

CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer:

1.
$$\frac{CrO_2Cl_2}{CH_2Cl_2} \land A \xrightarrow{H_3O^+} B \xrightarrow{NaHSO_3} Product$$

The product is

Answer (2)

(4)

SO₃Na

Sol.

$$\begin{array}{c} \text{CH}_{3} \\ \hline \\ \text{CrO}_{2}\text{Cl}_{2} \\ \hline \\ \text{CH}_{2}\text{Cl}_{2} \\ \hline \\ \text{A} \\ \end{array} \begin{array}{c} \text{CH(OCrOHCl}_{2})_{2} \\ \hline \\ \text{H}_{3}\text{O}^{*} \\ \hline \\ \text{B} \\ \\ \text{Benzaldehyde} \\ \hline \\ \text{NaHSO}_{3} \\ \hline \\ \text{OH} \\ \end{array}$$

- 2. Density of 3 M NaOH is 1.25 g/ml. Molality of solution is
 - (1) 2.65
- (2) 2.5
- (3) 2.8
- (4) 3

Answer (1)

Sol.
$$M = \frac{1000 \text{ M}}{1000 \text{ d} - \text{M} \times \text{M}_0}$$

$$=\frac{3\times1000}{1250-3\times40}$$

$$=\frac{3\times1000}{1130}=2.65$$

- Arrange according to CFSE.
 - (i) $[Co(NH_3)_4]^{2+}$
 - (ii) $[Co(NH_3)_6]^{3+}$
 - (iii) [Co(NH₃)₆]²⁺
 - (iv) $[Co(en)_3]^{3+}$
 - (1) (iv) > (ii) > (iii) > (i)
 - (2) (iv) > (iii) > (i) > (i)
 - (3) (i) > (ii) > (iv)
 - (4) (i) > (ii) > (iii) > (iv)

Answer (1)

(1) **Delivering Champions Consistently** Aakash



Sol. Crystal Field Splitting Energy (CFSE)

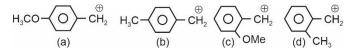
- ∞ Charge on central metal ion

On this basis the correct decreasing order of

CFSE

 $[Co(en)_3]^{3+} > [Co(NH_3)_6]^{3+} > [Co(NH_3)_6]^{2+} >$ $[Co(NH_3)_4]^{2+}$

4. What is correct order of stability of carbocation.



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

Answer (3)

Sol. Solution stability of $C^{\oplus} \propto +M$, HC, +I

$$\propto \frac{1}{-M.-Z}$$

- 5. Which of the following anion will not undergoe disproportionation?
 - (1) CIO₄
- (2) CIO₃
- (3) CIO₂
- (4) CIO

Answer (1)

Sol. In $ClO_4^- \rightarrow$ chlorine is in its highest oxidation state i.e., +7.

Chlorine can exhibit -1 to +7 oxidation state.

The oxidation states of chlorine which can undergo disproportionation are: 0, +1, +3 and +5.

- 6. Compare dipole moment of
 - (I) NF₃
- (II) CHCl₃
- (III) H₂S
- (IV) HBr
- (1) I > II > III > IV
- (2) II > III > I > IV
- (3) |I| > |I| > |V| > 1
- (4) III > I > IV > II

Answer (3)

Sol. NF₃

CHCl₃ H₂S

H₂S HBr

⇒ 0.230 1.04

0.95

0.79

So, order is

 $CHCl_3 > H_2S > HBr > NF_3$

7. Given below are two statements

S-I: Lassaigne test is used for detection of Nitrogen, phosphorous, sulphur and Halogens.

S-II: Lassaigne extract is made with magnesium metal.

- (1) Both S-I and S-II are correct.
- (2) Both S-I and S-II are incorrect.
- (3) S-I is correct but S-II is incorrect.
- (4) S-I is incorrect but S-II is correct

Answer (3)

Sol. Lassaigne extract is made with sodium metal, and not with magnesium metal.

- 8. Which one has two secondary Hydrogen atoms?
 - (1) 2, 2, 4, 4-tetramethylheptane
 - (2) 2, 2, 3, 4-tetramethylheptane
 - (3) 2, 2, 3, 3-tetramethyloctane
 - (4) 2, 2, 3-trimethylpentane

Answer (4)

Sol. (1)

Number of 2°H = 6

(2)

Number of $2^{\circ}H = 4$

(3)

 \checkmark Number of 2°H = 8

(4)

Number of $2^{\circ}H = 2$

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JEE (Main)-2025 : Phase-1 (22-01-2025)-Evening



Secondary butyl cyclohexane when reacts with Br₂
 in presence of sunlight produce

Answer (1)

Sol.

- 200 mL of 0.2 M solution of NaOH is mixed with 400
 mL of 0.5 M NaOH solution. Molarity of mixture is
 - (1) 0.4
- (2) 0.6
- (3) 4 M
- (4) 0.8 M

Answer (1)

Sol. $M_1 = 0.2 M$

 $M_2 = 0.5 M$

 $V_1 = 200 \text{ mL}$

 $V_2 = 400 \text{ mL}$

Molarity of mixture
$$= \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$$
$$= \frac{0.2 \times 200 + 0.5 \times 400}{600} M$$
$$= \frac{40 + 200}{600}$$
$$= \frac{240}{600} = 0.4 M$$

11. Correct structure of L-Glyceraldehyde is

CHO
$$(1) H \xrightarrow{CH_2OH} OH$$

$$CH_2OH$$

Answer (3)

Sol.
$$CH_2OH$$
 CH_2OH CH_2OH CH_2OH CHO CHO

- 12. Identify the extensive and intensive property?
 - (1) Mass, volume, conductivity Intensive property
 - (2) Mass, temperature, heat, volume Extensive property
 - (3) Mass, volume, internal energy Extensive property
 - (4) Density, temperature, moles, internal energy Intensive property

Answer (3)

- **Sol.** The properties which do not depend upon amount of substance is known as intensive property and the properties which depend upon amount of substance are extensive properties of matter.
 - Mass, volume and internal energy depend on amount of substance.
- Among Group-15 elements, what is the maximum covalency of an element having weakest E–E bond (E = element)
 - (1) 4

(2) 3

(3) 5

(4) 2

Answer (3)

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Sol. The E - E bond energies of the elements of group-15 are

N - N167 kJ mol-1 P - P201 kJ mol-1 As - As 146 kJ mol-1 Sb - Sb 121 kJ mol-1

Antimony (Sb) has the weakest E – E bond and its maximum covalency is 5.

14. What is the relation between K_{sp} and S of Zr₃ (PO₄)₄

(1) $S = \left(\frac{K_{sp}}{6912}\right)^{\frac{1}{7}}$ (2) $S = \left(\frac{K_{sp}}{144}\right)^{\frac{1}{7}}$

(3) $S = \frac{K_{sp}}{6912}$

Answer (1)

Sol.
$$Zr_3(PO_4)_4(s) = 3Zr_{3s}^{4+}(aq) + 4PO_4^{3-}(aq)$$

$$K_{sp} = (3s)^{3}(4s)^{4}$$

$$= 27 \times 256 \text{ S}^{7}$$

$$K_{sp} = 6912 \text{ S}^{7}$$

$$S = \left(\frac{K_{sp}}{6912}\right)^{\frac{1}{7}}$$

15. Match the column and choose the correct option

(A)	$\left(\frac{\partial H}{\partial T}\right)_{P}$	(P)	СР
(B)	$\left(\frac{\partial \mathbf{G}}{\partial \mathbf{P}}\right)_{\mathbf{T}}$	(Q)	Cv
(C)	$\left(\frac{\partial U}{\partial T}\right)_{V}$	(R)	Shear
(D)	$\left(\frac{\partial \mathbf{G}}{\partial T}\right)_{P}$	(S)	V

- (1) (A) (P), (B) (S), (C) (Q), (D) (R)
- (2) (A) (P), (B) (S), (C) (R), (D) (Q)
- (3) (A) (P), (B) (R), (C) (Q), (D) (S)
- (4) (A) (Q), (B) (S), (C) (P), (D) (R)

Answer (1)

- **Sol.** Heat exchanged at constant pressure is ΔH Heat exchanged at constant volume is ΔU
- 16. Consider the following statements S-1 and S-2 and choose the correct option.
 - S-1: During corrosion pure metal acts as anode and impure metal acts as cathode.
 - S-2: Rate of corrosion is more in alkaline medium than in acidic medium.
 - (1) Both S-1 and S-2 are correct
 - (2) Both S-1 and S-2 are incorrect
 - (3) S-1 is correct but S-2 is incorrect
 - (4) S-1 is incorrect but S-2 is correct

Answer (2)

Sol. In corrosion, a metal is oxidised by loss of electrons to oxygen. Electron released at anodic spot move through the same metal and go to another spot on the metal and reduce oxygen in the presence of H+ (which is believed to be available from H₂CO₃ formed due to dissolution of CO₂ from air into water.

Cathode : $O_2(q) + 4H^+ + 4e^- \rightarrow 2H_2O(l)$

$$E_{H^{+}|O_{2}|H_{2}O}^{0} = 1.23 \text{ V}$$

Anode : 2Fe(s) \rightarrow 2Fe²⁺ + 4e⁻ $E_{Fe^{2+}IFe}^{0} = -0.44 \text{ V}$

- Both the statements S-1 and S-2 are incorrect.
- 17.
- 18.
- 19.
- 20.

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. In Ru and Nb, if in Ru, 4d electrons are x and in Nb, 4d electrons are y then find the sum of x and y.

Answer (11)

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Sol.
$$44$$
Ru \Rightarrow [Kr] $4d^75s^1$

$$x = 7$$

$$_{41}\text{Nb} \Rightarrow [\text{Kr}] 4d^45s^1$$

$$y = 4$$

$$x + y = 11$$

How many hydrogen bonds are present in a molecule of the complex?

Answer (2)

Sol.
$$Ni^{2+}$$
 +2 $CH_3 - C = N - OH$
 $CH_3 - C = N - OH$ +2 $OH^- \longrightarrow$

[Ni(DMG)₂]

Number of H-bonds in a molecule of [Ni(DMG)₂] = 2

23. R - Br + Mg
$$\xrightarrow{\text{dry ether}}$$
 A $\xrightarrow{\text{H}_2\text{O}}$

How many R - Br can form isopentane?

Answer (4)

Sol.

Total 4 R-Br can form isopentane in this reaction.

24.
$$C_6H_6$$

Monobromination

Single product

A moles of H_2

Cat.

Cat.

Completely hydrogenated product

Find the number of π -electrons in C₆H₆.

Answer (8)

Sol. Degree of unsaturation of $C_6H_6 = 4$

C₆H₆ is a symmetrical dialkyne.

$$HC \equiv C - CH_2 - CH_2 - C \equiv CH$$

$$(C_6H_6)$$

$$HC \equiv C - CH - CH_2 - C \equiv CH$$

$$(Single product)$$

$$HC \equiv C - CH_2 - CH_2 - C \equiv CH + 4H_2$$

$$HC \equiv C - CH_2 - CH_2 - C \equiv CH + 4H_2$$
 (C_6H_6)
 $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

Number of π -electrons in C₆H₆ = 8

25. Calculate the radius of first excited state of He⁺ ion (in Å)

Answer (1)

Sol.
$$r = a_0 \frac{n^2}{z}$$

$$z = 2$$

$$r = a_0 \frac{4}{2}$$

$$= 2a_0$$

$$= 2 \times 0.529$$

$$= 1.058$$

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