Aakash + BYJU'S

Answers & Solutions
for

Time : 45 min.   **M.M. : 200**

CUET UG-2023
## (Chemistry)

IMPORTANT INSTRUCTIONS:

1.   The test is of 45 Minutes duration.

2.   The test contains 50 Questions out of which 40 questions need to be attempted.

3.   Marking Scheme of the test:

   a.   Correct answer or the most appropriate answer: Five marks (+5)

   b.   Any incorrect option marked will be given minus one mark (–1).

   c.   Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

1.   Number of coulombs required for the reduction of 1 mol of MnO_4^- to Mn^{2+} is

   (1) 1.93×10^5 C

   (2) 4.825×10^5 C

   (3) 5.79×10^5 C

   (4) 2.89×10^5 C

Answer (2)

Sol. $\overset{+7}{Mn}O_4^- + 5e^- \longrightarrow Mn^{2+}$
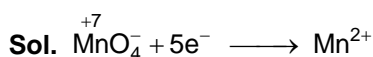
   For 1 mole MnO_4^-, 5 moles electrons are involved.

   Total charge required = $96500 \times 5 = 4.825 \times 10^5$ C

2.   Match **List I** with **List II**.

	LIST I		LIST II
A.	Zone refining	I.	Titanium
B.	Mond's process	II.	Zinc
C.	Electrolytic refining	III.	Nickel
D.	van-Arkel method	IV.	Germanium

   (1) A-III, B-I, C-IV, D-II

   (2) A-IV, B-II, C-III, D-I

   (3) A-IV, B-III, C-II, D-I

   (4) A-II, B-IV, C-I, D-III

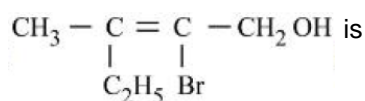**Answer (3)**

Sol. Refining method | Metal refined

Refining method	Metal refined
Zone refining	Germanium
Mond's process	Nickel
Electrolytic refining	Zinc
van-Arkel method	Titanium

3. The IUPAC name of the compound

$$CH_3 - \overset{}{\underset{C_2H_5}{C}} = \overset{}{\underset{Br}{C}} - CH_2\,OH \text{ is}$$
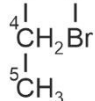
(1) 2-Bromo-3-methyl pent-2-en-1-ol

(2) 2-Bromo-3-ethyl but-2-en-1-ol

(3) 2-Bromo-3-methyl but-2-en-1-ol

(4) 2-Ethyl-3-bromo but-2-en-1-ol

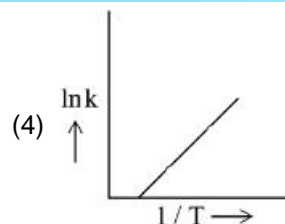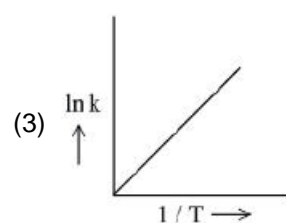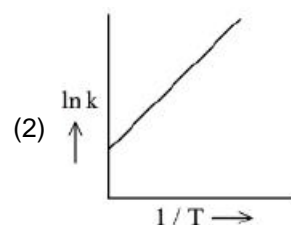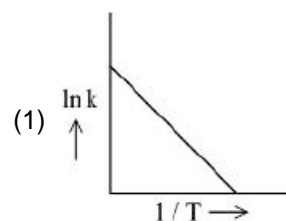**Answer (1)**

Sol.
$$CH_3 - \overset{3}{C} = \overset{2}{C} - \overset{1}{C}H_2 - OH$$
$$\underset{5}{\overset{4}{C}}H_2Br$$
$$\overset{5}{C}H_3$$

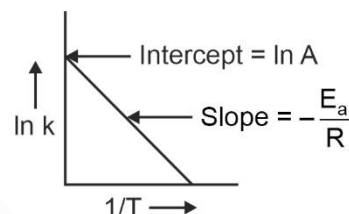2-Bromo-3-methyl pent-2-en-1-ol

4. According to Arrhenius rate equation, rate constant k is equal to $A \cdot e^{-E_a/RT}$. Which of the following options represents the graph of ln k vs $\dfrac{1}{T}$?

(1)

(2)

(3)

(4)

Answer (1)

Sol. $k = Ae^{-E_a/RT}$

or, $\ln k = \ln A - \dfrac{E_a}{RT}$

Intercept = ln A

Slope = $-\dfrac{E_a}{R}$

5. Since physisorption arises mainly because of van der Waals forces, it means adsorption is : (pick the incorrect option)

(1) Non-specific in nature

(2) Reversible in nature

(3) Multimolecular in layer

(4) Enthalpy dependent

Answer (4)

Sol. For physisorption, the enthalpy of adsorption is low. Hence practically, it is enthalpy independent.

6. A solution of copper sulphate cannot be stored in zinc vessel because

(1) Copper is more reactive than zinc

(2) Reduction potential of copper is less than zinc

(3) Oxidation potential of copper is higher than zinc

(4) Reduction potential of copper is higher than zinc

Answer (4)

Sol. $Zn(s) + Cu^{2+}(aq) \rightarrow Cu(s) + Zn^{2+}(aq)$

$E^0_{Cu^{2+}/Cu} = +0.34V$

$E^0_{Zn^{2+}/Zn} = -0.76V$

$E^0_{Cell} = E^0_R - E^0_L = 0.34 + 0.76 = 1.1V$

Zinc will be oxidised to Zn^{2+} and Cu^{2+} will be reduced to Cu

Reduction potential of copper is, higher than zinc.

7. Which of the following are the characteristics of chemisorption?

A. Highly specific in nature

B. Low activation energy

C. High heat of adsorption

D. Reversible in nature

Choose the correct answer from the options given below:

(1) A and D only

(2) A and C only

(3) B and D only

(4) B and C only

Answer (2)
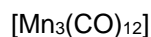
Sol. characteristics of chemisorption

- It is highly specific in nature

- Heat of adsorption is high

8. The molecular formula of dodecacarbonyltrimanganese (0)

(1) $[Mn_2(CO)_{11}]$

(2) $[Mn_3(CO)_{12}]$

(3) $[Mn_3(CO)_{10}]$

(4) $[Mn_2(CO)_{12}]$

Answer (2)

Sol. Dodeca stands for 12

$[Mn_3(CO)_{12}]$

dodecacarbonyltrimanganese (0)

9. In the given equations (Note: equations are not balanced)

$Zn + Conc\ HNO_3 \rightarrow Zn(NO_3)_2 + \boxed{x} + H_2O...(1)$

$Zn + Dil.\ HNO_3 \rightarrow Zn(NO_3)_2 + \boxed{y} + H_2O...(2)$
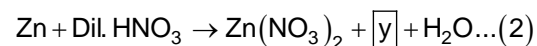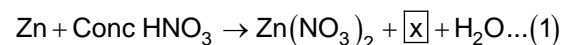
the compounds x and y respectively are:

(1) NO_2 and NO

(2) NO_2 and NO_2

(3) N_2O and NO_2

(4) NO_2 and N_2O

Answer (4)

Sol. $Zn + 4HNO_3(conc) \rightarrow Zn(NO_3)_2 + 2H_2O + 2\underset{\boxed{x}}{NO_2}$

$4Zn + 10HNO_3(dilute) \rightarrow 4Zn(NO_3)_2 + 5H_2O + \underset{\boxed{y}}{N_2O}$
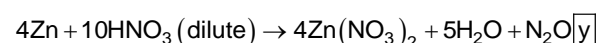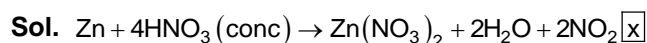
10. The most effective electrolyte for the coagulation $Fe_2O_3.H_2O/Fe^{3+}$ is

A. AgCl

B. $FeCl_3$

C. $MgCl_2$

D. $K_4[Fe(CN)_6]$

E. KCl

Choose the correct answer from the options given below:

(1) A and B only

(2) D only

(3) E only

(4) C only

Answer (2)

Sol. $Fe_2O_3.H_2O/Fe^{3+}$ is positively

Charged sol. It is coagulated by negatively charged species.

More is the negative charge more easily the colloid will be precipitated.

$[Fe(CN)_6]^{4-}$ has highest charge among the given option.

11. Which among the following are correctly matched?

A. $C_6H_5OCH_2CH_3$ – Phenetole

B. $C_6H_5O(CH_2)_6CH_3$ – Heptyl phenyl ether

C. $C_6H_5OCH_3$ – Dimethyl ether

D. $C_2H_5OCH_2CH_3$ – Methyl ethyl ether

Choose the correct answer from the options given below:

(1) A and B only

(2) C and D only

(3) A and C only

(4) B and D only

Answer (1)

Sol. $C_6H_5OCH_3$: Methyl phenyl ether

$C_2H_5O–CH_2CH_3$: Diethyl ether

12. When Br_2 is treated with aqueous solution of NaF, NaCl, NaI separately

(1) F_2, Cl_2, I_2 are liberated

(2) Only F_2 and Cl_2 are liberated

(3) Only Cl_2 is liberated

(4) Only I_2 is liberated

Answer (4)

Sol. Order of oxidizing power

$F_2 > Cl_2 > Br_2 > I_2$

$\therefore Br_2 + NaI \rightarrow NaBr + I_2$
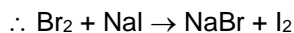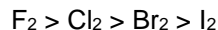
13. In a pure crystal, the lattice point cannot be occupied by_____

(1) an atom

(2) a molecule

(3) an ion

(4) an electron

Answer (4)

Sol. Each point in a crystal lattice represents one constituent particle which may be an atom, a molecule or an ion.

So, in pure crystal, lattice point cannot be occupied by an electron.

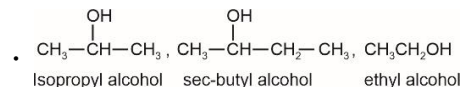**14.** Out of the following compounds, which will give iodoform test.

A. Isopropyl alcohol

B. Isobutyl alcohol

C. Secondary butyl alcohol

D. Ethyl alcohol

E. Acetic Acid
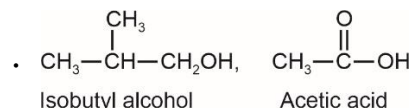
Choose the correct answer from the options given below:

(1) A, B, D
(2) A, C, D

(3) A, D
(4) A, D, E

Answer (2)

Sol. Compounds containing $CH_3-\overset{\overset{OH}{|}}{CH}-$ and $CH_3-\overset{\overset{O}{\|}}{C}-$ groups gives iodoform test

$\underset{\text{Isopropyl alcohol}}{CH_3-\overset{\overset{OH}{|}}{CH}-CH_3}$, $\underset{\text{sec-butyl alcohol}}{CH_3-\overset{\overset{OH}{|}}{CH}-CH_2-CH_3}$, $\underset{\text{ethyl alcohol}}{CH_3CH_2OH}$

will give iodoform test

$\underset{\text{Isobutyl alcohol}}{CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2OH}$, $\underset{\text{Acetic acid}}{CH_3-\overset{\overset{O}{\|}}{C}-OH}$

will not give iodoform test

15. Oxidation of acetaldehyde with SeO_2 forms:

(1) Ethanoic acid
(2) Methanolic acid

(3) Glyoxal
(4) Oxalic acid

Answer (3)

Sol. $CH_3CHO + SeO_2 \longrightarrow \underset{\text{glyoxal}}{OHC-CHO} + Se + H_2O$

Aldehydes or ketones on oxidation with SeO_2 gives dicarbonyl compounds.

16. The product 'Y' in the following reaction sequence is
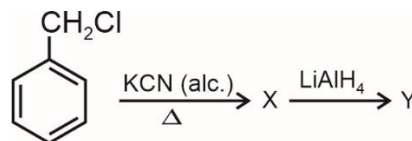
Answer (4)

Sol.
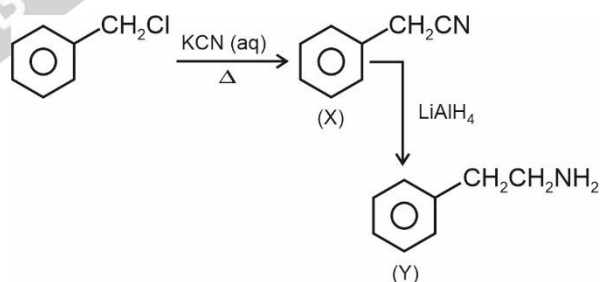
17. The synthesis of alkyl fluoride is best accomplished by the following reaction
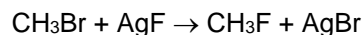
$CH_3Br + AgF \rightarrow CH_3F + AgBr$

The reaction is termed as:

(1) Swarts reaction

(2) Finkelstein reaction

(3) Wurtz reaction

(4) Fittig reaction

Answer (1)

Sol. $CH_3Br + AgF \rightarrow CH_3F + AgBr$

This reaction is Swarts reaction.

18. What is/are true regarding most of the medicines

- A. They are colloidal in nature
- B. Their particle size range from 1-1000 nm
- C. They have large surface area
- D. They are easily assimilated

Choose the correct answer from the options given below:

(1) A, B only

(2) B, C only

(3) A, B, C only

(4) A, B, C, D only

Answer (4)

Sol. Most of the medicines are colloidal in nature as colloidal medicines are more effective because they have large surface area and are therefore easily assimilated.

The range of diameter of colloidal particles is between 1 and 1000 nm.

19. Mn_2O_7, CrO and V_2O_5 respectively are:

(1) Acidic, amphoteric and basic

(2) Basic, acidic and amphoteric

(3) Amphoteric, basic and acidic
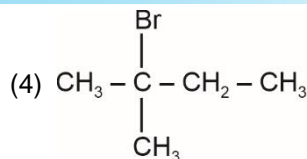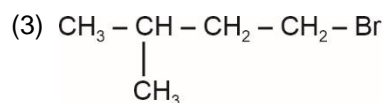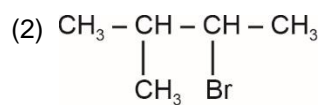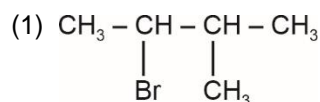
(4) Acidic, basic and amphoteric

Answer (4)

Sol. Mn_2O_7 : Acidic

CrO : Basic

V_2O_5 : Amphoteric

20.

$$H_3C - CH - CH - CH_3 + HBr \rightarrow A$$
$$\quad\quad\; | \quad\quad |$$
$$\quad\quad CH_3 \;\; OH$$

A (predominantly) is

(1)
$$CH_3 - CH - CH - CH_3$$
$$\quad\quad\; | \quad\quad |$$
$$\quad\quad Br \quad CH_3$$

(2)
$$CH_3 - CH - CH - CH_3$$
$$\quad\quad\quad | \quad\quad |$$
$$\quad\quad\; CH_3 \;\; Br$$

(3)
$$CH_3 - CH - CH_2 - CH_2 - Br$$
$$\quad\quad\; |$$
$$\quad\quad CH_3$$

(4)
$$\quad\quad\quad Br$$
$$\quad\quad\quad |$$
$$CH_3 - C - CH_2 - CH_3$$
$$\quad\quad\quad |$$
$$\quad\quad\; CH_3$$

Answer (4)

Sol.
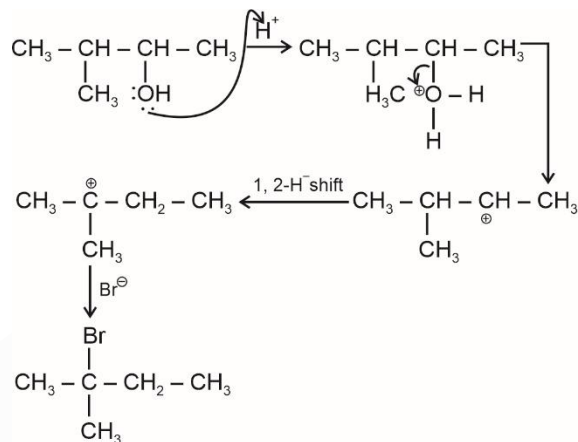
21. Match List I with List II

	List I		List II (van't Hoff factor)
A.	$K_4[Fe(CN)_6]$	I.	3
B.	K_2SO_4	II.	0.5
C.	CH_3COOH in benzene	III.	5
D.	KCl	IV.	2

Choose the correct answer from the options given below:

(1) A-III, B-I, C-II, D-IV

(2) A-III, B-I, C-IV, D-II

(3) A-II, B-I, C-III, D-IV

(4) A-II, B-III, C-I, D-IV

Answer (1)

Sol. (A) $K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}$

i = 5

(B) $K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$

i = 3

(C) $2CH_3COOH \rightleftharpoons (CH_3COOH)_2$

(Dimerisation in benzene)

$i = \dfrac{1}{2} = 0.5$

(D) $KCl \rightarrow K^+ + Cl^-$

i = 2

So, A-III, B-I, C-II, D-IV

22. Chlorine is extracted from brine by

(1) Oxidation

(2) Leaching

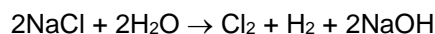(3) Distillation

(4) Reduction

Answer (1)

Sol. Chlorine is manufactured by the electrolysis of Brine (Chlor-Alkali Process)

$2NaCl + 2H_2O \rightarrow Cl_2 + H_2 + 2NaOH$

At Cathode: $2H^+(aq) + 2e^- \rightarrow H_2(g)$ (Reduction)

At Anode: $2Cl^-(aq) \rightarrow Cl_2(g) + 2e^-$ (Oxidation)

23. Match List I with List II: Match the test use for distinguishing the organic compounds

	List I		**List II**
A.	$(CH_3)_3N$, $CH_3CH_2CH_2NH_2$	I.	Tollen's test
B.	HCOOH, CH_3COOH	II.	Lucas test
C.	$CH_3-C(=O)-CH_2-CH_2-CH_3$, $CH_3-CH_2-C(=O)-CH_2-CH_3$	III.	Carbylamine test
D.	$CH_3-CH_2-CH_2-CH_2-OH$, $CH_3-C(CH_3)(CH_3)-OH$	IV.	Iodoform test

Choose the correct answer from the options given below:

(1) A-I, B-II, C-III, D-IV

(2) A-III, B-II, C-I, D-IV

(3) A-III, B-I, C-IV, D-II

(4) A-III, B-IV, C-II, D-I

Answer (3)

Sol.

	Organic Compounds	Test	Remark
A.	$(CH_3)_3N$ (3° Amine) & $CH_3CH_2CH_2NH_2$ (1° Amine)	Carbylamine Test	Carbylamine test is performed by primary amine
B.	HCOOH & CH_3COOH	Tollen's Test	Formic acid gives positive Tollen's test while acetic acid does not $HCOOH + Ag_2O \rightarrow H_2O + CO_2 + 2Ag\downarrow$
C.	$CH_3-C(=O)-CH_2CH_2CH_3$ (α–Methylketone) & $CH_3CH_2C(=O)-CH_2CH_3$	Iodoform Test	α-methylketones give positive Iodoform test while other ketones does not
D.	$CH_3CH_2CH_2CH_2OH$ (1° Alcohol) & $CH_3-C(CH_3)(CH_3)-OH$ (3° Alcohol)	Lucas Test	Reaction with $ZnCl_2$/conc. HCl (Lucas reagent) with tertiary alcohol forms immediate turbidity while primary alcohol does not get turbidity even on heating

A-III, B-I, C-IV, D-II

24. Match List I with List II

	List I		List II
A.	Mathematical expression for rate of reaction	I.	rate constant
B.	Rate of reaction for zero order reaction is equal to	II.	rate law
C.	Unit of rate constant for zero order reaction is same as that of	III.	order of slowest step
D.	Order of a complex reaction is determined by	IV.	rate of reaction

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I

(2) A-I, B-II, C-III, D-IV

(3) A-II, B-I, C-IV, D-III

(4) A-IV, B-III, C-I, D-II

Answer (3)

Sol. A. Mathematical expression for rate of reaction

$\Rightarrow$ Rate Law

For a general reaction $\rightarrow$ aA + bB $\rightarrow$ cC + dD

Rate Law

Rate = $k[A]^x [B]^y$

B. Rate of reaction for zero order reaction is equal to

$\Rightarrow$ Rate constant

r = k [Reactant]^0 = k

C. Unit of rate constant for zero order reaction

= rate of reaction $\Rightarrow$ mol L^{-1} s^{-1}

D. Order of complex reaction $\Rightarrow$ Order of slowest step

25. Aryl halides do not undergo nucleophilic substitution reactions under ordinary conditions because

A. approach of nucleophile is retarded

B. carbon carrying halogen atom is sp^3 hybridised

C. the substrate molecule is destabilised due to resonance

D. of partial double bond character between carbon and halogen.

Choose the correct answer from the options given below:
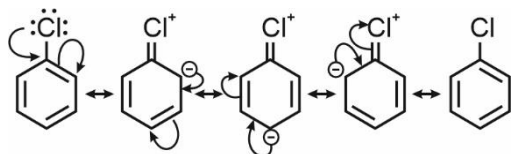
(1) A and D only

(2) B and C only

(3) A and C only

(4) B and D only

Answer (1)

Sol. In haloarenes carbon carrying halogen is sp^2 hybridised and the electron pairs on halogen atom are in conjugation with π electrons of the ring (Resonance effect) causing stabilization

Here, C – Cl bond acquires partial double bond character. Also approach of nucleophile is retarded due to electron rich arenes.

So, (B) and (C) are incorrect while (A) & (D) are correct.

26. Arrange the given compounds in order of decreasing oxidation state of nitrogen

A. N_2

B. NO

C. HNO_3

D. NH_4Cl

Choose the correct answer from the options given below:

(1) $HNO_3 > NO > NH_4Cl > N_2$

(2) $HNO_3 > NO > N_2 > NH_4Cl$

(3) $HNO_3 > NH_4Cl > NO > N_2$

(4) $NO > HNO_3 > NH_4Cl > N_2$

Answer (2)

Sol.

	Species	Oxidation state of N
A.	$\overset{0}{N_2}$	0
B.	NO	+2
C.	$\overset{+1}{H}\overset{+5}{N}\overset{-2}{O_3}$	+5
D.	$\overset{-3}{N}\overset{+1}{H_4}\overset{-1}{Cl}$	–3

Order of decreasing oxidation state

$\Rightarrow HNO_3 > NO > N_2 > NH_4Cl$

27. For a substance at a given temperature, the osmotic pressure of its concentrated solution

(1) Is same as that of dilute solution

(2) Is lower than that of dilute solution

(3) Is higher than that of dilute solution

(4) Cannot be compared with osmotic pressure of dilute solution

Answer (3)

Sol. $\pi = iCRT$ where C = concentration

i = van't Hoff factor

For the same solution, at same temperature

$\pi \propto C$

More the concentration, more would be its osmotic pressure. So, dilute solution will have low π while concentrated solution will have high value of π.

$\therefore \pi$ of concentrated solution is higher than that of dilute solution.

28. Match **List I** with **List II**

	List I		List II
A.	Cubic cell	I.	$\alpha = \beta = \gamma = 90^\circ$
B.	Monoclinic cell	II.	$\alpha = \beta = 90^\circ, \gamma = 120^\circ$
C.	Triclinic cell	III.	$\alpha = \gamma = 90^\circ, \beta \neq 90^\circ$
D.	Hexagonal cell	IV.	$\alpha \neq \beta \neq \gamma \neq 90^\circ$

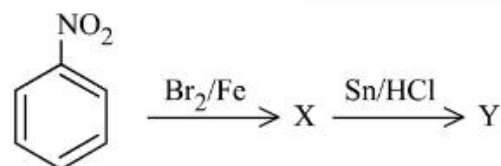Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV   (2) A-III, B-I, C-II, D-IV
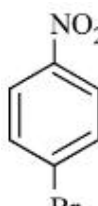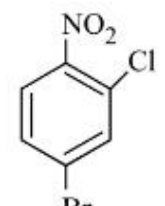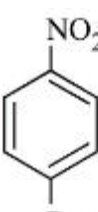
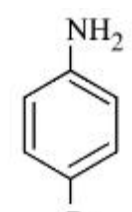(3) A-III, B-I, C-IV, D-II   (4) A-I, B-III, C-IV, D-II
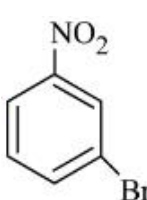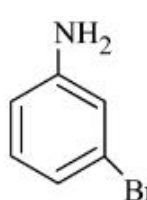
Answer (4)

Sol.

	Crystal system	Axial Angles
A.	Cubic cell	$\alpha = \beta = \gamma = 90^\circ$
B.	Monoclinic cell	$\alpha = \gamma = 90^\circ, \beta \neq 90^\circ$
C.	Triclinic cell	$\alpha \neq \beta \neq \gamma \neq 90^\circ$
D.	Hexagonal cell	$\alpha = \beta = 90^\circ, \gamma = 120^\circ$

So, A-I, B-III, C-IV, D-II

29. The products X and Y for the below reaction are:

30. Isomerism shown by $[Co(NH_3)_3(NO_2)_3]$ is

(1) Cis and trans

(2) Facial and meridional

(3) Optical

(4) Solvate

Answer (2)

Sol. $[Co(NH_3)_3(NO_2)_3]$ is an octahedral complex of Ma_3b_3 type. It shows facial and meridional isomerism.

29. (continued)

(1)

(2)

(3)

(4)

Answer (3)

Sol.
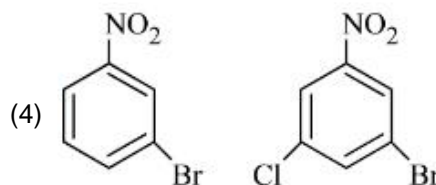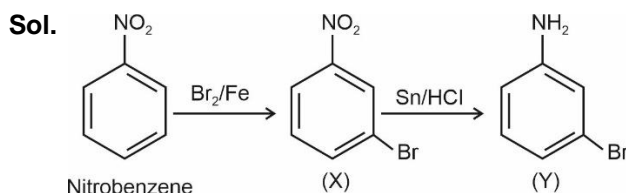
As $-NO_2$ is m-directing group so, X is m-Bromonitrobenzene.

Reduction of nitroarene results in the formation of aniline.

So, Y is m-Bromoaniline.
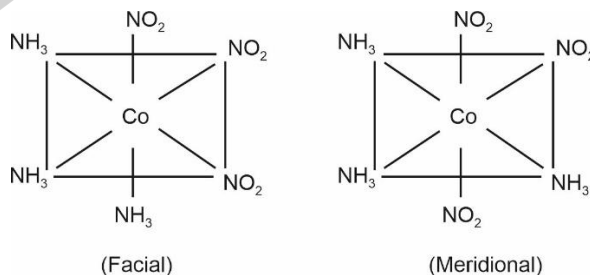
31. On the basis of the information available from the reaction

$$\frac{4}{3} Al + O_2 \rightarrow \frac{2}{3} Al_2O_3, \Delta G = -827 \text{ kJ/mol}^{-1}$$
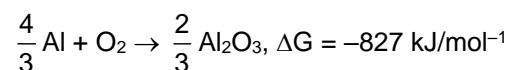
The minimum e.m.f. required to carry the electrolysis of Al_2O_3 is ($F = 96500$ C mol^{-1})

(1) 2.14 V   (2) 4.29 V

(3) 6.42 V   (4) 8.56 V

Answer (1)

Sol. EMF: $E = \dfrac{-\Delta G}{nF}$

For given reaction

e^- exchanged for Al = 3

Hence for $\dfrac{4}{3}$ Al $= \dfrac{4}{3} \times 3 = 4$ electron

$E = \dfrac{-(-827 \times 10^3)}{4 \times 96500}$

$\quad = 2.14$ V

32. Identify the product 'X' in the following reaction:

$C_2H_5COONa \xrightarrow[\text{Heat}]{\text{NaOH+CaO}} X + Na_2CO_3$

(1) C_2H_4 (2) C_2H_6

(3) C_3H_8 (4) C_3H_6

Answer (2)

Sol. Given reaction is decarboxylation of sodium salt of carboxylic acid by soda lime method

$C_2H_5COONa \xrightarrow[\text{Heat}]{\text{NaOH+CaO}} C_2H_6 + Na_2CO_3$

33. Which of the following compound is most reactive towards nucleophilic addition reaction?

(1) $CH_3 - \overset{\overset{\displaystyle O}{\|}}{C} - H$

(2) $CH_3 - \underset{\underset{\displaystyle O}{\|}}{C} - CH_3$

(3) ⬡$- \underset{\underset{\displaystyle O}{\|}}{C} - H$

(4) ⬡$- \underset{\underset{\displaystyle O}{\|}}{C} - CH_3$

Answer (1)

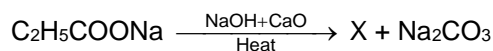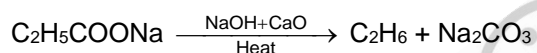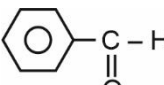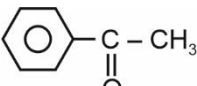**Sol.** • Aldehydes are more reactive than ketones towards nucleophilic addition reaction

• Aliphatic aldehydes are more reactive than the aromatic aldehydes towards nucleophilic addition reaction

Hence order of reactivity

1 > 3 > 2 > 4

34. The activation energy for a reaction at a temperature T K was found to be 2.303 RT J/mol. The ratio of the rate constant to Arrhenius factor is

(1) 10^{-1} (2) 10^{-2}

(3) 2×10^{-2} (4) 2×10^{-3}

Answer (1)

Sol. Arrhenius equation

$k = Ae^{-E_a/RT}$

$\dfrac{k}{A} = e^{-E_a/RT}$

$\log\left(\dfrac{k}{A}\right) = \dfrac{-E_a}{2.303\, RT} = \dfrac{-2.303\, RT}{2.303\, RT}$

$\qquad\qquad = -1$

$\dfrac{k}{A} = 10^{-1}$

35. Which of the following hormone is responsible for the development of secondary female characteristic and participate in control of menstrual cycle?

(1) Adrenal cortex   (2) Estradiol

(3) Androgens   (4) Progesterone

Answer (2)

Sol. Estradiol is the hormone responsible for the development of secondary female characteristic and participate in control of menstrual cycle.

36. If two substances A and B have $P_A^\circ : P_B^\circ = 1 : 2$ and have mole fraction in the ratio 1 : 2, then mole fraction of A in vapours is

(1) 0.33

(2) 0.2

(3) 0.25

(4) 0.52

Answer (2)

Sol. According to Raoult's law and Dalton's law of partial pressure

$P_A^\circ X_A = P_S Y_A$ … (i)

$P_B^\circ X_B = P_S Y_B$ … (ii)

(i) ÷ (ii)

$\dfrac{Y_A}{Y_B} = \dfrac{P_A^\circ X_A}{P_B^\circ X_B} = \dfrac{1}{2} \times \dfrac{1}{2} = \dfrac{1}{4}$

Hence, $Y_A = \dfrac{1}{4+1} = \dfrac{1}{5} = 0.2$

37. Chemisorption has the following traits:

A. High enthalpy of adsorption

B. Reversible

C. Favoured by high temperature

D. Requires low activation enthalpy

Choose the correct answer from the option given below:

(1) A, B only

(2) A, C only

(3) A, B, C only

(4) A, B, D only

Answer (2)

Sol. Traits of chemisorption is

* Has high enthalpy of adsorption.

* Not reversible

* Favoured by high temperature

* Requires high activation energy

38. Match **List I** with **List II**

	List I		List II
A.	C_6H_5CHO	I.	Precipitation with 2, 4 DNP
B.	$CH_3C \equiv CH$	II.	Precipitation with $AgNO_3$ (ammoniacal)
C.	HCN	III.	Nucleophile
D.	I^-	IV.	Cyanohydrin formation

Choose the correct answer from the options given below:

(1) A-I, B-II, C-III, D-IV

(2) A-IV, B-III, C-II, D-I

(3) A-I, B-II, C-IV, D-III

(4) A-II, B-III, C-I, D-IV

Answer (3)

Sol. * Carbonyl compounds like C_6H_5CHO give 2, 4-DNP test.

* Terminal alkynes like $CH_3C \equiv CH$ give precipitate with ammoniacal $AgNO_3$.

* HCN forms cyanohydrin with carbonyl compounds.

* I^- is a good nucleophile.

39. Match **List I** with **List II**

	List I		List II
A.	XeF_6	I.	sp^3d^3 distorted octahedral
B.	XeO_3	II.	sp^3d^2 square planar
C.	$XeOF_4$	III.	sp^3 pyramidal
D.	XeF_4	IV.	sp^3d^2 square pyramidal

Choose the correct answer from the options given below:

(1) A-I, B-III, C-IV, D-II

(2) A-I, B-II, C-III, D-IV

(3) A-IV, B-III, C-I, D-II

(4) A-II, B-III, C-IV, D-I

Answer (1)

Sol.

Molecule	Hybridisation	Shape
XeF_6	sp^3d^3	Distorted octahedral
XeO_3	sp^3	Pyramidal
$XeOF_4$	sp^3d^2	Square pyramidal
XeF_4	sp^3d^2	Square planar

40. Predict the product for the following reaction :
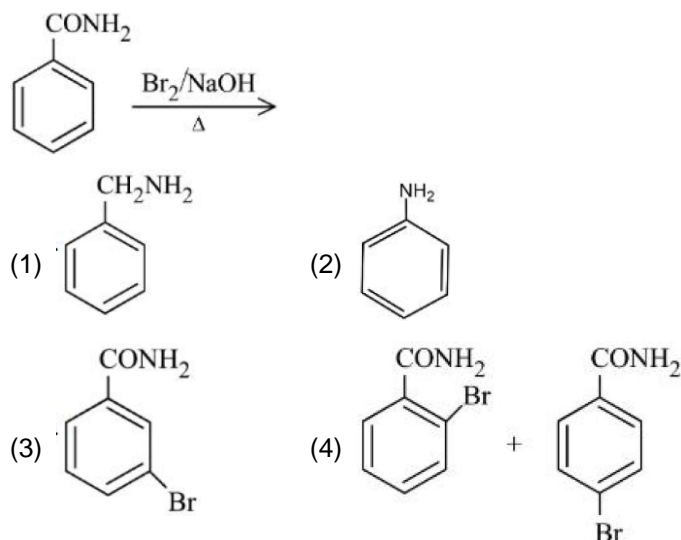
Answer (2)

Sol. This is Hofmann bromamide degradation reaction in which 1° amines are obtained from amides.
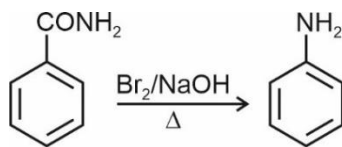
Paragraph for Question Numbers Q. 41 to Q. 45

Answer the question on the basis of passage given below:

In the periodic table, the d-block contains the elements of group 3 to 12. The d-orbitals are progressively filled in each of the four long periods. The elements of d block referred as transition metals have partly filled d orbitals and exhibit certain characteristic properties such as variety of oxidation states. states, formation of coloured ions, act as catalyst and show paramagnetic behaviour.

The two inner transition metal series 4f and 5f are known as Lanthanoids and Actinoids respectively. The lanthanoids resemble one another more closely as compared to ordinary transition elements in any series.

41. The catalytic activity of transition metals and their compounds is ascribed mainly to

(1) Their ability to adopt variable oxidation states

(2) Their chemical reactivity

(3) Their magnetic behaviour

(4) Their outer most orbital which has two electrons

Answer (1)

Sol. The catalytic activity of transition metals and their compounds is ascribed to their ability to adopt multiple oxidation states and to form complex. eg. V_2O_5 in contact process, finely divided Fe in Haber's process.

42. In context of the Lanthanoids, which of the following statements is/are **NOT** correct?

A. There is a gradual decrease in the radii of the members with increasing atomic number in the series

B. Availability of 4f electrons results in the formation of compounds in +4 oxidation state for all the members of the series.

C. Because of similar properties, the separation of lanthanoids is not easy.

D. La(OH)$_3$ is least basic among hydroxides of lanthanoids.

E. Ce^{2+} can act as an oxidising agent.

Choose the correct answer from the options given below:

(1) A and E only

(2) B and D only

(3) C and D only

(4) B and E only

Answer (2)

Sol. • The formation of Ce^{4+} is favoured by its noble gas configuration, but it is a strong oxidant reverting to the common +3 oxidation state. The E° value for Ce^{4+}/ Ce^{3+} is +1.74 V which suggests that it can oxidise water.

• +4 oxidation state is shown by, Ce, Pr, Nd, Tb, Dy only.

43. The bonds present in the structure of dichromate ion are

(1) Six equivalent Cr-O bonds and one O-O bond

(2) Six equivalent Cr-O bonds and one Cr-Cr bond

(3) Eight equivalent Cr-O bods

(4) Six equivalent Cr-O bonds and one Cr-O-Cr bond

Answer (4)

Sol. Structure of $Cr_2O_7^{2-}$ is
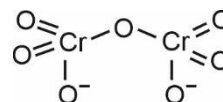
• Due to resonance 6 Cr–O bonds are equivalent.

• One Cr–O–Cr bond is also present in dichromate ion.

44. For the four successive transition elements given below, the stability of +2 oxidation state will be

A. Cr (Atomic number, Z = 24)

B. Mn (Z = 25)

C. Fe (Z = 26)

D. Co (Z = 27)

Choose the correct answer from the options given below:

(1) Cr > Mn > Co > Fe

(2) Mn > Fe > Cr > Co

(3) Fe > Mn > Co > Cr

(4) Co > Mn > Fe > Cr

Answer (2)

Sol. The order of stability of +2 oxidation state will be

Mn > Fe > Cr > Co

- Higher the reduction potential greater the tendency of M^{2+} to get reduced and lower will be the oxidation state stability.

- Mn^{2+} is most stable due to its half filled configuration.

45. Highest oxidation state of manganese in fluoride is +4 (MnF_4) but highest oxidation state in oxides is +7 (Mn_2O_7) because

(1) Fluorine is more electronegative than oxygen.

(2) Fluorine does not possess d-orbitals.

(3) Fluorine stabilises lower oxidation state.

(4) Fluorine can form single bond only while oxygen forms double bond, in covalent compounds.

Answer (4)

Sol. The highest Mn fluoride is MnF_4 whereas the highest oxide is Mn_2O_7. The ability of oxygen to form multiple bonds to metals explains its superiority.

Paragraph for Question Numbers Q. 46 to Q. 50

Answer the question on the basis of passage given below:

Proteins are the polymers of about twenty different α-amino acids which are linked by peptide bonds. Proteins performs various structural and dynamic functions in the organisms. Proteins which contain only α-amino acids are called simple proteins. The secondary or tertiary structure of proteins get disturbed on change of pH or temperature and they are not able to perform their function. This is called denaturation of proteins. Enzymes are biocatalysts which speed up the reaction in biosystems. Vitamins are accessory food factors required in the diet. They are classified as fat soluble (A, D, E and K) and water soluble (B group and C). Deficiency of vitamin leads to many diseases. Nucleic acids are the polymers of nucleotides which in turn consist of a base, a pentose sugar and phosphate moiety. Nucleic acids are responsible for the transfer of characters from parents of offsprings. There are two types of nucleic acids -DNA and RNA. DNA contains a five carbon sugar molecule called 2-deoxyribose whereas RNA contains ribose.

46. During denaturation of proteins.

(1) Biological activity remains unaltered

(2) 3° Structure remains unaltered

(3) 2° Structure remains unaltered

(4) 1° Structure remain unaltered

Answer (4)

Sol.
- During denaturation secondary and tertiary structures are destroyed but primary structure remains intact.
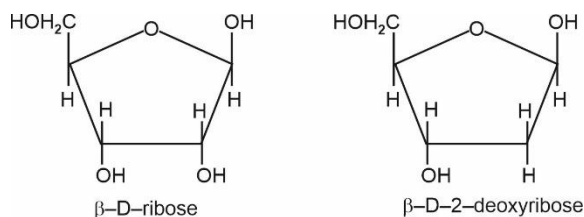
- It loses its biological, activity during denaturation.

47. RNA and DNA differ due to presence/absence of oxygen at which carbon of sugar moiety?

(1) 4th

(2) 3rd

(3) 2nd

(4) 1st

Answer (3)

Sol. In DNA molecules, the sugar moiety is β-D-2-deoxyribose whereas in RNA molecule. It is β-D-ribose. Which differ in the structure at C − 2 position.

β–D–ribose   β–D–2–deoxyribose

48. Deficiency of which of following vitamins can cause scurvy (loosening and bleeding of gum)?

(1) Vitamin A

(2) Vitamin C

(3) Vitamin D

(4) Vitamin K

Answer (2)

Sol. ● Deficiency of vitamin C (Ascorbic acid) causes Scurvy.

49. Which of the following is an essential amino acids?

(1) Leucine

(2) Glycine

(3) Alanine

(4) Aspartic acid

Answer (1)

Sol. ● Leucine is an essential amino acid which cannot be synthesised in the body and must be obtained through diet.

50. Which of the following vitamin cannot be stored in our body?

(1) Vitamin D

(2) Vitamin B_{12}

(3) Vitamin K

(4) Vitamin B_2

Answer (4)

Sol. ● Vitamin A, D, E and K are fat soluble. They are stored in liver and adipose tissues.

Whereas, B group vitamins and vitamin C are soluble in water and cannot be stored in our body. (Except vitamin B_{12})

❑ ❑ ❑