

KCET PYQ 2024

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CHEMISTRY

Q1 Which of the following set of polymers are used as fibre?

(i) Teflon (ii) Starch (iii) Terylene (iv) Orlon

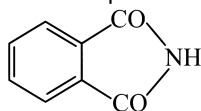
[KCET 2024]

- (A) (i) and (ii) (B) (ii) and (iii)
(C) (iii) and (iv) (D) (i) and (iv)

Q2 The biodegradable polymer obtained by polymerisation of glycine and aminocaproic acid is **[KCET 2024]**

- (A) nylon 6
(B) PHBV
(C) nylon-2, nylon-6
(D) nylon-6, 10

Q3 The compound



[KCET 2024]

- (A) sucralose (B) aspartame
(C) saccharin (D) alitame

Q4 Which one of the following is a cationic detergent? **[KCET 2024]**

- (A) Cetyltrimethylammonium bromide
(B) Sodium dodecylbenzene sulphonate
(C) Dodecylbenzene sulphonic acid
(D) Dodecylbenzene

Q5 The type of linkage present between nucleotides is **[KCET 2024]**

- (A) phosphoester linkage
(B) phosphodiester linkage
(C) amide linkage
(D) glycosidic linkage

Q6 $\alpha - D - (+) - \text{glucose}$ and $\beta - D - (+) - \text{glucose}$ are

[KCET 2024]

- (A) enantiomers (B) conformers
(C) epimers (D) anomers

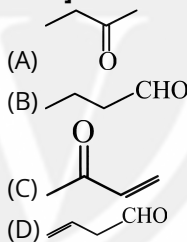
Q7 Propanone and propanal are **[KCET 2024]**

- (A) position isomers
(B) functional isomers
(C) chain isomers
(D) geometrical isomers

Q8 Sodium ethanoate on heating with soda lime gives 'X'. Electrolysis of aqueous solution of sodium ethanoate gives 'Y'. 'X' and 'Y' respectively are **[KCET 2024]**

- (A) methane and ethane
(B) methane and methane
(C) ethane and methane
(D) ethane and ethane

Q9 But-1-yne on reaction with dil. H_2SO_4 in presence of Hg^{2+} ions at 333 K gives **[KCET 2024]**



Q10 Biologically active adrenaline and ephedrine used to increase blood pressure contain

- (A) primary amino group
(B) secondary amino group
(C) tertiary amino group
(D) quaternary ammonium salt

Q11 In the reaction, Aniline $\xrightarrow[\text{Dil. HCl}]{\text{NaNO}_2}$ P $\xrightarrow[\text{NaOH}]{\text{Phenol}}$ Q

[KCET 2024]

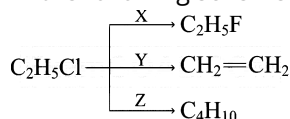
- (A) $\text{C}_6\text{H}_5\text{N}_2\text{Cl}$
(B) ortho-hydroxyazobenzene
(C) para-hydroxyazobenzene
(D) meta-hydroxyazobenzene



Q12 The female sex hormone which is responsible for the development of secondary female characteristics and participates in the control of menstrual cycle is **[KCET 2024]**

- (A) testosterone (B) estradiol
(C) insulin (D) thyroxine

Q13 In the following scheme of reaction.



X, y and Z respectively are **[KCET 2024]**

- (A) AgF, alcoholic KOH and benzene
(B) HF, aqueous KOH and Na in dry ether
(C) Hg_2F_2 , alcoholic KOH and Na in dry ether
(D) CoF_2 , aqueous KOH and benzene

Q14 8.8 g of monohydric alcohol added to ethyl magnesium iodide in ether liberates 2240 cm^3 of ethane at STP. This monohydric alcohol when oxidised using pyridinium-chloro-chromate, forms a carbonyl compound that answers silver mirror test (Tollen's test). The monohydric alcohol is **[KCET 2024]**

- (A) butan-2-ol
(B) 2,2-dimethyl propan-1-ol
(C) pentan-2-ol
(D) 2, 2-dimethyl ethan-1-ol

Q15 When a tertiary alcohol 'A' ($\text{C}_4\text{H}_{10}\text{O}$) reacts with $20\%\text{H}_3\text{PO}_4$ at 358 K , it gives a compound 'B' (C_4H_8) as a major product. The IUPAC name of the compound 'B' is **[KCET 2024]**

- (A) but-1-ene
(B) but-2-ene
(C) cyclobutane
(D) 2-methylpropene

Q16 PCC is **[KCET 2024]**

- (A) $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Pyridine}$
(B) $\text{CrO}_3 + \text{CHCl}_3$
(C) $\text{CrO}_3 + \text{H}_2\text{SO}_4$
(D) A complex of chromium trioxide with pyridine + HCl

Q17 On treating 100 mL of 0.1 M aqueous solution of the complex $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ with excess of AgNO_3 , 2.86 g of AgCl was obtained. The complex is **[KCET 2024]**

- (A) $[\text{Cr}(\text{H}_2\text{O})_3\text{Cl}_3] \cdot 3\text{H}_2\text{O}$
(B) $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$
(C) $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}^2\text{Cl}_2] \cdot \text{H}_2\text{O}$
(D) $[\text{Cr}(\text{H}_2\text{O})_6\text{Cl}_3]$

Q18 The complex compounds $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ are **[KCET 2024]**

- (A) coordination isomers
(B) geometrical isomers
(C) optical isomers
(D) ionisation isomers

Q19 Which of the following statements are true about $[\text{CoF}_6]^{3-}$ ion?

- I. The complex has octahedral geometry.
II. Coordination number of Co is 3 and oxidation state is +6.
III. The complex is sp^3d^2 hybridised.
IV. It is a high spin complex. **[KCET 2024]**
(A) I, II and IV (B) I, III and IV
(C) II and IV (D) II, III and IV

Q20 A haloalkane undergoes $\text{S}_{\text{N}}2$ or $\text{S}_{\text{N}}1$ reaction depending on **[KCET 2024]**

- (A) solvent used in the reaction
(B) low temperature
(C) the type of halogen atom
(D) stability of the haloalkane

Q21 2-methyl propane can be prepared by Wurtz reaction. The haloalkanes taken along with metallic sodium and dry ether are : **[KCET 2024]**

- (A) chloromethane and 2-chloropropane
(B) chloroethane and chloromethane
(C) chloroethane and 1-chloropropane
(D) chloromethane and 1-chloropropane

Q22 In the analysis of III group basic radicals of salts, the purpose of adding $\text{NH}_4\text{Cl(s)}$ to NH_4OH is **[KCET 2024]**

- (A) to increase the concentration of OH^- ions
(B) to precipitate the radicals of group IV and V
(C) to suppress the dissociation of NH_4OH
(D) to introduce Cl^- ions



- Q23** Solubility product of CaC_2O_4 at a given temperature in pure water is $4 \times 10^{-9} (\text{mol L}^{-1})^2$. Solubility of CaC_2O_4 at the same temperature is **[KCET 2024]**
 (A) $6.3 \times 10^{-5} \text{ mol L}^{-1}$
 (B) $2 \times 10^{-5} \text{ mol L}^{-1}$
 (C) $2 \times 10^{-4} \text{ mol L}^{-1}$
 (D) $6.3 \times 10^{-4} \text{ mol L}^{-1}$
- Q24** In the reaction between moist SO_2 and acidified permanganate solution. **[KCET 2024]**
 (A) SO_2 is oxidised to SO_4^{2-} . MnO_4^- is reduced to Mn^{2+} .
 (B) SO_2 is reduced to S. MnO_4^- is oxidised to MnO_4 .
 (C) SO_2 is oxidised to SO_3^{2-} . MnO_4^- is reduced to MnO_2 .
 (D) SO_2 is reduced to H_2S . MnO_4^- is oxidised to MnO_4 .
- Q25** Which one of the following properties is generally not applicable to ionic hydrides? **[KCET 2024]**
 (A) Non-volatile
 (B) Non-conducting in solid state
 (C) Crystalline
 (D) Volatile
- Q26** Which one of the following nitrate will decompose to give NO_2 on heating? **[KCET 2024]**
 (A) NaNO_3 (B) KNO_3
 (C) RbNO_3 (D) LiNO_3
- Q27** Which of the following halides cannot be hydrolysed? **[KCET 2024]**
 (A) CCl_4 (B) SiCl_4
 (C) GeCl_4 (D) SnCl_4
- Q28** 0.48 g of an organic compound on complete combustion produced 0.22 g of CO_2 . The percentage of C in the given organic compound is **[KCET 2024]**
 (A) 25 (B) 50
 (C) 12.5 (D) 87.5
- Q29** In the given sequence of reactions, identify P', Q', R' and S' respectively.

$$\text{CH}_2=\text{CH}_2 \xrightarrow{\text{P}} \underset{\text{Br}}{\text{CH}_2}-\underset{\text{Br}}{\text{CH}_2} \xrightarrow{\text{Q}},$$

$$\text{CH}_2=\text{CH}-\text{Br} \xrightarrow{\text{R}} \text{CH}\equiv\text{CH} \xrightarrow{\text{S}} \text{C}_6\text{H}_6$$
[KCET 2024]
 (A) Br_2 , Alc. KOH, NaOH, Al_2O_3
 (B) HBr, Alc. KOH, CaC_2 , KMnO_4
 (C) HBr, Alc. KOH, NaNH_2 , Red hot iron tube
 (D) Br_2 , Alc. KOH, NaNH_2 , Red hot iron tube
- Q30** The first chlorinated organic insecticide prepared is **[KCET 2024]**
 (A) gamma-xene (B) chloroform
 (C) COCl_2 (D) DDT
- Q31** Which of the following crystals has the unit cell such that $a = b \neq c$ and $\alpha = \beta = 90^\circ, \gamma = 120^\circ$? **[KCET 2024]**
 (A) Zinc blende
 (B) Graphite
 (C) Cinnabar
 (D) Potassium dichromate
- Q32** MnO exhibits **[KCET 2024]**
 (A) ferrimagnetism
 (B) antiferromagnetism
 (C) ferromagnetism
 (D) paramagnetism
- Q33** The number of atoms in 4.5 g of a face-centred cubic crystal with edge length 300 pm is (Given : Density = 10 g cm^{-3} and $N_A = 6.022 \times 10^{23}$) **[KCET 2024]**
 (A) 6.6×10^{20} (B) 6.6×10^{23}
 (C) 6.6×10^{19} (D) 6.6×10^{22}
- Q34** Vapour pressure of a solution containing 18 g of glucose and 178.2 g of water at 100°C is (Vapour pressure of pure water at $100^\circ\text{C} = 760$ torr) **[KCET 2024]**
 (A) 76.0 torr (B) 752.0 torr
 (C) 7.6 torr (D) 3207.6 torr



- Q35** A mixture of phenol and aniline shows negative deviation from Raoult's law. This is due to the formation of **[KCET 2024]**
 (A) polar covalent bond
 (B) non-polar covalent bond
 (C) intermolecular hydrogen bond
 (D) intramolecular hydrogen bond
- Q36** Which one of the following pairs will show positive deviation from Raoult's law ? **[KCET 2024]**
 (A) Water -HCl
 (B) Benzene - Methanol
 (C) Water-HNO₃
 (D) Acetone - Chloroform
- Q37** How many coulombs are required to oxidise 0.1 mole of H₂O to oxygen? **[KCET 2024]**
 (A) $1.93 \times 10^5 \text{ C}$
 (B) $1.93 \times 10^4 \text{ C}$
 (C) $3.86 \times 10^4 \text{ C}$
 (D) $9.65 \times 10^3 \text{ C}$
- Q38** A current of 3 A is passed through a molten calcium salt for 1 hr 47 min 13 s . The mass of calcium deposited is (Molar mass of Ca = 40 g mol⁻¹) **[KCET 2024]**
 (A) 6.0 g (B) 2.0 g
 (C) 8.0 g (D) 4.0 g
- Q39** The value of 'A' in the equation $\lambda_m = \lambda_m^0 - A\sqrt{C}$ is same for the pair **[KCET 2024]**
 (A) NaCl and CaCl₂
 (B) CaCl₂ and MgSO₄
 (C) NaCl and KBr
 (D) MgCl₂ and NaCl
- Q40** For the reaction, $A \rightleftharpoons B$, $E_a = 50 \text{ kJ mol}^{-1}$ and $\Delta H = -20 \text{ kJ mol}^{-1}$
 When a catalyst is added E_a decreases by 10 kJ mol⁻¹. What is the E_a for the backward reaction in the presence of catalyst? **[KCET 2024]**
 (A) 60 kJ mol⁻¹
 (B) 40 kJ mol⁻¹
 (C) 70 kJ mol⁻¹
 (D) 20 kJ mol⁻¹
- Q41** For the reaction, $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$, rate and rate constant are $1.02 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$ and $3.4 \times 10^{-5} \text{ s}^{-1}$ respectively at a given instant. The molar concentration of PCl₅ at that instant is **[KCET 2024]**
 (A) 8.0 mol L⁻¹
 (B) 3.0 mol L⁻¹
 (C) 0.2 mol L⁻¹
 (D) 2.0 mol L⁻¹
- Q42** Which one of the following does not represent Arrhenius equation? **[KCET 2024]**
 (A) $\log k = \log A - \frac{E_a}{2.303 RT}$
 (B) $k = Ae^{\frac{-E_a}{RT}}$
 (C) $\ln k = -\frac{E_a}{RT} + \ln A$
 (D) $k = Ae^{\frac{E_a}{RT}}$
- Q43** Identify the incorrect statement **[KCET 2024]**
 (A) Values of colligative properties of colloidal solution are of small order compared to values of true solution.
 (B) Tyndall effect is observed only when diameter of the dispersed particles is not much smaller than wavelength of incident light.
 (C) Colour of colloidal solution depends on the wavelength of light scattered by the dispersed particles.
 (D) Brownian movement is due to balanced bombardment of molecules of dispersion medium on colloidal particles.
- Q44** For the coagulations of positively charged hydrated ferric - oxide sol, the flocculating power of the ions is in the order: **[KCET 2024]**
 (A) $\text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{Cl}^- > [\text{Fe}(\text{CN})_6]^{4-}$
 (B) $\text{Cl}^- > \text{SO}_4^{2-} > \text{PO}_4^{3-} > [\text{Fe}(\text{CN})_6]^{4-}$
 (C) $\text{SO}_4^{2-} = \text{Cl}^- = \text{PO}_4^{3-} = [\text{Fe}(\text{CN})_6]^{4-}$
 (D) $[\text{Fe}(\text{CN})_6]^{4-} > \text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{Cl}^-$
- Q45** Gold sol is not a **[KCET 2024]**
 (A) macromolecular colloid
 (B) lyophobic colloid
 (C) multimolecular colloid
 (D) negatively charged colloid



Q46 The incorrect statement about Hall -Heroult process is **[KCET 2024]**

- (A) carbon anode is oxidised to CO and CO₂.
- (B) Na₃AlF₆ helps to decrease the melting point of the electrolyte.
- (C) CaF₂ helps to increase the conductivity of the electrolyte.
- (D) oxidation state of oxygen changes in the overall cell reaction.

Q47 Select the correct statement : **[KCET 2024]**

- (A) Roasting involves heating the ore in the absence of air.
- (B) Calcination involves heating the ore above its melting point.
- (C) Smelting involves heating the ore with suitable reducing agent and flux below its melting point.
- (D) Calcination of calcium carbonate is endothermic.

Q48 NO₂ gas is **[KCET 2024]**

- (A) colourless, neutral
- (B) colourless, acidic
- (C) brown, acidic
- (D) brown neutral

Q49 Identify the incorrect statement from the following. **[KCET 2024]**

- (A) Oxides of nitrogen in the atmosphere can cause depletion of the ozone layer.
- (B) Ozone absorbs the intense ultraviolet radiation of Sun.
- (C) Depletion of ozone layer is because of its chemical reactions with chlorofluoro alkanes.
- (D) Ozone absorbs infrared radiation.

Q50 The correct decreasing order of boiling point of hydrogen halides is **[KCET 2024]**

- (A) HF > HCl > HBr > HI
- (B) HI > HBr > HCl > HF
- (C) HF > HI > HBr > HCl
- (D) HI > HF > HBr > HCl

Q51 The synthetically produced radioactive noble gas by the collision of $^{249}_{98}\text{Cf}$ with $^{48}_{20}\text{Ca}$ is **[KCET 2024]**

- (A) radon
- (B) radium
- (C) oganesson
- (D) xenon

Q52 The transition element ($\approx 5\%$) present with lanthanoid metal in misch metal is **[KCET 2024]**

- (A) Mg
- (B) Fe
- (C) Zn
- (D) Co

Q53 Match the following

- I. Zn²⁺ (i) d⁸ configuration
- II. Cu²⁺ (ii) Colourless
- III. Ni²⁺ (iii) $\mu = 1.73 \text{ BM}$

[KCET 2024]

- (A) I II III (i) (ii) (iii)
- (B) (ii) (iii) (i)
- (C) (ii) (i) (iii)
- (D) (i) (iii) (ii)

Q54 Which of the following statements related to lanthanoids is incorrect ? **[KCET 2024]**

- (A) Lanthanoids are silvery white soft metals.
- (B) Samarium shows +2 oxidation state.
- (C) Ce⁺⁴ solutions are widely used as oxidising agents in titrimetric analysis.
- (D) Colour of lanthanoid ion in solution is due to d – d transition.

Q55 A metalloid is **[KCET 2024]**

- (A) Bi
- (B) Sb
- (C) P
- (D) Se

Q56 A pair of isoelectronic species having bond order of one is **[KCET 2024]**

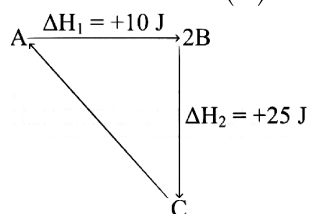
- (A) N₂, CO
- (B) N₂, NO⁺
- (C) O₂²⁻, F₂
- (D) CO, NO⁺

Q57 Identify the wrong relation for real gases : **[KCET 2024]**

- (A) $Z = \frac{V_{\text{ideal}}}{V_{\text{real}}}$
- (B) $p_{\text{ideal}} = p_{\text{real}} + \frac{an^2}{V^2}$
- (C) $V_{\text{real}} = V_{\text{ideal}} - nb$
- (D) $\left(p + \frac{a}{V^2}\right)(V - b) = RT$



Q58 From the diagram $(Z) = \frac{V_{\text{real}}}{V_{\text{ideal}}}$



$\Delta_r H$ for the reaction, $C \rightarrow A$ is **[KCET 2024]**

- (A) +35 J (B) -15 J
(C) -35 J (D) +15 J

Q59 For which one of the following mixtures is composition uniform throughout? **[KCET 2024]**

- (A) Sand and water.
(B) Grains and pulses with stone.
(C) Mixture of oil and water.
(D) Dilute aqueous solution of sugar.

Q60 The energy associated with first orbit of He^+ is **[KCET 2024]**

- (A) 0 J
(B) $-8.72 \times 10^{-18} \text{ J}$
(C) $-4.58 \times 10^{-18} \text{ J}$
(D) $-0.545 \times 10^{-18} \text{ J}$



Answer Key

Q1 C
Q2 C
Q3 C
Q4 A
Q5 B
Q6 D
Q7 B
Q8 A
Q9 A
Q10 B
Q11 C
Q12 B
Q13 C
Q14 B
Q15 D
Q16 D
Q17 C
Q18 D
Q19 B
Q20 A
Q21 A
Q22 C
Q23 A
Q24 A
Q25 D
Q26 D
Q27 A
Q28 C
Q29 D
Q30 D

Q31 B
Q32 B
Q33 D
Q34 B
Q35 C
Q36 B
Q37 B
Q38 D
Q39 C
Q40 A
Q41 B
Q42 D
Q43 D
Q44 D
Q45 A
Q46 D
Q47 D
Q48 C
Q49 D
Q50 C
Q51 C
Q52 B
Q53 B
Q54 D
Q55 B
Q56 C
Q57 A
Q58 C
Q59 D
Q60 B



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

The polymers that are used as fibers are :

Terylene : Also known as polyester, this is a synthetic polymer that is widely used as a fiber in textiles due to its durability, resistance to stretching and shrinking, and quick-drying properties.

Orlon : This is a trade name for polyacrylonitrile, a synthetic polymer that is used to make acrylic fibers, known for their wool-like feel and used for sweaters, hats, and other garments.

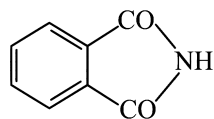
Therefore, the correct option is :

Option C : (iii) and (iv)

Q2 Text Solution:

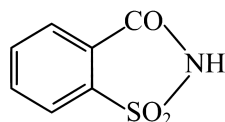
The biodegradable polymer Nylon-2, nylon 6, is an alternating polyamide copolymer of glycine [$\text{H}_2\text{N} - \text{CH}_2 - \text{COOH}$] and amino caproic acid [$\text{H}_2\text{N}(\text{CH}_2)_5\text{COOH}$].

Q3 Text Solution:



The given structure is a phthalimide but no option of phthalimide is given.

However, among the given options it is similar to saccharin. The structure of saccharin is



Q4 Text Solution:

Cationic detergents are quaternary ammonium salts of amines with acetates, chlorides or bromides as anions. Among the given options cetyltrimethyl ammonium bromide is a popular cationic detergent. It is used in hair conditioners.

Q5 Text Solution:

Phosphodiester linkage is the type of linkage present between nucleotides in a nucleic acid strand. This linkage involves the formation of a covalent bond between the phosphate group of one nucleotide's 5' carbon and the hydroxyl group of the 3' carbon of the adjacent nucleotide. This connection forms the backbone of DNA and RNA strands. Each phosphodiester linkage contributes to the stability and continuity of the nucleic acid structure, facilitating the polymerization of nucleotides into long chains.

In mathematical terms :

$$\text{Nucleotide}_1 \xrightarrow{\text{phosphodiester link}} \text{Nucleotide}_2$$

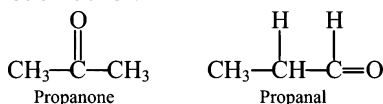
This linkage is crucial for the replication and function of genetic material. It contrasts with other types of linkages found in biology, such as glycosidic linkages, which form between sugars and bases in nucleotides, or amide linkages, found in proteins between amino acids.

Q6 Text Solution:

α -D-(+)-glucose and β -D-(+)-glucose are called anomers. These are the two cyclic hemiacetal forms of glucose that differ only in the configuration of the hydroxyl group at C1.

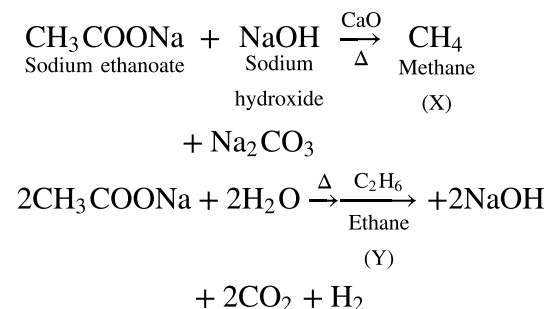
Q7 Text Solution:

Propanone and propanal have the same molecular formula but different functional group i.e. ketone and aldehyde respective. Hence, these two are the functional isomers of each other.



Q8 Text Solution:

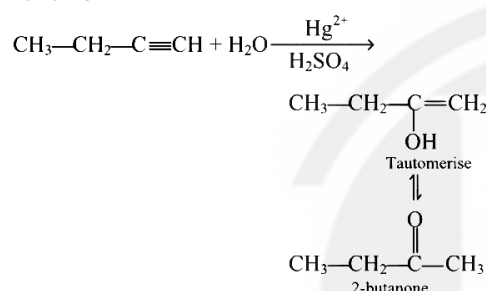
The complete reaction sequence involved is as follows



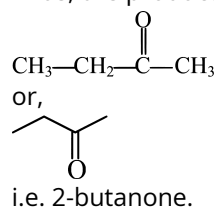
Thus, the compounds X and Y are methane and ethane respectively.

Q9 Text Solution:

The complete reaction sequence involved is as follows



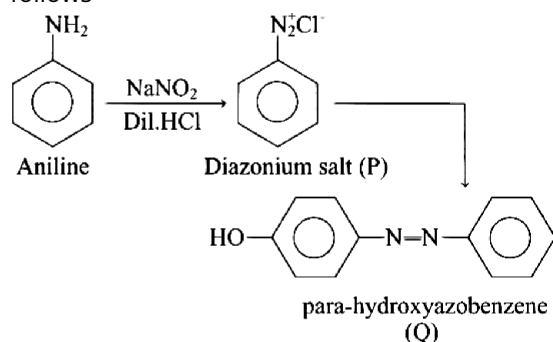
Thus, the product formed is

**Q10 Text Solution:**

Biologically active adrenaline and ephedrine used to increase blood pressure contains secondary amino group.

Q11 Text Solution:

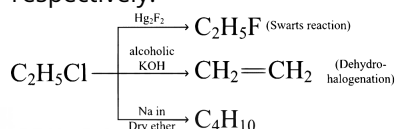
The complete reaction sequence proceeds as follows

**Q12 Text Solution:**

The correct answer is **estradiol** (Option B). Estradiol is a form of estrogen, the primary female sex hormone, and it plays a critical role in the development of secondary sexual characteristics in females (such as breast development) as well as regulating various phases of the menstrual cycle.

Q13 Text Solution:

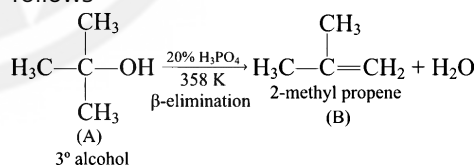
In the given scheme of reaction, X, Y and Z are Hg_2F_2 , alc. KOH and Na in dry ether respectively.

**Q14 Text Solution:**

Given that, 8.8 g of monohydric alcohol liberates 2240 cm^3 of ethane. So, 88 g of monohydric alcohol will liberate 22400 cm^3 (STP) Now, the carbonyl compound that can oxidise Tollens reagent is aldehyde and it is the oxidising product of 1° alcohol. So, among the given options 2, 2-dimethyl propan-1-ol (molecular mass = 88) is the required monohydric alcohol.

Q15 Text Solution:

The complete reaction sequence involved is as follows



Thus, the IUPAC name of the product B is 2-methyl propene.

Q16 Text Solution:

PCC is pyridinium chlorochromate. It is a complex of chromium trioxide with pyridine + HCl, i.e. $[\text{C}_5\text{H}_5\text{NH}]^+[\text{CrO}_3\text{Cl}]^-$.

It is a reagent in organic synthesis used primarily for oxidation of alcohols to form carbonyl.

Q17 Text Solution:

Given, Molarity of the complex = 0.1 M
Volume of the complex = 100 mL
Mass of AgCl obtained = 2.86 g
Now, no. of moles in $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$



$$= \frac{\text{molarity} \times \text{volume}}{1000} = \frac{0.1 \times 100}{1000} = 0$$

.01 moles

$$\text{No. of moles of AgCl} = \frac{2.86}{143} = 0$$

.02 moles

Number of Cl^- ions present in the ionisation sphere

$$= \frac{\text{Moles of ions precipitated with excess AgNO}_3}{\text{Moles of complex}}$$

$$= \frac{0.02}{0.01} = 2$$

It means two chlorine ions must be present in the solution. So, the complex will be $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$

Q18 Text Solution:

The complex $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ are ionisation isomers of each other.

- This form of isomerism arises when the counter ion in a complex salt is itself a potential ligand and can displace a ligand which can then become the counter ion.

Q19 Text Solution:

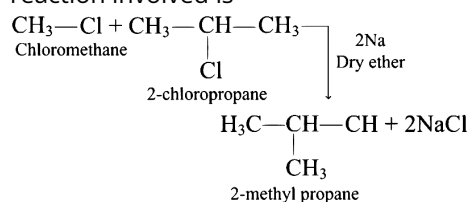
Statements given in I, III and IV are true regarding $[\text{CoF}_6]^{3-}$ ion while II is false. The correct form of statement II is coordination number of Co is 6 and its oxidation state is +3.

Q20 Text Solution:

- Haloalkanes undergoing $\text{S}_\text{N}2$ or $\text{S}_\text{N}1$ reaction depends upon the solvent used in the reaction.
- $\text{S}_\text{N}2$ reactions are generally carried out in polar aprotic solvent while $\text{S}_\text{N}1$ reactions are carried out in polar protic solvents.

Q21 Text Solution:

To prepare 2-methyl propane by Wurtz reaction, the haloalkanes that should be taken along with metallic sodium and dry ether are chloromethane and 2-chloropropane. The reaction involved is



Q22 Text Solution:

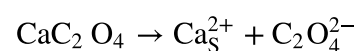
In the analysis of III group basic radicals of salts, the purpose of adding $\text{NH}_4\text{Cl}(\text{s})$ to NH_4OH is, to suppress the dissociation of NH_4OH due to the common ion effect.

Q23 Text Solution:

Given,

$$K_{\text{sp}} = 4 \times 10^{-9} (\text{mol L}^{-1})^2$$

$$S = ?$$



$$4 \times 10^{-9} = S^2$$

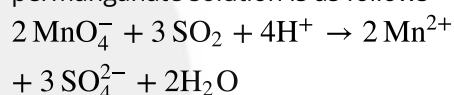
$$\Rightarrow S = \sqrt{4 \times 10^{-9}}$$

$$= 6.3 \times 10^{-5} \text{ mol/L}$$

Thus, the solubility of CaC_2O_4 is $6.3 \times 10^{-5} \text{ mol/L}$.

Q24 Text Solution:

The reaction between moist SO_2 and acidified permanganate solution is as follows



Thus, from the reaction it is clear that SO_2 is oxidised to SO_4^{2-} while MnO_4^- is reduced to Mn^{2+} .

Q25 Text Solution:

Ionic hydrides are generally non-volatile in nature, due to its high melting point. Thus, option (d) is not applicable to ionic hydrides.

Q26 Text Solution:

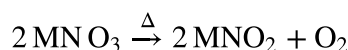
Among the given nitrates, only LiNO_3 will decompose to give NO_2 when heated. In contrast, the nitrates of sodium (Na), potassium (K), and rubidium (Rb) decompose to release oxygen instead.

The decomposition reactions are as follows:

For lithium nitrate (LiNO_3):



For sodium, potassium, and rubidium nitrates (MNO_3 , where $\text{M} = \text{Na}, \text{K}, \text{Rb}$):



Here, LiNO_3 uniquely produces NO_2 along with the metal oxide and oxygen.



Q27 Text Solution:

Among the given halides, only CCl_4 cannot be hydrolysed due to absence of vacant d-orbitals.

Q28 Text Solution:

To determine the percentage of carbon in the given organic compound, follow these steps:

Amount of Carbon in CO_2 :

The molecular weight of CO_2 is calculated as follows:

Carbon (C): 12 g/mol

Oxygen (O): 16 g/mol (so, O_2 is 32 g/mol)

Therefore, the molecular weight of CO_2 is: $12 + 32 = 44$ g/mol

The amount of carbon in CO_2 is given by the ratio of the atomic weight of carbon to the molecular weight of carbon dioxide:

$$\text{Fraction of Carbon in } \text{CO}_2 = \frac{12}{44}$$

Calculate the Mass of Carbon:

Given that 0.22 g of CO_2 is produced, the mass of carbon from CO_2 is:

$$\text{Mass of Carbon} = 0.22 \times \frac{12}{44} = 0.06 \text{ g}$$

Calculate the Percentage of Carbon:

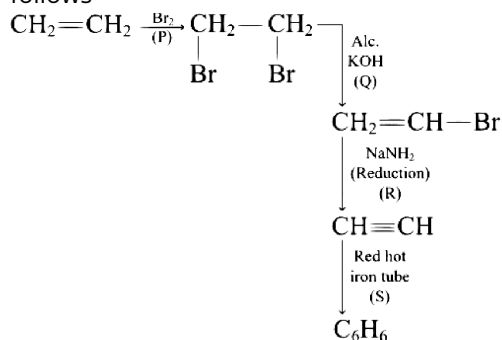
The percentage of carbon in the original organic compound (0.48 g) is:

$$\text{Percentage of Carbon} = \left(\frac{0.06}{0.48} \right) \times 100 = 12.5\%$$

Therefore, the percentage of carbon in the organic compound is **12.5%** (Option C).

Q29 Text Solution:

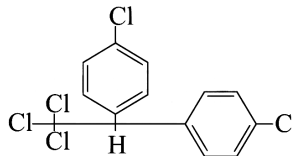
The complete reaction sequence involved is as follows



Thus, the reagent P, Q, R and S are Br_2 , alc. KOH, NaNH_2 , Red hot iron respectively.

Q30 Text Solution:

The first chlorinated organic insecticide was DDT. Dichloro diphenyl trichloroethane.

**Q31 Text Solution:**

The given crystal system is hexagonal crystal system. Among the given options only graphite will satisfy the given condition.

Q32 Text Solution:

MnO exhibit antiferromagnetism. They have domain structure similar to ferromagnetic substance, but their domains are oppositely oriented and cancel out each other's magnetic moment.

Q33 Text Solution:

Given, Face centred crystal, so $Z = 4$

$$\text{edge length (a)} = 300 \text{ pm} = 300 \times 10^{-10} \text{ cm}$$

$$\text{density (d)} = 10 \text{ g/cm}^3$$

$$N_A = 6.022 \times 10^{23}$$

$$\text{Using the formula } = \frac{Z \times M}{N_A \times a^3} M$$

$$= \frac{d \times N_A \times a^3}{Z}$$

$$= \frac{10 \times 6.022 \times 10^{23} \times (300 \times 10^{-10})^3}{4}$$

$$\Rightarrow M = 40.65 \text{ g}$$

So, 40.65 g contains 6.022×10^{23} atoms

Let 4.5 g contains x atom

$$\Rightarrow x = \frac{6.022 \times 10^{23}}{40.65} \times 4.5 = 6.6 \times 10^{22} \text{ atoms}$$

Q34 Text Solution:

$$\frac{P_0 - P_s}{P_0} = \chi_{\text{Glucose}} \dots (i)$$

Now, number of moles of glucose

$$= \frac{18}{180} = 0.1$$

$$\text{number of moles of water} = \frac{178.2}{18} = 9.9$$

Mole fraction of glucose

$$= \frac{\text{Number of moles of glucose}}{\text{Number of moles of water} + \text{Number of moles of glucose}}$$

$$= \frac{0.1}{0.1 + 9.9} = 0.01$$

Substituting the value of mole fraction in Eq. (i)

$$\frac{760 - p}{760} = 0.01$$

$$p = 752.4 \text{ torr}$$

$$\approx 752.0 \text{ torr}$$

Q35 Text Solution:

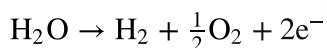
Mixture of phenol and aniline shows negative deviation from Raoult's law due to the formation of intermolecular hydrogen bonding.

Q36 Text Solution:

Among the given options benzene-methanol shows positive deviation from Raoult's law. The vapour pressure of such solutions are higher than that predicated by Raoult's law.

Q37 Text Solution:

The reaction involved is as follows



So,

from the equation it is clear that 1 mole of H_2O requires

$$= 2 \times 96500 \text{ C}$$

So, 0.1 mole of H_2O will require

$$= \frac{2 \times 96500 \times 0.1}{1}$$

$$= 19300 \text{ C}$$

$$= 1.93 \times 10^4 \text{ C}$$

Q38 Text Solution:

$$t = 1 \text{ hr } 47 \text{ min } 13 \text{ sec} = 6433 \text{ seconds}$$

$$\text{Molar mass of Ca} = 40 \text{ g/mol}$$

Current (i)

$$= 3 \text{ A} \quad \text{Mass of calcium deposited (w)} = ?$$

Using Faraday's 2nd law

$$w = z \cdot i \cdot t \dots (i)$$

$$\text{where, } z = \frac{M}{n \times 96500} = \frac{40}{2 \times 96500}$$

Substitute the value of Z and given values in equation

$$W = \frac{40 \times 3 \times 6433}{2 \times 96500} = 3.99 \text{ g} \approx 4 \text{ g}$$

Q39 Text Solution:

Among the given options, option containing NaCl and KBr will have same value of 'A'. It is because all electrolytes of a particular type i.e. here 1 - 1 electrolytes, have the same value of 'A'.

Q40 Text Solution:

For the reaction $A \rightleftharpoons B$, the activation energy (E_a) for the forward reaction is initially 50 kJ/mol and the enthalpy change (ΔH) is -20 kJ/mol . Thus, the activation energy for the backward reaction ($E_{a, \text{backward}}$) is calculated as:

$$E_{a, \text{backward}} = E_a + |\Delta H|$$

Substituting the given values:

$$E_{a, \text{backward}} = 50 \text{ kJ/mol} + 20 \text{ kJ/mol}$$

$$= 70 \text{ kJ/mol}$$

When a catalyst is added, the activation energy for the forward reaction decreases by 10 kJ/mol:

$$E_{a, \text{forward, catalyst}} = 50 \text{ kJ/mol} - 10 \text{ kJ/mol}$$

$$= 40 \text{ kJ/mol}$$

A catalyst equally reduces the activation energy for both the forward and backward reactions. Therefore, the new activation energy for the backward reaction in the presence of the catalyst is:

$$E_{a, \text{backward, catalyst}} = 70 \text{ kJ/mol} - 10 \text{ kJ/mol}$$

$$= 60 \text{ kJ/mol}$$

Thus, the correct option is

Option A

$$60 \text{ kJ/mol}$$

Q41 Text Solution:

To determine the molar concentration of PCl_5 at a given instant for the reaction $\text{PCl}_5 \rightarrow \text{PCl}_3 + \text{Cl}_2$, we use the rate law expression:



$$\text{Rate} = k[\text{PCl}_5]$$

Given values are :

$$\text{Rate} = 1.02 \times 10^{-4} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$\text{Rate constant, } k = 3.4 \times 10^{-5} \text{ s}^{-1}$$

We can find the concentration $[\text{PCl}_5]$ using the formula by rearranging it as follows:

$$\text{Rate} = k[\text{PCl}_5]$$

Substitute the given values into the equation:

$$1.02 \times 10^{-4} = 3.4 \times 10^{-5} [\text{PCl}_5]$$

To solve for $[\text{PCl}_5]$, divide both sides by 3.4×10^{-5} :

$$[\text{PCl}_5] = \frac{1.02 \times 10^{-4}}{3.4 \times 10^{-5}}$$

After calculating the division, we find:

$$[\text{PCl}_5] = 3 \text{ mol L}^{-1}$$

Thus, the molar concentration of PCl_5 at that instant is 3 mol L^{-1} .

Q42 Text Solution:

Among the given options, option (d) i.e. $K = Ae^{\frac{E_a}{RT}}$ does not represent Arrhenius equation.

Q43 Text Solution:

Among the given statements incorrect statement is given in option (d). Its correct form is "Brownian movement is due to unbalanced bombardment of molecules of dispersion medium on colloidal particles".

Q44 Text Solution:

Generally, greater the valence of the flocculating ion added, the greater is its power to cause precipitation. This is called as Hardy-Schulze rule.

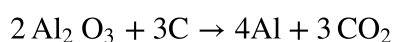
So according to Hardy-Schulze rule the flocculating power of the ions is in the order $[\text{Fe}(\text{CN})_6]^{4-} > \text{PO}_4^{3-} > \text{SO}_4^{2-} > \text{Cl}^-$

Q45 Text Solution:

Gold sols are multi molecular, negatively charged lyophobic colloid. Hence, among the given options it is not a macromolecular colloid.

Q46 Text Solution:

The incorrect statement about Hall-Heroult process is given in option (d). It is because in this process oxidation state of oxygen remains same in the overall cell reaction.



Q47 Text Solution:

Among the given statements, correct statement is given in option (d). While statement given in options (a), (b) and (c) are incorrect. Their correct form are as follows

- Roasting involves heating the ore in the regular supply of air.
- Calcination involves heating the ore below its melting point.
- Smelting is the process by which a metal is obtained at temperature beyond the melting point from its ore.

Q48 Text Solution:

NO_2 gas is brown and acidic, so the correct choice is:

Option C: brown, acidic

NO_2 stands for nitrogen dioxide, which is a reddish-brown gas known for its characteristic pungent smell. It is one of the primary pollutants resulting from the combustion of fossil fuels and is a contributor to atmospheric reactions that produce smog and acid rain. As an acidic gas, NO_2 can dissolve in water to form nitric and nitrous acids, contributing to environmental issues such as acid rain.

Q49 Text Solution:

Option D is incorrect.

Ozone primarily absorbs ultraviolet (UV) radiation, particularly in the wavelength range of 240 to 320 nanometers, which helps to protect living organisms from harmful UV rays emitted by the sun. It does not absorb infrared radiation significantly; instead, gases such as carbon dioxide (CO_2), water vapor (H_2O), and methane (CH_4) are primarily responsible for the absorption of infrared radiation, contributing to the greenhouse effect.

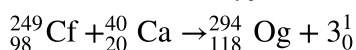
Q50 Text Solution:

HF is hydrogen bonded, thus it has highest boiling point. The remaining hydrogen halides are gaseous and their boiling points depend on the van der Waals' forces. Greater the molecule mass, greater will be the van der Waals' forces. Hence higher is the boiling point. Thus, the correct order is $\text{HF} > \text{HI} > \text{HBr} > \text{HCl}$



Q51 Text Solution:

The reaction of ${}^{249}_{98}\text{Cf}$ and ${}^{40}_{20}\text{Ca}$ takes place as follows



Thus,

the radio active noble gas formed is Oganesson ($Z = 118$)

Q52 Text Solution:

The alloy "misch metal" consists of a lanthanoid metal (95%) and iron (5%) and traces of S, C, Ca and Al.

Q53 Text Solution:

The correct match is I-(ii), II-(iii), III-(i)

- Zn^{2+} ($Z = 30$) The outer electronic configuration of Zn^{2+} is $3d^{10}$. Thus, it has no unpaired electrons. Hence, it is colourless.
- Cu^{2+} ($Z = 29$) The outer electronic configuration of Cu^{2+} is $3d^9$. Hence, it contains one unpaired electron. So, $\mu = \sqrt{1(1+2)} = 1.73 \text{ BM}$
- Ni^{2+} ($Z = 28$) The outer electronic configuration of $4d^8 \text{ Ni}^{2+}$ is $3d^8$. Hence, its configuration is d^8 .

Q54 Text Solution:

The incorrect statement regarding lanthanoids is given in option (d). Its correct form is colour of Lanthanoid ion in solution is due to f-f transition.

Q55 Text Solution:

A metalloid can be defined as chemical elements whose physical and chemical properties lies in between metal and non-metal. Among the given option only antimony (Sb) is metalloid.

Q56 Text Solution:

Among the given isoelectronic species, O_2^{2-} and F_2 contains $18e^-$ each and their bond order is 1.

$$\text{For } \text{O}_2^{2-} \text{ B.O} = \frac{N_b - N_a}{2} = \frac{10 - 8}{2} = 1$$

$$\text{For } \text{F}_2 \text{ B.O} = \frac{N_b - N_a}{2} = \frac{10 - 8}{2} = 1$$

Q57 Text Solution:

Wrong relation about real gases is given in option a. Its correct form is

$$Z = \frac{V_{\text{resal}}}{V_{\text{ideal}}}$$

(Z = Compressibility factor)

Q58 Text Solution:

$\Delta_r H$ for $\text{C} \rightarrow \text{A}$ is given by

$$\Delta H_{\text{C}} = \Delta H_1 + \Delta H_2$$

(A→C) (A→B) (B→C)

$$\Delta H_{\text{(A→C)}} = 10 + 25 = 35 \text{ J}$$

$$\Delta H_{\text{C→A}} = -\Delta H_{\text{A→C}} = -35 \text{ J}$$

Q59 Text Solution:

Homogeneous mixtures have uniform composition through out. Thus, among the given options, dilute aqueous solution of sugar has uniform composition.

Q60 Text Solution:

Given :

Atomic number (Z) = 2

Principal quantum number (n) = 1

The formula for the energy of an orbit is :

$$E = -2.18 \times 10^{-18} \times \frac{Z^2}{n^2}$$

Substituting the values of Z and n into the formula, we get : $E = -2.18 \times 10^{-18} \times \frac{(2)^2}{(1)^2}$

This simplifies to : $E = -8.72 \times 10^{-18} \text{ J}$

Thus, the energy associated with the first orbit of He^+ is $-8.72 \times 10^{-18} \text{ J}$.



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