1. Assertion: Ionisation energy of nitrogen is more than oxygen.

Reason: In 2p orbital electron feel more repulsion in oxygen in comparison to nitrogen.

(1) Assertion and reason both are correct and reason is correct explanation of assertion.
(2) Assertion and reason both are correct statements but reason is not correct explanation of assertion.
(3) Assertion is correct but reason is wrong statement.
2. | Column-I | Column-II |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Siderite</td>
<td>(a) KCl, MgCl₂, 6H₂O</td>
</tr>
<tr>
<td>(ii) Malachite</td>
<td>(b) CuCO₃, Cu(OH)₂</td>
</tr>
<tr>
<td>(iii) Camalite</td>
<td>(c) ZnCO₃</td>
</tr>
<tr>
<td>(iv) Calamine</td>
<td>(d) FeCO₃</td>
</tr>
</tbody>
</table>

Correct match is:

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>d</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>(2)</td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>(3)</td>
<td>d</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>(4)</td>
<td>d</td>
<td>b</td>
<td>c</td>
</tr>
</tbody>
</table>

Ans. (1)

Sol. Siderite → FeCO₃
Malachite → CuCO₃, Cu(OH)₂
Camalite → KCl, MgCl₂, 6H₂O
Calamine → ZnCO₃

3. Which of the following is correct option regarding CH₄, NH₄⁺, and BH₄⁻:

(1) All are isoelectronic & tetrahedral.
(2) All are not isoelectronic but tetrahedral.
(3) All are isoelectronic but only two are tetrahedral.
(4) All are isoelectronic but all are not tetrahedral.

Ans. (1)

Sol. Species | CH₄ | NH₄⁺ | BH₄⁻ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of electron</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Structure</td>
<td>Tetrahedral</td>
<td>Tetrahedral</td>
<td>Tetrahedral</td>
</tr>
</tbody>
</table>

---

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| JEE MAH-2022 | DATE: 25-06-2022 (SHIFT-2) | PAPER-1 | MEMORY BASED | CHEMISTRY |

4. Which set of compounds contain carbon compound?

(1) Baking soda, Washing soda
(2) Baking soda, Caustic soda
(3) Washing soda, Caustic soda
(4) Only Washing soda

Ans. (1)

Sol. Compound | Formula |
---|---|
(1) Baking soda | NaHCO₃ |
(2) Washing soda | Na₂CO₃.10H₂O |
(3) Caustic soda | NaOH |

5. 1 Mole of CoCl₂.6NH₃ on reaction with excess of AgNO₃ give 2 moles of AgCl then value of X is:

Ans. (5)

Sol. CoCl₂.6NH₃ + AgNO₃ (excess) → AgCl

1 mole | 2 moles

It means 2 Cl are outside the co-ordinations sphere & co-ordination number of Co is 6
So possible complex is [Co(NH₃)₆Cl₂]x
So x = 5

6. The magnetic moment (spin only) of complex [MnBr₆]²⁺ is ......... BM

[Report your answer to nearest integer]
7. For a first order reaction $K = 6.3 \times 10^{-19} \text{ e}^{-2000T}$. Then the value of activation energy in kJ is:

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

Given $R = 8.314 \text{ J/mole \times K}$

Report your answer to the nearest integer.

$$K = 6.3 \times 10^{-19} \text{ e}^{-2000T}$$

$$K = 6.3 \times 10^{-19} = 26 \times 10^3$$

$E_a = 26 \times 10^3 \times 8.314 = 216.164 \times 10^3 \text{ J} = 216.164 \text{ kJ}$

8. In 100 L vessel at 810 K, 4 mole of Ar and 5 mole of PCl$_5$ are taken. At equilibrium total pressure of gases is 8 atm, then value of $K_p$ is:

$$K_p = \frac{[P(Cl_2)]^4}{[P(Cl)]^5}$$

[Report your answer to nearest integer]

9. For a solution containing nonvolatile non-electrolyte solute concentration is 1.5 m. The elevation in boiling point ($\Delta T_b$) is 4 K while at concentration of 4.5 m depression in freezing point ($\Delta T_f$) is 4 K then find ratio of $K_b$.

$$\Delta T_b = K_b \times m$$

$$\frac{\Delta T_b}{\Delta T_f} = \frac{K_b \times m_1}{K_b \times m_2} = \frac{K_b \times 1.5}{K_b \times 4.5} = \frac{1.5}{4.5} = \frac{1}{3}$$

$$K_b = 3$$

10. Shape and number of lone pair electrons in BrF$_3$ is:

(1) Bent T-shape, 2 lone pair  
(2) Bent T-shape, 1 lone pair  
(3) See-Saw, 2 lone pair  
(4) See-Saw, 1 lone pair

Answer:

(1) Bent T-shape, 2 lone pair
11. A 42.14% (w/v) NaCl solution is used to coagulate a 1 L of colloidal solution in 10 hours; then, coagulation value for 2 hours is:

(a) 36 mole
(b) 36 millimole
(c) 1440 mole
(d) 1440 millimole

**Ans.** (d)

**Sol.**

Coagulation value = \( \text{millimole of electrolyte} / \text{Volume of solution in L} \)

\[
\text{Molarity of NaCl} = \frac{42.14 \times 10}{58.5} = 7.2 \text{ M}
\]

millimole of NaCl electrolyte = 7.2 mole = 72000 millimole

Coagulation value for 10 hours = \( \frac{\text{millimole of electrolyte}}{\text{Volume of solution in L}} = 72000 \)

For 2 hours Coagulation value = \( \frac{72000}{5} = 1440 \text{ millimole} \)

12. For the following cell: Pt(s) | H_2(g) | H^+(aq) || Cu^2+(aq) | Cu(s) at pH = 3, \( E_{\text{cell}} = 0.31 \text{ V} \) and \( [\text{Cu}^2+] = 10^{-7} \), then value of \( x \) is .......

**Ans.** (7)

**Sol.**

Cathode: \( \text{Cu}^2+ + 2e^- \rightarrow \text{Cu(s)} \)

Anode: \( \text{H}_2(g) \rightarrow 2\text{H}^+ + 2e^- \)

Overall: \( \text{H}_2(g) + \text{Cu}^2+(aq) \rightarrow 2\text{H}^+(aq) + \text{Cu(s)} \)

\( E_{\text{cell}} = E_{\text{anode}} - E_{\text{cathode}} = \frac{R T}{2F} \log \left( \frac{[\text{H}^+]^2}{[\text{Cu}^2+]} \right) \)

\( 0.31 = 0.34 - \frac{0.059}{2} \log \left( \frac{[\text{H}^+]^2}{[\text{Cu}^2+]} \right) \)

\( 0.31 = 0.34 + 0.03 \left[ - \log [\text{H}^+]^2 + \log [\text{Cu}^2+] \right] \)

\( 0.31 = 0.34 + 0.03 \left[ -2pH + \log [\text{Cu}^2+] \right] \)

\( 0.31 = 0.34 + 0.03 \left[ -2pH + \log [\text{Cu}^2+] \right] \)

\( 0.31 = 0.34 + 0.03 \left[ -2 \times 3 + \log [\text{Cu}^2+] \right] \)

\( -0.03 = 0.03 \left[ \log [\text{Cu}^2+] \right] \)

\( -0.03 = 0.03 \left[ \log [\text{Cu}^2+] \right] \)

\( -1 = 0 + \log [\text{Cu}^2+] \)

\( -7 = \log [\text{Cu}^2+] \)

\( [\text{Cu}^2+] = 10^{-7} \)

\( x = 7 \)

13. **Statement-I**: CuSO_4+5H_2O contain Cu-O Bond

**Statement-II**: Sulphur and oxygen donate it's electron pair and act as ligand.

(1) Both \( S_1 \) & \( S_2 \) are true
(2) Both \( S_1 \) & \( S_2 \) are false
(3) \( S_1 \) is true & \( S_2 \) is false
(4) \( S_1 \) is false & \( S_2 \) is true

**Ans.** (3)
14. An inorganic compound on reaction with BaCl₂ give white ppt which on reaction with dilute HCl which on reaction with dilute HCl give characteristics smell. Which anion is present in inorganic compound

(1) $\text{I}^-$  
(2) $\text{S}^{2-}$  
(3) $\text{SO}_4^{2-}$  
(4) $\text{SO}_3^{2-}$

Ans. (3)

Sol. $\text{SO}_4^{2-} + \text{Ba}^{2+} \rightarrow \text{BaSO}_4\downarrow$ (White ppt)  
$\text{HCl}$ (Burning sulphur like smell)

$\text{S}^{2-} + \text{Ba}^{2+} \rightarrow \text{No PPT}$

15. Identify the correct graph for $2s$-orbital for $\psi^2(r)$ vs $r$.

(1) $\psi^2(r)$  
(2) $\psi^2(r)$  
(3) $\psi^2(r)$  
(4) $\psi^2(r)$

Ans. (1)

16. A container contains 128 gram O₂ (g) and 16 gram H₂, then volume of gaseous mixture at STP is (Report your answer to nearest integer)

Ans. (269)

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Sol. $n_{\text{O}_2} = \frac{128}{32} = 4 \text{ mole}$

$n_{\text{H}_2} = \frac{16}{2} = 8 \text{ mole}$

$n_{\text{total}} = 12$

Volume at STP = $12 \times 22.4 = 268.8 \text{ L} = 269 \text{ L}$

17. What is the value of $x$ in:

---
18. A compound decompose according to a 1st order reaction. Find time taken (in hours) to reduce concentration from initial value to 6.25% if its half life is 5 hour.

Ans. (20)

Sol. $100 \rightarrow 50 \rightarrow 25 \rightarrow 12.5 \rightarrow 6.25$
total time $= 4 \times 5 = 20$ hours

19. Identify most stable carbocation out of following.

(1) $\text{H}_3\text{C}$
(2) $\text{OCH}_3$
(3) $\text{CH}_2\text{O}$
(4) $\text{H}_3\text{C}$

Ans. (3)

Sol. Due to extend conjugation most stable carbocation is

20. Friedel craft alkylolation of aniline gives

(1) Secondary amine
(2) Amide product after attack on aniline
(3) ortho/para alkyl derivative
(4) Meta alkyl derivative

Ans. (1)

Sol. $\text{NH}_2 + R - X \rightarrow \text{NH}-R$

2^{nd}$ amine

---

21. On heating which structure not affected.

(1) Secondary structure of protein
(2) Primary structure of protein
(3) Tertiary structure of protein
(4) Quaternary structure of protein

Ans. (2)

Sol. During denaturation of protein 2 and 3 structure are destroyed but 1$^{st}$ structure remain intact.

22. Statement-I: Dacron is an example of polyester compound.

Statement-II: Dacron is a combination of terephthalic acid & ethylene glycol.

(1) Statement-I and statement-II both are correct and statement-II is correct explanation of statement-I.
(2) Statement-I and statement-II both are correct statements but statement-II is not correct explanation of statement-I.
(3) statement-I is correct but statement-II is wrong statement.
(4) statement-I is wrong but statement-II is correct statement.

Ans. (1)

Sol. It is fact.

23. Find number of sp$^2$ carbon atoms in final products.

\[
\begin{array}{c}
\text{OH} \\
\text{CH}_3 \\
\text{CH}_2
\end{array}
\]
24. Most stable carbocation possible in above reaction is:

Ans. (1)

Sol. CH₃-CH₂-CH₂-CH₂-Cl → CH₂-CH₂-CH₂-CH₂⁺

25. Find out number of π-bonds in product from by above reaction.

Ans. (2)

26. Chloroxyleneol and terpineol work as:

(1) Antiseptic  (2) Disinfectant  (3) Antipyretic  (4) Antibiotic

Ans. (1)

Sol. Commonly used antiseptic Dettol is a mixture of chloroxyleneol and terpineol.

27. Reaction involve in troposphere during acid rain.

(1) H₂S + O₂ → S + H₂O  (2) S + NaOH → Na₂S + Na₂SO₃ + H₂O
(3) I₂ + Na₂S₂O₃ → Na₂S₄O₆ + NaI  (4) 2SO₂ + O₂ + 2H₂O → 2H₂SO₄

Ans. (4)

Sol. SO₂ and NO₂ after oxidation and reaction with H₂O are major contributors to acid rain.

28. 184 g per mole of given compound having C = 52.4%, H = 4.9% and Br = 42.7% and both A and B react with KMnO₄ & will give benzoic acid and para-bromo benzoic acid respectively than identify compound A and B. Compound A is optically active.
Ans. (3)

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Sol.

Optically active (A)

Br

\[
\text{Br} \quad \text{C}_{12}H_{16}O
\]

Optically active \( R + S \)

29. Find out number of chiral alcohol of molecular formula \( C_4H_9O \).

Ans. (2)

Sol. \( C_4H_9O \rightarrow \) Only 2-Butanol is chiral with \( R \) or \( S \) configuration.

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