADH

64. Choose the **correct** pair from the following :

- |     |                |                                            |
|-----|----------------|--------------------------------------------|
| (1) | Polymerases -  | Break the DNA into fragments               |
| (2) | Nucleases -    | Separate the two strands of DNA            |
| (3) | Exonucleases - | Make cuts at specific positions within DNA |
| (4) | Ligases -      | Join the two DNA molecules                 |

65. Identify the **correct** statement with reference to human digestive system.

- (1) Serosa is the innermost layer of the alimentary canal.
- (2) Ileum is a highly coiled part.
- (3) Vermiform appendix arises from duodenum.
- (4) Ileum opens into small intestine.

66. Embryological support for evolution was disapproved by :

- (1) Alfred Wallace
- (2) Charles Darwin
- (3) Oparin
- (4) Karl Ernst von Baer

67. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

- (1) High concentration of Progesterone
- (2) Low concentration of LH
- (3) Low concentration of FSH
- (4) High concentration of Estrogen

68. The specific palindromic sequence which is recognized by EcoRI is :
- (1) 5' - GGAACC - 3'  
3' - CCTTGG - 5'
  - (2) 5' - CTTAAG - 3'  
3' - GAATTC - 5'
  - (3) 5' - GGATCC - 3'  
3' - CCTAGG - 5'
  - (4) 5' - GAATTC - 3'  
3' - CTTAAG - 5'
69. The first phase of translation is :
- (1) Recognition of DNA molecule
  - (2) Aminoacylation of tRNA
  - (3) Recognition of an anti-codon
  - (4) Binding of mRNA to ribosome
70. Floridean starch has structure similar to :
- (1) Amylopectin and glycogen
  - (2) Mannitol and algin
  - (3) Laminarin and cellulose
  - (4) Starch and cellulose
71. Strobili or cones are found in :
- (1) *Pteris*
  - (2) *Marchantia*
  - (3) *Equisetum*
  - (4) *Salvinia*
72. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?
- (1) 2
  - (2) 14
  - (3) 8
  - (4) 4
73. Snow-blindness in Antarctic region is due to :
- (1) Inflammation of cornea due to high dose of UV-B radiation
  - (2) High reflection of light from snow
  - (3) Damage to retina caused by infra-red rays
  - (4) Freezing of fluids in the eye by low temperature
74. The enzyme enterokinase helps in conversion of :
- (1) trypsinogen into trypsin
  - (2) caseinogen into casein
  - (3) pepsinogen into pepsin
  - (4) protein into polypeptides
75. Match the following with respect to meiosis :
- |                |                     |
|----------------|---------------------|
| (a) Zygotene   | (i) Terminalization |
| (b) Pachytene  | (ii) Chiasmata      |
| (c) Diplotene  | (iii) Crossing over |
| (d) Diakinesis | (iv) Synapsis       |
- Select the **correct** option from the following :
- |     |       |       |       |       |
|-----|-------|-------|-------|-------|
|     | (a)   | (b)   | (c)   | (d)   |
| (1) | (iv)  | (iii) | (ii)  | (i)   |
| (2) | (i)   | (ii)  | (iv)  | (iii) |
| (3) | (ii)  | (iv)  | (iii) | (i)   |
| (4) | (iii) | (iv)  | (i)   | (ii)  |
76. Which of the following statements about inclusion bodies is **incorrect** ?
- (1) These are involved in ingestion of food particles.
  - (2) They lie free in the cytoplasm.
  - (3) These represent reserve material in cytoplasm.
  - (4) They are not bound by any membrane.
77. Match the following columns and select the **correct** option.
- | Column - I      |       | Column - II                              |  |
|-----------------|-------|------------------------------------------|--|
| (a) Eosinophils | (i)   | Immune response                          |  |
| (b) Basophils   | (ii)  | Phagocytosis                             |  |
| (c) Neutrophils | (iii) | Release histaminase, destructive enzymes |  |
| (d) Lymphocytes | (iv)  | Release granules containing histamine    |  |
- |     |       |      |       |       |
|-----|-------|------|-------|-------|
|     | (a)   | (b)  | (c)   | (d)   |
| (1) | (iv)  | (i)  | (ii)  | (iii) |
| (2) | (i)   | (ii) | (iv)  | (iii) |
| (3) | (ii)  | (i)  | (iii) | (iv)  |
| (4) | (iii) | (iv) | (ii)  | (i)   |

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78. The transverse section of a plant shows following anatomical features :

- (a) Large number of scattered vascular bundles surrounded by bundle sheath.
- (b) Large conspicuous parenchymatous ground tissue.
- (c) Vascular bundles conjoint and closed.
- (d) Phloem parenchyma absent.

Identify the category of plant and its part :

- (1) Monocotyledonous root
- (2) Dicotyledonous stem
- (3) Dicotyledonous root
- (4) Monocotyledonous stem

79. Match the following columns and select the correct option.

| Column - I          |            | Column - II        |            |
|---------------------|------------|--------------------|------------|
| (a) Pituitary gland | (i)        | Grave's disease    |            |
| (b) Thyroid gland   | (ii)       | Diabetes mellitus  |            |
| (c) Adrenal gland   | (iii)      | Diabetes insipidus |            |
| (d) Pancreas        | (iv)       | Addison's disease  |            |
| <b>(a)</b>          | <b>(b)</b> | <b>(c)</b>         | <b>(d)</b> |
| (1) (iii)           | (ii)       | (i)                | (iv)       |
| (2) (iii)           | (i)        | (iv)               | (ii)       |
| (3) (ii)            | (i)        | (iv)               | (iii)      |
| (4) (iv)            | (iii)      | (i)                | (ii)       |

80. Match the following columns and select the correct option.

| Column - I                |            | Column - II                        |            |
|---------------------------|------------|------------------------------------|------------|
| (a) Placenta              | (i)        | Androgens                          |            |
| (b) Zona pellucida        | (ii)       | Human Chorionic Gonadotropin (hCG) |            |
| (c) Bulbo-urethral glands | (iii)      | Layer of the ovum                  |            |
| (d) Leydig cells          | (iv)       | Lubrication of the Penis           |            |
| <b>(a)</b>                | <b>(b)</b> | <b>(c)</b>                         | <b>(d)</b> |
| (1) (i)                   | (iv)       | (ii)                               | (iii)      |
| (2) (iii)                 | (ii)       | (iv)                               | (i)        |
| (3) (ii)                  | (iii)      | (iv)                               | (i)        |
| (4) (iv)                  | (iii)      | (i)                                | (ii)       |

81. In water hyacinth and water lily, pollination takes place by :

- (1) water currents only
- (2) wind and water
- (3) insects and water
- (4) insects or wind

82. According to Robert May, the global species diversity is about :

- (1) 20 million
- (2) 50 million
- (3) 7 million
- (4) 1.5 million

83. Match the following columns and select the correct option.

| Column - I                     |            | Column - II    |            |
|--------------------------------|------------|----------------|------------|
| (a) 6 - 15 pairs of gill slits | (i)        | <i>Trygon</i>  |            |
| (b) Heterocercal caudal fin    | (ii)       | Cyclostomes    |            |
| (c) Air Bladder                | (iii)      | Chondrichthyes |            |
| (d) Poison sting               | (iv)       | Osteichthyes   |            |
| <b>(a)</b>                     | <b>(b)</b> | <b>(c)</b>     | <b>(d)</b> |
| (1) (iii)                      | (iv)       | (i)            | (ii)       |
| (2) (iv)                       | (ii)       | (iii)          | (i)        |
| (3) (i)                        | (iv)       | (iii)          | (ii)       |
| (4) (ii)                       | (iii)      | (iv)           | (i)        |

84. The process of growth is maximum during :

- (1) Lag phase
- (2) Senescence
- (3) Dormancy
- (4) Log phase

85. Match the following columns and select the correct option.

| Column - I                         |       | Column - II                   |  |
|------------------------------------|-------|-------------------------------|--|
| (a) Bt cotton                      | (i)   | Gene therapy                  |  |
| (b) Adenosine deaminase deficiency | (ii)  | Cellular defence              |  |
| (c) RNAi                           | (iii) | Detection of HIV infection    |  |
| (d) PCR                            | (iv)  | <i>Bacillus thuringiensis</i> |  |

|            |            |            |            |
|------------|------------|------------|------------|
| <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| (1) (iii)  | (ii)       | (i)        | (iv)       |
| (2) (ii)   | (iii)      | (iv)       | (i)        |
| (3) (i)    | (ii)       | (iii)      | (iv)       |
| (4) (iv)   | (i)        | (ii)       | (iii)      |

86. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                                 |
|------------|-----------------|-------------|---------------------------------|
| (a)        | Organ of Corti  | (i)         | Connects middle ear and pharynx |
| (b)        | Cochlea         | (ii)        | Coiled part of the labyrinth    |
| (c)        | Eustachian tube | (iii)       | Attached to the oval window     |
| (d)        | Stapes          | (iv)        | Located on the basilar membrane |

|     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iii) | (i)   | (iv) | (ii)  |
| (2) | (iv)  | (ii)  | (i)  | (iii) |
| (3) | (i)   | (ii)  | (iv) | (iii) |
| (4) | (ii)  | (iii) | (i)  | (iv)  |

87. Which one of the following is the most abundant protein in the animals ?

- (1) Collagen
- (2) Lectin
- (3) Insulin
- (4) Haemoglobin

88. Identify the **wrong** statement with reference to immunity.

- (1) When ready-made antibodies are directly given, it is called "Passive immunity".
- (2) Active immunity is quick and gives full response.
- (3) Foetus receives some antibodies from mother, it is an example for passive immunity.
- (4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

89. Montreal protocol was signed in 1987 for control of :

- (1) Emission of ozone depleting substances
- (2) Release of Green House gases
- (3) Disposal of e-wastes
- (4) Transport of Genetically modified organisms from one country to another

90. Match the trophic levels with their **correct** species examples in grassland ecosystem.

|     |                      |       |         |
|-----|----------------------|-------|---------|
| (a) | Fourth trophic level | (i)   | Crow    |
| (b) | Second trophic level | (ii)  | Vulture |
| (c) | First trophic level  | (iii) | Rabbit  |
| (d) | Third trophic level  | (iv)  | Grass   |

Select the **correct** option :

|     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iii) | (ii)  | (i)   | (iv) |
| (2) | (iv)  | (iii) | (ii)  | (i)  |
| (3) | (i)   | (ii)  | (iii) | (iv) |
| (4) | (ii)  | (iii) | (iv)  | (i)  |

91. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

The pitch of the screw gauge is :

- (1) 0.25 mm
- (2) 0.5 mm
- (3) 1.0 mm
- (4) 0.01 mm

92. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

- (1)  $\frac{1}{\sqrt{2} n \pi d^2}$
- (2)  $\frac{1}{\sqrt{2} n^2 \pi d^2}$
- (3)  $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
- (4)  $\frac{1}{\sqrt{2} n \pi d}$

93. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

- (1) four times
- (2) one-fourth
- (3) zero
- (4) doubled

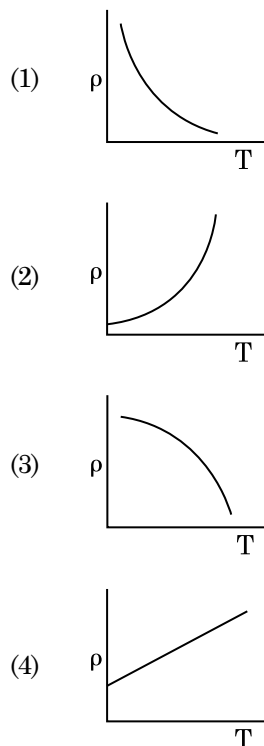
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94. In a certain region of space with volume  $0.2 \text{ m}^3$ , the electric potential is found to be  $5 \text{ V}$  throughout. The magnitude of electric field in this region is :

- (1)  $0.5 \text{ N/C}$
- (2)  $1 \text{ N/C}$
- (3)  $5 \text{ N/C}$
- (4) zero

95. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature ( $T$ ) for copper ?



96. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is :

- (1)  $\frac{Mg(L_1 - L)}{AL}$
- (2)  $\frac{MgL}{AL_1}$
- (3)  $\frac{MgL}{A(L_1 - L)}$
- (4)  $\frac{MgL_1}{AL}$

97. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency  $6 \text{ Hz}$ . When tension in B is slightly decreased, the beat frequency increases to  $7 \text{ Hz}$ . If the frequency of A is  $530 \text{ Hz}$ , the original frequency of B will be :

- (1)  $524 \text{ Hz}$
- (2)  $536 \text{ Hz}$
- (3)  $537 \text{ Hz}$
- (4)  $523 \text{ Hz}$

98. A  $40 \mu\text{F}$  capacitor is connected to a  $200 \text{ V}$ ,  $50 \text{ Hz}$  ac supply. The rms value of the current in the circuit is, nearly :

- (1)  $2.05 \text{ A}$
- (2)  $2.5 \text{ A}$
- (3)  $25.1 \text{ A}$
- (4)  $1.7 \text{ A}$

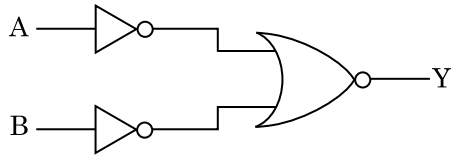
99. A ball is thrown vertically downward with a velocity of  $20 \text{ m/s}$  from the top of a tower. It hits the ground after some time with a velocity of  $80 \text{ m/s}$ . The height of the tower is : ( $g = 10 \text{ m/s}^2$ )

- (1)  $340 \text{ m}$
- (2)  $320 \text{ m}$
- (3)  $300 \text{ m}$
- (4)  $360 \text{ m}$

100. An electron is accelerated from rest through a potential difference of  $V$  volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2} \text{ nm}$ , the potential difference is :

- (1)  $10^2 \text{ V}$
- (2)  $10^3 \text{ V}$
- (3)  $10^4 \text{ V}$
- (4)  $10 \text{ V}$

101. For the logic circuit shown, the truth table is :



(1)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

(2)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

(3)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

(4)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

102. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ C m}$ . The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

- (1) 200 V  
(2) 400 V  
(3) zero  
(4) 50 V

103. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :

$$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$

- (1)  $8.0 \times 10^{-5} \text{ T m A}^{-1}$   
(2)  $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$   
(3)  $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$   
(4)  $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$

104. The increase in the width of the depletion region in a p-n junction diode is due to :

- (1) reverse bias only  
(2) both forward bias and reverse bias  
(3) increase in forward current  
(4) forward bias only

105. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :

- (1) 5.0 g  
(2) 10.0 g  
(3) 20.0 g  
(4) 2.5 g

106. The energy equivalent of 0.5 g of a substance is :

- (1)  $4.5 \times 10^{13} \text{ J}$   
(2)  $1.5 \times 10^{13} \text{ J}$   
(3)  $0.5 \times 10^{13} \text{ J}$   
(4)  $4.5 \times 10^{16} \text{ J}$

107. The solids which have the negative temperature coefficient of resistance are :

- (1) insulators only  
(2) semiconductors only  
(3) insulators and semiconductors  
(4) metals

108. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to :

- (1)  $\frac{2A}{\mu}$   
(2)  $\mu A$   
(3)  $\frac{\mu A}{2}$   
(4)  $\frac{A}{2\mu}$

109. For which one of the following, Bohr model is **not** valid ?

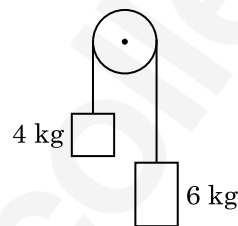
- (1) Singly ionised helium atom ( $\text{He}^+$ )  
(2) Deuteron atom  
(3) Singly ionised neon atom ( $\text{Ne}^+$ )  
(4) Hydrogen atom

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110. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :
- (1)  $1.83 \times 10^{-7} \text{ rad}$
  - (2)  $7.32 \times 10^{-7} \text{ rad}$
  - (3)  $6.00 \times 10^{-7} \text{ rad}$
  - (4)  $3.66 \times 10^{-7} \text{ rad}$
111. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?
- (1) 32 N
  - (2) 30 N
  - (3) 24 N
  - (4) 48 N
112. A charged particle having drift velocity of  $7.5 \times 10^{-4} \text{ m s}^{-1}$  in an electric field of  $3 \times 10^{-10} \text{ Vm}^{-1}$ , has a mobility in  $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$  of :
- (1)  $2.5 \times 10^6$
  - (2)  $2.5 \times 10^{-6}$
  - (3)  $2.25 \times 10^{-15}$
  - (4)  $2.25 \times 10^{15}$
113. For transistor action, which of the following statements is **correct** ?
- (1) Base, emitter and collector regions should have same size.
  - (2) Both emitter junction as well as the collector junction are forward biased.
  - (3) The base region must be very thin and lightly doped.
  - (4) Base, emitter and collector regions should have same doping concentrations.
114. The capacitance of a parallel plate capacitor with air as medium is  $6 \mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes  $30 \mu\text{F}$ . The permittivity of the medium is :
- ( $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ )
- (1)  $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (2)  $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (3)  $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (4)  $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

115. Taking into account of the significant figures, what is the value of  $9.99 \text{ m} - 0.0099 \text{ m}$  ?
- (1) 9.98 m
  - (2) 9.980 m
  - (3) 9.9 m
  - (4) 9.9801 m
116. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



- (1)  $g/2$
  - (2)  $g/5$
  - (3)  $g/10$
  - (4)  $g$
117. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature  $27^\circ\text{C}$ . Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )
- (1)  $0.2 \text{ kg/m}^3$
  - (2)  $0.1 \text{ kg/m}^3$
  - (3)  $0.02 \text{ kg/m}^3$
  - (4)  $0.5 \text{ kg/m}^3$
118. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : ( $c = \text{speed of electromagnetic waves}$ )
- (1) 1 : 1
  - (2) 1 : c
  - (3) 1 :  $c^2$
  - (4) c : 1
119. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
- ( $\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$ )
- (1)  $3.14 \times 10^{-4} \text{ T}$
  - (2)  $6.28 \times 10^{-5} \text{ T}$
  - (3)  $3.14 \times 10^{-5} \text{ T}$
  - (4)  $6.28 \times 10^{-4} \text{ T}$

120. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :
- half
  - four times
  - one-fourth
  - double
121. A resistance wire connected in the left gap of a metre bridge balances a  $10\ \Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of  $1\ \Omega$  of the resistance wire is :
- $1.0 \times 10^{-1}\text{ m}$
  - $1.5 \times 10^{-1}\text{ m}$
  - $1.5 \times 10^{-2}\text{ m}$
  - $1.0 \times 10^{-2}\text{ m}$
122. The energy required to break one bond in DNA is  $10^{-20}\text{ J}$ . This value in eV is nearly :
- 0.6
  - 0.06
  - 0.006
  - 6
123. When a uranium isotope  ${}_{92}^{235}\text{U}$  is bombarded with a neutron, it generates  ${}_{36}^{89}\text{Kr}$ , three neutrons and :
- ${}_{40}^{91}\text{Zr}$
  - ${}_{36}^{101}\text{Kr}$
  - ${}_{36}^{103}\text{Kr}$
  - ${}_{56}^{144}\text{Ba}$
124. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- adiabatic
  - isochoric
  - isobaric
  - isothermal
125. Light with an average flux of  $20\text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20\text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :
- $12 \times 10^3\text{ J}$
  - $24 \times 10^3\text{ J}$
  - $48 \times 10^3\text{ J}$
  - $10 \times 10^3\text{ J}$
126. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio :
- $\frac{9}{4}$
  - $\frac{3}{2}$
  - $\frac{5}{3}$
  - $\frac{27}{8}$
127. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and T, absolute temperature)
- $\frac{3}{2} k_B T$
  - $\frac{5}{2} k_B T$
  - $\frac{7}{2} k_B T$
  - $\frac{1}{2} k_B T$
128. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead C is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is :
- 0.5
  - 1.0
  - 1.0
  - zero

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129. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

- (1) 50 cm
- (2) 67 cm
- (3) 80 cm
- (4) 33 cm

130. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

- (1)  $\frac{3\pi}{2}$  rad
- (2)  $\frac{\pi}{2}$  rad
- (3) zero
- (4)  $\pi$  rad

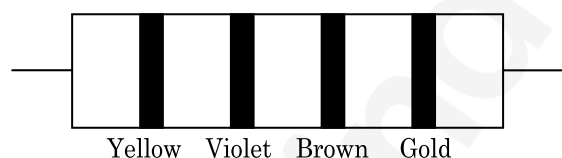
131. The Brewsters angle  $i_b$  for an interface should be :

- (1)  $30^\circ < i_b < 45^\circ$
- (2)  $45^\circ < i_b < 90^\circ$
- (3)  $i_b = 90^\circ$
- (4)  $0^\circ < i_b < 30^\circ$

132. Dimensions of stress are :

- (1)  $[ML^2T^{-2}]$
- (2)  $[ML^0T^{-2}]$
- (3)  $[ML^{-1}T^{-2}]$
- (4)  $[MLT^{-2}]$

133. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

- (1) 47 k $\Omega$ , 10%
- (2) 4.7 k $\Omega$ , 5%
- (3) 470  $\Omega$ , 5%
- (4) 470 k $\Omega$ , 5%

134. A spherical conductor of radius 10 cm has a charge of  $3.2 \times 10^{-7}$  C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

- (1)  $1.28 \times 10^5$  N/C
- (2)  $1.28 \times 10^6$  N/C
- (3)  $1.28 \times 10^7$  N/C
- (4)  $1.28 \times 10^4$  N/C

135. Find the torque about the origin when a force of  $3\hat{j}$  N acts on a particle whose position vector is  $2\hat{k}$  m.

- (1)  $6\hat{j}$  N m
- (2)  $-6\hat{i}$  N m
- (3)  $6\hat{k}$  N m
- (4)  $6\hat{i}$  N m

136. The mixture which shows positive deviation from Raoult's law is :

- (1) Benzene + Toluene
- (2) Acetone + Chloroform
- (3) Chloroethane + Bromoethane
- (4) Ethanol + Acetone

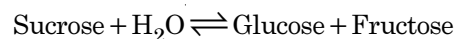
137. Which of the following is **not** correct about carbon monoxide ?

- (1) It reduces oxygen carrying ability of blood.
- (2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
- (3) It is produced due to incomplete combustion.
- (4) It forms carboxyhaemoglobin.

138. The number of Faradays(F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of Ca = 40 g mol $^{-1}$ ) is :

- (1) 2
- (2) 3
- (3) 4
- (4) 1

139. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\ominus$  at the same temperature will be :

- (1)  $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- (2)  $8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
- (3)  $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
- (4)  $-8.314 \text{ J mol}^{-1} \text{K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$

140. For the reaction,  $2\text{Cl(g)} \rightarrow \text{Cl}_2\text{(g)}$ , the **correct** option is :

- (1)  $\Delta_r H > 0$  and  $\Delta_r S < 0$
- (2)  $\Delta_r H < 0$  and  $\Delta_r S > 0$
- (3)  $\Delta_r H < 0$  and  $\Delta_r S < 0$
- (4)  $\Delta_r H > 0$  and  $\Delta_r S > 0$

141. Paper chromatography is an example of :  
 (1) Partition chromatography  
 (2) Thin layer chromatography  
 (3) Column chromatography  
 (4) Adsorption chromatography
142. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce 2.0 g of the reactant to 0.2 g is :  
 (1) 200 s  
 (2) 500 s  
 (3) 1000 s  
 (4) 100 s
143. Which of the following oxoacid of sulphur has  $-\text{O}-\text{O}-$  linkage ?  
 (1)  $\text{H}_2\text{SO}_4$ , sulphuric acid  
 (2)  $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid  
 (3)  $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid  
 (4)  $\text{H}_2\text{SO}_3$ , sulphurous acid
144. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :  
 (1) Cannizzaro's reaction  
 (2) Cross Cannizzaro's reaction  
 (3) Cross Aldol condensation  
 (4) Aldol condensation
145. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :  
 (1)  $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$   
 (2)  $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$   
 (3)  $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$   
 (4)  $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
146. Which of the following is a cationic detergent ?  
 (1) Sodium stearate  
 (2) Cetyltrimethyl ammonium bromide  
 (3) Sodium dodecylbenzene sulphonate  
 (4) Sodium lauryl sulphate
147. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is :  
 (1) 4.90 BM  
 (2) 5.92 BM  
 (3) 2.84 BM  
 (4) 3.87 BM
148. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and NaCl. Which of the following compound(s) crystallise(s) ?  
 (1) Only NaCl  
 (2) Only  $\text{MgCl}_2$   
 (3) NaCl,  $\text{MgCl}_2$  and  $\text{CaCl}_2$   
 (4) Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$
149. Match the following and identify the **correct** option.  

|                                           |                                               |
|-------------------------------------------|-----------------------------------------------|
| (a) $\text{CO(g)} + \text{H}_2\text{(g)}$ | (i) $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$ |
| (b) Temporary hardness of water           | (ii) An electron deficient hydride            |
| (c) $\text{B}_2\text{H}_6$                | (iii) Synthesis gas                           |
| (d) $\text{H}_2\text{O}_2$                | (iv) Non-planar structure                     |

|     |            |            |            |            |
|-----|------------|------------|------------|------------|
|     | <b>(a)</b> | <b>(b)</b> | <b>(c)</b> | <b>(d)</b> |
| (1) | (iii)      | (ii)       | (i)        | (iv)       |
| (2) | (iii)      | (iv)       | (ii)       | (i)        |
| (3) | (i)        | (iii)      | (ii)       | (iv)       |
| (4) | (iii)      | (i)        | (ii)       | (iv)       |
150. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :  
 (a)  $\beta$ -Elimination reaction  
 (b) Follows Zaitsev rule  
 (c) Dehydrohalogenation reaction  
 (d) Dehydration reaction  
 (1) (a), (c), (d)  
 (2) (b), (c), (d)  
 (3) (a), (b), (d)  
 (4) (a), (b), (c)
151. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?  
 (1)  $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$   
 (2)  $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$   
 (3)  $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$   
 (4)  $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
152. Identify the **correct** statement from the following :  
 (1) Blister copper has blistered appearance due to evolution of  $\text{CO}_2$ .  
 (2) Vapour phase refining is carried out for Nickel by Van Arkel method.  
 (3) Pig iron can be moulded into a variety of shapes.  
 (4) Wrought iron is impure iron with 4% carbon.

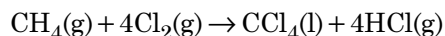
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153. Sucrose on hydrolysis gives :

- (1)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose
- (2)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose
- (3)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose
- (4)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose

154. What is the change in oxidation number of carbon in the following reaction ?



- (1) 0 to +4
- (2) -4 to +4
- (3) 0 to -4
- (4) +4 to +4

155. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.

- (1) Copper
- (2) Calcium
- (3) Potassium
- (4) Iron

156. Which of the following alkane cannot be made in good yield by Wurtz reaction ?

- (1) 2,3-Dimethylbutane
- (2) n-Heptane
- (3) n-Butane
- (4) n-Hexane

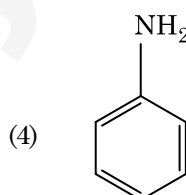
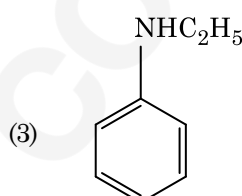
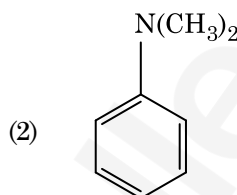
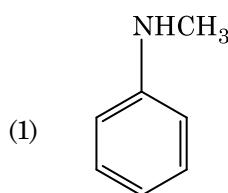
157. Measuring Zeta potential is useful in determining which property of colloidal solution ?

- (1) Solubility
- (2) Stability of the colloidal particles
- (3) Size of the colloidal particles
- (4) Viscosity

158. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12 \text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

- (1) 0.80 K
- (2) 0.40 K
- (3) 0.60 K
- (4) 0.20 K

159. Which of the following amine will give the carbylamine test ?



160. Which of the following is a natural polymer ?

- (1) poly (Butadiene-styrene)
- (2) polybutadiene
- (3) poly (Butadiene-acrylonitrile)
- (4) *cis*-1,4-polyisoprene

161. Identify the **incorrect** statement.

- (1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
- (2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
- (3) The oxidation states of chromium in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are not the same.
- (4)  $\text{Cr}^{2+} (\text{d}^4)$  is a stronger reducing agent than  $\text{Fe}^{2+} (\text{d}^6)$  in water.

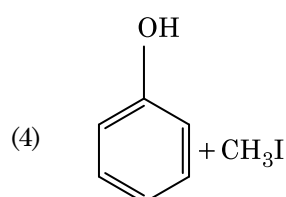
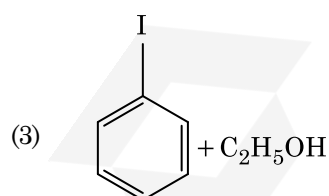
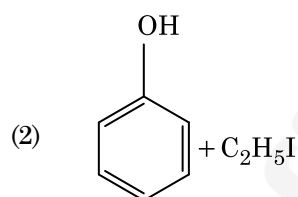
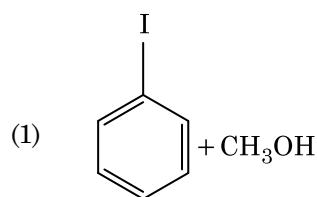
162. Which of the following set of molecules will have zero dipole moment ?

- (1) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
- (2) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
- (3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
- (4) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

163. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

- (1) Oxygen gas
- (2)  $\text{H}_2\text{S}$  gas
- (3)  $\text{SO}_2$  gas
- (4) Hydrogen gas

164. Anisole on cleavage with HI gives :



165. The number of protons, neutrons and electrons in  $^{175}_{71}\text{Lu}$ , respectively, are :

- (1) 104, 71 and 71
- (2) 71, 71 and 104
- (3) 175, 104 and 71
- (4) 71, 104 and 71

166. Match the following :

|     | Oxide                   |       | Nature     |
|-----|-------------------------|-------|------------|
| (a) | CO                      | (i)   | Basic      |
| (b) | BaO                     | (ii)  | Neutral    |
| (c) | $\text{Al}_2\text{O}_3$ | (iii) | Acidic     |
| (d) | $\text{Cl}_2\text{O}_7$ | (iv)  | Amphoteric |

Which of the following is correct option ?

|     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (ii)  | (i)   | (iv)  | (iii) |
| (2) | (iii) | (iv)  | (i)   | (ii)  |
| (3) | (iv)  | (iii) | (ii)  | (i)   |
| (4) | (i)   | (ii)  | (iii) | (iv)  |

167. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

- (1) + R effect of  $-\text{CH}_3$  groups
- (2) - R effect of  $-\text{CH}_3$  groups
- (3) Hyperconjugation
- (4) - I effect of  $-\text{CH}_3$  groups

168. Which one of the followings has maximum number of atoms ?

- (1) 1 g of  $\text{Mg(s)}$  [Atomic mass of  $\text{Mg} = 24$ ]
- (2) 1 g of  $\text{O}_2(\text{g})$  [Atomic mass of  $\text{O} = 16$ ]
- (3) 1 g of  $\text{Li(s)}$  [Atomic mass of  $\text{Li} = 7$ ]
- (4) 1 g of  $\text{Ag(s)}$  [Atomic mass of  $\text{Ag} = 108$ ]

G2

169. Which of the following is a basic amino acid ?

- (1) Alanine
- (2) Tyrosine
- (3) Lysine
- (4) Serine

170. The correct option for free expansion of an ideal gas under adiabatic condition is :

- (1)  $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
- (2)  $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
- (3)  $q > 0$ ,  $\Delta T > 0$  and  $w > 0$
- (4)  $q = 0$ ,  $\Delta T = 0$  and  $w = 0$

171. Identify the **incorrect** match.

| Name            | IUPAC Official Name |
|-----------------|---------------------|
| (a) Unnilunium  | (i) Mendelevium     |
| (b) Unniltrium  | (ii) Lawrencium     |
| (c) Unnilhexium | (iii) Seaborgium    |
| (d) Unununnium  | (iv) Darmstadtium   |
| (1) (b), (ii)   |                     |
| (2) (c), (iii)  |                     |
| (3) (d), (iv)   |                     |
| (4) (a), (i)    |                     |

172. Identify a molecule which does **not** exist.

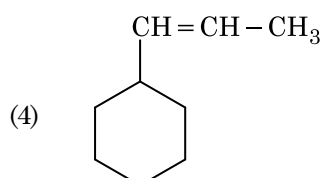
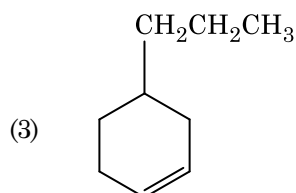
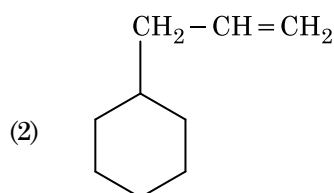
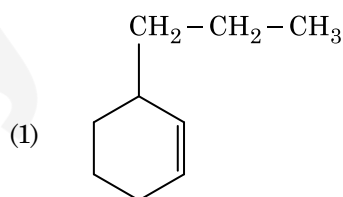
- (1)  $\text{Li}_2$
- (2)  $\text{C}_2$
- (3)  $\text{O}_2$
- (4)  $\text{He}_2$

20

173. Identify the **correct** statements from the following :

- (a)  $\text{CO}_2(\text{g})$  is used as refrigerant for ice-cream and frozen food.
- (b) The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.
- (c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
- (d) CO is colorless and odourless gas.
- (1) (a) and (c) only
- (2) (b) and (c) only
- (3) (c) and (d) only
- (4) (a), (b) and (c) only

174. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



175. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

- (1) Sec. butyl alcohol
- (2) Tert. butyl alcohol
- (3) Isobutyl alcohol
- (4) Isopropyl alcohol

176. A mixture of  $N_2$  and Ar gases in a cylinder contains 7 g of  $N_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $N_2$  is :

[Use atomic masses (in  $g\ mol^{-1}$ ) : N = 14, Ar = 40]

- (1) 12 bar
- (2) 15 bar
- (3) 18 bar
- (4) 9 bar

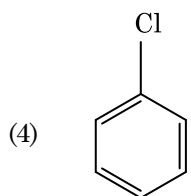
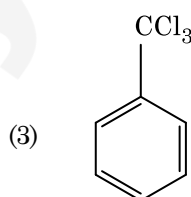
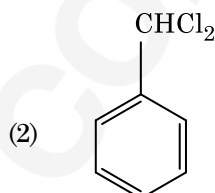
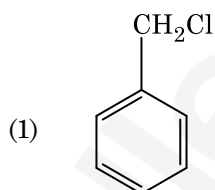
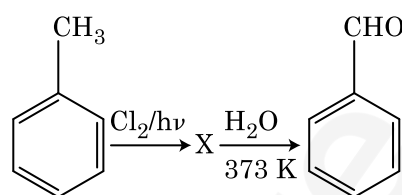
177. An increase in the concentration of the reactants of a reaction leads to change in :

- (1) heat of reaction
- (2) threshold energy
- (3) collision frequency
- (4) activation energy

178. Find out the solubility of  $Ni(OH)_2$  in 0.1 M NaOH. Given that the ionic product of  $Ni(OH)_2$  is  $2 \times 10^{-15}$ .

- (1)  $2 \times 10^{-8}\ M$
- (2)  $1 \times 10^{-13}\ M$
- (3)  $1 \times 10^8\ M$
- (4)  $2 \times 10^{-13}\ M$

179. Identify compound X in the following sequence of reactions :



180. Urea reacts with water to form A which will decompose to form B. B when passed through  $Cu^{2+}$  (aq), deep blue colour solution C is formed. What is the formula of C from the following ?

- (1)  $[Cu(NH_3)_4]^{2+}$
- (2)  $Cu(OH)_2$
- (3)  $CuCO_3 \cdot Cu(OH)_2$
- (4)  $CuSO_4$

G2

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Space For Rough Work



**Space For Rough Work**

G2

24

Space For Rough Work



Test Booklet Code

ANKHA

No. :

**H2**

This Booklet contains 24 pages.

**Do not open this Test Booklet until you are asked to do so.****Important Instructions :**

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **side-1** and **side-2** carefully with **blue/black** ball point pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. **On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**
6. The CODE for this Booklet is **H2**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/ Answer Sheet.
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. **Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.**
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.
15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Name of the Candidate (in Capitals) : \_\_\_\_\_

Roll Number : in figures \_\_\_\_\_

: in words \_\_\_\_\_

Centre of Examination (in Capitals) : \_\_\_\_\_

Candidate's Signature : \_\_\_\_\_ Invigilator's Signature : \_\_\_\_\_

Facsimile signature stamp of

Centre Superintendent : \_\_\_\_\_

## H2

## 2

1. The number of protons, neutrons and electrons in  $^{175}_{71}\text{Lu}$ , respectively, are :
  - (1) 175, 104 and 71
  - (2) 71, 104 and 71
  - (3) 104, 71 and 71
  - (4) 71, 71 and 104
2. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals.
  - (1) Potassium
  - (2) Iron
  - (3) Copper
  - (4) Calcium
3. Which of the following is **not** correct about carbon monoxide ?
  - (1) It is produced due to incomplete combustion.
  - (2) It forms carboxyhaemoglobin.
  - (3) It reduces oxygen carrying ability of blood.
  - (4) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
4. Which one of the followings has maximum number of atoms ?
  - (1) 1 g of Li(s) [Atomic mass of Li = 7]
  - (2) 1 g of Ag(s) [Atomic mass of Ag = 108]
  - (3) 1 g of Mg(s) [Atomic mass of Mg = 24]
  - (4) 1 g of  $\text{O}_2(\text{g})$  [Atomic mass of O = 16]
5. Paper chromatography is an example of :
  - (1) Column chromatography
  - (2) Adsorption chromatography
  - (3) Partition chromatography
  - (4) Thin layer chromatography
6. Which of the following is a natural polymer ?
  - (1) poly (Butadiene-acrylonitrile)
  - (2) *cis*-1,4-polyisoprene
  - (3) poly (Butadiene-styrene)
  - (4) polybutadiene
7. The mixture which shows positive deviation from Raoult's law is :
  - (1) Chloroethane + Bromoethane
  - (2) Ethanol + Acetone
  - (3) Benzene + Toluene
  - (4) Acetone + Chloroform
8. The calculated spin only magnetic moment of  $\text{Cr}^{2+}$  ion is :
  - (1) 2.84 BM
  - (2) 3.87 BM
  - (3) 4.90 BM
  - (4) 5.92 BM
9. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?
  - (1) Hyperconjugation
  - (2) -I effect of  $-\text{CH}_3$  groups
  - (3) +R effect of  $-\text{CH}_3$  groups
  - (4) -R effect of  $-\text{CH}_3$  groups
10. The correct option for free expansion of an ideal gas under adiabatic condition is :
  - (1)  $q > 0$ ,  $\Delta T > 0$  and  $w > 0$
  - (2)  $q = 0$ ,  $\Delta T = 0$  and  $w = 0$
  - (3)  $q = 0$ ,  $\Delta T < 0$  and  $w > 0$
  - (4)  $q < 0$ ,  $\Delta T = 0$  and  $w = 0$
11. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :
  - (a)  $\beta$ -Elimination reaction
  - (b) Follows Zaitsev rule
  - (c) Dehydrohalogenation reaction
  - (d) Dehydration reaction
  - (1) (a), (b), (d)
  - (2) (a), (b), (c)
  - (3) (a), (c), (d)
  - (4) (b), (c), (d)

12. Identify the **correct** statements from the following :

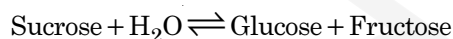
- $\text{CO}_2(\text{g})$  is used as refrigerant for ice-cream and frozen food.
- The structure of  $\text{C}_{60}$  contains twelve six carbon rings and twenty five carbon rings.
- ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
- $\text{CO}$  is colorless and odourless gas.

- (c) and (d) only
- (a), (b) and (c) only
- (a) and (c) only
- (b) and (c) only

13. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?

- $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
- $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
- $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
- $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$

14. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant ( $K_c$ ) is  $2 \times 10^{13}$  at 300 K, the value of  $\Delta_r G^\ominus$  at the same temperature will be :

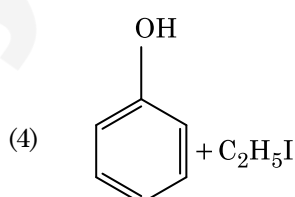
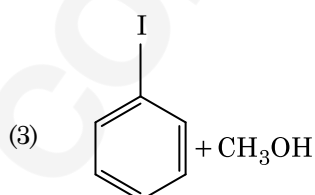
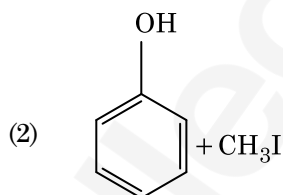
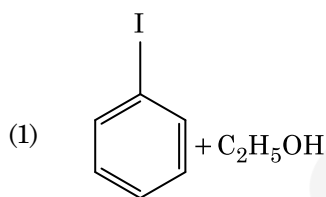
- $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
- $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
- $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$

15. Identify the **incorrect** match.

| Name            | IUPAC Official Name |
|-----------------|---------------------|
| (a) Unnilunium  | (i) Mendelevium     |
| (b) Unniltrium  | (ii) Lawrencium     |
| (c) Unnilhexium | (iii) Seaborgium    |
| (d) Unununnium  | (iv) Darmstadtium   |

- (d), (iv)
- (a), (i)
- (b), (ii)
- (c), (iii)

16. Anisole on cleavage with HI gives :



17. Identify the **correct** statement from the following :

- Pig iron can be moulded into a variety of shapes.
- Wrought iron is impure iron with 4% carbon.
- Blister copper has blistered appearance due to evolution of  $\text{CO}_2$ .
- Vapour phase refining is carried out for Nickel by Van Arkel method.

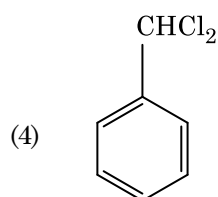
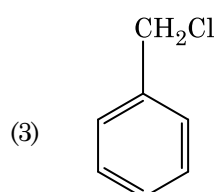
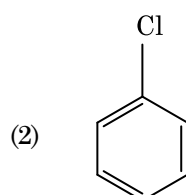
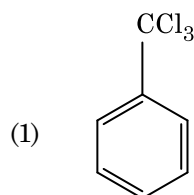
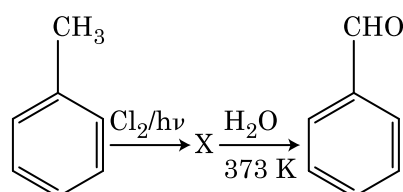
18. For the reaction,  $2\text{Cl}(\text{g}) \rightarrow \text{Cl}_2(\text{g})$ , the **correct** option is :

- $\Delta_r H < 0$  and  $\Delta_r S < 0$
- $\Delta_r H > 0$  and  $\Delta_r S > 0$
- $\Delta_r H > 0$  and  $\Delta_r S < 0$
- $\Delta_r H < 0$  and  $\Delta_r S > 0$

H2

4

19. Identify compound X in the following sequence of reactions :



20. Match the following :

|     | Oxide                          |       | Nature     |
|-----|--------------------------------|-------|------------|
| (a) | CO                             | (i)   | Basic      |
| (b) | BaO                            | (ii)  | Neutral    |
| (c) | Al <sub>2</sub> O <sub>3</sub> | (iii) | Acidic     |
| (d) | Cl <sub>2</sub> O <sub>7</sub> | (iv)  | Amphoteric |

Which of the following is **correct** option ?

|     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iv)  | (iii) | (ii)  | (i)   |
| (2) | (i)   | (ii)  | (iii) | (iv)  |
| (3) | (ii)  | (i)   | (iv)  | (iii) |
| (4) | (iii) | (iv)  | (i)   | (ii)  |

21. Urea reacts with water to form **A** which will decompose to form **B**. **B** when passed through  $\text{Cu}^{2+}$  (aq), deep blue colour solution **C** is formed. What is the formula of **C** from the following ?

- (1)  $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
- (2)  $\text{CuSO}_4$
- (3)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (4)  $\text{Cu}(\text{OH})_2$

22. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :

- (1)  $\text{SO}_2$  gas
- (2) Hydrogen gas
- (3) Oxygen gas
- (4)  $\text{H}_2\text{S}$  gas

23. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :

- (1)  $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
- (2)  $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
- (3)  $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$
- (4)  $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$

24. Sucrose on hydrolysis gives :

- (1)  $\alpha$ -D-Fructose +  $\beta$ -D-Fructose
- (2)  $\beta$ -D-Glucose +  $\alpha$ -D-Fructose
- (3)  $\alpha$ -D-Glucose +  $\beta$ -D-Glucose
- (4)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose

25. Which of the following is a basic amino acid ?

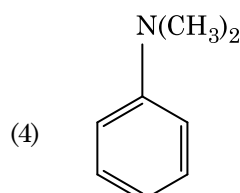
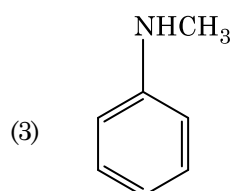
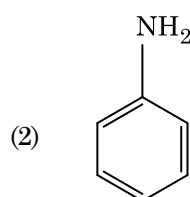
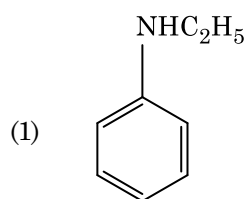
- (1) Lysine
- (2) Serine
- (3) Alanine
- (4) Tyrosine

26. Which of the following set of molecules will have zero dipole moment ?
- Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
  - Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene
  - Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
  - Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
27. The freezing point depression constant ( $K_f$ ) of benzene is  $5.12 \text{ K kg mol}^{-1}$ . The freezing point depression for the solution of molality  $0.078 \text{ m}$  containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :
- 0.60 K
  - 0.20 K
  - 0.80 K
  - 0.40 K
28. Which of the following oxoacid of sulphur has  $\text{—O—O—}$  linkage ?
- $\text{H}_2\text{S}_2\text{O}_7$ , pyrosulphuric acid
  - $\text{H}_2\text{SO}_3$ , sulphurous acid
  - $\text{H}_2\text{SO}_4$ , sulphuric acid
  - $\text{H}_2\text{S}_2\text{O}_8$ , peroxodisulphuric acid
29. HCl was passed through a solution of  $\text{CaCl}_2$ ,  $\text{MgCl}_2$  and  $\text{NaCl}$ . Which of the following compound(s) crystallise(s) ?
- $\text{NaCl}$ ,  $\text{MgCl}_2$  and  $\text{CaCl}_2$
  - Both  $\text{MgCl}_2$  and  $\text{CaCl}_2$
  - Only  $\text{NaCl}$
  - Only  $\text{MgCl}_2$
30. Measuring Zeta potential is useful in determining which property of colloidal solution ?
- Size of the colloidal particles
  - Viscosity
  - Solubility
  - Stability of the colloidal particles
31. The rate constant for a first order reaction is  $4.606 \times 10^{-3} \text{ s}^{-1}$ . The time required to reduce  $2.0 \text{ g}$  of the reactant to  $0.2 \text{ g}$  is :
- 1000 s
  - 100 s
  - 200 s
  - 500 s
32. Which of the following alkane cannot be made in good yield by Wurtz reaction ?
- n-Butane
  - n-Hexane
  - 2,3-Dimethylbutane
  - n-Heptane
33. Match the following and identify the **correct** option.
- |     |                                       |       |                                           |
|-----|---------------------------------------|-------|-------------------------------------------|
| (a) | $\text{CO(g)} + \text{H}_2\text{(g)}$ | (i)   | $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$ |
| (b) | Temporary hardness of water           | (ii)  | An electron deficient hydride             |
| (c) | $\text{B}_2\text{H}_6$                | (iii) | Synthesis gas                             |
| (d) | $\text{H}_2\text{O}_2$                | (iv)  | Non-planar structure                      |
- |     | (a)   | (b)   | (c)  | (d)  |
|-----|-------|-------|------|------|
| (1) | (i)   | (iii) | (ii) | (iv) |
| (2) | (iii) | (i)   | (ii) | (iv) |
| (3) | (iii) | (ii)  | (i)  | (iv) |
| (4) | (iii) | (iv)  | (ii) | (i)  |
34. Find out the solubility of  $\text{Ni(OH)}_2$  in  $0.1 \text{ M NaOH}$ . Given that the ionic product of  $\text{Ni(OH)}_2$  is  $2 \times 10^{-15}$ .
- $1 \times 10^8 \text{ M}$
  - $2 \times 10^{-13} \text{ M}$
  - $2 \times 10^{-8} \text{ M}$
  - $1 \times 10^{-13} \text{ M}$
35. Identify a molecule which does **not** exist.
- $\text{O}_2$
  - $\text{He}_2$
  - $\text{Li}_2$
  - $\text{C}_2$

## H2

## 6

36. Which of the following amine will give the carbylamine test ?



37. Identify the **incorrect** statement.

- (1) The oxidation states of chromium in  $\text{CrO}_4^{2-}$  and  $\text{Cr}_2\text{O}_7^{2-}$  are not the same.
- (2)  $\text{Cr}^{2+}(\text{d}^4)$  is a stronger reducing agent than  $\text{Fe}^{2+}(\text{d}^6)$  in water.
- (3) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
- (4) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

38. An increase in the concentration of the reactants of a reaction leads to change in :

- (1) collision frequency
- (2) activation energy
- (3) heat of reaction
- (4) threshold energy

39. A mixture of  $\text{N}_2$  and Ar gases in a cylinder contains 7 g of  $\text{N}_2$  and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of  $\text{N}_2$  is :

[Use atomic masses (in  $\text{g mol}^{-1}$ ) : N = 14, Ar = 40]

- (1) 18 bar
- (2) 9 bar
- (3) 12 bar
- (4) 15 bar

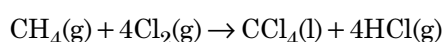
40. The number of Faradays(F) required to produce 20 g of calcium from molten  $\text{CaCl}_2$  (Atomic mass of Ca =  $40 \text{ g mol}^{-1}$ ) is :

- (1) 4
- (2) 1
- (3) 2
- (4) 3

41. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :

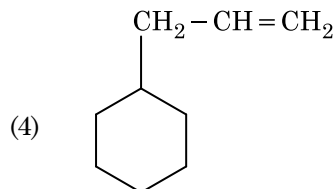
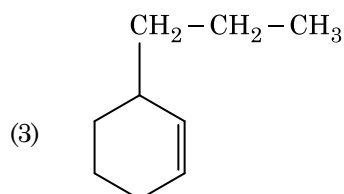
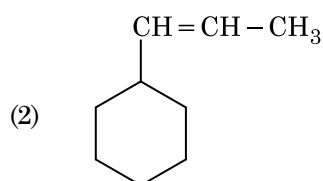
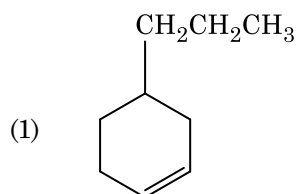
- (1) Cross Aldol condensation
- (2) Aldol condensation
- (3) Cannizzaro's reaction
- (4) Cross Cannizzaro's reaction

42. What is the change in oxidation number of carbon in the following reaction ?



- (1) 0 to -4
- (2) +4 to +4
- (3) 0 to +4
- (4) -4 to +4

43. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



44. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

- (1) Isobutyl alcohol
- (2) Isopropyl alcohol
- (3) Sec. butyl alcohol
- (4) Tert. butyl alcohol

45. Which of the following is a cationic detergent ?

- (1) Sodium dodecylbenzene sulphonate
- (2) Sodium lauryl sulphate
- (3) Sodium stearate
- (4) Cetyltrimethyl ammonium bromide

46. Flippers of Penguins and Dolphins are examples of :

- (1) Natural selection
- (2) Adaptive radiation
- (3) Convergent evolution
- (4) Industrial melanism

47. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage ( $G_0$ ). This process occurs at the end of :

- (1)  $G_2$  phase
- (2) M phase
- (3)  $G_1$  phase
- (4) S phase

48. Match the following :

- |                                     |               |
|-------------------------------------|---------------|
| (a) Inhibitor of catalytic activity | (i) Ricin     |
| (b) Possess peptide bonds           | (ii) Malonate |
| (c) Cell wall material in fungi     | (iii) Chitin  |
| (d) Secondary metabolite            | (iv) Collagen |

Choose the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (ii)  | (iii) | (i)   | (iv) |
| (2) | (ii)  | (iv)  | (iii) | (i)  |
| (3) | (iii) | (i)   | (iv)  | (ii) |
| (4) | (iii) | (iv)  | (i)   | (ii) |

49. Floridean starch has structure similar to :

- (1) Laminarin and cellulose
- (2) Starch and cellulose
- (3) Amylopectin and glycogen
- (4) Mannitol and algin

50. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their :

- (1) Effect on reproduction
- (2) Nutritive value
- (3) Growth response
- (4) Defence action

51. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is  $6.6 \times 10^9$  bp, then the length of the DNA is approximately :

- (1) 2.7 meters
- (2) 2.0 meters
- (3) 2.5 meters
- (4) 2.2 meters

## H2

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52. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is :
- (1) Plasmolysis
  - (2) Transpiration
  - (3) Root pressure
  - (4) Imbibition
53. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.
- (1) Allele 'i' does not produce any sugar.
  - (2) The gene (I) has three alleles.
  - (3) A person will have only two of the three alleles.
  - (4) When  $I^A$  and  $I^B$  are present together, they express same type of sugar.
54. Dissolution of the synaptonemal complex occurs during :
- (1) Leptotene
  - (2) Pachytene
  - (3) Zygotene
  - (4) Diplotene
55. Which of the following is put into Anaerobic sludge digester for further sewage treatment ?
- (1) Activated sludge
  - (2) Primary sludge
  - (3) Floating debris
  - (4) Effluents of primary treatment
56. Which of the following statements are **true** for the phylum-Chordata ?
- (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
  - (b) In Vertebrata notochord is present during the embryonic period only.
  - (c) Central nervous system is dorsal and hollow.
  - (d) Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.
- (1) (b) and (c)
  - (2) (d) and (c)
  - (3) (c) and (a)
  - (4) (a) and (b)
57. Select the option including all sexually transmitted diseases.
- (1) Cancer, AIDS, Syphilis
  - (2) Gonorrhoea, Syphilis, Genital herpes
  - (3) Gonorrhoea, Malaria, Genital herpes
  - (4) AIDS, Malaria, Filaria
58. Cuboidal epithelium with brush border of microvilli is found in :
- (1) eustachian tube
  - (2) lining of intestine
  - (3) ducts of salivary glands
  - (4) proximal convoluted tubule of nephron
59. The transverse section of a plant shows following anatomical features :
- (a) Large number of scattered vascular bundles surrounded by bundle sheath.
  - (b) Large conspicuous parenchymatous ground tissue.
  - (c) Vascular bundles conjoint and closed.
  - (d) Phloem parenchyma absent.
- Identify the category of plant and its part :
- (1) Dicotyledonous root
  - (2) Monocotyledonous stem
  - (3) Monocotyledonous root
  - (4) Dicotyledonous stem
60. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?
- (1) Inbreeding
  - (2) Out crossing
  - (3) Mutational breeding
  - (4) Cross breeding
61. Montreal protocol was signed in 1987 for control of :
- (1) Disposal of e-wastes
  - (2) Transport of Genetically modified organisms from one country to another
  - (3) Emission of ozone depleting substances
  - (4) Release of Green House gases

62. Match the following columns and select the **correct** option.

| Column - I |                                | Column - II |                               |
|------------|--------------------------------|-------------|-------------------------------|
| (a)        | Bt cotton                      | (i)         | Gene therapy                  |
| (b)        | Adenosine deaminase deficiency | (ii)        | Cellular defence              |
| (c)        | RNAi                           | (iii)       | Detection of HIV infection    |
| (d)        | PCR                            | (iv)        | <i>Bacillus thuringiensis</i> |

|     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (i)   | (ii)  | (iii) | (iv)  |
| (2) | (iv)  | (i)   | (ii)  | (iii) |
| (3) | (iii) | (ii)  | (i)   | (iv)  |
| (4) | (ii)  | (iii) | (iv)  | (i)   |

63. According to Robert May, the global species diversity is about :

- (1) 7 million
- (2) 1.5 million
- (3) 20 million
- (4) 50 million

64. Choose the **correct** pair from the following :

- (1) Exonucleases - Make cuts at specific positions within DNA
- (2) Ligases - Join the two DNA molecules
- (3) Polymerases - Break the DNA into fragments
- (4) Nucleases - Separate the two strands of DNA

65. Identify the **wrong** statement with regard to Restriction Enzymes.

- (1) Sticky ends can be joined by using DNA ligases.
- (2) Each restriction enzyme functions by inspecting the length of a DNA sequence.
- (3) They cut the strand of DNA at palindromic sites.
- (4) They are useful in genetic engineering.

66. Match the organism with its use in biotechnology.

|     |                                  |       |                                     |
|-----|----------------------------------|-------|-------------------------------------|
| (a) | <i>Bacillus thuringiensis</i>    | (i)   | Cloning vector                      |
| (b) | <i>Thermus aquaticus</i>         | (ii)  | Construction of first rDNA molecule |
| (c) | <i>Agrobacterium tumefaciens</i> | (iii) | DNA polymerase                      |
| (d) | <i>Salmonella typhimurium</i>    | (iv)  | Cry proteins                        |

Select the **correct** option from the following :

|     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (iii) | (iv)  | (i)   | (ii) |
| (2) | (ii)  | (iv)  | (iii) | (i)  |
| (3) | (iv)  | (iii) | (i)   | (ii) |
| (4) | (iii) | (ii)  | (iv)  | (i)  |

67. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                                 |
|------------|-----------------|-------------|---------------------------------|
| (a)        | Organ of Corti  | (i)         | Connects middle ear and pharynx |
| (b)        | Cochlea         | (ii)        | Coiled part of the labyrinth    |
| (c)        | Eustachian tube | (iii)       | Attached to the oval window     |
| (d)        | Stapes          | (iv)        | Located on the basilar membrane |

|     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (i)   | (ii)  | (iv) | (iii) |
| (2) | (ii)  | (iii) | (i)  | (iv)  |
| (3) | (iii) | (i)   | (iv) | (ii)  |
| (4) | (iv)  | (ii)  | (i)  | (iii) |

68. The QRS complex in a standard ECG represents :

- (1) Repolarisation of ventricles
- (2) Repolarisation of auricles
- (3) Depolarisation of auricles
- (4) Depolarisation of ventricles

69. Identify the substances having glycosidic bond and peptide bond, respectively in their structure :

- (1) Inulin, insulin
- (2) Chitin, cholesterol
- (3) Glycerol, trypsin
- (4) Cellulose, lecithin

H2

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70. Which of the following regions of the globe exhibits highest species diversity ?

- (1) Amazon forests
- (2) Western Ghats of India
- (3) Madagascar
- (4) Himalayas

71. Match the following columns and select the **correct** option.

| Column - I |                       | Column - II |                                    |
|------------|-----------------------|-------------|------------------------------------|
| (a)        | Placenta              | (i)         | Androgens                          |
| (b)        | Zona pellucida        | (ii)        | Human Chorionic Gonadotropin (hCG) |
| (c)        | Bulbo-urethral glands | (iii)       | Layer of the ovum                  |
| (d)        | Leydig cells          | (iv)        | Lubrication of the Penis           |

- |     |       |       |      |       |
|-----|-------|-------|------|-------|
|     | (a)   | (b)   | (c)  | (d)   |
| (1) | (ii)  | (iii) | (iv) | (i)   |
| (2) | (iv)  | (iii) | (i)  | (ii)  |
| (3) | (i)   | (iv)  | (ii) | (iii) |
| (4) | (iii) | (ii)  | (iv) | (i)   |

72. Match the following columns and select the **correct** option.

| Column - I |                 | Column - II |                    |
|------------|-----------------|-------------|--------------------|
| (a)        | Pituitary gland | (i)         | Grave's disease    |
| (b)        | Thyroid gland   | (ii)        | Diabetes mellitus  |
| (c)        | Adrenal gland   | (iii)       | Diabetes insipidus |
| (d)        | Pancreas        | (iv)        | Addison's disease  |

- |     |       |       |      |       |
|-----|-------|-------|------|-------|
|     | (a)   | (b)   | (c)  | (d)   |
| (1) | (ii)  | (i)   | (iv) | (iii) |
| (2) | (iv)  | (iii) | (i)  | (ii)  |
| (3) | (iii) | (ii)  | (i)  | (iv)  |
| (4) | (iii) | (i)   | (iv) | (ii)  |

73. Which of the following is **not** an inhibitory substance governing seed dormancy ?

- (1) Para-ascorbic acid
- (2) Gibberellic acid
- (3) Absciscic acid
- (4) Phenolic acid

74. If the head of cockroach is removed, it may live for few days because :

- (1) the head holds a  $\frac{1}{3}$ <sup>rd</sup> of a nervous system while the rest is situated along the dorsal part of its body.
- (2) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.
- (3) the cockroach does not have nervous system.
- (4) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.

75. The number of substrate level phosphorylations in one turn of citric acid cycle is :

- (1) Three
- (2) Zero
- (3) One
- (4) Two

76. The process of growth is maximum during :

- (1) Dormancy
- (2) Log phase
- (3) Lag phase
- (4) Senescence

77. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?

- (1) 8
- (2) 4
- (3) 2
- (4) 14

78. In gel electrophoresis, separated DNA fragments can be visualized with the help of :

- (1) Ethidium bromide in infrared radiation
- (2) Acetocarmine in bright blue light
- (3) Ethidium bromide in UV radiation
- (4) Acetocarmine in UV radiation

79. Identify the basic amino acid from the following.

- (1) Valine
- (2) Tyrosine
- (3) Glutamic Acid
- (4) Lysine

80. Match the following with respect to meiosis :

- |                |                     |
|----------------|---------------------|
| (a) Zygotene   | (i) Terminalization |
| (b) Pachytene  | (ii) Chiasmata      |
| (c) Diplotene  | (iii) Crossing over |
| (d) Diakinesis | (iv) Synapsis       |

Select the **correct** option from the following :

- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (ii)  | (iv)  | (iii) | (i)   |
| (2) | (iii) | (iv)  | (i)   | (ii)  |
| (3) | (iv)  | (iii) | (ii)  | (i)   |
| (4) | (i)   | (ii)  | (iv)  | (iii) |

81. Match the following diseases with the causative organism and select the **correct** option.

- | Column - I     |       | Column - II        |  |
|----------------|-------|--------------------|--|
| (a) Typhoid    | (i)   | <i>Wuchereria</i>  |  |
| (b) Pneumonia  | (ii)  | <i>Plasmodium</i>  |  |
| (c) Filariasis | (iii) | <i>Salmonella</i>  |  |
| (d) Malaria    | (iv)  | <i>Haemophilus</i> |  |
- 
- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iv)  | (i)   | (ii)  | (iii) |
| (2) | (i)   | (iii) | (ii)  | (iv)  |
| (3) | (iii) | (iv)  | (i)   | (ii)  |
| (4) | (ii)  | (i)   | (iii) | (iv)  |

82. Match the following concerning essential elements and their functions in plants :

- |               |                                             |
|---------------|---------------------------------------------|
| (a) Iron      | (i) Photolysis of water                     |
| (b) Zinc      | (ii) Pollen germination                     |
| (c) Boron     | (iii) Required for chlorophyll biosynthesis |
| (d) Manganese | (iv) IAA biosynthesis                       |

Select the **correct** option :

- |     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iv)  | (i)   | (ii) | (iii) |
| (2) | (ii)  | (i)   | (iv) | (iii) |
| (3) | (iv)  | (iii) | (ii) | (i)   |
| (4) | (iii) | (iv)  | (ii) | (i)   |

83. Which of the following would help in prevention of diuresis ?

- (1) Decrease in secretion of renin by JG cells
- (2) More water reabsorption due to undersecretion of ADH
- (3) Reabsorption of  $\text{Na}^+$  and water from renal tubules due to aldosterone
- (4) Atrial natriuretic factor causes vasoconstriction

84. Snow-blindness in Antarctic region is due to :

- (1) Damage to retina caused by infra-red rays
- (2) Freezing of fluids in the eye by low temperature
- (3) Inflammation of cornea due to high dose of UV-B radiation
- (4) High reflection of light from snow

85. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to :

- (1) Insect predators
- (2) Insect pests
- (3) Fungal diseases
- (4) Plant nematodes

86. Select the **correct** events that occur during inspiration.

- (a) Contraction of diaphragm
  - (b) Contraction of external inter-costal muscles
  - (c) Pulmonary volume decreases
  - (d) Intra pulmonary pressure increases
- (1) only (d)
  - (2) (a) and (b)
  - (3) (c) and (d)
  - (4) (a), (b) and (d)

87. Which of the following is **correct** about viroids ?

- (1) They have free DNA without protein coat.
- (2) They have RNA with protein coat.
- (3) They have free RNA without protein coat.
- (4) They have DNA with protein coat.

H2

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88. Match the following columns and select the correct option.

| Column - I |                | Column - II |                                         |
|------------|----------------|-------------|-----------------------------------------|
| (a)        | Floating Ribs  | (i)         | Located between second and seventh ribs |
| (b)        | Acromion       | (ii)        | Head of the Humerus                     |
| (c)        | Scapula        | (iii)       | Clavicle                                |
| (d)        | Glenoid cavity | (iv)        | Do not connect with the sternum         |

|     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iv)  | (iii) | (i)  | (ii)  |
| (2) | (ii)  | (iv)  | (i)  | (iii) |
| (3) | (i)   | (iii) | (ii) | (iv)  |
| (4) | (iii) | (ii)  | (iv) | (i)   |

89. Match the following columns and select the correct option.

| Column - I |                                                              | Column - II |                   |
|------------|--------------------------------------------------------------|-------------|-------------------|
| (a)        | Gregarious, polyphagous pest                                 | (i)         | <i>Asterias</i>   |
| (b)        | Adult with radial symmetry and larva with bilateral symmetry | (ii)        | Scorpion          |
| (c)        | Book lungs                                                   | (iii)       | <i>Ctenoplana</i> |
| (d)        | Bioluminescence                                              | (iv)        | <i>Locusta</i>    |

|     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (ii)  | (i)   | (iii) | (iv)  |
| (2) | (i)   | (iii) | (ii)  | (iv)  |
| (3) | (iv)  | (i)   | (ii)  | (iii) |
| (4) | (iii) | (ii)  | (i)   | (iv)  |

90. Ray florets have :

- (1) Half inferior ovary
- (2) Inferior ovary
- (3) Superior ovary
- (4) Hypogynous ovary

91. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?

- (1) GIFT and ICSI
- (2) ZIFT and IUT
- (3) GIFT and ZIFT
- (4) ICSI and ZIFT

92. Match the following columns and select the correct option.

| Column - I |                               | Column - II |                                  |
|------------|-------------------------------|-------------|----------------------------------|
| (a)        | <i>Clostridium butylicum</i>  | (i)         | Cyclosporin-A                    |
| (b)        | <i>Trichoderma polysporum</i> | (ii)        | Butyric Acid                     |
| (c)        | <i>Monascus purpureus</i>     | (iii)       | Citric Acid                      |
| (d)        | <i>Aspergillus niger</i>      | (iv)        | Blood cholesterol lowering agent |

|     | (a)   | (b)   | (c)  | (d)   |
|-----|-------|-------|------|-------|
| (1) | (iv)  | (iii) | (ii) | (i)   |
| (2) | (iii) | (iv)  | (ii) | (i)   |
| (3) | (ii)  | (i)   | (iv) | (iii) |
| (4) | (i)   | (ii)  | (iv) | (iii) |

93. The plant parts which consist of two generations - one within the other :

- (a) Pollen grains inside the anther
  - (b) Germinated pollen grain with two male gametes
  - (c) Seed inside the fruit
  - (d) Embryo sac inside the ovule
- (1) (a) and (d)
  - (2) (a) only
  - (3) (a), (b) and (c)
  - (4) (c) and (d)

94. Which of the following is **not** an attribute of a population ?

- (1) Species interaction
- (2) Sex ratio
- (3) Natality
- (4) Mortality

95. The sequence that controls the copy number of the linked DNA in the vector, is termed :

- (1) Recognition site
- (2) Selectable marker
- (3) Ori site
- (4) Palindromic sequence

96. The specific palindromic sequence which is recognized by EcoRI is :

- (1) 5' - GGATCC - 3'  
3' - CCTAGG - 5'
- (2) 5' - GAATTC - 3'  
3' - CTTAAG - 5'
- (3) 5' - GGAACC - 3'  
3' - CCTTGG - 5'
- (4) 5' - CTTAAG - 3'  
3' - GAATTC - 5'

97. Experimental verification of the chromosomal theory of inheritance was done by :
- (1) Morgan
  - (2) Mendel
  - (3) Sutton
  - (4) Boveri

98. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :
- (1) Ammonia and hydrogen
  - (2) Ammonia alone
  - (3) Nitrate alone
  - (4) Ammonia and oxygen

99. Match the following columns and select the **correct** option.

| Column - I |                            | Column - II |                |
|------------|----------------------------|-------------|----------------|
| (a)        | 6 - 15 pairs of gill slits | (i)         | <i>Trygon</i>  |
| (b)        | Heterocercal caudal fin    | (ii)        | Cyclostomes    |
| (c)        | Air Bladder                | (iii)       | Chondrichthyes |
| (d)        | Poison sting               | (iv)        | Osteichthyes   |
| (a)        | (b)                        | (c)         | (d)            |
| (1)        | (i)                        | (iv)        | (iii)          |
| (2)        | (ii)                       | (iii)       | (iv)           |
| (3)        | (iii)                      | (iv)        | (i)            |
| (4)        | (iv)                       | (ii)        | (iii)          |

100. Identify the **incorrect** statement.

- (1) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
- (2) Heart wood does not conduct water but gives mechanical support.
- (3) Sapwood is involved in conduction of water and minerals from root to leaf.
- (4) Sapwood is the innermost secondary xylem and is lighter in colour.

101. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is **correct** ?

- (1) There is no relationship between Gross primary productivity and Net primary productivity.
- (2) Gross primary productivity is always less than net primary productivity.
- (3) Gross primary productivity is always more than net primary productivity.
- (4) Gross primary productivity and Net primary productivity are one and same.

102. Which of the following refer to **correct** example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action ?

- (a) Darwin's Finches of Galapagos islands.
- (b) Herbicide resistant weeds.
- (c) Drug resistant eukaryotes.
- (d) Man-created breeds of domesticated animals like dogs.
- (1) only (d)
- (2) only (a)
- (3) (a) and (c)
- (4) (b), (c) and (d)

103. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle ?

- (1) Low concentration of FSH
- (2) High concentration of Estrogen
- (3) High concentration of Progesterone
- (4) Low concentration of LH

104. In light reaction, plastoquinone facilitates the transfer of electrons from :

- (1) PS-I to ATP synthase
- (2) PS-II to Cytb<sub>6</sub>f complex
- (3) Cytb<sub>6</sub>f complex to PS-I
- (4) PS-I to NADP<sup>+</sup>

## H2

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- 105.** Which of the following statements is **not correct** ?
- (1) Genetically engineered insulin is produced in *E-Coli*.
  - (2) In man insulin is synthesised as a proinsulin.
  - (3) The proinsulin has an extra peptide called C-peptide.
  - (4) The functional insulin has A and B chains linked together by hydrogen bonds.
- 106.** From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
  - (2)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $800^\circ\text{C}$
  - (3)  $\text{CH}_3$ ,  $\text{H}_2$ ,  $\text{NH}_4$  and water vapor at  $800^\circ\text{C}$
  - (4)  $\text{CH}_4$ ,  $\text{H}_2$ ,  $\text{NH}_3$  and water vapor at  $600^\circ\text{C}$
- 107.** Select the **correct** match.
- (1) Thalassemia - X linked
  - (2) Haemophilia - Y linked
  - (3) Phenylketonuria - Autosomal dominant trait
  - (4) Sickle cell anaemia - Autosomal recessive trait, chromosome-11
- 108.** Embryological support for evolution was disapproved by :
- (1) Oparin
  - (2) Karl Ernst von Baer
  - (3) Alfred Wallace
  - (4) Charles Darwin
- 109.** Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- (1) Renal calculi and Hyperglycaemia
  - (2) Uremia and Ketonuria
  - (3) Uremia and Renal Calculi
  - (4) Ketonuria and Glycosuria
- 110.** The enzyme enterokinase helps in conversion of :
- (1) pepsinogen into pepsin
  - (2) protein into polypeptides
  - (3) trypsinogen into trypsin
  - (4) caseinogen into casein
- 111.** Strobili or cones are found in :
- (1) *Equisetum*
  - (2) *Salvinia*
  - (3) *Pteris*
  - (4) *Marchantia*
- 112.** Meiotic division of the secondary oocyte is completed :
- (1) At the time of fusion of a sperm with an ovum
  - (2) Prior to ovulation
  - (3) At the time of copulation
  - (4) After zygote formation
- 113.** The body of the ovule is fused within the funicle at :
- (1) Chalaza
  - (2) Hilum
  - (3) Micropyle
  - (4) Nucellus
- 114.** Goblet cells of alimentary canal are modified from :
- (1) Compound epithelial cells
  - (2) Squamous epithelial cells
  - (3) Columnar epithelial cells
  - (4) Chondrocytes
- 115.** Which of the following statements about inclusion bodies is **incorrect** ?
- (1) These represent reserve material in cytoplasm.
  - (2) They are not bound by any membrane.
  - (3) These are involved in ingestion of food particles.
  - (4) They lie free in the cytoplasm.
- 116.** Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- (1) Absciscic acid
  - (2) Cytokinin
  - (3) Gibberellin
  - (4) Ethylene

117. Identify the **correct** statement with reference to human digestive system.

- (1) Vermiform appendix arises from duodenum.
- (2) Ileum opens into small intestine.
- (3) Serosa is the innermost layer of the alimentary canal.
- (4) Ileum is a highly coiled part.

118. The ovary is half inferior in :

- (1) Plum
- (2) Brinjal
- (3) Mustard
- (4) Sunflower

119. The infectious stage of *Plasmodium* that enters the human body is :

- (1) Male gametocytes
- (2) Trophozoites
- (3) Sporozoites
- (4) Female gametocytes

120. Identify the **wrong** statement with reference to immunity.

- (1) Foetus receives some antibodies from mother, it is an example for passive immunity.
- (2) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
- (3) When ready-made antibodies are directly given, it is called "Passive immunity".
- (4) Active immunity is quick and gives full response.

121. Match the trophic levels with their **correct** species examples in grassland ecosystem.

- |                          |              |
|--------------------------|--------------|
| (a) Fourth trophic level | (i) Crow     |
| (b) Second trophic level | (ii) Vulture |
| (c) First trophic level  | (iii) Rabbit |
| (d) Third trophic level  | (iv) Grass   |

Select the **correct** option :

- |     | (a)   | (b)   | (c)   | (d)  |
|-----|-------|-------|-------|------|
| (1) | (i)   | (ii)  | (iii) | (iv) |
| (2) | (ii)  | (iii) | (iv)  | (i)  |
| (3) | (iii) | (ii)  | (i)   | (iv) |
| (4) | (iv)  | (iii) | (ii)  | (i)  |

122. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?

- (1) Polysomes
- (2) Endoplasmic reticulum
- (3) Peroxisomes
- (4) Golgi bodies

123. Identify the **correct** statement with regard to G<sub>1</sub> phase (Gap 1) of interphase.

- (1) Nuclear Division takes place.
- (2) DNA synthesis or replication takes place.
- (3) Reorganisation of all cell components takes place.
- (4) Cell is metabolically active, grows but does not replicate its DNA.

124. The first phase of translation is :

- (1) Recognition of an anti-codon
- (2) Binding of mRNA to ribosome
- (3) Recognition of DNA molecule
- (4) Aminoacylation of tRNA

125. Name the enzyme that facilitates opening of DNA helix during transcription.

- (1) RNA polymerase
- (2) DNA ligase
- (3) DNA helicase
- (4) DNA polymerase

126. The roots that originate from the base of the stem are :

- (1) Lateral roots
- (2) Fibrous roots
- (3) Primary roots
- (4) Prop roots

127. Identify the **wrong** statement with reference to transport of oxygen.

- (1) Low pCO<sub>2</sub> in alveoli favours the formation of oxyhaemoglobin.
- (2) Binding of oxygen with haemoglobin is mainly related to partial pressure of O<sub>2</sub>.
- (3) Partial pressure of CO<sub>2</sub> can interfere with O<sub>2</sub> binding with haemoglobin.
- (4) Higher H<sup>+</sup> conc. in alveoli favours the formation of oxyhaemoglobin.

## H2

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- 128.** Select the **correct** statement.
- (1) Insulin is associated with hyperglycemia.
  - (2) Glucocorticoids stimulate gluconeogenesis.
  - (3) Glucagon is associated with hypoglycemia.
  - (4) Insulin acts on pancreatic cells and adipocytes.
- 129.** Bilaterally symmetrical and acoelomate animals are exemplified by :
- (1) Annelida
  - (2) Ctenophora
  - (3) Platyhelminthes
  - (4) Aschelminthes
- 130.** The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of :
- (1) 1 molecule of 4-C compound and 1 molecule of 2-C compound
  - (2) 2 molecules of 3-C compound
  - (3) 1 molecule of 3-C compound
  - (4) 1 molecule of 6-C compound
- 131.** Which one of the following is the most abundant protein in the animals ?
- (1) Insulin
  - (2) Haemoglobin
  - (3) Collagen
  - (4) Lectin
- 132.** Which of the following pairs is of unicellular algae ?
- (1) *Chlorella* and *Spirulina*
  - (2) *Laminaria* and *Sargassum*
  - (3) *Gelidium* and *Gracilaria*
  - (4) *Anabaena* and *Volvox*
- 133.** In water hyacinth and water lily, pollination takes place by :
- (1) insects and water
  - (2) insects or wind
  - (3) water currents only
  - (4) wind and water

- 134.** Which of the following statements is **correct** ?
- (1) Adenine does not pair with thymine.
  - (2) Adenine pairs with thymine through two H-bonds.
  - (3) Adenine pairs with thymine through one H-bond.
  - (4) Adenine pairs with thymine through three H-bonds.
- 135.** Match the following columns and select the **correct** option.
- | Column - I      |       | Column - II                              |  |
|-----------------|-------|------------------------------------------|--|
| (a) Eosinophils | (i)   | Immune response                          |  |
| (b) Basophils   | (ii)  | Phagocytosis                             |  |
| (c) Neutrophils | (iii) | Release histaminase, destructive enzymes |  |
| (d) Lymphocytes | (iv)  | Release granules containing histamine    |  |
- |     | (a)   | (b)  | (c)   | (d)   |
|-----|-------|------|-------|-------|
| (1) | (ii)  | (i)  | (iii) | (iv)  |
| (2) | (iii) | (iv) | (ii)  | (i)   |
| (3) | (iv)  | (i)  | (ii)  | (iii) |
| (4) | (i)   | (ii) | (iv)  | (iii) |
- 136.** In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :
- (1) 537 Hz
  - (2) 523 Hz
  - (3) 524 Hz
  - (4) 536 Hz
- 137.** The capacitance of a parallel plate capacitor with air as medium is  $6 \mu\text{F}$ . With the introduction of a dielectric medium, the capacitance becomes  $30 \mu\text{F}$ . The permittivity of the medium is :
- $(\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2})$
- (1)  $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (2)  $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (3)  $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
  - (4)  $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

138. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

- (1) zero
- (2)  $\pi$  rad
- (3)  $\frac{3\pi}{2}$  rad
- (4)  $\frac{\pi}{2}$  rad

139. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

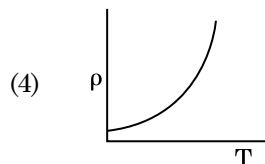
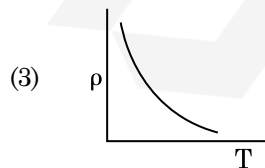
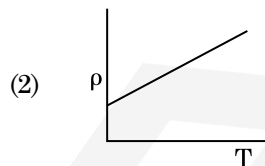
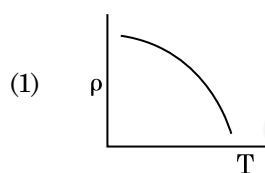
- (1) zero
- (2) doubled
- (3) four times
- (4) one-fourth

140. A spherical conductor of radius 10 cm has a charge of  $3.2 \times 10^{-7}$  C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

- (1)  $1.28 \times 10^7$  N/C
- (2)  $1.28 \times 10^4$  N/C
- (3)  $1.28 \times 10^5$  N/C
- (4)  $1.28 \times 10^6$  N/C

141. Which of the following graph represents the variation of resistivity ( $\rho$ ) with temperature (T) for copper ?



142. For transistor action, which of the following statements is **correct** ?

- (1) The base region must be very thin and lightly doped.
- (2) Base, emitter and collector regions should have same doping concentrations.
- (3) Base, emitter and collector regions should have same size.
- (4) Both emitter junction as well as the collector junction are forward biased.

143. The average thermal energy for a mono-atomic gas is : ( $k_B$  is Boltzmann constant and T, absolute temperature)

- (1)  $\frac{7}{2} k_B T$
- (2)  $\frac{1}{2} k_B T$
- (3)  $\frac{3}{2} k_B T$
- (4)  $\frac{5}{2} k_B T$

144. In a certain region of space with volume  $0.2 \text{ m}^3$ , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

- (1) 5 N/C
- (2) zero
- (3) 0.5 N/C
- (4) 1 N/C

145. A capillary tube of radius  $r$  is immersed in water and water rises in it to a height  $h$ . The mass of the water in the capillary is 5 g. Another capillary tube of radius  $2r$  is immersed in water. The mass of water that will rise in this tube is :

- (1) 20.0 g
- (2) 2.5 g
- (3) 5.0 g
- (4) 10.0 g

146. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

- (1) 80 cm
- (2) 33 cm
- (3) 50 cm
- (4) 67 cm

147. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :
- isobaric
  - isothermal
  - adiabatic
  - isochoric
148. The energy required to break one bond in DNA is  $10^{-20}$  J. This value in eV is nearly :
- 0.006
  - 6
  - 0.6
  - 0.06
149. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ( $g = 10 \text{ m/s}^2$ )
- 300 m
  - 360 m
  - 340 m
  - 320 m
150. The energy equivalent of 0.5 g of a substance is :
- $0.5 \times 10^{13} \text{ J}$
  - $4.5 \times 10^{16} \text{ J}$
  - $4.5 \times 10^{13} \text{ J}$
  - $1.5 \times 10^{13} \text{ J}$
151. The solids which have the negative temperature coefficient of resistance are :
- insulators and semiconductors
  - metals
  - insulators only
  - semiconductors only
152. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is  $1.227 \times 10^{-2} \text{ nm}$ , the potential difference is :
- $10^4 \text{ V}$
  - $10 \text{ V}$
  - $10^2 \text{ V}$
  - $10^3 \text{ V}$
153. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :
- $$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$
- $3.14 \times 10^{-5} \text{ T}$
  - $6.28 \times 10^{-4} \text{ T}$
  - $3.14 \times 10^{-4} \text{ T}$
  - $6.28 \times 10^{-5} \text{ T}$
154. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : ( $c = \text{speed of electromagnetic waves}$ )
- $1 : c^2$
  - $c : 1$
  - $1 : 1$
  - $1 : c$
155. A short electric dipole has a dipole moment of  $16 \times 10^{-9} \text{ C m}$ . The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of  $60^\circ$  with the dipole axis is :
- $$\left( \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
- zero
  - 50 V
  - 200 V
  - 400 V
156. An iron rod of susceptibility 599 is subjected to a magnetising field of  $1200 \text{ A m}^{-1}$ . The permeability of the material of the rod is :
- $$(\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1})$$
- $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
  - $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
  - $8.0 \times 10^{-5} \text{ T m A}^{-1}$
  - $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
157. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?
- 24 N
  - 48 N
  - 32 N
  - 30 N

158. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale.

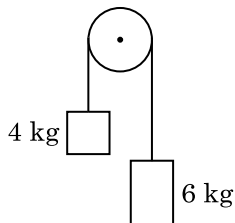
The pitch of the screw gauge is :

- (1) 1.0 mm
- (2) 0.01 mm
- (3) 0.25 mm
- (4) 0.5 mm

159. The quantities of heat required to raise the temperature of two solid copper spheres of radii  $r_1$  and  $r_2$  ( $r_1 = 1.5 r_2$ ) through 1 K are in the ratio :

- (1)  $\frac{5}{3}$
- (2)  $\frac{27}{8}$
- (3)  $\frac{9}{4}$
- (4)  $\frac{3}{2}$

160. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity ( $g$ ) is :



- (1)  $g/10$
- (2)  $g$
- (3)  $g/2$
- (4)  $g/5$

161. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

- (1)  $6.00 \times 10^{-7}$  rad
- (2)  $3.66 \times 10^{-7}$  rad
- (3)  $1.83 \times 10^{-7}$  rad
- (4)  $7.32 \times 10^{-7}$  rad

162. The increase in the width of the depletion region in a p-n junction diode is due to :

- (1) increase in forward current
- (2) forward bias only
- (3) reverse bias only
- (4) both forward bias and reverse bias

163. Light with an average flux of  $20 \text{ W/cm}^2$  falls on a non-reflecting surface at normal incidence having surface area  $20 \text{ cm}^2$ . The energy received by the surface during time span of 1 minute is :

- (1)  $48 \times 10^3 \text{ J}$
- (2)  $10 \times 10^3 \text{ J}$
- (3)  $12 \times 10^3 \text{ J}$
- (4)  $24 \times 10^3 \text{ J}$

164. The mean free path for a gas, with molecular diameter  $d$  and number density  $n$  can be expressed as :

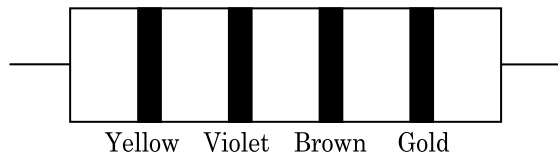
- (1)  $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
- (2)  $\frac{1}{\sqrt{2} n \pi d}$
- (3)  $\frac{1}{\sqrt{2} n \pi d^2}$
- (4)  $\frac{1}{\sqrt{2} n^2 \pi d^2}$

165. A  $40 \mu\text{F}$  capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

- (1) 25.1 A
- (2) 1.7 A
- (3) 2.05 A
- (4) 2.5 A

H2

166. The color code of a resistance is given below :



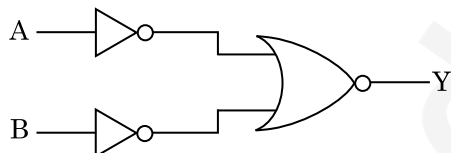
The values of resistance and tolerance, respectively, are :

- (1) 470  $\Omega$ , 5%
- (2) 470 k $\Omega$ , 5%
- (3) 47 k $\Omega$ , 10%
- (4) 4.7 k $\Omega$ , 5%

167. A wire of length  $L$ , area of cross section  $A$  is hanging from a fixed support. The length of the wire changes to  $L_1$  when mass  $M$  is suspended from its free end. The expression for Young's modulus is :

- (1)  $\frac{MgL}{A(L_1 - L)}$
- (2)  $\frac{MgL_1}{AL}$
- (3)  $\frac{Mg(L_1 - L)}{AL}$
- (4)  $\frac{MgL}{AL_1}$

168. For the logic circuit shown, the truth table is :



- (1)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |
- (2)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |
- (3)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |
- (4)

| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

20

169. A series LCR circuit is connected to an ac voltage source. When  $L$  is removed from the circuit, the phase difference between current and voltage is  $\frac{\pi}{3}$ . If instead  $C$  is removed from the circuit, the phase difference is again  $\frac{\pi}{3}$  between current and voltage. The power factor of the circuit is :

- (1) -1.0
- (2) zero
- (3) 0.5
- (4) 1.0

170. Dimensions of stress are :

- (1)  $[ML^{-1}T^{-2}]$
- (2)  $[MLT^{-2}]$
- (3)  $[ML^2T^{-2}]$
- (4)  $[ML^0T^{-2}]$

171. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : ( $R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ )

- (1) 0.02 kg/m<sup>3</sup>
- (2) 0.5 kg/m<sup>3</sup>
- (3) 0.2 kg/m<sup>3</sup>
- (4) 0.1 kg/m<sup>3</sup>

172. Find the torque about the origin when a force of  $3\hat{j} \text{ N}$  acts on a particle whose position vector is  $2\hat{k} \text{ m}$ .

- (1)  $6\hat{k} \text{ N m}$
- (2)  $6\hat{i} \text{ N m}$
- (3)  $6\hat{j} \text{ N m}$
- (4)  $-6\hat{i} \text{ N m}$

173. For which one of the following, Bohr model is **not** valid ?

- (1) Singly ionised neon atom ( $\text{Ne}^+$ )
- (2) Hydrogen atom
- (3) Singly ionised helium atom ( $\text{He}^+$ )
- (4) Deuteron atom

174. When a uranium isotope  ${}_{92}^{235}\text{U}$  is bombarded with a neutron, it generates  ${}_{36}^{89}\text{Kr}$ , three neutrons and :
- ${}_{36}^{103}\text{Kr}$
  - ${}_{56}^{144}\text{Ba}$
  - ${}_{40}^{91}\text{Zr}$
  - ${}_{36}^{101}\text{Kr}$
175. Taking into account of the significant figures, what is the value of  $9.99\text{ m} - 0.0099\text{ m}$  ?
- 9.9 m
  - 9.9801 m
  - 9.98 m
  - 9.980 m
176. The Brewsters angle  $i_b$  for an interface should be :
- $i_b = 90^\circ$
  - $0^\circ < i_b < 30^\circ$
  - $30^\circ < i_b < 45^\circ$
  - $45^\circ < i_b < 90^\circ$
177. A charged particle having drift velocity of  $7.5 \times 10^{-4}\text{ m s}^{-1}$  in an electric field of  $3 \times 10^{-10}\text{ Vm}^{-1}$ , has a mobility in  $\text{m}^2\text{ V}^{-1}\text{ s}^{-1}$  of :
- $2.25 \times 10^{-15}$
  - $2.25 \times 10^{15}$
  - $2.5 \times 10^6$
  - $2.5 \times 10^{-6}$
178. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :
- one-fourth
  - double
  - half
  - four times
179. A resistance wire connected in the left gap of a metre bridge balances a  $10\ \Omega$  resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of  $1\ \Omega$  of the resistance wire is :
- $1.5 \times 10^{-2}\text{ m}$
  - $1.0 \times 10^{-2}\text{ m}$
  - $1.0 \times 10^{-1}\text{ m}$
  - $1.5 \times 10^{-1}\text{ m}$
180. A ray is incident at an angle of incidence  $i$  on one surface of a small angle prism (with angle of prism  $A$ ) and emerges normally from the opposite surface. If the refractive index of the material of the prism is  $\mu$ , then the angle of incidence is nearly equal to :
- $\frac{\mu A}{2}$
  - $\frac{A}{2\mu}$
  - $\frac{2A}{\mu}$
  - $\mu A$
- o o o -

H2

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Space For Rough Work



**Space For Rough Work**

H2

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Space For Rough Work

