PART : CHEMISTRY

Section-I

Single Choice Type

This section contains **35 Single choice questions.** Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **Only One** is correct.

bl [k.M esa 35 ,dy fodYih iz'u gSa izR;sd iz'u ds 4 fodYi (1), (2), (3) rFkk (4) gSa ftuesa ls flQZ ,d lgh gSA

51. The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is :

fuEu foy;uksa dks uk;k x;k %

250 ml ty esa 10 g Xywdksl ($C_6H_{12}O_6$) dks ?kksydj (P_1), 250 ml ty esa 10 g ;wfj;k (CH_4N_2O) dks ?kksydj (P_2) ,oa 250 ml ty esa 10 g lqØksl ($C_{12}H_{22}O_{11}$) dks ?kksydj (P_3)A bu foy;uksa ds ijklj.k nkc uksa ds ?kVrs Øe dk lgh fodYi gS

(1) $P_1 > P_2 > P_3$ (2) $P_2 > P_3 > P_1$ (3) $P_3 > P_1 > P_2$ (4) $P_2 > P_1 > P_3$

Ans. (4)

Sol. $\pi = iCRT$

C = Concentration of solution

i = 1 for all non-electrolyte solute

molar mass of solute $\downarrow \Rightarrow$ Concentration $\uparrow \Rightarrow$ Osmotic pressure $\uparrow$

Osmotic pressure $\propto \frac{1}{\text{MolarMass}}$

Molar mass :	Glucose	Urea	Sucrose
	180	60	342 g/mole
	(P_1)	(P_2)	(P_3)

Order of osmotic pressure : $P_2 > P_1 > (P_3)$

52. Which one among the following is the correct option for right relationship between C_P and C_V for meone mole of ideal gas ?

fuEu esa ls dkSu lk fodYi ,d eksy vkn'kZ xSl ds fy, C_P ,oa C_V ds lgh lEca/k dks O;Dr djrk gS

(1) $C_P - C_V = R$ (2) $C_P = RC_V$ (3) $C_V - RC_P$ (4) $C_P + C_V = R$

Ans. (1)

Sol. $C_P - C_V = R$

Meyer's relation.

53. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?

(1) Hund's Rule (2) Hofmann Rule (3) Huckel's Rule (4) Saytzeff's Rule

2- czkseksisUVsu ds fogkbMªkstsuhdj.k vfHkfØ;k dk eq[; mRikn isUV-2-bZu gSA mDr mRikn dk fuekZ.k vk/kkfjr gksrk gS

(1) gq.M fu;e (2) gkWQeSu fu;e ij (3) gdy fu;e ij (4) lsVt+sQ fu;e ij

Ans. (4)

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Sol. $\xrightarrow{\text{Elimination}}$ Major product during dehydrohalogenation.

Major product formation decided by saytzeft's rule.

54. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]

,d dkcZfud ;kSfxd esa 78% (Hkkj }kjk) dkcZu ,oa 'ks"k izfr'kr gkbMªkstu dh ek=k gSA bl ;kSfxd ds ewykuqikrh lw=k dk lgh fodYi gS [ijek.kq Hkkj % C = 12, H = 1]

(1) CH_2 (2) CH_3 (3) CH_4 (4) CH

Ans. (2)

Sol. Remaining part of H = 100 – 78 = 22%

Element	% by mass	Mole	Sample ratio
C	78%	$\frac{78}{12} = 6.5$	$\frac{6.5}{6.5} = 1$
H	22%	$\frac{22}{1} = 22$	$\frac{22}{6.5} = 3.38$

∴ Empirical formula of organic compound = CH_3

55. Zr (Z = 40) and Hf (Z = 72) have similar atomic and ionic radii because of :

(1) diagonal relationship (2) lanthanoid contraction

(3) having similar chemical properties (4) belonging to same group

Zr (Z = 40) ,oa Hf (Z = 72) ds ijekf.od ,oa vk;fud f=kT;k,¡ leku gSa blds dkj.k gS

(1) fod.kZ lEcU/k (2) ySUFksukW;M vkdqapu

(3) nksuksa ds jklk;fud xq.k/keZ leku gSa (4) nksuksa leku lewg ds lnL; gSa

Ans. (2)

Sol. Zr(40) and Hf (Z = 72) have similar atomic and Ionic Radius because of Lanthanide contraction.

56. Which of the following reactions is the metal displacement reaction ? Choose the right option.

fuEu vfHkfØ;kvksa esa ls dkSu /kkrq foLFkkiu vfHkfØ;k gS\ lgh fodYi pqfu,

(1) $Cr_2O_3 + 2Al \xrightarrow{\Delta} Al_2O_3 + 2Cr$ (2) $Fe + 2HCl \longrightarrow FeCl_2 + H_2\uparrow$

(3) $2Pb(NO_3)_2 + 2PbO + 4NO_2 + O_2\uparrow$ (4) $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

Ans. (1)

Sol. $Cr_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Cr$

Al metal displace Cr from Cr_2O_3 of high temperature in Alumino thermite process.

57. The structures of beryllium chloride in solid state and vapour phase, are :

(1) Linear in both (2) Dimer and Linear, respectively

(3) Chain in both (4) Chain and dimer, respectively

csfjfy;e DyksjkbM dh Bksl voLFkk ,oa ok"i voLFkk esa lajpuk, gSa

(1) nksuksa esa js[kh; (2) Øe'k% f}yd ,oa js[kh;

(3) nksuksa esa J`a[kyk (4) Øe'k% J`a[kyk ,oa f}yd

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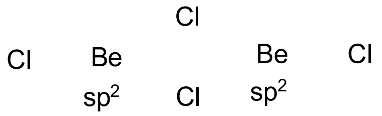
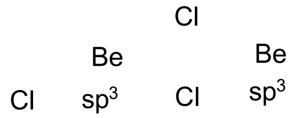
Ans. (4)

Sol. $BeCl_2$ (g) – Vapour phase exist as dimer



$BeCl_2$ (s) – Solid phase from chain polymer



58. The **incorrect** statement among the following is :

(1) Most of the trivalent Lanthanoid ions are colourless in the solid state.
(2) Lanthanoids are good conductros of heat and electricity.
(3) Actinoids are highly reactive metals, especially when finely divided.
(4) Actinoid contraction is greater for element to element than Lanthanoid contraction.

fuEu esa ls vlR; dFku gS

(1) vf/kdka'k f=kla;ksth ySUFkSukW;M vk;u Bksl voLFkk esa jaxghu gksrsgSa
(2) ySUFksukW;M Å"ek ,oafo qr ds vPNs pkyd gksrsgSa
(3) ,fDVukW;M vR;f/kd vfHkfØ;k'khy /kkrq, gSafo'ks"k :i ls t osw{e foHkkftr gS
(4) ySUFksukW;M vkdqapu dh rqyuk esa ,d rRo lsnwljsrRo dk ,fDVukW;M vkdqapu vf/kd gS

Ans. (1)

Sol. (1) Most of the trivalent Lanthanoid ions are coloured both in solid state and in aqueous solution.

59. Ethylene diamineteraacetate (EDTA) ion is :

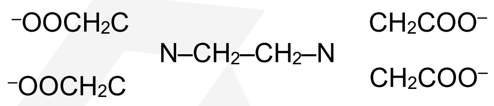
(1) Unidentate ligand
(2) Bidentate ligand with two "N" donor atoms
(3) Tridentate ligand with three "N" donor atoms
(4) Hexadentate ligand with four "O" and two "N" doner atoms

,fFkyhu Mkb,sehuVsVªk,slhVsV (EDTA) vk;u gS

(1) ,dnarqj fyxUM
(2) nks "N" nkrk ijek kqvkasdslkFk f}narqj fyxUM
(3) rhu "N" nkrk ijek kqvkasdslkFk f=knarqj fyxUM
(4) pkj "O" ,oanks"N" nkrk ijek kqvkasdslkFk "kV~narqj fyxUM

Ans. (4)

Sol. EDTA is a hexadentate ligand with 4-oxygen and two ‘N’ donar atom.



60. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is :

[Speed of light, $c = 3.0 \times 10^{8}\ ms^{-1}$]

vkWy bafM;k jsfM;ks ubZ fnYyh dk ,d LVs'ku 1,368 kHz (fdyks gV~Zt) dh vko`fÙk ij izlkj.k djrk gSA lapkjd (VªkalehVj) }kjk mRlftZr fo|qr pqEcdh; fofdj.k dk rjaxnS/;Z gS

[izdk'k dk osx] $c = 3.0 \times 10^{8}\ ms^{-1}$]

(1) 219.2 m (2) 2192 m (3) 21.92 m (4) 219.3 m

Ans. (4)

Sol. Frequency $\nu = 1368$ KHz

$\nu = 1368 \times 10^{3}$ Hz

$C = 3 \times 10^{8}$ m/sec.

$\lambda = ?$

We know that,

$$\nu = \frac{C}{\lambda}$$

$$\lambda = \frac{3 \times 10^{8}}{1368 \times 10^{3}}$$

$$\boxed{\lambda = 219.3 \text{ metre.}}$$

61. **Statement I :** Acid strength increases in the order given as HF << HCl << HBr << HI.

Statement II : As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are false.

(2) **Statement I** is correct but **Statement II** are false.

(3) **Statement I** is incorrect but **Statement II** is true.

(4) Both **Statement I** and **Statement II** are true.

dFku I : vEyh; lkeF;Zn, x, Øekuqlkj c<+rk gS HF << HCl << HBr << HI.

dFku II : tSls&tSls lewg esa uhps tkus ij rRo F, Cl, Br, I dk vkdkj c<+rk tkrk gS oSls&oSs HF, HCl, HBr rFkk HI ds ca/k dh izcyrk ?kVrh tkrh gSA vr% vEyh; lkeF;Z c<+rk tkrk gSA

miq;ZDr dFkuksa ds izdk'k esa uhps fn, gq, fodYiksa esa ls lgh mÙkj pqusaA

(1) nksuksa dFku I rFkk dFku II xyr gSa

(2) dFku I lgh gS ysfdu dFku II xyr gSA

(3) dFku I xyr gS ysfdu dFku II lgh gSA

(4) nksuksa dFku I rFkk dFku II lgh gSa

Ans. (4)

Sol.
T
HF M–H
HCl M size increase
HBr Bond strength of M–H bond↓
HI Acidic strength↑
B

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62. Noble gases are named because of their inertness towards reactivity. Identify and **incorrect** statement about them.

(1) Noble gases have very high melting and boiling points

(2) Noble gases have weak dispersion forces.

(3) Noble gases have large positive values of electron gain enthalpy.

(4) Noble gases are sparingly soluble in water.

mRd`"V xSlksa dk uke mudh jklk;fud vfHkfØ;k ds izfr vfØ;rk ds dkj.k iM+k gSA muls lEcfU/kr vlR; dFku dks igpkusaA

(1) mRd`"V xSlksa ds xyukad ,oa DoFkukad vfr mPp gksrs gSaA

(2) mRd`"V xSlksa esa nqcZy ifj{ksi.k cy gksrs gSaA

(3) mRd`"V xSlksa ds bysDVªkWu yfC/k ,UFkSYih dk eku mPp /kukRed gksrk gSA

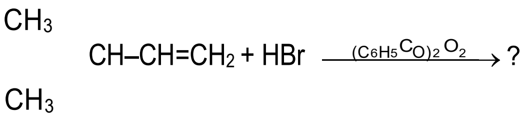
(4) mRd`"V xSlsa ty esa vR; foys; gSaA

Ans. (1)

Sol. Noble gases have very low melting and boiling points. Due to present of very weak vander wall force of attraction. (London force)

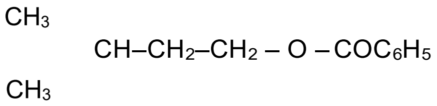
63. The major product of the following chemical reaction is :

fuEu jklk;fud vfHkfØ;k esa eq[; mRikn gS



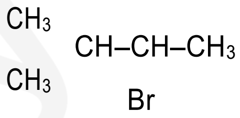
$$(CH_3)_2CH–CH=CH_2 + HBr \xrightarrow{(C_6H_5CO)_2O_2} ?$$

(1)



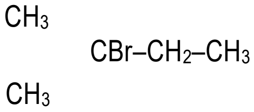
$$(CH_3)_2CH–CH_2–CH_2 – O – COC_6H_5$$

(2)



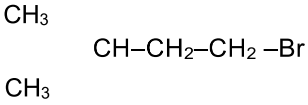
$$(CH_3)_2CH–CH(Br)–CH_3$$

(3)



$$(CH_3)_2CBr–CH_2–CH_3$$

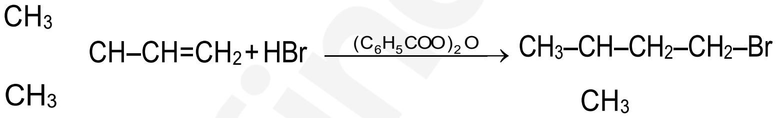
(4)



$$(CH_3)_2CH–CH_2–CH_2 –Br$$

Ans. (4)

Sol.



$$(CH_3)_2CH–CH=CH_2 + HBr \xrightarrow{(C_6H_5COO)_2O} (CH_3)_2CH–CH_2–CH_2–Br$$

This is kharas effect or peroxide effect. Which show free radical addition reaction by anti markovnikoft rule.

64. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91.0 S cm^2 mol^{-1} respectively. The moalr conductance of CH_3COOH at infinite dilution is.

Choose the right option for your answer.

NaCl, HCl ,oa CH_3COONa dh vuar ruqrk ij eksyj pkydrk Øe'k% 126.45, 426.16 ,oa 91.0 S cm^2 mol^{-1} gSA vuar ruqrk ij CH_3COOH dh eksy pkydrk gSA

(1) 390.71 S cm^2 mol^{-1} (2) 698.28 S cm^2 mol^{-1} (3) 540.48 S cm^2 mol^{-1} (4) 201.28 S cm^2 mol^{-1}

Ans. (1)

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Sol. $\lambda^{\infty}_{m(NaCl)}$ = 126.45 cm^2 mol^{-1}, $\lambda^{\infty}_{m(HCl)}$ = 426.16 cm^2 mol^{-1}, $\lambda^{\infty}_{m(CH_3COOH)}$ = ?

$\lambda^{\infty}_{m(CH_3COOH)} = \lambda^{\infty}_{m(CH_3COONa)} + \lambda^{\infty}_{m(HCl)} - \lambda^{\infty}_{m(NaCl)}$

= 91 + 426.16 – 126.45

= 390.71 S cm^2 mole^{-1}

65. The compound which show metamerism is :

e/;ko;ork iznf'kZr djus okyk ;kSfxd gS

(1) C_3H_8O (2) C_3H_6O (3) $C_4H_{10}O$ (4) C_5H_{12}

Ans. (3)

Sol. $C_4H_{10}O$ can show metamerism because its ether structure can make metamers.

O

O

Metamers to each other

C_3H_{12}, C_3H_8O, C_3H_6O can not show metamerism because no change in alkyl group possible.

66. The correct sequence of bond enthalpy of 'C–X' bond is :

'C–X' ca/k dh ,UFkSYih dk lgh Øe gS

(1) $CH_3 - F > CH_3 - Cl > CH_3 - Br > CH_3 - I$
(2) $CH_3 - F < CH_3 - Cl > CH_3 - Br > CH_3 - I$
(3) $CH_3 - Cl > CH_3 - F > CH_3 - Br > CH_3 - I$
(4) $CH_3 - F < CH_3 - Cl < CH_3 - Br < CH_3 - I$

Ans. (1)

Sol. $CH_3 - F > CH_3 - Cl > CH_3 - Br > CH_3 - O$

485 328 276 240 KJ/mol

67. Choose the correct option for graphical representation of Boyle's law, which shows a graph of pressure vs. Volume of a gas at different of a gas at different temperatures :

kW;y ds fu;e dk lgh xzkQh; fu:i k pqusa tksfofHkUu rkikaij xSl dk nk vs. vk;ru dksiznf'kZr dj jgk gks

(1) ↑ Pressure (P) (bar) (200 K, 400 K, 600 K) Volume (V) → (dm^3)

(2) ↑ Pressure (P) (bar) 200 K 400 K 600 K Volume (V) → (dm^3)

(3) ↑ Pressure (P) (bar) 600 K 400 K 200 K Volume (V) → (dm^3)

(4) ↑ Pressure (P) (bar) 200 K 400 K 600 K Volume (V) → (dm^3)

Ans. (3)

Sol. For Boyles Law

Temperature → Constant

$\boxed{V \propto \frac{1}{P}}$ $\boxed{P\uparrow, V\downarrow}$

Area under curve = PV

and PV ∝T

So PV ↑ ⇒ T ↑

↑

P

600 K

400 K

200 K

V→

68. Right option of the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are:

fdlh "kV~dks.kh; vk ¼gsDlkxksuy fizefeVo½ ,dd dksf"Bdk esa prq"Qydh; ,oa v"VQydh; fjfDr;ksa dh la[;k gsrq lgh fodYi gS

(1) 6, 12 (2) 2, 1 (3) 12, 6 (4) 8, 4

Ans. (3)

Sol. For hexagonal primitive unit cell

Number of effective atoms per unit cell Z = 6

∴ Total no. of tetrahedral voids = 2Z

= 2×6

= 12

Total no. of octahedral voids = Z

= 6

69. Given below are two statements :

Statement I : Aspirin and Paracetamol belong to the class of narcotic analgesics.

Statement II : Morphine and Heroin are non-narcotic analgesics.

In the light of the above statements, choose the correct answer from the options given below.

(1) Both **Statement I** and **Statement II** are false

(2) **Statement I** is correct but **Statement II** is false

(3) **Statement I** is incorrect but **Statement II** is true

(4) Both **Statement I** and **Statement II** are true

uhps nks dFku fn, x, gSa

dFku I : ,sfLifju ,oa iSjkflVkekWy Lokid ihM+kgkjh ¼ukjdksfVd ,susYtsfld½ oxZ ds gSaA

dFku II : ekWQhZu ,oa gsjksbu vLokid ihM+kgkjh ¼ukWu&ukjdksfVd ,susYtsfld½ oxZ ds gSaA

mi;qZDr dFkuksa ds izdk'k esa uhps fn, gq, fodYiksa esa ls lgh mÙkj pqus

(1) nksuksa dFku I rFkk dFku II xyr gSa

(2) dFku I lgh gS ysfdu dFku II xyr gSA

(3) dFku I xyr gS ysfdu dFku II lgh gSA

(4) nksuksa dFku I rFkk dFku II lgh gSa

Ans. (1)

Sol. Aspirin and Paracetamol are non-narcotic analgesics where as Morphine and Heroin are narcotic analgesics.

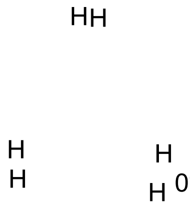
70. Dihedral angle of least stable conformer of ethane is :

,sFksu dsfuEure LFkk;h la:i k esa f}ry dks.k gS

(1) 180°　　(2) 60°　　(3) 0°　　(4) 120°

Ans. (3)

Sol. Dihydral angel of least stable conformer (fully Eclipsed) is 0º.



0º angle.

71. Which one of the following methods can be used to obtain highly pure metal is liquid at room temperature?

(1) Chromatography　　(2) Distillation　　(3) Zone refining　　(4) Electrolysis

fuEu esa ls fdl fof/k dk mi;ksx dj vR;f/kd 'kq) /kkrq dksizkIr dj ldrs gS tksdejsds rki ij nzo gS\

(1) o.kZysf[kdh　　(2) vklou　　(3) eaMy ifj"dj.k　　(4) fo|qr vi?kVu

Ans. (3)

Sol. Zone refining method of purification is used for highly pure metal or semimetal Ga, Si, B, Ge, In.
Ga is liquid at room temperature.

72. Match **List-I** with **List-II**

List –I	**List-II**
(a) PCl_5	(i) Square pyramidal
(b) SF_6	(ii) Trigonal planar
(c) BrF_5	(iii) Octahedral
(d) BF_3	(iv) Trigonal bipyramidal

Choose the **correct** answer from the options given below

lwph-I dk feyku lwph-II ls djsa

lwph-I	lwph-II
(a) PCl_5	(i) oxZ fijkfeMh
(b) SF_6	(ii) f=kdks.kh; lery;
(c) BrF_5	(iii) v"VQydh;
(d) BF_3	(iv) f=kdks.kh; f}fijkfeMh

uhps fn, x, fodYiksa esa ls lgh mÙkj pqusa

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

Ans. (4)

Sol. PCl_5

Cl

Cl – P – Cl

Cl Cl

bp = 5

_ <u>p = 0</u>

total = 5 <u>Trigonal bipyramidal</u>

SF_6

F

F F

S

F F F

bp = 6

<u>p = 0</u>

total = 6 sp^3d^2 octahedral

BF_3

F

F– B

F

bp = 3

_ <u>p = 0</u>

total = 3 <u>Trigonal planar</u>

BrF_5

F F

Br

F F F

bp = 5

<u>p = 1</u>

total = 6 sp^3d^2 square pyramidal

So correct answer

(a) $PCl_5 \longrightarrow$ trigonal bipyramidal (iv)

(b) $SF_6 \longrightarrow$ octahedral (iii)

(c) $BrF_5 \longrightarrow$ square pyramidal (i)

(d) $BF_3 \longrightarrow$ trigonal planar (ii)

73. Tritium, a radioactive isotopes of hydrogen, emits which of the following particles ?

(1) Alpha (α) (2) Gamma(γ) (3) Neutron(n) (4) Beta(β^-)

gkbMªkstu dk ,d jsfM;ks,fDVo leLFkkfud] VªkbfV;e] fuEu esa ls fdl d.k dk mRltZu djrk gS\

(1) vYQk(α) (2) xkek(γ) (3) U;wVªkWu(n) (4) hVk(β^-)

Ans. (4)

Sol. Tritium is a Radioactive and emit low energy β^- particle {$t_{1/2}$ = 12.33 years}

74. Which of the following polymers is prepared by addition polymerisation ?

(1) Nylon-66 (2) Novolac (3) Dacron (4) Teflon

fuEu gqydksa esa ls dkSu ;ksxkRed gqydu ds }kjk fufeZr fd;k tkrk gS

(1) ukbykWu-66 (2) uksoksysd (3) MsØkWu (4) Vs¶ykWu

Ans. (4)

Sol. Teflon is a polymer of tetra fluoroethene so it is a Homo-polymer and addition polymer.

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75. What is the IUPAC name of the organic compound formed in the following chemical reaction ?

Acetone $\xrightarrow[\text{(ii) } H_2O, H^+]{\text{(i) } C_2H_5MgBr, \text{dry Ether}}$ Product

(1) pentan-2-ol (2) pentan-3-ol
(3) 2-methyl butan-2-ol (4) 2-methyl propan-2-ol

fuEu jklk;fud vfHkfØ;k esa fufeZr dk Zcd ;kSfxd dk IUPAC uke D;k gS\

,slhVksu $\xrightarrow[\text{(ii) } H_2O, H^+]{\text{(i) } C_2H_5MgBr, \text{dry Ether}}$ mRikn

(1) isUVsu-2-vkWy (2) isUVsu-3-vkWy
(3) 2-esfFky C;wVsu-2-vkWy (4) 2-esfFky izksisu-2-vkWy

Ans. (3)

76. The RBC deficiency is deficiency disease of :
(1) Vitamin B_6 (2) Vitamin B_1 (3) Vitamin B_2 (4) Vitamin B_{12}

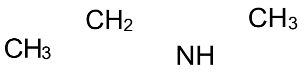
RBC dh deh] ghurk tfur jksx gS
(1) foVkfeu B_6 (2) foVkfeu B_1 (3) foVkfeu B_2 (4) foVkfeu B_{12}

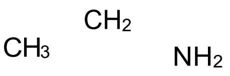
Ans. (4)

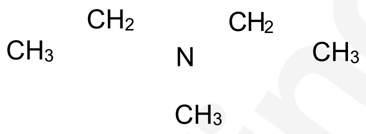
Sol. RBC deficiency is deficiency disease of B-12.

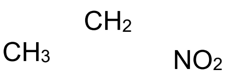
77. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali

ml ;kSfxd dks igpkus tks fgUlcxZ vfHkdeZd ds lkFk fØ;k djds Bksl uk,xk tks {kkj esa ?kqyu'khy gS

(1) 

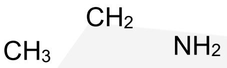
(2) 

(3) 

(4) 

Ans. (2)

Sol. Hinsberg reagent is used to identify amine (1°/2°/3°). If 1° amine react with Hinsberg reagent than white solid ppt appear which dissolve in alkali.



1° amine

78. Among the following alkaline earth metal halides one which is covalent and soluble in organic solvents is:

(1) Strontium chloride (2) Magnesium chloride
(3) Beryllium chloride (4) Calcium chloride

fuEu {kkjh; e`nk /kkrq gSykbMksa esa ls dkSu lgla;kstd ,oa dkcZfud foyk;dksa esa ?kqyu'khy gS\

(1) LVªkWfUV'k;e DyksjkbM (2) eSXuhf'k;e DyksjkbM
(3) csfjfy;e DyksjkbM (4) dSfY'k;e DyksjkbM

Ans. (3)

Sol.
T
$BeCl_2$ Size of cation ↑
$MgCl_2$ Covalent Char. ↓
$CaCl_2$
$SrCl_2$
B

So $BeCl_2$ has covalent nature so it is soluble in organic solvent.

79. The correct structure of 2,6-Dimethyl-dec-4-ene is :

2,6-MkbesfFky-Msd-4-bZu dh lgh lajpuk gS

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

Ans. (4)

Sol. Correct structure of 2,6-Dimethyl dec-4-ene

4
5 3 2 1
10
6 8
7 9

80. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is :

dqy 14 izdkj ds czsoS tkydksa dh var% dsfUnzr ,dd dksf"Bdkvksa dh la[;k ds fy, lgh fodYi gS

(1) 5 (2) 2 (3) 3 (4) 7

Ans. (3)

Sol. 3 body center found in cubic, tetragonal and orthorhombic in 14 type of bravis lattice.

81. The right option for the statement "Tyndall effect is exhibited by"………is :

(1) Glucose solution (2) Starch solution (3) Urea solution (4) NaCl solution

"fVUMy izHkko fuEu ds }kjk iznf'kZr fd;k tkrk gS" lgh fodYi pqusa

(1) Xywdksl foy;u (2) LVkpZ foy;u (3) ;wfj;k foy;u (4) NaCl foy;u

Ans. (2)

Sol. Starch solution is a type of colloidal solution and other are true solution so Starch solution shows Tyndall effect.

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82. The pK_b of dimethylamine and pK_a of acetic acid are 3.27 and 4.77 respectively at T(K). The correct option for the pH of dimethylammonium acetate solution is :

T(K) ij MkbesfFky,sehu dk pK_b ,oa,slhfVd vEy dk pK_a dk eku Øe'k% 3.27 ,oa4.77 gSA MkbesfFkyveksfu;e ,lhVsV foy;u ds pH dk lgh fodYi gS

(1) 5.50 (2) 7.75 (3) 6.25 (4) 8.50

Ans. (2)

Sol. $pK_b = 3.27$ (dimethylamine)

$pK_b = 4.77$ (acetic acid)

for dimethyl ammonium acetate it is an (WA + WB) salt.

$$pH = 7 + \frac{1}{2} pK_a - \frac{1}{2} pK_b$$

$$= 7 + \frac{1}{2} \times 4.77 - \frac{1}{2} \times 3.27$$

$$pH = 7 + 2.385 - 1.635$$

$$\boxed{pH = 7.75}$$

83. BF_3 is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

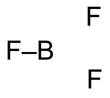
(1) sp^3 and 6 (2) sp^2 and 6 (3) sp^3 and 8 (4) sp^3 and 4

BF_3 ,d leryh; ,oa bysDVªkWu U;wu ;kSfxd gSA dsUnzh; ijek.kq dk ladj.k ,oa mlds pkjksa vksj bysDVªkWuksa dh la[;k gS] Øe'k% %

(1) sp^3 rFkk 6 (2) sp^2 rFkk 6 (3) sp^3 rFkk 8 (4) sp^3 rFkk 4

Ans. (2)

Sol. $BF_3 \longrightarrow$



$F{-}B(F)_2$

(sp^2 and $6e^-$)

Hybridisation of B is sp^2 and $6e^-$ around central atom.

84. The maximum temperature that can be achieved in blast furnace is :

(1) upto 2200 K (2) upto 1900 K (3) upto 5000 K (4) upto 1200 K

okR;k Hkêh esa izkIr fd;k tk ldus okyk vf/kdre rkieku gS

(1) 2200 K rd (2) 1900 K rd (3) 5000 K rd (4) 1200 K rd

Ans. (1)

Sol. In blast furnace highest temperature 2170 K (2200k) is found in lower part.

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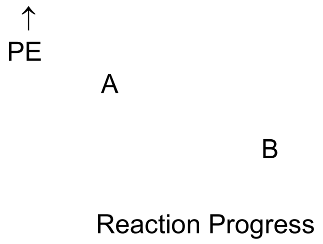
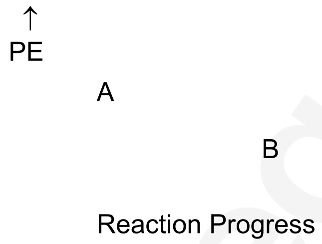
85. For a reaction A → B enthalpy of reaction –4.2 kJ mol^{-1} and enthalpy of activation is 9.6 kJ mol^{-1}. The correct potential energy profile for the reaction is shown in option.

fdlh vfHkfØ;k A → B dsfy, vfHkfØ;k dh ,UFkSYih –4.2 kJ mol^{-1} ,oa lfØ;k dh ,UFkSYih 9.6 kJ mol^{-1} gSA vfHkfØ;k dsfy, lgh fLFkfrt ÅtkZ vkjs[k fuEu fodYi esa iznf'kZr fd;k x;k gSA

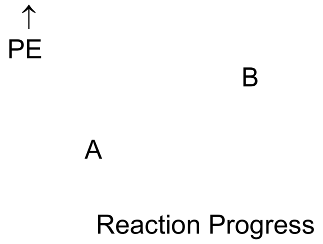
(1)



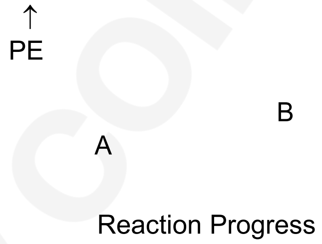
(2)



(3)



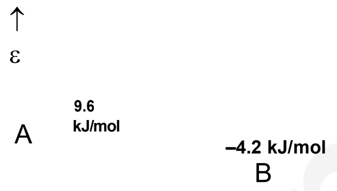
(4)



Ans. (1)

Sol. A → B reaction ΔH = –4.2 kJ/mol

It is an exothermic reaction for this Energy of Reactant > Energy of product



E_a is approx. double of ΔH reaction.

Section-II

Single Choice Type

This section contains **15 Single choice questions.** Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **Only One** is correct.

bl [k.M esa 15 ,dy fodYih iz'u gSa iR;sd iz'u ds 4 fodYi (1), (2), (3) rFkk (4) gSa ftuesa ls flQZ ,d lgh gSA

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86. Match List – I with List – II.

List – I	**List – II**
(a) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$	(i) Acid rain
(b) $HOCl(g) \xrightarrow{h\nu} HO + Cl$	(ii) Smog
(c) $CaCO_3 + H_2SO_4 \longrightarrow CaSO_4 + H_2O + CO_2$	(iii) Ozone depletion
(d) $NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$	(iv) Tropospheric pollution

Choose the **correct** answer from the options given below :

lwph– I dk feyku lwph – II ls djsa

lwph – I	lwph – II
(a) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$	(i) vEy o"kkZ
(b) $HOCl(g) \xrightarrow{h\nu} HO + Cl$	(ii) /kwe&dksgjk
(c) $CaCO_3 + H_2SO_4 \longrightarrow CaSO_4 + H_2O + CO_2$	(iii) vkstksu {kj k
(d) $NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$	(iv) {kksHkeaMyh; iznw'k k

uhps fn, x, fodYiksa esa lgh mÙkj pqusaA

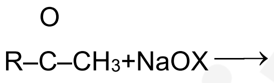
(1) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
(2) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)
(3) (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i)
(4) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)

Ans. (2)

Sol.

(a) $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$	(iv) Tropospheric pollution
(b) $HOCl(g) \xrightarrow{h\nu} HO + Cl$	(iii) Ozone depletion
(c) $CaCO_3 + H_2SO_4 \longrightarrow CaSO_4 + H_2O + CO_2$	(i) Acid rain
(d) $NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$	(ii) Smog

87. Match List – I with List – II.

List – I	**List – II**
(a) $\xrightarrow[\text{Anhyd. AlCl}_3\text{/CuCl}]{\text{CO, HCl}}$	(i) Hell-Volhard-Zelinsky reaction
(b)  $R\!-\!\overset{\displaystyle O}{C}\!-\!CH_3 + NaOX \longrightarrow$	(ii) Gattermann-Koch reaction
(c) $R\!-\!CH_2\!-\!OH + R'COOH \xrightarrow{\text{Conc. } H_2SO_4}$	(iii) Haloform reaction
(d) $R\!-\!CH_2COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2\text{ / Red P}}$	(iv) Esterification

Choose the **correct** answer from the options given below.

lwph– I dk feyku lwph – II ls djsa

lwph – I

(a) $\xrightarrow[\text{futZy } AlCl_3 / CuCl]{CO,\ HCl}$

(b) $R{-}\overset{O}{\overset{\|}{C}}{-}CH_3 + NaOX \longrightarrow$

(c) $R{-}CH_2{-}OH + R'COOH \xrightarrow{\text{lkUnz } H_2SO_4}$

(d) $R{-}CH_2COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2 / \text{yky } P}$

lwph – II

(i) gsy&QksykMZ&tsfyaLdh vfHkfØ;k

(ii) xkVjeku&dks[k vfHkfØ;k

(iii) gSykQkeZ vfHkfØ;k

(iv) ,LVjhdj.k

uhps fn, x, fodYiksa ls lgh fodYi pqusa

(1) (a) – (iii), (b) – (ii), (c) – (i), (d) – (iv)

(2) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)

(3) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

(4) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

Ans. (3)

Sol. (1) + CO HCl Gatterman- Koch reaction (ii)

(2) $R{-}\overset{O}{\overset{\|}{C}}{-}CH_3$ + NaOX Haloform reaction (iii)

(3) $R{-}CH_2{-}OH + R'COOH$ Esterification (iv)

(4) $R{-}CH_2{-}COOH$ (1) X_2/Red p (2) H_2O H.V.Z. reaction (i)

88. The intermediate compound 'X' in the following chemical reaction is :

fuEu jklk;fud vfHkfØ;k esa e/;orhZ mRikn 'X' gS

CH_3 + $CrO_2Cl_2 \xrightarrow{CS_2} X \xrightarrow{H_3O^+}$ O C H

(1) $CH(OCOCH_3)_2$

(2) CH Cl Cl

(3) CH Cl H

(4) $CH(OCrOHCl_2)_2$

Ans. (4)

Sol. CH_3 + CrO_2Cl_2 CS_2 $CH(OCrOHCl_2)_2$ H_3O^+ CHO

Toluene Chromium complex Benzaldehyde

89. Which of the following molecules is non-polar in nature ?

fn, x, v kqvksa esa ls dkSu v/kqzoh; izd`fr dk gS\

(1) CH_2O (2) $SbCl_5$ (3) NO_2 (4) $POCl_3$

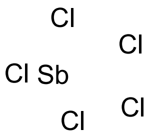
Ans. (2)

Sol. $SbCl_5$ is non-polar

Hybridisation sp^3d

Geometry $\Rightarrow$ Trigonal bipyramidal which is symmetrical geometry so dipole moment is zero.

So it is non-polar.



90. $CH_3CH_2COO^-Na^+ \xrightarrow[\text{Heat}]{\text{NaOH + ?}} CH_3CH_3 + Na_2CO_3.$

Consider the above reaction and identify the missing reagent/chemical.

(1) Red Phosphorus (2) CaO (3) DIBAL-H (4) B_2H_6

$CH_3CH_2COO^-Na^+ \xrightarrow[\text{xeZ}]{\text{NaOH + ?}} CH_3CH_3 + Na_2CO_3.$

Mi;qZDr vfHkfØ;k esa vuqifLFkr vfHkdeZd@jlk;u dks igpkus\

(1) yky QkLQksjl (2) CaO (3) DIBAL-H (4) B_2H_6

Ans. (2)

Sol. This is sodalime decarboxylation so with NaOH, CaO is required.

91. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it ?

(1) $H_2O < H_2S < H_2Se < H_2Te$: Increasing pK_a values
(2) $NH_3 < PH_3 < AsH_3 < SbH_3$: Increasing acidic character
(3) $CO_2 < SiO_2 < SnO_2 < PbO_2$: Increasing oxidizing power
(4) $HF < HCl < HBr < HI$: Increasing acidic strength

fuEu esa ls fdl O;oLFkk esa] muds lkeus rk, x, xq.k/keZ ds vuqlkj] mfpr Øe ugha fn;k x;k gS\

(1) $H_2O < H_2S < H_2Se < H_2Te$: pK_a ekuksa ds <+rs Øe esa
(2) $NH_3 < PH_3 < AsH_3 < SbH_3$: vEyh; y{k.k ds <+rs Øe esa
(3) $CO_2 < SiO_2 < SnO_2 < PbO_2$: vkWDlhdj.k {kerk ds <+rs Øe esa
(4) $HF < HCl < HBr < HI$: vEyh; lkeF;Z ds <+rs Øe esa

Ans. (1)

Sol. Acidic strength of Hydra acid increase from top to bottom in a group of p-block elements and pK_a value decrease.

So, $pK_a = H_2O > H_2S > H_2Se > H_2Te$

92. From the following pairs of ions which one is not an iso-electronic pair ?

vk;uksa ds fuEufyf[kr ;qXeksa esa ls dkSu ,d lebysDVªkWfud ;qXe ugha gS\

(1) Na^+, Mg^{2+} (2) Mn^{2+}, Fe^{3+} (3) Fe^{2+}, Mn^{2+} (4) O^{2-}, F^-

Ans. (3)

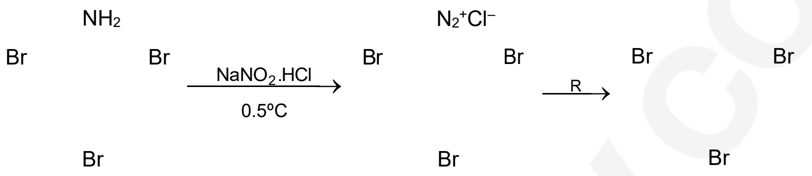
Sol.

Fe^{+2} Z = 26 No. of e^- = 24	Mn^{+2} 25 23
O^{-2} No. of e^- = 10	F^- 10
Na^+ No. of e^- = 10	Mg^{+2} 10
Mn^{+2} No. of e^- = 23	Fe^{+3} 23

Ans. Fe^{+2} and Mn^{+2} are not Iso-electronic

93. The reagent 'R' in the given sequence of chemical reaction is :

jklk;fud vfHkfØ;k ds fn, Øe esa vfHkdeZd 'R' gS



(1) CH_3CH_2OH (2) HI (3) CuCN/KCN (4) H_2O

Ans. (1)

Sol. Reagent R is either C_2H_5OH or H_3PO_2 which reduce $PhN_2^+Cl^-$ into Benzene.

94. Match List – I with List – II.

List – I	**List – II**
(a) $[Fe(CN)_6]^{3-}$	(i) 5.92 BM
(b) $[Fe(H_2O)_6]^{3+}$	(ii) 0 BM
(c) $[Fe(CN)_6]^{4-}$	(iii) 4.90 BM
(d) $[Fe(H_2O)_6]^{2+}$	(iv) 1.73 BM

Choose the **correct** answer from the options given below.

lwph– I dk feyku lwph – II ls djsa

lwph – I	lwph – II
(a) $[Fe(CN)_6]^{3-}$	(i) 5.92 BM
(b) $[Fe(H_2O)_6]^{3+}$	(ii) 0 BM
(c) $[Fe(CN)_6]^{4-}$	(iii) 4.90 BM
(d) $[Fe(H_2O)_6]^{2+}$	(iv) 1.73 BM

uhps fn, x, fodYiksa esa ls lgh mÙkj pqusaA

(1) (a) – (ii), (b) – (iv), (c) – (iii), (d) – (i)
(2) (a) – (i), (b) – (iii), (c) – (iv), (d) – (ii)
(3) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)
(4) (a) – (iv), (b) – (ii), (c) – (i), (d) – (iii)

Ans. (3)

Sol.

(A) $[Fe(CN)_6]^{3-}$	Fe^{3+}	$3d^5$	CN^- strong ligand
	n=1	μ = 1.73 BM	
(B) $[Fe(H_2O)_6]^{3+}$	Fe^{3+}	$3d^5$	H_2O weak ligand
	n=5	μ = 5.92 BM	
(C) $[Fe(CN)_6]^{4-}$	Fe^{2+}	$3d^6$	CN^- strong ligand
	n=0	μ = 0	
(D) $[Fe(H_2O)_6]^{2+}$	Fe^{2+}	$3d^6$	H_2O weak ligand
	n=4	μ = 4.9 BM	

95. The correct option for the value of vapour pressure of a solution at 45ºC with benzene to octane in molar ratio 3 : 2 is :
[At 45ºC vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg. Assume Ideal gas]
(1) 168 mm of Hg (2) 336 mm of Hg (3) 350 mm of Hg (4) 160 mm of Hg

95. 45ºC ij ,d foy;u ftlesa csathu ,oa vkWDVsu dk eksyj vuqikr 3 : 2 gks] mlds ok"i nk dseku dk lgh fodYi gS
(1) 168 mm of Hg (2) 336 mm of Hg (3) 350 mm of Hg (4) 160 mm of Hg
[45ºC ij csathu dk ok"i nk 280 mm Hg rFkk vkWDVsu dk ok"i nk 420 mm Hg gSA vkn'kZ xSl ekusaA]
(1) 168 mm Hg (2) 336 mm Hg (3) 350 mm Hg (4) 160 mm Hg

Ans. (2)

Sol. P^o_A for benzene = 280 mm of Hg
P^o_B for octane = 420 mm of Hg

$$\frac{n_A}{n_B} = \frac{3}{2}$$

According to Raoult's law ss

$$P = P^o_A X_A + P^o_B X_B$$

$$= 280 \times \frac{3}{5} + 420 \times \frac{2}{5} = \frac{840 + 840}{5}$$

$$= \frac{1680}{5} = 336 \text{ mm Hg}$$

96. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is –5 × 10^3 K. The value of E_a of the reaction is. Choose the correct option for your answer. [Given R = 8.314 JK^{-1} mol^{-1}]

fdlh izFke dksfV dh vfHkfØ;k dsfy, vkjsfu;l lehdj.k $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ ds<ky dk eku –5 × 10^3 K gSA vfHkfØ;k dsfy, E_a dk eku gSA lgh fodYi pqusa [fn;k x;k gS R = 8.314 JK^{-1} mol^{-1}]

(1) 83.0 kJ mol^{-1} (2) 166 kJ mol^{-1} (3) –83 kJ mol^{-1} (4) 41.5 kJ mol^{-1}

Ans. (4)

Sol. $$\ln k = \frac{-E_a}{RT} + \ln A$$

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slope = $\frac{-E_a}{R}$

$-5 \times 10^3 = \frac{-E_a}{R}$

$E_a = 5 \times 10^3 \times R$
$= 5 \times 10^3 \times 8.314$
$= 41.57 \times 10^3$ J
$= 41.57$ kJ mol^{-1}

97. For irreversible expansion of an ideal gas under isothermal condition, the correct option is :
lerkih; ifjfLFkfr;ksa fdlh vkn'kZxSl dsvuqRØe kh; ižj k dsfy, lgh fodYi gS

(1) $\Delta U \neq 0, \Delta S_{total} \neq 0$ (2) $\Delta U = 0, \Delta S_{total} \neq 0$ (3) $\Delta U \neq 0, \Delta S_{total} = 0$ (4) $\Delta U = 0, \Delta S_{total} = 0$

Ans. (2)

Sol. For irreversible isothermal expansion as temperature constant

$\Delta Y = \frac{f}{2} nR\Delta T = 0$

$\Delta S_{total} > 0$ for irreversible process

$\Delta U = 0, \Delta S_{total} \neq 0$

98. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g O_2 and 2 g H_2 confined in a total volume of one litre at 0ºC is : [Given R = 0.082 L atm mol^{-1} K^{-1}, T = 273 K]
1 yhVj vk;ru esa 0ºC ij ,d fefJ k ftlesa 4 g O_2 ,oa 2 g H_2 yh xbZ gks] mldk dqy nk (atm. esa) dslgh fodYi dkspqusaA [fn;k x;k gS R = 0.082 L atm mol^{-1} K^{-1}, T = 273 K]

(1) 2.602 (2) 25.18 (3) 26.02 (4) 2.518

Ans. (2)

Sol. No. of mole of $H_2 = \frac{2}{2} = 1$ mole

No. of mole of $O_2 = \frac{4}{32} = \frac{1}{8}$ mole

Total no. of mole of gaseous = $1 + \frac{1}{8} = \frac{9}{8}$ mole

Acc to PV = nRT

$P = \frac{nRT}{V} = \frac{9}{8} \times \frac{0.082 \times 273}{1}$

P = 25.18 atm.

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99. The product formed in the following chemical reaction is :

fuEu jklk;fud vfHkfØ;k esa fufeZr mRikn gS

O O

CH_2–C–OCH$_3$ $\xrightarrow[C_2H_5OH]{NaBH_4}$?

CH_3

(1) OH

CH_2–CH_2–OH

CH_3

(2) OH H

CH_2–C–CH_3

OH

CH_3

(3) OH O

CH_2–C–OCH$_3$

CH_3

(4) OH H

CH_2–C–OCH$_3$

OH

CH_3

Ans. (3)

Sol. $NaBH_4$ reduce only Ketone. Not ester.

OH O

CH_2–C–OCH$_3$

CH_3

Given in option (1)

100. The molar conductivity of 0.007 M acetic acid is 20 S cm^2 mol^{-1}. What is the dissociation constant of acetic acid ? Choose the correct option. [$\Lambda^\circ_{H^+}$ = 350 S cm^2 mol^{-1} ; $\Lambda^\circ_{CH_3COO^-}$ = 50 S cm^2 mol^{-1}]

0.007 M ,lhfVd vEy dh eksyj pkydrk 20 S cm^2 mol^{-1} gSA ,lhfVd vEy dk fo;kstu fLFkjkad D;k gS\ lgh fodYi pqusa [$\Lambda^\circ_{H^+}$ = 350 S cm^2 mol^{-1} ; $\Lambda^\circ_{CH_3COO^-}$ = 50 S cm^2 mol^{-1}]

(1) 2.50 × 10^{-4} mol L^{-1}
(2) 1.75 × 10^{-5} mol L^{-1}
(3) 2.50 × 10^{-5} mol L^{-1}
(4) 1.75 × 10^{-4} mol L^{-1}

Ans. (2)

Sol.
$$\alpha = \frac{\lambda^C_M}{\lambda^\infty_M} = \frac{\lambda^C_M}{\lambda^\infty_{(H^+)} + \lambda^\infty_{CH_3COO^-}} = \frac{20}{350+50}$$

$$= \frac{20}{400} = \frac{1}{20}$$

$$K_a = \frac{C\alpha^2}{1-\alpha}$$

$$\boxed{K_a = C\alpha^2}$$

$$= 0.007 \times \left(\frac{1}{20}\right)^2 = \frac{7\times10^{-3}}{400}$$

$$K_a = \frac{7}{4} \times 10^{-5}$$

= 1.75 × 10^{-5} mol/lt

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PART : BIOLOGY

Section - A (Biology : Botany)

Section-I

Single Choice Type

This section contains **35 Single choice questions.** Each question has 4 choices (1), (2), (3) and (4) for its answer, out of which **Only One** is correct.

bl [k M esa 35 ,dy fodYih iz'u gSa izR;sd iz'u ds4 fodYi (1), (2), (3) rFkk (4) gSa ftuesa ls flQZ ,d lgh gSA

101. Amensalism can be represented as :

(1) Species A (+) ;Species B (+)
(2) Species A (-) ; Species B (-)
(3) Species A (+) ;Species B (0)
(4) Species A (-) ; Species B(0)

vUrjtkfr; ijthfodk dksfdl izdkj fu:fir fd;k tk ldrk gS

(1) tkfr A (+) ;tkfr B (+)
(2) tkfr A (-) ; tkfr B (-)
(3) tkfr A (+) ;tkfr B (0)
(4) tkfr A (-) ; tkfr B(0)

Ans. **(4)**

102. In the equation GPP - R = NPP R represents:

(1) Retardation factor
(2) Environment factor
(3) Respiration losses
(4) Radiant energy

lehdj k GPP - R = NPP esa R fdls fu:fir djrk gS

(1) eand dkjd
(2) i;kZoj k dkjd
(3) 'oluh; {kfr
(4) fofdj k ÅtkZ

Ans. **(3)**

103. The plant hormone used to destroy weeds in a field is:

(1) NAA
(2) 2,4-D
(3) IBA
(4) IAA

,d [ksr esa ?kkl ikl dh lekIr djus dsfy, dkSulk iknd gkjeksu mi;ksx esa ayk;k tkrk gS

(1) ,u , ,
(2) 2,4-Mh
(3) vkbZ h ,
(4) vkbZ, ,

Ans. **(2)**

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