1. In neutral medium KMnO₄ oxidise thiosulphate to

(1) S₂O₅²⁻  (2) S₂O₇²⁻  (3) SO₄²⁻  (4) SO₃²⁻

Ans. (4)

Sol. In neutral medium

8KMnO₄ + 3S₂O₅²⁻ + H₂O → 8MnO₄²⁻ + 6SO₄²⁻ + 20H⁺
2. How many among the following are non-planar
   \( \text{PCl}_3, \text{SO}_3, [\text{Al(OH)}_2]^+, \text{BF}_3, \text{NO}_2^-, \text{H}_2\text{O}_2 \)
   Ans. (3)

   Sol. (i) \( \text{PCl}_3 \) - Pyramidal, non-planar
   (ii) \( \text{SO}_3 \) - Trigonal, Planar
   (iii) \([\text{Al(OH)}_2]^+\) - Tetrahedral, non-planar
   (iv) \( \text{BF}_3 \) - Trigonal, planar
   (v) \( \text{NO}_2^- \) - Trigonal, planar
   (vi) \( \text{H}_2\text{O}_2 \) - Open book, planar

3. The group I element A having highest hydration enthalpy has similar properties of group II element B, then element B is :
   (1) Mg  (2) Be  (3) Ca  (4) Sr

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4. Assertion : Boron is unable to form \([\text{BF}_3]^+\).
   Reason : Boron has small size.
   (1) Assertion is true, Reason is true and Reason is correct explanation of Assertion
   (2) Assertion is true, Reason is true and Reason is not correct explanation of Assertion.
   (3) Assertion is true and Reason is false
   (4) Assertion is false and Reason is true
   Ans. (2)

   Sol. Boron do not form \([\text{BF}_3]^+\). Since Boron does not have vacant d orbitals it can not expand octet.

5. Correct order of ionisation energy of following element with outermost electronic configuration
   (a) \(3s^2 \)  (b) \(3s^23p^2 \)  (c) \(3s^33p^1 \)  (d) \(3s^33p^3 \)
   (1) \(a < b < c < d \)  (2) \(a < c < b < d \)  (3) \(a < b < c < d \)  (4) \(c < a < b < d \)
   Ans. (1)

   Sol. Correct order of IE is \( s^1 < p^1 < s^2 < p^2 < p^3 \).

6. In how many of the following ones iron is present.

   [Image of iron structure]

   Ans. (3)
7. **Assertion**: Dissolved substance of colloidal solution can be separated by using parchment paper.

**Reason**: Particles of true solution can not pass through parchment paper while particles of colloidal solution pass through parchment paper.

1. Assertion is true, Reason is true and Reason is correct explanation of Assertion.
2. Assertion is true, Reason is true and Reason is not correct explanation of Assertion.
3. Assertion is true and Reason is false.
4. Assertion is false and Reason is true.

**Ans.** (3)

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**Sol.** Colloidal solution particles can be separated using parchment paper.

True solution can pass through parchment paper while colloidal particle can not pass.

8. Metal in complex have low oxidation state when ligands are:

1. Good n acceptor.
2. Good n donor.
3. Poor n donor.
4. Poor n donor.

**Ans.** (1)

**Sol.** When metal has low oxidation state, it has more electron density in d orbital. So it has more tendency to back donate electrons. Thus compound must have good n acceptor ligand.

9. Ferric solution on reaction with potassium Ferrocyanide give Prussian blue colour due to formation of which complex

1. Fe₃⁺[Fe(CN)₆]³⁻
2. Fe[Fe(CN)₆]³⁻
3. [Fe(OH)₃](NH₄)₃
4. [Fe(NH₄)₃][Fe(CN)₆]

**Ans.** (1)

**Sol.** 4 Fe³⁺ + 3 [Fe(CN)₆]³⁻ → Fe₃[Fe(CN)₆]↓ (Prussian Blue)

10. Identify correct titration graph for titration of NH₄OH with HCl.

**Sol.**

- **Graph (1)**: Incorrect as it shows a decrease in pH with the addition of acid.
- **Graph (2)**: Incorrect as it shows a decrease in pH without a change in volume of acid.
- **Graph (3)**: Correct as it shows an increase in pH with the addition of acid.
- **Graph (4)**: Incorrect as it shows a decrease in pH without a change in volume of acid.
11. For a real gas value of compressibility factor is 2 at 25°C and 99 atm pressure, then value of van der Waal constant \( b \) is \( \ldots \ldots \cdot 10^{-2} \) (Lit/mole) \( [R = 0.083 \text{ L atm mole}^{-1} \text{K}^{-1}] \) [Assuming pressure to be very high]

Ans. (25)

12. Arrange following according to decreasing order of energy

(a) \( n = 3, l = 0, m = 0, s = \frac{-1}{2} \)

(b) \( n = 3, l = 1, m = -1, s = \frac{1}{2} \)

(c) \( n = 3, l = 2, m = +2, s = 1 \)

(d) \( n = 4, l = 0, m = 0, s = \frac{1}{2} \)

 Ans. (1)

Sol. Energy depends on \((n + l)\) so correct order = \(3d > 4s > 3p > 3s\)

13. In 100 gram water a solute is added & vapour pressure of solution is half of the pure solven. The vapour pressure of pure water is 23.76 mm of Hg then find the number of mole of solute added.

[Report your answer to nearest integer]

Ans. (6)
14. 100 ml. 0.1 M H₂SO₄ is mixed in 50 ml. 0.1 M NaOH solution, the normality of resulting solution is \( \ldots \times 10^{-1} \) N

**Ans.** (1)

**Sol.**

\[
\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}
\]

millimole: 10  5

millimole: 7.5  0

Molarity of H₂SO₄ = \( \frac{7.5}{150} \)

Normality of solution = \( \frac{7.5}{150} \) \( \times 10^{-1} \)

15.

\[\text{R}^* \rightarrow \begin{align*}
1. \text{NaOH} & \rightarrow \text{A (Major product)} \\
2. & \\
(1) & \\
(2) & \\
(3) & \\
(4) & \\
\end{align*}\]

**Ans.** (2)

**Sol.**

\[\text{R}^* \rightarrow \begin{align*}
1. \text{NaOH} & \rightarrow \text{R}^* \rightarrow \text{Br} \\
(1) & \\
(2) & \\
(3) & \\
(4) & \\
\end{align*}\]
17. 5 gram of toluene is converted to benzaldehyde. The efficiency of this process is 92%. The weight of benzaldehyde produced in $x \times 10^{-2}$ gram, $x$ is

$$\text{Mole of toluene} = \frac{5}{92} \text{ mole}$$

$$\text{Mole of benzaldehyde} = \frac{5 \times 92}{92 \times 100}$$

$$\text{Weight of benzaldehyde} = \frac{5 \times 92}{92}\times 106 = 530 \times 10^{-2} \text{ gram}.$$  

$$x = 530$$

18. An organic compound (A) if dissolved in water turn blue litmus red. The molecular mass of the compound is 131 ± 2. If compound is reacted with nitrous acid followed by phenol in alkaline medium gives orange coloured solution. Compound “A” is

Anss. (2)

Sol. Anilinium chloride is acidic in solution and turns blue litmus red. With Nitrous acid, it forms benzendiazonium chloride. Which react with phenol in alkaline medium gives orange coloured solution.

19. Which causes more lathers.

(1) Sodium rosinate  
(2) Sodium stearate  
(3) Sodium carbonate  
(4) Trisodium phosphate

Ans. (1)

Sol. Sodium rosinate produced more lather.

20. Statement-I: Fly ash and slag released by still industry are used to in cement industry.

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Statement-II: Plastic waste are lead free.
(1) Statement-I is correct only.
(2) Statement-II is correct only.
(3) Both statement-I & II are correct.
(4) Statement-I is incorrect and Statement-II is correct.

Ans. (3)
Sol. Plastic waste are called green fuel.

21. Match the following

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Neoprene</td>
<td>(i) Tetrafluoroethene</td>
</tr>
<tr>
<td>(B) Teflon</td>
<td>(ii) Acrylonitrile</td>
</tr>
<tr>
<td>(C) Acrylan</td>
<td>(iii) Isoprene</td>
</tr>
<tr>
<td>(D) Natural rubber</td>
<td>(iv) Chloroprene</td>
</tr>
<tr>
<td>(1) (A)-(iv), (B)-(i), (C)-(ii), (D)-(iii)</td>
<td>(2) (A)-(i), (B)-(ii), (C)-(iii), (D)-(i)</td>
</tr>
<tr>
<td>(3) (A)-(i), (B)-(i), (C)-(iii), (D)-(iv)</td>
<td>(4) (A)-(i), (B)-(i), (C)-(iv), (D)-(iii)</td>
</tr>
</tbody>
</table>

Ans. (1)

22. Match the following

<table>
<thead>
<tr>
<th>Column-I (substance)</th>
<th>Column-II Method (Purification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Acetone + CHCl₃</td>
<td>(i) Sublimation</td>
</tr>
<tr>
<td>(B) Naphthalene + NaCl</td>
<td>(ii) Distillation</td>
</tr>
<tr>
<td>(C) Water + Aniline</td>
<td>(iii) Crystallisation</td>
</tr>
<tr>
<td>(D) Naphthalene + Benzoic acid</td>
<td>(iv) Steam distillation</td>
</tr>
<tr>
<td>(1) (A)-(iii), (B)-(i), (C)-(ii), (D)-(iv)</td>
<td>(2) (A)-(iv), (B)-(iii), (C)-(i), (D)-(i)</td>
</tr>
<tr>
<td>(3) (A)-(i), (B)-(i), (C)-(iv), (D)-(i)</td>
<td>(4) (A)-(i), (B)-(i), (C)-(v), (D)-(iii)</td>
</tr>
</tbody>
</table>

Ans. (4)

23. Match the following

<table>
<thead>
<tr>
<th>Column-I (Reactant)</th>
<th>Column-II (Product)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Glucose + HI</td>
<td>(i) Salicylic acid</td>
</tr>
<tr>
<td>(B) Glucose + HNO₃</td>
<td>(ii) n-Hexane</td>
</tr>
<tr>
<td>(C) Glucose + Bromine water</td>
<td>(iii) Gluconic acid</td>
</tr>
<tr>
<td>(D) Glucose + Acetic Anhydride</td>
<td>(iv) Glucose pentaacetate</td>
</tr>
<tr>
<td>(1) (A)-(i), (B)-(i), (C)-(iii), (D)-(iv)</td>
<td>(2) (A)-(i), (B)-(i), (C)-(iii), (D)-(iv)</td>
</tr>
<tr>
<td>(3) (A)-(i), (B)-(i), (C)-(iii), (D)-(iii)</td>
<td>(4) (A)-(iv), (B)-(iii), (C)-(i), (D)-(i)</td>
</tr>
</tbody>
</table>

Ans. (1)

24. Match the following

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) R–C–Cl+H₂Pd–BaSO₄ Boiling Xylene</td>
<td>R–C–O</td>
</tr>
<tr>
<td>(B) R–C=N S™Cl₂/NaCl R–CH=O</td>
<td>(ii) Gattermann-Koch reaction</td>
</tr>
<tr>
<td>(C) Toluene + CrO₄Cl₂</td>
<td>CHO</td>
</tr>
<tr>
<td>(D) Benzene CH₃CO _HCl Anthy AlC₃/Cu(I)</td>
<td>CHO</td>
</tr>
</tbody>
</table>