

Test Booklet Code

NAKHA

No. :

E3

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 **E3**. 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.
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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.

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1. Which of the following is a basic amino acid ?
 - (1) Serine
 - (2) Alanine
 - (3) Tyrosine
 - (4) Lysine
2. 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 $w > 0$
3. Measuring Zeta potential is useful in determining which property of colloidal solution ?
 - (1) Viscosity
 - (2) Solubility
 - (3) Stability of the colloidal particles
 - (4) Size of the colloidal particles
4. The calculated spin only magnetic moment of Cr^{2+} ion is :
 - (1) 3.87 BM
 - (2) 4.90 BM
 - (3) 5.92 BM
 - (4) 2.84 BM
5. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :
 - (a) β -Elimination reaction
 - (b) Follows Zaitsev rule
 - (c) Dehydrohalogenation reaction
 - (d) Dehydration reaction
 - (1) (a), (b), (c)
 - (2) (a), (c), (d)
 - (3) (b), (c), (d)
 - (4) (a), (b), (d)
6. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be :
 - (1) Hydrogen gas
 - (2) Oxygen gas
 - (3) H_2S gas
 - (4) SO_2 gas

7. Which of the following is **not** correct about carbon monoxide ?
 - (1) It forms carboxyhaemoglobin.
 - (2) It reduces oxygen carrying ability of blood.
 - (3) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
 - (4) It is produced due to incomplete combustion.
8. Sucrose on hydrolysis gives :
 - (1) β -D-Glucose + α -D-Fructose
 - (2) α -D-Glucose + β -D-Glucose
 - (3) α -D-Glucose + β -D-Fructose
 - (4) α -D-Fructose + β -D-Fructose
9. Match the following and identify the **correct** option.

(a) $\text{CO(g)} + \text{H}_2\text{(g)}$ (b) Temporary hardness of water (c) B_2H_6 (d) H_2O_2	(i) $\text{Mg(HCO}_3)_2 + \text{Ca(HCO}_3)_2$ (ii) An electron deficient hydride (iii) Synthesis gas (iv) Non-planar structure
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	(a)	(b)	(c)	(d)
(1)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(ii)	(i)	(iv)
(3)	(iii)	(iv)	(ii)	(i)
(4)	(i)	(iii)	(ii)	(iv)
10. An increase in the concentration of the reactants of a reaction leads to change in :
 - (1) activation energy
 - (2) heat of reaction
 - (3) threshold energy
 - (4) collision frequency
11. Which of the following is a natural polymer ?
 - (1) *cis*-1,4-polyisoprene
 - (2) poly (Butadiene-styrene)
 - (3) polybutadiene
 - (4) poly (Butadiene-acrylonitrile)

12. 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) 100 s
(2) 200 s
(3) 500 s
(4) 1000 s

13. 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 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), (b) and (c) only
(2) (a) and (c) only
(3) (b) and (c) only
(4) (c) and (d) only

14. 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 :

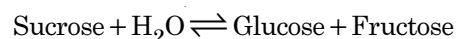
[Use atomic masses (in g mol^{-1}): N = 14, Ar = 40]

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

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

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

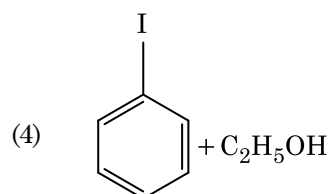
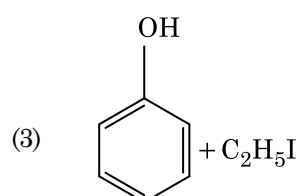
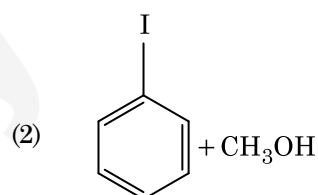
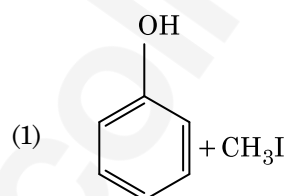
16. Hydrolysis of sucrose is given by the following reaction.



If the equilibrium constant (K_c) is 2×10^{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) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
(3) $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
(4) $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$

17. Anisole on cleavage with HI gives :



18. 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

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19. Paper chromatography is an example of :

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

20. 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) (a), (i)
- (2) (b), (ii)
- (3) (c), (iii)
- (4) (d), (iv)

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

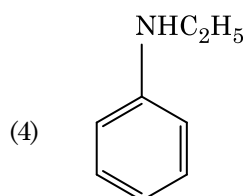
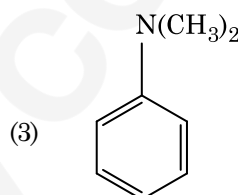
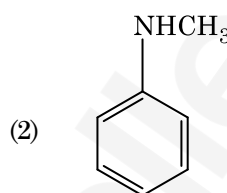
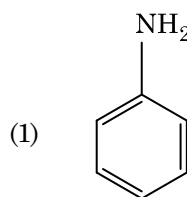
- (1) 1 g of Ag(s) [Atomic mass of Ag = 108]
- (2) 1 g of Mg(s) [Atomic mass of Mg = 24]
- (3) 1 g of O₂(g) [Atomic mass of O = 16]
- (4) 1 g of Li(s) [Atomic mass of Li = 7]

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

- (1) - I effect of - CH₃ groups
- (2) + R effect of - CH₃ groups
- (3) - R effect of - CH₃ groups
- (4) Hyperconjugation

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



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

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

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

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

26. 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
27. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
- $\text{SCN}^- < \text{F}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 - $\text{SCN}^- < \text{F}^- < \text{CN}^- < \text{C}_2\text{O}_4^{2-}$
 - $\text{F}^- < \text{SCN}^- < \text{C}_2\text{O}_4^{2-} < \text{CN}^-$
 - $\text{CN}^- < \text{C}_2\text{O}_4^{2-} < \text{SCN}^- < \text{F}^-$
28. Which of the following is a cationic detergent ?
- Sodium lauryl sulphate
 - Sodium stearate
 - Cetyltrimethyl ammonium bromide
 - Sodium dodecylbenzene sulphonate
29. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :
- Isopropyl alcohol
 - Sec. butyl alcohol
 - Tert. butyl alcohol
 - Isobutyl alcohol
30. 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 ?
- CuSO_4
 - $[\text{Cu}(\text{NH}_3)_4]^{2+}$
 - $\text{Cu}(\text{OH})_2$
 - $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
31. The number of Faradays(F) required to produce 20 g of calcium from molten CaCl_2 (Atomic mass of Ca = 40 g mol⁻¹) is :
- 1
 - 2
 - 3
 - 4
32. 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 $\Delta_r S < 0$
33. 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 2×10^{-15} .
- 2×10^{-13} M
 - 2×10^{-8} M
 - 1×10^{-13} M
 - 1×10^8 M
34. The freezing point depression constant (K_f) of benzene is 5.12 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) :
- 0.20 K
 - 0.80 K
 - 0.40 K
 - 0.60 K
35. 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 CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are not the same.
36. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :
- $\frac{\sqrt{3}}{4} \times 288$ pm
 - $\frac{\sqrt{2}}{4} \times 288$ pm
 - $\frac{4}{\sqrt{3}} \times 288$ pm
 - $\frac{4}{\sqrt{2}} \times 288$ pm

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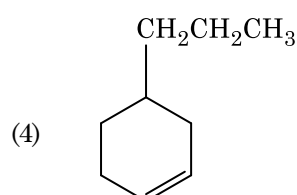
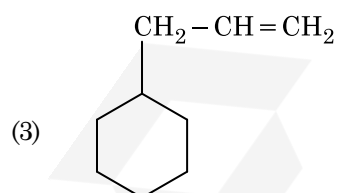
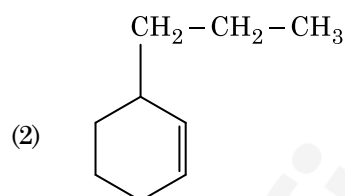
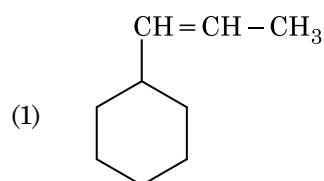
37. Identify a molecule which does **not** exist.

- (1) He_2
- (2) Li_2
- (3) C_2
- (4) O_2

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

- (1) H_2SO_3 , sulphurous acid
- (2) H_2SO_4 , sulphuric acid
- (3) $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid
- (4) $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid

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



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40. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl . Which of the following compound(s) crystallise(s) ?

- (1) Both MgCl_2 and CaCl_2
- (2) Only NaCl
- (3) Only MgCl_2
- (4) NaCl , MgCl_2 and CaCl_2

41. Match the following :

	Oxide		Nature
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al_2O_3	(iii)	Acidic
(d)	Cl_2O_7	(iv)	Amphoteric

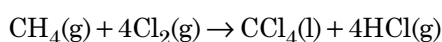
Which of the following is **correct** option ?

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

42. 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

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

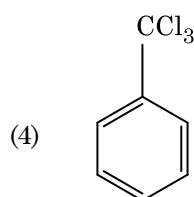
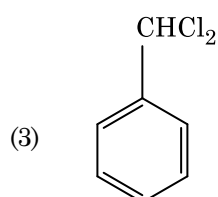
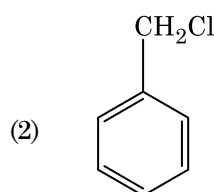
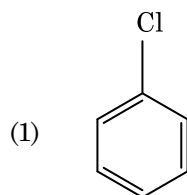
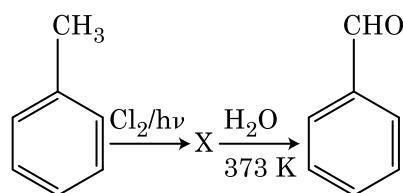


- (1) +4 to +4
- (2) 0 to +4
- (3) -4 to +4
- (4) 0 to -4

44. 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_2 .
- (3) Vapour phase refining is carried out for Nickel by Van Arkel method.
- (4) Pig iron can be moulded into a variety of shapes.

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



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

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

47. 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

48. The enzyme enterokinase helps in conversion of :

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

49. 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

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

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

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

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

52. Goblet cells of alimentary canal are modified from :

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

53. Floridean starch has structure similar to :

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

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54. 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.
55. 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
56. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1) CH_4 , H_2 , NH_3 and water vapor at 800°C
 - (2) CH_3 , H_2 , NH_4 and water vapor at 800°C
 - (3) CH_4 , H_2 , NH_3 and water vapor at 600°C
 - (4) CH_3 , H_2 , NH_3 and water vapor at 600°C
57. 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.
58. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.
- (1) Cytokinin
 - (2) Gibberellin
 - (3) Ethylene
 - (4) Absciscic acid
59. 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
60. Embryological support for evolution was disapproved by :
- (1) Karl Ernst von Baer
 - (2) Alfred Wallace
 - (3) Charles Darwin
 - (4) Oparin
61. Dissolution of the synaptonemal complex occurs during :
- (1) Pachytene
 - (2) Zygotene
 - (3) Diplotene
 - (4) Leptotene
62. 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
63. 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*
64. 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

65. Strobili or cones are found in :

- (1) *Salvinia*
- (2) *Pteris*
- (3) *Marchantia*
- (4) *Equisetum*

66. The roots that originate from the base of the stem are :

- (1) Fibrous roots
- (2) Primary roots
- (3) Prop roots
- (4) Lateral roots

67. The ovary is half inferior in :

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

68. 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)

69. 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.

70. 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

71. 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.

72. 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)

73. 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

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74. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
- (1) Endoplasmic reticulum
 - (2) Peroxisomes
 - (3) Golgi bodies
 - (4) Polysomes
75. 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.
76. Which of the following would help in prevention of diuresis ?
- (1) More water reabsorption due to undersecretion of ADH
 - (2) Reabsorption of Na^+ and water from renal tubules due to aldosterone
 - (3) Atrial natriuretic factor causes vasoconstriction
 - (4) Decrease in secretion of renin by JG cells
77. 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.
78. 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)
79. 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) only
 - (2) (a), (b) and (c)
 - (3) (c) and (d)
 - (4) (a) and (d)
80. 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) |
81. The QRS complex in a standard ECG represents :
- (1) Repolarisation of auricles
 - (2) Depolarisation of auricles
 - (3) Depolarisation of ventricles
 - (4) Repolarisation of ventricles

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

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

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

84. 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

85. 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) |

86. Flippers of Penguins and Dolphins are examples of :

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

87. 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 6.6×10^9 bp, then the length of the DNA is approximately :

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

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) | (ii) | (iv) | (i) | (iii) |
| (2) | (i) | (iii) | (ii) | (iv) |
| (3) | (iii) | (ii) | (iv) | (i) |
| (4) | (iv) | (iii) | (i) | (ii) |

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

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

90. 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 |

E3

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91. 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.
92. Ray florets have :
- (1) Inferior ovary
 - (2) Superior ovary
 - (3) Hypogynous ovary
 - (4) Half inferior ovary
93. Which of the following is **not** an inhibitory substance governing seed dormancy ?
- (1) Gibberellic acid
 - (2) Absciscic acid
 - (3) Phenolic acid
 - (4) Para-ascorbic acid
94. 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
95. 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.

96. Bilaterally symmetrical and acoelomate animals are exemplified by :
- (1) Ctenophora
 - (2) Platyhelminthes
 - (3) Aschelminthes
 - (4) Annelida
97. 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) |
98. 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
99. 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) | (iii) | (iv) | (ii) | (i) |
| (2) | (iv) | (i) | (ii) | (iii) |
| (3) | (i) | (ii) | (iv) | (iii) |
| (4) | (ii) | (i) | (iii) | (iv) |

100. 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.

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

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

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

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

103. 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

104. 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*.

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. 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) |

107. 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)

108. 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.

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109. 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'

110. 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)

111. 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)	(ii)
(2) (iii)	(ii)	(i)	(iv)
(3) (iii)	(i)	(iv)	(ii)
(4) (ii)	(i)	(iv)	(iii)

112. 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)	(i)
(2) (iii)	(iv)	(i)	(ii)
(3) (iv)	(ii)	(iii)	(i)
(4) (i)	(iv)	(iii)	(ii)

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

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

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

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

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

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

116. 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

117. 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) | (i) |
| (2) (iv) | (iii) | (i) | (ii) |
| (3) (iii) | (ii) | (iv) | (i) |
| (4) (iii) | (iv) | (i) | (ii) |

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

- (1) PS-II to Cytb₆f complex
- (2) Cytb₆f complex to PS-I
- (3) PS-I to NADP⁺
- (4) PS-I to ATP synthase

119. The process of growth is maximum during :

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

120. 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

121. 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>Ctenoplanea</i>
(d)	Bioluminescence			(iv) <i>Locusta</i>
	(a)	(b)	(c)	(d)
(1)	(i)	(iii)	(ii)	(iv)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(iii)	(ii)	(i)	(iv)
(4)	(ii)	(i)	(iii)	(iv)

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

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

123. Identify the basic amino acid from the following.

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

124. 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)

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

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

126. 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

127. 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

E3

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128. 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

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

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

130. 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) |

131. 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^A and I^B are present together, they express same type of sugar.
- (4) Allele 'i' does not produce any sugar.

132. 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

133. 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

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

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

135. 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) |

136. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

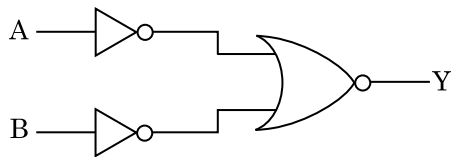
Its density is : ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) 0.5 kg/m³
- (2) 0.2 kg/m³
- (3) 0.1 kg/m³
- (4) 0.02 kg/m³

137. When a uranium isotope ${}_{92}^{235}\text{U}$ is bombarded with a neutron, it generates ${}_{36}^{89}\text{Kr}$, three neutrons and :

- (1) ${}_{56}^{144}\text{Ba}$
- (2) ${}_{40}^{91}\text{Zr}$
- (3) ${}_{36}^{101}\text{Kr}$
- (4) ${}_{36}^{103}\text{Kr}$

138. 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

139. 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) 2.5 g
- (2) 5.0 g
- (3) 10.0 g
- (4) 20.0 g

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

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

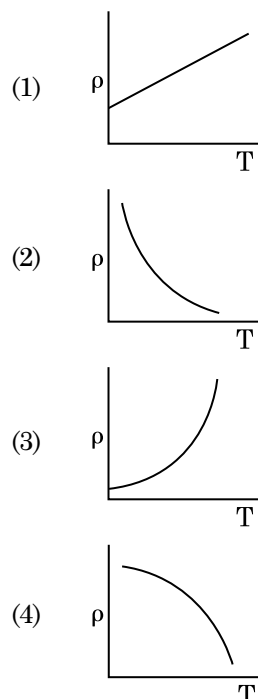
141. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

- (1) zero
- (2) 0.5 N/C
- (3) 1 N/C
- (4) 5 N/C

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

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

143. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?



E3

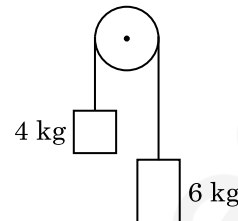
18

144. 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° 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) 50 V
 - (2) 200 V
 - (3) 400 V
 - (4) zero
145. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 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) $48 \times 10^3 \text{ J}$
146. 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) $i_b = 90^\circ$
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 :
- (1) isothermal
 - (2) adiabatic
 - (3) isochoric
 - (4) isobaric

148. 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) $g/10$
149. 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 :
- (1) double
 - (2) half
 - (3) four times
 - (4) one-fourth
150. 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.
151. 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) $3.66 \times 10^{-7} \text{ rad}$
 - (2) $1.83 \times 10^{-7} \text{ rad}$
 - (3) $7.32 \times 10^{-7} \text{ rad}$
 - (4) $6.00 \times 10^{-7} \text{ rad}$

152. 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 :
- $1.0 \times 10^{-2}\text{ m}$
 - $1.0 \times 10^{-1}\text{ m}$
 - $1.5 \times 10^{-1}\text{ m}$
 - $1.5 \times 10^{-2}\text{ m}$
153. The energy equivalent of 0.5 g of a substance is :
- $4.5 \times 10^{16}\text{ J}$
 - $4.5 \times 10^{13}\text{ J}$
 - $1.5 \times 10^{13}\text{ J}$
 - $0.5 \times 10^{13}\text{ J}$
154. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :
- $\frac{1}{\sqrt{2} n \pi d}$
 - $\frac{1}{\sqrt{2} n \pi d^2}$
 - $\frac{1}{\sqrt{2} n^2 \pi d^2}$
 - $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
155. The energy required to break one bond in DNA is 10^{-20} J . This value in eV is nearly :
- 6
 - 0.6
 - 0.06
 - 0.006
156. Find the torque about the origin when a force of $3\hat{j}\text{ N}$ acts on a particle whose position vector is $2\hat{k}\text{ m}$.
- $6\hat{i}\text{ N m}$
 - $6\hat{j}\text{ N m}$
 - $-6\hat{i}\text{ N m}$
 - $6\hat{k}\text{ N m}$
157. The increase in the width of the depletion region in a p-n junction diode is due to :
- forward bias only
 - reverse bias only
 - both forward bias and reverse bias
 - increase in forward current
158. 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)
- $c : 1$
 - $1 : 1$
 - $1 : c$
 - $1 : c^2$
159. A spherical conductor of radius 10 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 cm from the centre of the sphere ?
- $$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\text{ N m}^2/\text{C}^2 \right)$$
- $1.28 \times 10^4\text{ N/C}$
 - $1.28 \times 10^5\text{ N/C}$
 - $1.28 \times 10^6\text{ N/C}$
 - $1.28 \times 10^7\text{ N/C}$
160. Dimensions of stress are :
- $[\text{MLT}^{-2}]$
 - $[\text{ML}^2\text{T}^{-2}]$
 - $[\text{ML}^0\text{T}^{-2}]$
 - $[\text{ML}^{-1}\text{T}^{-2}]$
161. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :
- $\pi\text{ rad}$
 - $\frac{3\pi}{2}\text{ rad}$
 - $\frac{\pi}{2}\text{ rad}$
 - zero

E3

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162. 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) zero
- (2) 0.5
- (3) 1.0
- (4) -1.0

163. 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) 1.7 A
- (2) 2.05 A
- (3) 2.5 A
- (4) 25.1 A

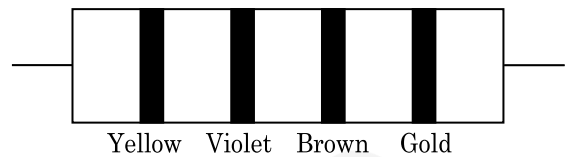
164. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

- (1) 523 Hz
- (2) 524 Hz
- (3) 536 Hz
- (4) 537 Hz

165. 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 μ , then the angle of incidence is nearly equal to :

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

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



The values of resistance and tolerance, respectively, are :

- (1) 470 k Ω , 5%
- (2) 47 k Ω , 10%
- (3) 4.7 k Ω , 5%
- (4) 470 Ω , 5%

167. 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) $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - (2) $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - (3) $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - (4) $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

168. 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) 33 cm
- (2) 50 cm
- (3) 67 cm
- (4) 80 cm

169. 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) 2.25×10^{15}
- (2) 2.5×10^6
- (3) 2.5×10^{-6}
- (4) 2.25×10^{-15}

170. 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 : ($g = 10 \text{ m/s}^2$)

- (1) 360 m
- (2) 340 m
- (3) 320 m
- (4) 300 m

171. The solids which have the negative temperature coefficient of resistance are :
- metals
 - insulators only
 - semiconductors only
 - insulators and semiconductors
172. 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
173. 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 :
- $\frac{27}{8}$
 - $\frac{9}{4}$
 - $\frac{3}{2}$
 - $\frac{5}{3}$
174. 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 ?
- 48 N
 - 32 N
 - 30 N
 - 24 N
175. 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
176. 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 :
- 0.01 mm
 - 0.25 mm
 - 0.5 mm
 - 1.0 mm
177. For which one of the following, Bohr model is **not** valid ?
- Hydrogen atom
 - Singly ionised helium atom (He^+)
 - Deuteron atom
 - Singly ionised neon atom (Ne^+)
178. 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 :
- $\frac{MgL_1}{AL}$
 - $\frac{Mg(L_1 - L)}{AL}$
 - $\frac{MgL}{AL_1}$
 - $\frac{MgL}{A(L_1 - L)}$
179. 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 :
- ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)
- $6.28 \times 10^{-4} \text{ T}$
 - $3.14 \times 10^{-4} \text{ T}$
 - $6.28 \times 10^{-5} \text{ T}$
 - $3.14 \times 10^{-5} \text{ T}$
180. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1} . The permeability of the material of the rod is :
- ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)
- $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
 - $8.0 \times 10^{-5} \text{ T m A}^{-1}$
 - $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
 - $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$

E3

22

Space For Rough Work



Space For Rough Work

E3

24

Space For Rough Work



Test Booklet Code

NAKHA

No. :

F3

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 **F3**. 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 : _____

F3

2

1. 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.

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

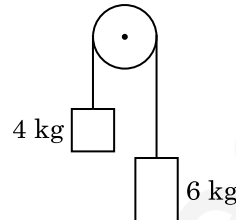
$$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$
 - (1) 1.28×10^6 N/C
 - (2) 1.28×10^7 N/C
 - (3) 1.28×10^4 N/C
 - (4) 1.28×10^5 N/C

3. 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) 7.32×10^{-7} rad
 - (2) 6.00×10^{-7} rad
 - (3) 3.66×10^{-7} rad
 - (4) 1.83×10^{-7} rad

4. Dimensions of stress are :
 - (1) $[\text{ML}^0\text{T}^{-2}]$
 - (2) $[\text{ML}^{-1}\text{T}^{-2}]$
 - (3) $[\text{MLT}^{-2}]$
 - (4) $[\text{ML}^2\text{T}^{-2}]$

5. 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

6. 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) $g/2$

7. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :
 - (1) 10^3 V
 - (2) 10^4 V
 - (3) 10 V
 - (4) 10^2 V

8. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :
 - (1) 1 N/C
 - (2) 5 N/C
 - (3) zero
 - (4) 0.5 N/C

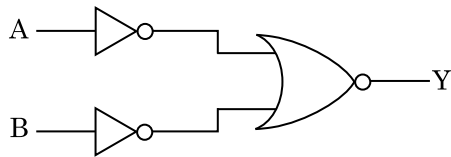
9. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C . Its density is : ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)
 - (1) 0.1 kg/m^3
 - (2) 0.02 kg/m^3
 - (3) 0.5 kg/m^3
 - (4) 0.2 kg/m^3

10. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :
 - (1) $\frac{1}{\sqrt{2} n^2 \pi d^2}$
 - (2) $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
 - (3) $\frac{1}{\sqrt{2} n \pi d}$
 - (4) $\frac{1}{\sqrt{2} n \pi d^2}$

11. 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 : ($g = 10 \text{ m/s}^2$)

(1) 320 m
(2) 300 m
(3) 360 m
(4) 340 m

12. 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

13. 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° with the dipole axis is :

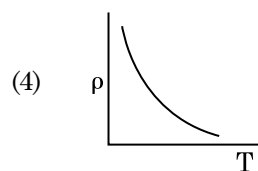
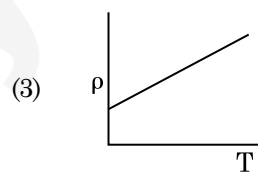
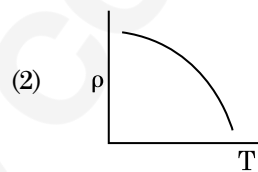
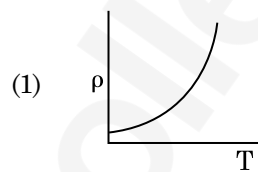
$$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

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

14. 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

15. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?



16. 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

17. 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) $3.14 \times 10^{-4} \text{ T}$

F3

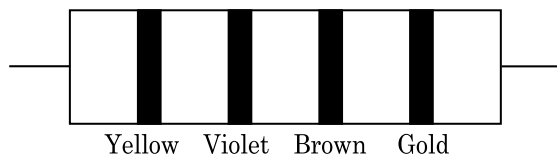
4

18. For which one of the following, Bohr model is **not** valid ?
- Deuteron atom
 - Singly ionised neon atom (Ne^+)
 - Hydrogen atom
 - Singly ionised helium atom (He^+)
19. The energy equivalent of 0.5 g of a substance is :
- $1.5 \times 10^{13} \text{ J}$
 - $0.5 \times 10^{13} \text{ J}$
 - $4.5 \times 10^{16} \text{ J}$
 - $4.5 \times 10^{13} \text{ J}$
20. 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
21. 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
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 - 523 Hz
 - 524 Hz
22. 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
23. 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 :
- $\frac{3}{2}$
 - $\frac{5}{3}$
 - $\frac{27}{8}$
 - $\frac{9}{4}$
24. The Brewsters angle i_b for an interface should be :
- $45^\circ < i_b < 90^\circ$
 - $i_b = 90^\circ$
 - $0^\circ < i_b < 30^\circ$
 - $30^\circ < i_b < 45^\circ$
25. 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
26. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1} . The permeability of the material of the rod is :
- ($\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$)
- $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
 - $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
 - $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
 - $8.0 \times 10^{-5} \text{ T m A}^{-1}$
27. 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 :
- ($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$)
- $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - $5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - $1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

28. 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) 2.5×10^{-6}
- (2) 2.25×10^{-15}
- (3) 2.25×10^{15}
- (4) 2.5×10^6

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



The values of resistance and tolerance, respectively, are :

- (1) 4.7 k Ω , 5%
 - (2) 470 Ω , 5%
 - (3) 470 k Ω , 5%
 - (4) 47 k Ω , 10%
30. The solids which have the negative temperature coefficient of resistance are :
- (1) semiconductors only
 - (2) insulators and semiconductors
 - (3) metals
 - (4) insulators only
31. 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
32. A 40 μF 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

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

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

34. 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) $\frac{3}{2} k_B T$

35. 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

36. 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 :

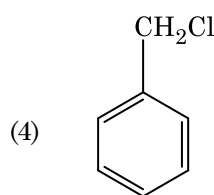
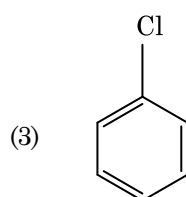
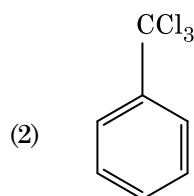
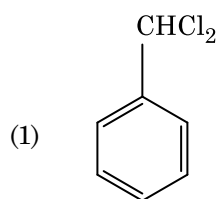
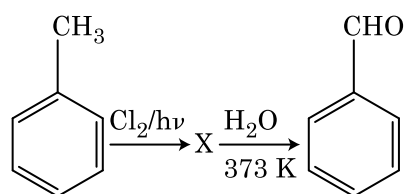
- (1) $\frac{MgL}{AL_1}$
- (2) $\frac{MgL}{A(L_1 - L)}$
- (3) $\frac{MgL_1}{AL}$
- (4) $\frac{Mg(L_1 - L)}{AL}$

F3

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37. 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 μ , then the angle of incidence is nearly equal to :
- (1) μA
 - (2) $\frac{\mu A}{2}$
 - (3) $\frac{A}{2\mu}$
 - (4) $\frac{2A}{\mu}$
38. 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
39. 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 :
- (1) four times
 - (2) one-fourth
 - (3) double
 - (4) half
40. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :
- (1) 0.06
 - (2) 0.006
 - (3) 6
 - (4) 0.6
41. When a uranium isotope ${}_{92}^{235}\text{U}$ is bombarded with a neutron, it generates ${}_{36}^{89}\text{Kr}$, three neutrons and :
- (1) ${}_{36}^{101}\text{Kr}$
 - (2) ${}_{36}^{103}\text{Kr}$
 - (3) ${}_{56}^{144}\text{Ba}$
 - (4) ${}_{40}^{91}\text{Zr}$
42. 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) 67 cm
 - (2) 80 cm
 - (3) 33 cm
 - (4) 50 cm
43. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2 . The energy received by the surface during time span of 1 minute is :
- (1) $24 \times 10^3 \text{ J}$
 - (2) $48 \times 10^3 \text{ J}$
 - (3) $10 \times 10^3 \text{ J}$
 - (4) $12 \times 10^3 \text{ J}$
44. The increase in the width of the depletion region in a p-n junction diode is due to :
- (1) both forward bias and reverse bias
 - (2) increase in forward current
 - (3) forward bias only
 - (4) reverse bias only
45. A resistance wire connected in the left gap of a metre bridge balances a 10Ω 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 1Ω of the resistance wire is :
- (1) $1.5 \times 10^{-1} \text{ m}$
 - (2) $1.5 \times 10^{-2} \text{ m}$
 - (3) $1.0 \times 10^{-2} \text{ m}$
 - (4) $1.0 \times 10^{-1} \text{ m}$

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



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

- (1) C_2
- (2) O_2
- (3) He_2
- (4) Li_2

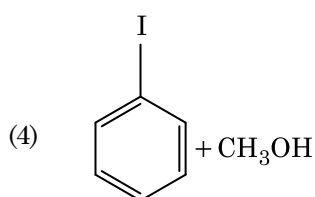
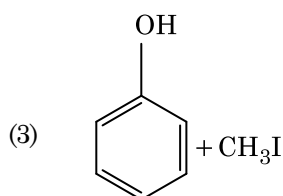
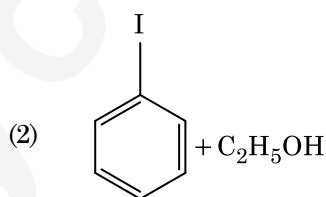
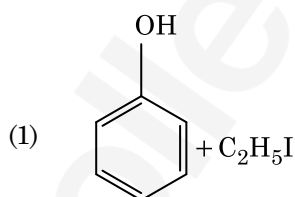
48. Which of the following is a natural polymer ?

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

49. 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

50. Anisole on cleavage with HI gives :



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

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

F3

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52. The calculated spin only magnetic moment of Cr^{2+} ion is :

- (1) 5.92 BM
- (2) 2.84 BM
- (3) 3.87 BM
- (4) 4.90 BM

53. Match the following :

Oxide	Nature
(a) CO	(i) Basic
(b) BaO	(ii) Neutral
(c) Al_2O_3	(iii) Acidic
(d) Cl_2O_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) |

54. 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) $\text{Cu}(\text{OH})_2$
- (2) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
- (3) CuSO_4
- (4) $[\text{Cu}(\text{NH}_3)_4]^{2+}$

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

(a) $\text{CO}(\text{g}) + \text{H}_2(\text{g})$	(i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$
(b) Temporary hardness of water	(ii) An electron deficient hydride
(c) B_2H_6	(iii) Synthesis gas
(d) H_2O_2	(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) |

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

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

57. 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) 0.40 K
- (2) 0.60 K
- (3) 0.20 K
- (4) 0.80 K

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

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

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

- (1) - R effect of - CH_3 groups
- (2) Hyperconjugation
- (3) - I effect of - CH_3 groups
- (4) + R effect of - CH_3 groups

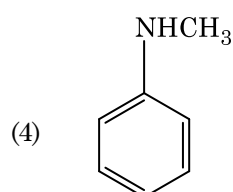
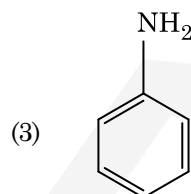
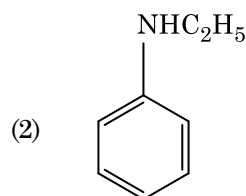
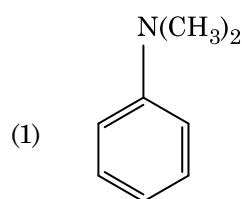
60. Find out the solubility of $\text{Ni}(\text{OH})_2$ in 0.1 M NaOH. Given that the ionic product of $\text{Ni}(\text{OH})_2$ is 2×10^{-15} .

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

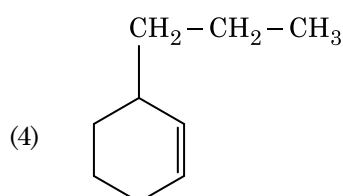
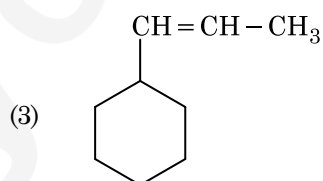
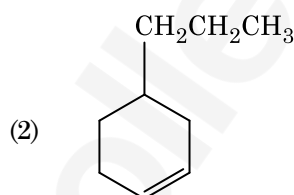
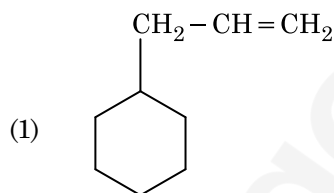
61. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give :

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

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



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



64. 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) 15 bar
- (2) 18 bar
- (3) 9 bar
- (4) 12 bar

65. Which of the following is the **correct** order of increasing field strength of ligands to form coordination compounds ?
- $F^- < SCN^- < C_2O_4^{2-} < CN^-$
 - $CN^- < C_2O_4^{2-} < SCN^- < F^-$
 - $SCN^- < F^- < C_2O_4^{2-} < CN^-$
 - $SCN^- < F^- < CN^- < C_2O_4^{2-}$
66. Paper chromatography is an example of :
- Thin layer chromatography
 - Column chromatography
 - Adsorption chromatography
 - Partition chromatography
67. Sucrose on hydrolysis gives :
- α -D-Glucose + β -D-Fructose
 - α -D-Fructose + β -D-Fructose
 - β -D-Glucose + α -D-Fructose
 - α -D-Glucose + β -D-Glucose
68. 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 :
- 500 s
 - 1000 s
 - 100 s
 - 200 s
69. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as :
- Cross Cannizzaro's reaction
 - Cross Aldol condensation
 - Aldol condensation
 - Cannizzaro's reaction
70. Which of the following is **not** correct about carbon monoxide ?
- The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
 - It is produced due to incomplete combustion.
 - It forms carboxyhaemoglobin.
 - It reduces oxygen carrying ability of blood.
71. 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 2×10^{13} at 300 K, the value of $\Delta_r G^\ominus$ at the same temperature will be :
- $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(3 \times 10^{13})$
 - $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(4 \times 10^{13})$
 - $-8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
 - $8.314 \text{ J mol}^{-1} \text{ K}^{-1} \times 300 \text{ K} \times \ln(2 \times 10^{13})$
72. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl. Which of the following compound(s) crystallise(s) ?
- Only MgCl_2
 - NaCl, MgCl_2 and CaCl_2
 - Both MgCl_2 and CaCl_2
 - Only NaCl
73. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is :
- $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$
 - $\frac{4}{\sqrt{2}} \times 288 \text{ pm}$
 - $\frac{\sqrt{3}}{4} \times 288 \text{ pm}$
 - $\frac{\sqrt{2}}{4} \times 288 \text{ pm}$
74. Which of the following oxoacid of sulphur has $-O-O-$ linkage ?
- $\text{H}_2\text{S}_2\text{O}_8$, peroxodisulphuric acid
 - $\text{H}_2\text{S}_2\text{O}_7$, pyrosulphuric acid
 - H_2SO_3 , sulphurous acid
 - H_2SO_4 , sulphuric acid

75. 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 $\text{Cr}_2\text{O}_7^{2-}$ are not the same.
- (3) $\text{Cr}^{2+}(\text{d}^4)$ is a stronger reducing agent than $\text{Fe}^{2+}(\text{d}^6)$ 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.

76. Which of the following is a cationic detergent ?

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

77. 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 $w > 0$

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

- (1) H_2S gas
- (2) SO_2 gas
- (3) Hydrogen gas
- (4) Oxygen gas

79. 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 CO_2 .

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

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

81. 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)		

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

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

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

- (a) β -Elimination reaction
- (b) Follows Zaitsev rule
- (c) Dehydrohalogenation reaction
- (d) Dehydration reaction
| (1) | (b), (c), (d) | | |
| (2) | (a), (b), (d) | | |
| (3) | (a), (b), (c) | | |
| (4) | (a), (c), (d) | | |

84. The number of Faradays(F) required to produce 20 g of calcium from molten CaCl_2 (Atomic mass of Ca = 40 g mol⁻¹) is :

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

F3

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85. 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]

86. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, 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 $\Delta_r S < 0$

87. Identify the **correct** statements from the following :
- (a) $CO_2(g)$ is used as refrigerant for ice-cream and frozen food.
 - (b) The structure of 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) (b) and (c) only
 - (2) (c) and (d) only
 - (3) (a), (b) and (c) only
 - (4) (a) and (c) only

88. Measuring Zeta potential is useful in determining which property of colloidal solution ?
- (1) Stability of the colloidal particles
 - (2) Size of the colloidal particles
 - (3) Viscosity
 - (4) Solubility

89. What is the change in oxidation number of carbon in the following reaction ?
- $$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(l) + 4HCl(g)$$
- (1) -4 to +4
 - (2) 0 to -4
 - (3) +4 to +4
 - (4) 0 to +4

90. 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) Calcium
 - (2) Potassium
 - (3) Iron
 - (4) Copper

91. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- (1) Ketonuria and Glycosuria
 - (2) Renal calculi and Hyperglycaemia
 - (3) Uremia and Ketonuria
 - (4) Uremia and Renal Calculi

92. 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)
(1)	(iii)	(ii)	(iv)
(2)	(ii)	(iii)	(iv)
(3)	(iv)	(iii)	(i)
(4)	(i)	(iv)	(ii)

93. 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)
(1)	(ii)	(iii)	(iv)
(2)	(i)	(ii)	(iii)
(3)	(iv)	(i)	(ii)
(4)	(iii)	(ii)	(i)

94. 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

95. 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)		

96. 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

97. 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)

98. The QRS complex in a standard ECG represents :

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

99. The enzyme enterokinase helps in conversion of :

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

100. 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.

101. Ray florets have :

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

102. 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

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

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

104. Identify the **correct** statement with regard to G₁ 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.

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

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

106. 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".

107. 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)	(i)
(2)	(iv)	(iii)	(i)	(ii)
(3)	(ii)	(iv)	(i)	(iii)
(4)	(i)	(iii)	(ii)	(iv)

108. Identify the basic amino acid from the following.

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

109. 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)

110. 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.

111. 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)

112. 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

113. The roots that originate from the base of the stem are :

- (1) Prop roots
- (2) Lateral roots
- (3) Fibrous roots
- (4) Primary roots

114. 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 $\frac{1}{3}$ rd 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.

115. Strobili or cones are found in :

- (1) *Marchantia*
- (2) *Equisetum*
- (3) *Salvinia*
- (4) *Pteris*

116. Dissolution of the synaptonemal complex occurs during :

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

117. 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)

118. 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

119. 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)

120. 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

121. 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)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(i)	(ii)	(iii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(iv)	(iii)	(ii)	(i)

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- 122.** Name the enzyme that facilitates opening of DNA helix during transcription.
- (1) DNA polymerase
 - (2) RNA polymerase
 - (3) DNA ligase
 - (4) DNA helicase
- 123.** From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask :
- (1) CH_4 , H_2 , NH_3 and water vapor at 600°C
 - (2) CH_3 , H_2 , NH_3 and water vapor at 600°C
 - (3) CH_4 , H_2 , NH_3 and water vapor at 800°C
 - (4) CH_3 , H_2 , NH_4 and water vapor at 800°C
- 124.** Goblet cells of alimentary canal are modified from :
- (1) Chondrocytes
 - (2) Compound epithelial cells
 - (3) Squamous epithelial cells
 - (4) Columnar epithelial cells
- 125.** Cuboidal epithelium with brush border of microvilli is found in :
- (1) proximal convoluted tubule of nephron
 - (2) eustachian tube
 - (3) lining of intestine
 - (4) ducts of salivary glands
- 126.** In light reaction, plastoquinone facilitates the transfer of electrons from :
- (1) PS-I to NADP^+
 - (2) PS-I to ATP synthase
 - (3) PS-II to Cytb_6f complex
 - (4) Cytb_6f complex to PS-I
- 127.** 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 6.6×10^9 bp, then the length of the DNA is approximately :
- (1) 2.2 meters
 - (2) 2.7 meters
 - (3) 2.0 meters
 - (4) 2.5 meters
- 128.** Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
- (1) Golgi bodies
 - (2) Polysomes
 - (3) Endoplasmic reticulum
 - (4) Peroxisomes
- 129.** Which of the following statements is **not correct** ?
- (1) The functional insulin has A and B chains linked together by hydrogen bonds.
 - (2) Genetically engineered insulin is produced in *E-Coli*.
 - (3) In man insulin is synthesised as a proinsulin.
 - (4) The proinsulin has an extra peptide called C-peptide.
- 130.** 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.
- 131.** Floridean starch has structure similar to :
- (1) Mannitol and algin
 - (2) Laminarin and cellulose
 - (3) Starch and cellulose
 - (4) Amylopectin and glycogen
- 132.** 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) |

133. 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)

134. The process of growth is maximum during :

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

135. 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)

136. 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

137. 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 Na^+ and water from renal tubules due to aldosterone

138. 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.

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

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

140. 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.

141. Flippers of Penguins and Dolphins are examples of :

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

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- 142.** 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
- 143.** 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.
- 144.** 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
- 145.** 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)
- 146.** 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
- 147.** 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.
- 148.** 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.
- 149.** 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) | (ii) |
| (2) | (ii) | (i) | (iv) | (iii) |
| (3) | (iv) | (iii) | (i) | (ii) |
| (4) | (iii) | (ii) | (i) | (iv) |
- 150.** According to Robert May, the global species diversity is about :
- (1) 50 million
 - (2) 7 million
 - (3) 1.5 million
 - (4) 20 million

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

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

152. 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)	(iii)	(ii)	(i)
(2)	(ii)	(i)	(iii)
(3)	(i)	(iii)	(ii)
(4)	(iv)	(i)	(ii)

153. Embryological support for evolution was disapproved by :

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

154. 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)

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

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

156. 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.

157. The ovary is half inferior in :

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

158. 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)

159. 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

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160. 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

161. 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

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

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

163. 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

164. 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.

165. 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'

166. 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

167. 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

168. 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

169. 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)

170. Bilaterally symmetrical and acoelomate animals are exemplified by :
- (1) Aschelminthes
 - (2) Annelida
 - (3) Ctenophora
 - (4) Platyhelminthes
171. Which of the following regions of the globe exhibits highest species diversity ?
- (1) Himalayas
 - (2) Amazon forests
 - (3) Western Ghats of India
 - (4) Madagascar
172. Select the **correct** match.
- | | | |
|-----------------------|---|--|
| (1) Sick cell anaemia | - | Autosomal recessive trait, chromosome-11 |
| (2) Thalassemia | - | X linked |
| (3) Haemophilia | - | Y linked |
| (4) Phenylketonuria | - | Autosomal dominant trait |
173. Which one of the following is the most abundant protein in the animals ?
- (1) Lectin
 - (2) Insulin
 - (3) Haemoglobin
 - (4) Collagen
174. 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
175. In water hyacinth and water lily, pollination takes place by :
- (1) wind and water
 - (2) insects and water
 - (3) insects or wind
 - (4) water currents only
176. 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
177. 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
178. 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
179. Which of the following is **not** an attribute of a population ?
- (1) Mortality
 - (2) Species interaction
 - (3) Sex ratio
 - (4) Natality
180. 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
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Space For Rough Work



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Space For Rough Work



Test Booklet Code

NAKHA

No. :

G3

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 **G3**. 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. Identify the **wrong** statement with reference to transport of oxygen.
- (1) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
 - (2) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
 - (3) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.
 - (4) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .

2. 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)

3. 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

4. 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)	(a)	(b)
(1)	(iii)	(iv)	(i)
(2)	(ii)	(i)	(iii)
(3)	(iv)	(i)	(ii)
(4)	(i)	(iii)	(ii)

5. 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)

6. 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

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

- (1) Cytb_6f complex to PS-I
- (2) PS-I to NADP^+
- (3) PS-I to ATP synthase
- (4) PS-II to Cytb_6f complex

8. 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

9. The QRS complex in a standard ECG represents :

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

10. 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), (b) and (c)
 - (c) and (d)
 - (a) and (d)
 - (a) only
11. The infectious stage of *Plasmodium* that enters the human body is :
- Sporozoites
 - Female gametocytes
 - Male gametocytes
 - Trophozoites
12. Identify the **incorrect** statement.
- Sapwood is involved in conduction of water and minerals from root to leaf.
 - Sapwood is the innermost secondary xylem and is lighter in colour.
 - Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
 - Heart wood does not conduct water but gives mechanical support.
13. Flippers of Penguins and Dolphins are examples of :
- Convergent evolution
 - Industrial melanism
 - Natural selection
 - Adaptive radiation
14. Identify the **wrong** statement with reference to the gene 'I' that controls ABO blood groups.
- A person will have only two of the three alleles.
 - When I^A and I^B are present together, they express same type of sugar.
 - Allele 'i' does not produce any sugar.
 - The gene (I) has three alleles.
15. Which of the following statements are **true** for the phylum-Chordata ?
- In Urochordata notochord extends from head to tail and it is present throughout their life.
 - In Vertebrata notochord is present during the embryonic period only.
 - Central nervous system is dorsal and hollow.
 - Chordata is divided into 3 subphyla : Hemichordata, Tunicata and Cephalochordata.
- (c) and (a)
 - (a) and (b)
 - (b) and (c)
 - (d) and (c)
16. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus ?
- Uremia and Renal Calculi
 - Ketonuria and Glycosuria
 - Renal calculi and Hyperglycaemia
 - Uremia and Ketonuria
17. The first phase of translation is :
- Recognition of DNA molecule
 - Aminoacylation of tRNA
 - Recognition of an anti-codon
 - Binding of mRNA to ribosome
18. Ray florets have :
- Superior ovary
 - Hypogynous ovary
 - Half inferior ovary
 - Inferior ovary
19. The process of growth is maximum during :
- Lag phase
 - Senescence
 - Dormancy
 - Log phase

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20. The roots that originate from the base of the stem are :
- (1) Primary roots
 - (2) Prop roots
 - (3) Lateral roots
 - (4) Fibrous roots
21. 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
22. 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
23. Bilaterally symmetrical and acoelomate animals are exemplified by :
- (1) Platyhelminthes
 - (2) Aschelminthes
 - (3) Annelida
 - (4) Ctenophora
24. Identify the basic amino acid from the following.
- (1) Glutamic Acid
 - (2) Lysine
 - (3) Valine
 - (4) Tyrosine
25. 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
26. 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.
27. Experimental verification of the chromosomal theory of inheritance was done by :
- (1) Sutton
 - (2) Boveri
 - (3) Morgan
 - (4) Mendel
28. 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
29. 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.
30. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells ?
- (1) Peroxisomes
 - (2) Golgi bodies
 - (3) Polysomes
 - (4) Endoplasmic reticulum

31. 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)	(iii)
(2)	(i)	(ii)	(iv)	(iii)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iii)	(iv)	(ii)	(i)

32. Embryological support for evolution was disapproved by :

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

33. 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

34. 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.

35. 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

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

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

37. 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

38. Select the **correct** match.

- (1) Phenylketonuria - Autosomal dominant trait
- (2) Sickle cell anaemia - Autosomal recessive trait, chromosome-11
- (3) Thalassemia - X linked
- (4) Haemophilia - Y linked

39. 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

40. 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

41. 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*

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42. The transverse section of a plant shows following anatomical features :
- Large number of scattered vascular bundles surrounded by bundle sheath.
 - Large conspicuous parenchymatous ground tissue.
 - Vascular bundles conjoint and closed.
 - Phloem parenchyma absent.
- Identify the category of plant and its part :
- Monocotyledonous root
 - Dicotyledonous stem
 - Dicotyledonous root
 - Monocotyledonous stem
43. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits ?
- 2
 - 14
 - 8
 - 4
44. Floridean starch has structure similar to :
- Amylopectin and glycogen
 - Mannitol and algin
 - Laminarin and cellulose
 - Starch and cellulose
45. Identify the **correct** statement with regard to G₁ phase (Gap 1) of interphase.
- Reorganisation of all cell components takes place.
 - Cell is metabolically active, grows but does not replicate its DNA.
 - Nuclear Division takes place.
 - DNA synthesis or replication takes place.
46. By which method was a new breed 'Hisardale' of sheep formed by using Bikaneri ewes and Marino rams ?
- Mutational breeding
 - Cross breeding
 - Inbreeding
 - Out crossing

47. Identify the **wrong** statement with reference to immunity.
- When ready-made antibodies are directly given, it is called "Passive immunity".
 - Active immunity is quick and gives full response.
 - Foetus receives some antibodies from mother, it is an example for passive immunity.
 - When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".
48. The specific palindromic sequence which is recognized by EcoRI is :
- 5' - GGAACC - 3'
3' - CCTTGG - 5'
 - 5' - CTTAAG - 3'
3' - GAATTC - 5'
 - 5' - GGATCC - 3'
3' - CCTAGG - 5'
 - 5' - GAATTC - 3'
3' - CTTAAG - 5'
49. 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 6.6×10^9 bp, then the length of the DNA is approximately :
- 2.5 meters
 - 2.2 meters
 - 2.7 meters
 - 2.0 meters
50. If the head of cockroach is removed, it may live for few days because :
- 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 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.
 - the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

51. 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) |

52. The enzyme enterokinase helps in conversion of :

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

53. 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.

54. 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

55. 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.

56. 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) |

57. Goblet cells of alimentary canal are modified from :

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

58. 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) | (iii) | (iv) | (i) | (ii) |
| (2) | (iv) | (ii) | (iii) | (i) |
| (3) | (i) | (iv) | (iii) | (ii) |
| (4) | (ii) | (iii) | (iv) | (i) |

59. Dissolution of the synaptonemal complex occurs during :

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

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

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

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

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

63. 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) | (ii) | (i) | (iv) |
| (2) | (iii) | (i) | (iv) | (ii) |
| (3) | (ii) | (i) | (iv) | (iii) |
| (4) | (iv) | (iii) | (i) | (ii) |

64. 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

65. 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) |

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

- (1) Reabsorption of 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

67. 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

68. 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) |

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)	(i)	(iii)	(ii)
(2)	(iii)	(ii)	(iv)
(3)	(iv)	(iii)	(i)
(4)	(ii)	(iv)	(i)

70. 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

71. 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)	(iii)	(ii)	(i)
(2)	(ii)	(iii)	(iv)
(3)	(i)	(ii)	(iii)
(4)	(iv)	(i)	(ii)

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

- (1) CH_3 , H_2 , NH_4 and water vapor at 800°C
- (2) CH_4 , H_2 , NH_3 and water vapor at 600°C
- (3) CH_3 , H_2 , NH_3 and water vapor at 600°C
- (4) CH_4 , H_2 , NH_3 and water vapor at 800°C

73. 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)
(2)	(iii)	(ii)	(iv)
(3)	(iii)	(iv)	(i)
(4)	(ii)	(iv)	(iii)

74. 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

75. 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

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

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

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77. Strobili or cones are found in :

- (1) *Pteris*
- (2) *Marchantia*
- (3) *Equisetum*
- (4) *Salvinia*

78. 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)

79. 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

80. 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.

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81. 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) (i)	(iv)	(ii)	(iii)
(2) (iii)	(ii)	(iv)	(i)
(3) (ii)	(iii)	(iv)	(i)
(4) (iv)	(iii)	(i)	(ii)

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

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

83. 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)

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

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

85. 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) |

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

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

87. The ovary is half inferior in :

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

88. 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.

89. 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

90. 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

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

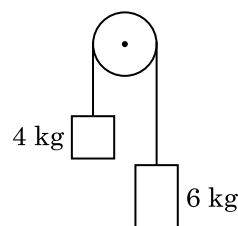
- (1) $\frac{3\pi}{2}$ rad
- (2) $\frac{\pi}{2}$ rad
- (3) zero
- (4) π rad

92. 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) $6.28 \times 10^{-4} \text{ T}$

93. 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

94. 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 : 1
- (2) 1 : c
- (3) 1 : c^2
- (4) c : 1

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95. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :
- (1) 0.5 N/C
 - (2) 1 N/C
 - (3) 5 N/C
 - (4) zero
96. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T , absolute temperature)
- (1) $\frac{3}{2} k_B T$
 - (2) $\frac{5}{2} k_B T$
 - (3) $\frac{7}{2} k_B T$
 - (4) $\frac{1}{2} k_B T$
97. 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) $6\hat{j} \text{ N m}$
 - (2) $-6\hat{i} \text{ N m}$
 - (3) $6\hat{k} \text{ N m}$
 - (4) $6\hat{i} \text{ N m}$
98. 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) $\frac{1}{\sqrt{2} n \pi d}$
99. 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) $4.5 \times 10^{16} \text{ J}$
100. 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
101. 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 :
- (1) adiabatic
 - (2) isochoric
 - (3) isobaric
 - (4) isothermal
102. 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) 0.2 kg/m^3
 - (2) 0.1 kg/m^3
 - (3) 0.02 kg/m^3
 - (4) 0.5 kg/m^3
103. When a uranium isotope ${}^{235}_{92}\text{U}$ is bombarded with a neutron, it generates ${}^{89}_{36}\text{Kr}$, three neutrons and :
- (1) ${}^{91}_{40}\text{Zr}$
 - (2) ${}^{101}_{36}\text{Kr}$
 - (3) ${}^{103}_{36}\text{Kr}$
 - (4) ${}^{144}_{56}\text{Ba}$
104. 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) 2.5×10^6
 - (2) 2.5×10^{-6}
 - (3) 2.25×10^{-15}
 - (4) 2.25×10^{15}
105. 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

106. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 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) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$

107. A spherical conductor of radius 10 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 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) $1.28 \times 10^5 \text{ N/C}$
- (2) $1.28 \times 10^6 \text{ N/C}$
- (3) $1.28 \times 10^7 \text{ N/C}$
- (4) $1.28 \times 10^4 \text{ N/C}$

108. 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) 0.5
- (2) 1.0
- (3) -1.0
- (4) zero

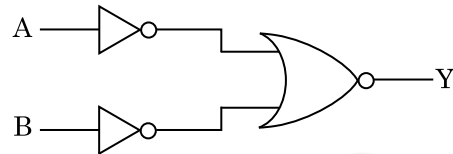
109. A capillary tube of radius r is immersed in water and water rises in it to a height h . The mass of the water in the capillary is 5 g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in this tube is :

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

110. 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 :

- (1) half
- (2) four times
- (3) one-fourth
- (4) double

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



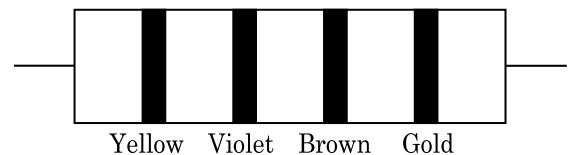
(1)	A	B	Y
	0	0	0
	0	1	1
	1	0	1
	1	1	1

(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

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



The values of resistance and tolerance, respectively, are :

- (1) 47 k Ω , 10%
- (2) 4.7 k Ω , 5%
- (3) 470 Ω , 5%
- (4) 470 k Ω , 5%

113. The capacitance of a parallel plate capacitor with air as medium is 6 μF . With the introduction of a dielectric medium, the capacitance becomes 30 μF . 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) $0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$

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114. 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 : ($g = 10 \text{ m/s}^2$)
- 340 m
 - 320 m
 - 300 m
 - 360 m
115. 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 ?
- 32 N
 - 30 N
 - 24 N
 - 48 N
116. 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 :
- 50 cm
 - 67 cm
 - 80 cm
 - 33 cm
117. The increase in the width of the depletion region in a p-n junction diode is due to :
- reverse bias only
 - both forward bias and reverse bias
 - increase in forward current
 - forward bias only
118. 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 ?
- four times
 - one-fourth
 - zero
 - doubled
119. 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 :
- $1.83 \times 10^{-7} \text{ rad}$
 - $7.32 \times 10^{-7} \text{ rad}$
 - $6.00 \times 10^{-7} \text{ rad}$
 - $3.66 \times 10^{-7} \text{ rad}$
120. A resistance wire connected in the left gap of a metre bridge balances a 10Ω 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 1Ω of the resistance wire is :
- $1.0 \times 10^{-1} \text{ m}$
 - $1.5 \times 10^{-1} \text{ m}$
 - $1.5 \times 10^{-2} \text{ m}$
 - $1.0 \times 10^{-2} \text{ m}$
121. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2 . The energy received by the surface during time span of 1 minute is :
- $12 \times 10^3 \text{ J}$
 - $24 \times 10^3 \text{ J}$
 - $48 \times 10^3 \text{ J}$
 - $10 \times 10^3 \text{ J}$
122. 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 μ , then the angle of incidence is nearly equal to :
- $\frac{2A}{\mu}$
 - μA
 - $\frac{\mu A}{2}$
 - $\frac{A}{2\mu}$
123. 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 :
- 2.05 A
 - 2.5 A
 - 25.1 A
 - 1.7 A
124. Dimensions of stress are :
- $[\text{ML}^2\text{T}^{-2}]$
 - $[\text{ML}^0\text{T}^{-2}]$
 - $[\text{ML}^{-1}\text{T}^{-2}]$
 - $[\text{MLT}^{-2}]$
125. The Brewsters angle i_b for an interface should be :
- $30^\circ < i_b < 45^\circ$
 - $45^\circ < i_b < 90^\circ$
 - $i_b = 90^\circ$
 - $0^\circ < i_b < 30^\circ$

126. 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) $\frac{MgL_1}{AL}$

127. 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° 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

128. 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) 524 Hz
- (2) 536 Hz
- (3) 537 Hz
- (4) 523 Hz

129. 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 V
- (2) 10^3 V
- (3) 10^4 V
- (4) 10 V

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

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

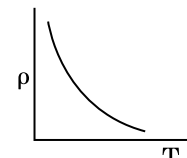
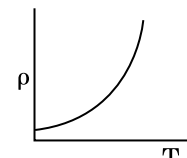
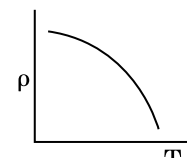
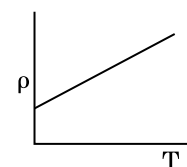
131. The energy required to break one bond in DNA is 10^{-20} J . This value in eV is nearly :

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

132. 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) $\frac{9}{4}$
- (2) $\frac{3}{2}$
- (3) $\frac{5}{3}$
- (4) $\frac{27}{8}$

133. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

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

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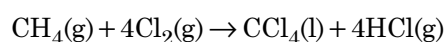
134. For transistor action, which of the following statements is **correct** ?

- (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.

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

- (1) Singly ionised helium atom (He^+)
- (2) Deuteron atom
- (3) Singly ionised neon atom (Ne^+)
- (4) Hydrogen atom

136. 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

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

- (1) Oxygen gas
- (2) H_2S gas
- (3) SO_2 gas
- (4) Hydrogen gas

138. 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

139. 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

140. 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

141. Which of the following is a natural polymer ?

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

142. 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

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

- | | |
|--|---|
| (a) $\text{CO}(\text{g}) + \text{H}_2(\text{g})$ | (i) $\text{Mg}(\text{HCO}_3)_2 + \text{Ca}(\text{HCO}_3)_2$ |
| (b) Temporary hardness of water | (ii) An electron deficient hydride |
| (c) B_2H_6 | (iii) Synthesis gas |
| (d) H_2O_2 | (iv) Non-planar structure |

(a) (b) (c) (d)

- (1) (iii) (ii) (i) (iv)
- (2) (iii) (iv) (ii) (i)
- (3) (i) (iii) (ii) (iv)
- (4) (iii) (i) (ii) (iv)

144. 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 $\Delta_r S > 0$
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. 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) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
 - (2) $\text{Cu}(\text{OH})_2$
 - (3) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
 - (4) CuSO_4
147. 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
148. 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
149. 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
150. 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
151. Identify a molecule which does **not** exist.
- (1) Li_2
 - (2) C_2
 - (3) O_2
 - (4) He_2
152. 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)
153. 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

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

- (1) Blister copper has blistered appearance due to evolution of 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.

155. 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

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

- (1) H_2SO_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) H_2SO_3 , sulphurous acid

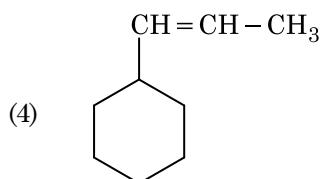
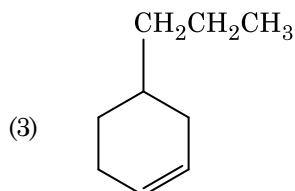
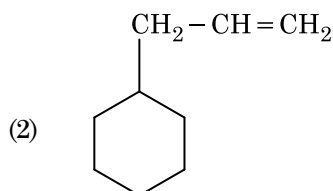
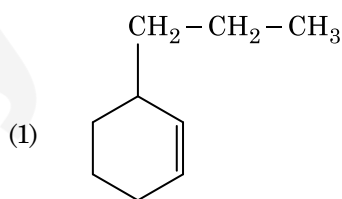
157. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is :

- (a) β -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)

158. 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 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

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



160. Paper chromatography is an example of :

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

161. Match the following :

	Oxide		Nature
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al ₂ O ₃	(iii)	Acidic
(d)	Cl ₂ 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)

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

- (1) 1 g of Mg(s) [Atomic mass of Mg = 24]
- (2) 1 g of O₂(g) [Atomic mass of O = 16]
- (3) 1 g of Li(s) [Atomic mass of Li = 7]
- (4) 1 g of Ag(s) [Atomic mass of Ag = 108]

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

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

164. The calculated spin only magnetic moment of Cr²⁺ ion is :

- (1) 4.90 BM
- (2) 5.92 BM
- (3) 2.84 BM
- (4) 3.87 BM

165. Sucrose on hydrolysis gives :

- (1) α-D-Glucose + β-D-Glucose
- (2) α-D-Glucose + β-D-Fructose
- (3) α-D-Fructose + β-D-Fructose
- (4) β-D-Glucose + α-D-Fructose

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

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

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

- (1) + R effect of – CH₃ groups
- (2) – R effect of – CH₃ groups
- (3) Hyperconjugation
- (4) – I effect of – CH₃ groups

168. Find out the solubility of Ni(OH)₂ in 0.1 M NaOH. Given that the ionic product of Ni(OH)₂ is 2×10^{-15} .

- (1) 2×10^{-8} M
- (2) 1×10^{-13} M
- (3) 1×10^8 M
- (4) 2×10^{-13} M

169. Which of the following is a cationic detergent ?

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

170. The freezing point depression constant (K_f) of benzene is 5.12 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

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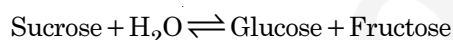
171. Identify the **incorrect** statement.

- (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 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.

172. 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.

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



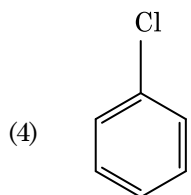
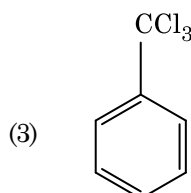
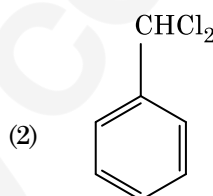
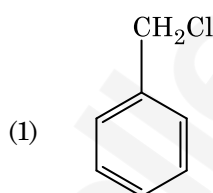
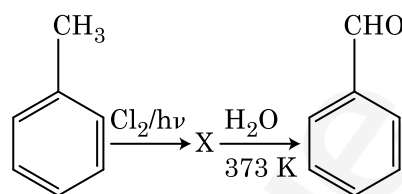
If the equilibrium constant (K_c) is 2×10^{13} at 300 K, the value of $\Delta_r G^\ominus$ at the same temperature will be :

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

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

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



176. 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 $w = 0$

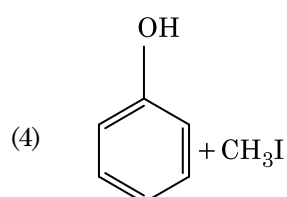
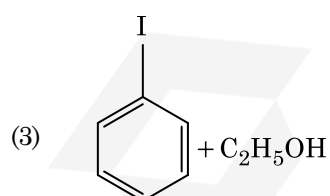
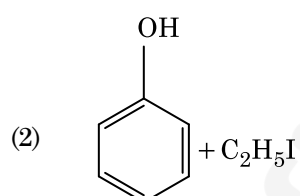
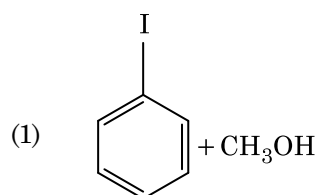
177. The number of Faradays(F) required to produce 20 g of calcium from molten CaCl_2 (Atomic mass of $\text{Ca} = 40 \text{ g mol}^{-1}$) is :

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

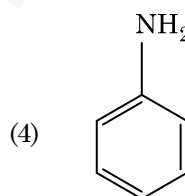
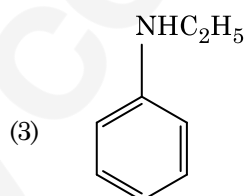
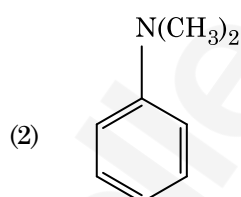
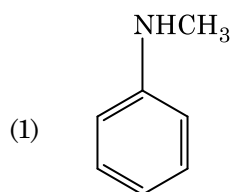
178. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl . Which of the following compound(s) crystallise(s) ?

- (1) Only NaCl
- (2) Only MgCl_2
- (3) NaCl , MgCl_2 and CaCl_2
- (4) Both MgCl_2 and CaCl_2

179. Anisole on cleavage with HI gives :



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



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Space For Rough Work



Space For Rough Work

G3

24

Space For Rough Work



Test Booklet Code

NAKHA

No. :

H3

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 **H3**. 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) : _____

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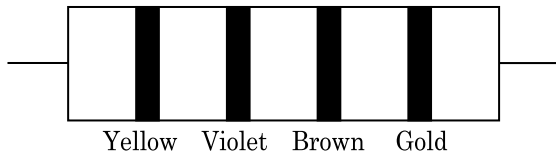
Candidate's Signature : _____ Invigilator's Signature : _____

Facsimile signature stamp of

Centre Superintendent : _____

H3

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



The values of resistance and tolerance, respectively, are :

- (1) 470 Ω , 5%
 - (2) 470 k Ω , 5%
 - (3) 47 k Ω , 10%
 - (4) 4.7 k Ω , 5%
2. 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) $6\hat{k}$ N m
 - (2) $6\hat{i}$ N m
 - (3) $6\hat{j}$ N m
 - (4) $-6\hat{i}$ N m
3. 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/m³
 - (2) 0.5 kg/m³
 - (3) 0.2 kg/m³
 - (4) 0.1 kg/m³
4. 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 :
- (1) isobaric
 - (2) isothermal
 - (3) adiabatic
 - (4) isochoric

2

5. 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
6. 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 μ , then the angle of incidence is nearly equal to :
- (1) $\frac{\mu A}{2}$
 - (2) $\frac{A}{2\mu}$
 - (3) $\frac{2A}{\mu}$
 - (4) μA
7. 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) 24 N
 - (2) 48 N
 - (3) 32 N
 - (4) 30 N
8. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 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) $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
 - (2) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$
 - (3) $8.0 \times 10^{-5} \text{ T m A}^{-1}$
 - (4) $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
9. 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.

10. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 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) $24 \times 10^3 \text{ J}$
11. 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° 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) zero
 - (2) 50 V
 - (3) 200 V
 - (4) 400 V
12. 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 : ($g = 10 \text{ m/s}^2$)
- (1) 300 m
 - (2) 360 m
 - (3) 340 m
 - (4) 320 m
13. A resistance wire connected in the left gap of a metre bridge balances a 10Ω 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 1Ω of the resistance wire is :
- (1) $1.5 \times 10^{-2} \text{ m}$
 - (2) $1.0 \times 10^{-2} \text{ m}$
 - (3) $1.0 \times 10^{-1} \text{ m}$
 - (4) $1.5 \times 10^{-1} \text{ m}$
14. When a uranium isotope ${}^{235}_{92}\text{U}$ is bombarded with a neutron, it generates ${}^{89}_{36}\text{Kr}$, three neutrons and :
- (1) ${}^{103}_{36}\text{Kr}$
 - (2) ${}^{144}_{56}\text{Ba}$
 - (3) ${}^{91}_{40}\text{Zr}$
 - (4) ${}^{101}_{36}\text{Kr}$
15. 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) $3.14 \times 10^{-5} \text{ T}$
 - (2) $6.28 \times 10^{-4} \text{ T}$
 - (3) $3.14 \times 10^{-4} \text{ T}$
 - (4) $6.28 \times 10^{-5} \text{ T}$
16. 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) $\frac{5}{2} k_B T$
17. 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

H3

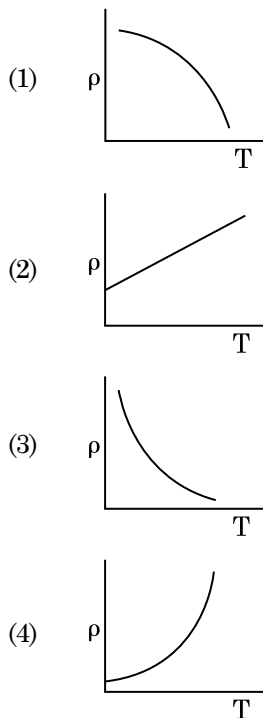
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18. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)
- $1 : c^2$
 - $c : 1$
 - $1 : 1$
 - $1 : c$
19. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :
- 6.00×10^{-7} rad
 - 3.66×10^{-7} rad
 - 1.83×10^{-7} rad
 - 7.32×10^{-7} rad
20. 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 :
- $\frac{MgL}{A(L_1 - L)}$
 - $\frac{MgL_1}{AL}$
 - $\frac{Mg(L_1 - L)}{AL}$
 - $\frac{MgL}{AL_1}$
21. 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
22. In a certain region of space with volume 0.2 m^3 , the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :
- 5 N/C
 - zero
 - 0.5 N/C
 - 1 N/C
23. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :
- $\frac{1}{\sqrt{2} n^2 \pi^2 d^2}$
 - $\frac{1}{\sqrt{2} n \pi d}$
 - $\frac{1}{\sqrt{2} n \pi d^2}$
 - $\frac{1}{\sqrt{2} n^2 \pi d^2}$
24. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :
- 10^4 V
 - 10 V
 - 10^2 V
 - 10^3 V
25. 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 :
- 537 Hz
 - 523 Hz
 - 524 Hz
 - 536 Hz
26. 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 :
- 25.1 A
 - 1.7 A
 - 2.05 A
 - 2.5 A
27. The increase in the width of the depletion region in a p-n junction diode is due to :
- increase in forward current
 - forward bias only
 - reverse bias only
 - both forward bias and reverse bias

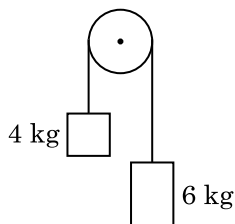
28. The Brewsters angle i_b for an interface should be :
- (1) $i_b = 90^\circ$
 - (2) $0^\circ < i_b < 30^\circ$
 - (3) $30^\circ < i_b < 45^\circ$
 - (4) $45^\circ < i_b < 90^\circ$
29. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :
- (1) zero
 - (2) π rad
 - (3) $\frac{3\pi}{2}$ rad
 - (4) $\frac{\pi}{2}$ rad
30. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-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) 1.28×10^7 N/C
 - (2) 1.28×10^4 N/C
 - (3) 1.28×10^5 N/C
 - (4) 1.28×10^6 N/C
31. 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) $0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
32. Taking into account of the significant figures, what is the value of $9.99 \text{ m} - 0.0099 \text{ m}$?
- (1) 9.9 m
 - (2) 9.9801 m
 - (3) 9.98 m
 - (4) 9.980 m
33. 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
34. Dimensions of stress are :
- (1) $[\text{ML}^{-1}\text{T}^{-2}]$
 - (2) $[\text{MLT}^{-2}]$
 - (3) $[\text{ML}^2\text{T}^{-2}]$
 - (4) $[\text{ML}^0\text{T}^{-2}]$
35. 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
36. The solids which have the negative temperature coefficient of resistance are :
- (1) insulators and semiconductors
 - (2) metals
 - (3) insulators only
 - (4) semiconductors only
37. 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) 2.25×10^{-15}
 - (2) 2.25×10^{15}
 - (3) 2.5×10^6
 - (4) 2.5×10^{-6}

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38. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?



39. 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 :



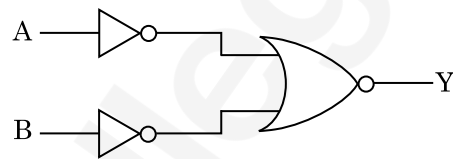
- (1) $g/10$
 (2) g
 (3) $g/2$
 (4) $g/5$
40. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is :
- (1) 1.0 mm
 (2) 0.01 mm
 (3) 0.25 mm
 (4) 0.5 mm

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41. 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 :

- (1) one-fourth
 (2) double
 (3) half
 (4) four times

42. 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

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

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

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

- (1) Singly ionised neon atom (Ne^+)
 (2) Hydrogen atom
 (3) Singly ionised helium atom (He^+)
 (4) Deuteron atom

45. 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 :
- $\frac{5}{3}$
 - $\frac{27}{8}$
 - $\frac{9}{4}$
 - $\frac{3}{2}$
46. The transverse section of a plant shows following anatomical features :
- Large number of scattered vascular bundles surrounded by bundle sheath.
 - Large conspicuous parenchymatous ground tissue.
 - Vascular bundles conjoint and closed.
 - Phloem parenchyma absent.
- Identify the category of plant and its part :
- Dicotyledonous root
 - Monocotyledonous stem
 - Monocotyledonous root
 - Dicotyledonous stem
47. Which of the following would help in prevention of diuresis ?
- Decrease in secretion of renin by JG cells
 - More water reabsorption due to undersecretion of ADH
 - Reabsorption of Na^+ and water from renal tubules due to aldosterone
 - Atrial natriuretic factor causes vasoconstriction
48. Which of the following statements is **not correct** ?
- 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.
 - The functional insulin has A and B chains linked together by hydrogen bonds.
49. Embryological support for evolution was disapproved by :
- Oparin
 - Karl Ernst von Baer
 - Alfred Wallace
 - Charles Darwin
50. Goblet cells of alimentary canal are modified from :
- Compound epithelial cells
 - Squamous epithelial cells
 - Columnar epithelial cells
 - Chondrocytes
51. The QRS complex in a standard ECG represents :
- Repolarisation of ventricles
 - Repolarisation of auricles
 - Depolarisation of auricles
 - Depolarisation of ventricles
52. In light reaction, plastoquinone facilitates the transfer of electrons from :
- PS-I to ATP synthase
 - PS-II to Cytb_6f complex
 - Cytb_6f complex to PS-I
 - PS-I to NADP^+
53. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are :
- Ammonia and hydrogen
 - Ammonia alone
 - Nitrate alone
 - Ammonia and oxygen
54. 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) |

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55. 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)	(ii)			
(2)	(ii)	(iii)	(iv)	(i)			
(3)	(iii)	(iv)	(i)	(ii)			
(4)	(iv)	(ii)	(iii)	(i)			

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

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

57. 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)

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

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

59. 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)

60. Bilaterally symmetrical and acoelomate animals are exemplified by :

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

61. Floridean starch has structure similar to :

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

62. Identify the **correct** statement with regard to G₁ 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.

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

- (1) the head holds a 1/3rd 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.

64. The enzyme enterokinase helps in conversion of :
- (1) pepsinogen into pepsin
 - (2) protein into polypeptides
 - (3) trypsinogen into trypsin
 - (4) caseinogen into casein

65. 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)

66. Identify the **wrong** statement with reference to transport of oxygen.
- (1) Low $p\text{CO}_2$ in alveoli favours the formation of oxyhaemoglobin.
 - (2) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .
 - (3) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
 - (4) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
67. 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
68. 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

69. 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.

70. Identify the basic amino acid from the following.

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

71. Flippers of Penguins and Dolphins are examples of :

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

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

- (1) CH_3 , H_2 , NH_3 and water vapor at 600°C
- (2) CH_4 , H_2 , NH_3 and water vapor at 800°C
- (3) CH_3 , H_2 , NH_4 and water vapor at 800°C
- (4) CH_4 , H_2 , NH_3 and water vapor at 600°C

73. 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'

74. 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

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75. 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
76. 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)
77. 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
78. 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) |

79. 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.
80. The body of the ovule is fused within the funicle at :
- (1) Chalaza
 - (2) Hilum
 - (3) Micropyle
 - (4) Nucellus
81. 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
82. 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) |
83. 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

84. Select the **correct** events that occur during inspiration.
- Contraction of diaphragm
 - Contraction of external inter-costal muscles
 - Pulmonary volume decreases
 - Intra pulmonary pressure increases
- only (d)
 - (a) and (b)
 - (c) and (d)
 - (a), (b) and (d)
85. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive ?
- GIFT and ICSI
 - ZIFT and IUT
 - GIFT and ZIFT
 - ICSI and ZIFT
86. The infectious stage of *Plasmodium* that enters the human body is :
- Male gametocytes
 - Trophozoites
 - Sporozoites
 - Female gametocytes
87. 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) |
88. 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 |
89. Which of the following statements is **correct** ?
- Adenine does not pair with thymine.
 - Adenine pairs with thymine through two H-bonds.
 - Adenine pairs with thymine through one H-bond.
 - Adenine pairs with thymine through three H-bonds.
90. Which one of the following is the most abundant protein in the animals ?
- Insulin
 - Haemoglobin
 - Collagen
 - Lectin
91. Which of the following pairs is of unicellular algae ?
- Chlorella* and *Spirulina*
 - Laminaria* and *Sargassum*
 - Gelidium* and *Gracilaria*
 - Anabaena* and *Volvox*
92. 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) and (d)
 - (a) only
 - (a), (b) and (c)
 - (c) and (d)
93. Identify the **incorrect** statement.
- Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
 - Heart wood does not conduct water but gives mechanical support.
 - Sapwood is involved in conduction of water and minerals from root to leaf.
 - Sapwood is the innermost secondary xylem and is lighter in colour.

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94. 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

95. 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

96. 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.

97. 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)

98. 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)
(2)	(iv)	(iii)	(i)
(3)	(iii)	(ii)	(i)
(4)	(iii)	(i)	(iv)

99. 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, Filariasis

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

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

101. 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

102. 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) |

103. 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>Ctenoplanea</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) |

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

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

105. Ray florets have :

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

106. 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 6.6×10^9 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

107. 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) |

108. 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) |

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109. 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)

110. The roots that originate from the base of the stem are :

- (1) Lateral roots
- (2) Fibrous roots
- (3) Primary roots
- (4) Prop roots

111. 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

112. 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.

113. 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.

114. The process of growth is maximum during :

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

115. 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

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

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

117. 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

118. Strobili or cones are found in :

- (1) *Equisetum*
- (2) *Salvinia*
- (3) *Pteris*
- (4) *Marchantia*

119. 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)

120. 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
121. 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.
122. The ovary is half inferior in :
- (1) Plum
 - (2) Brinjal
 - (3) Mustard
 - (4) Sunflower
123. 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
124. 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
125. Dissolution of the synaptonemal complex occurs during :
- (1) Leptotene
 - (2) Pachytene
 - (3) Zygotene
 - (4) Diplotene
126. 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
127. 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
128. 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.
129. Which of the following regions of the globe exhibits highest species diversity ?
- (1) Amazon forests
 - (2) Western Ghats of India
 - (3) Madagascar
 - (4) Himalayas
130. 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

- 131.** 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.
- 132.** Which of the following is **not** an attribute of a population ?
- (1) Species interaction
 - (2) Sex ratio
 - (3) Natality
 - (4) Mortality
- 133.** 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
- 134.** 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
- 135.** 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
- 136.** 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) B_2H_6 | (iii) Synthesis gas |
| (d) H_2O_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) |
- 137.** 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
- 138.** What is the change in oxidation number of carbon in the following reaction ?
- $$\text{CH}_4\text{(g)} + 4\text{Cl}_2\text{(g)} \rightarrow \text{CCl}_4\text{(l)} + 4\text{HCl(g)}$$
- (1) 0 to - 4
 - (2) + 4 to + 4
 - (3) 0 to + 4
 - (4) - 4 to + 4
- 139.** Sucrose on hydrolysis gives :
- (1) α -D-Fructose + β -D-Fructose
 - (2) β -D-Glucose + α -D-Fructose
 - (3) α -D-Glucose + β -D-Glucose
 - (4) α -D-Glucose + β -D-Fructose
- 140.** The calculated spin only magnetic moment of Cr^{2+} ion is :
- (1) 2.84 BM
 - (2) 3.87 BM
 - (3) 4.90 BM
 - (4) 5.92 BM

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

- (1) O_2
- (2) He_2
- (3) Li_2
- (4) C_2

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

- (1) $H_2S_2O_7$, pyrosulphuric acid
- (2) H_2SO_3 , sulphurous acid
- (3) H_2SO_4 , sulphuric acid
- (4) $H_2S_2O_8$, peroxodisulphuric acid

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

- (1) $CN^- < C_2O_4^{2-} < SCN^- < F^-$
- (2) $SCN^- < F^- < C_2O_4^{2-} < CN^-$
- (3) $SCN^- < F^- < CN^- < C_2O_4^{2-}$
- (4) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

144. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol⁻¹) is :

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

145. 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

146. Which of the following is a cationic detergent ?

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

147. Identify the **incorrect** statement.

- (1) The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.
- (2) $Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ 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.

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

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

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

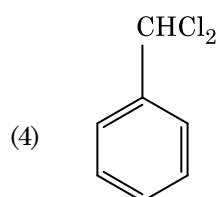
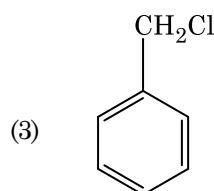
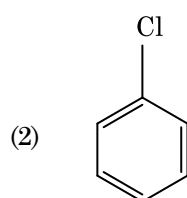
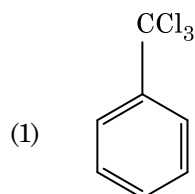
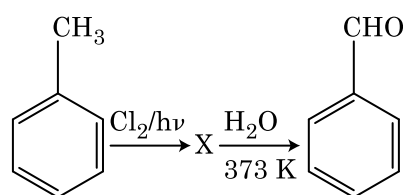
150. The freezing point depression constant (K_f) of benzene is 5.12 K kg mol⁻¹. The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places) :

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

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

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

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



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

- (1) Pig iron can be moulded into a variety of shapes.
- (2) Wrought iron is impure iron with 4% carbon.
- (3) Blister copper has blistered appearance due to evolution of CO_2 .
- (4) Vapour phase refining is carried out for Nickel by Van Arkel method.

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

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

155. Paper chromatography is an example of :

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

156. 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)	(d), (iv)		
(2)	(a), (i)		
(3)	(b), (ii)		
(4)	(c), (iii)		

157. 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 2×10^{-15} .

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

158. Which of the following is a natural polymer ?

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

159. 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

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

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

161. 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) 1000 s
- (2) 100 s
- (3) 200 s
- (4) 500 s

162. HCl was passed through a solution of CaCl_2 , MgCl_2 and NaCl. Which of the following compound(s) crystallise(s) ?

- (1) NaCl, MgCl_2 and CaCl_2
- (2) Both MgCl_2 and CaCl_2
- (3) Only NaCl
- (4) Only MgCl_2

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

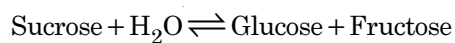
- (1) $q > 0$, $\Delta T > 0$ and $w > 0$
- (2) $q = 0$, $\Delta T = 0$ and $w = 0$
- (3) $q = 0$, $\Delta T < 0$ and $w > 0$
- (4) $q < 0$, $\Delta T = 0$ and $w = 0$

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

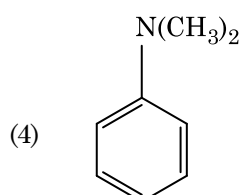
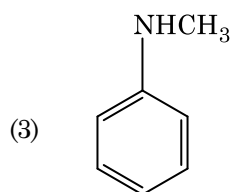
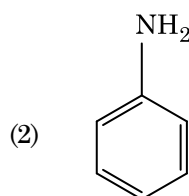
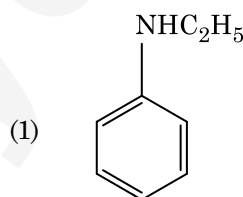
165. Hydrolysis of sucrose is given by the following reaction.



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

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

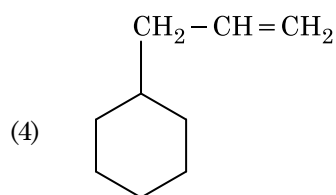
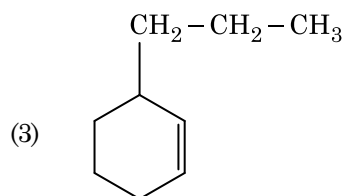
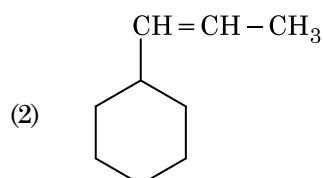
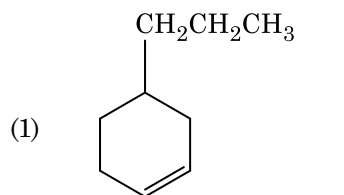
166. Which of the following amine will give the carbylamine test ?



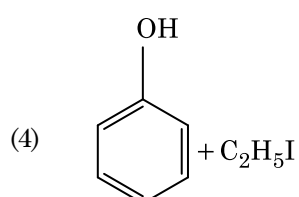
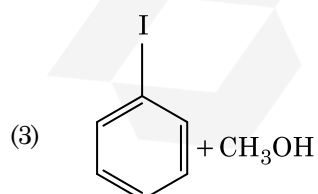
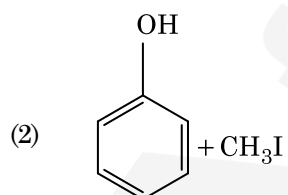
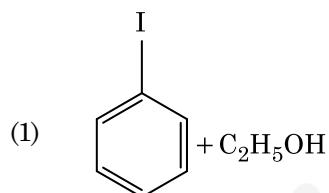
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167. An alkene on ozonolysis gives methanal as one of the product. Its structure is :



168. Anisole on cleavage with HI gives :



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

- (a) β -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)

170. 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

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

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

172. 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

173. 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 $\Delta_r S > 0$

174. Match the following :

	Oxide		Nature
(a)	CO	(i)	Basic
(b)	BaO	(ii)	Neutral
(c)	Al ₂ O ₃	(iii)	Acidic
(d)	Cl ₂ O ₇	(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)

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

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

176. A mixture of N₂ and Ar gases in a cylinder contains 7 g of N₂ 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 N₂ is :

[Use atomic masses (in g mol⁻¹) : N = 14, Ar = 40]

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

177. 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.

178. 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) $\frac{4}{\sqrt{3}} \times 288 \text{ pm}$

179. 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 O₂(g) [Atomic mass of O = 16]

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

- (1) SO₂ gas
- (2) Hydrogen gas
- (3) Oxygen gas
- (4) H₂S gas

- o o o -

H3

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Space For Rough Work



Space For Rough Work

H3

24

Space For Rough Work

