1. Which of the following element is not present in Nessler’s reagent.
   (1) K
   (2) N
   (3) I
   (4) Hg
2. At equilibrium reaction \( \text{PCl}_3(g) + \text{Cl}_2(g) \rightleftharpoons \text{PCl}_4(g) \) concentration of \( \text{PCl}_3, \text{Cl}_2 \) and \( \text{PCl}_4 \) is 0.2 Mole/Lit, 0.1 Mole/Lit and 0.4 Mole/Lit if 0.2 Mole/Lit \( \text{Cl}_2 \) is added, then new concentration of \( \text{PCl}_3 \) at New equilibrium is ______ x \( 10^3 \) Mole/Lit [Nearest integer]

Ans. 5

Sol. \[
\begin{align*}
\text{PCl}_3(g) + \text{Cl}_2(g) & \rightleftharpoons \text{PCl}_4(g) \\
\text{At equilibrium} & \quad \text{Mole} \quad \text{Mole} \quad \text{Mole} \\
0.2 & \quad 0.1 \quad 0.4 \\
\text{New equilibrium} & \quad (0.1-x) \quad (0.3-x) \quad (0.4+x) \\
\frac{0.4}{0.2 \times 0.1} &= \frac{0.4+x}{(0.1-x)(0.3-x)} \\
20 &= \frac{0.4+x}{0.1-x}(0.3-x) \\
(2-0.4x) &= 0.4+x \\
40x^2 - 156x + 11.6 &= 0 \\
x &= 0.5 
\end{align*}
\]

3. From following seven crystal system how many have Body Centered Unit Cell. Cubic, Tetragonal, Orthorhombic, Monoclinic, Hexagonal, Rhombohedral, Triclinic

Ans. 3

Sol. Cubic, Tetragonal & Orthorhombic crystal system have Body Centered Unit Cell.

4. How many solutions are isometric:

(1) 0.1 M NaCl & 0.2 M urea
(2) 0.1 M KCl & 0.1 M urea
(3) 0.1 M Al₂(SO₄)₃ & 0.5 M glucose
(4) 0.2 M Na₂PO₄ & 0.4 KCl

Ans. 3

Sol. For isometric solution \( i_1, c_1 = i_2, c_2 \)

<table>
<thead>
<tr>
<th>Solution</th>
<th>( i_1, c_1 )</th>
<th>( i_2, c_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>II</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>III</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>IV</td>
<td>0.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

5. Which of the following is most basic

(1) \( \text{B}_2\text{O}_3 \)
(2) \( \text{Al}_2\text{O}_3 \)
(3) \( \text{Ga}_2\text{O}_3 \)
(4) \( \text{Ti}_2\text{O}_3 \)

Ans. 4

Sol. \[
\begin{align*}
\text{B}_2\text{O}_3 & \rightarrow (\text{Basic} \quad \text{Character}) \\
\text{Al}_2\text{O}_3 & \quad \text{Ga}_2\text{O}_3 \\
\text{Ti}_2\text{O}_3 & \quad \text{Ga}_2\text{O}_3
\end{align*}
\]

6. Which of the following element is present in liquid state in boiling water

(1) Br
(2) Ga
(3) Li
(4) Cs

Ans. 2

Sol. Boiling point of Br is 80°C, so it vapourise in boiling water, while Ga does not react with boiling water upto 100°C.

7. IUPAC name of \( \text{K}_3 \left[ \text{Co}(\text{C}_2\text{O}_4)_2 \right] \)

(1) Potassium trioxalato Cobaltate (III)
(2) Potassium trioxalato Cobaltate (II)
(3) Potassium trioxalato Cobalt (III)
(4) Potassium trioxalato Cobalt (III)

Ans. 1

Sol. Theory Based

8. For following graph

[Graph not visible]
Identify correct option.

<table>
<thead>
<tr>
<th>No. of Intermediate</th>
<th>No. of Activated Complex</th>
<th>Rate determining Step</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>I</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>II</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>III</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>IV</td>
</tr>
</tbody>
</table>

Ans. (2)
Sol. No. of Intermediate = 2
No. of Activated Complex = 3
Rate determining Step = II

9. Enthalpy of combustion of Carbon, hydrogen and -393.5 KJ/Mole, -249 KJ/Mole & -1367 KJ/Mole. C2H5OH is then enthalpy of formation of C3H8OH is (-) ____________ KJ/Mole.
Ans. 167 KJ/Mole

Sol. 2C(s) + 3H2(g) + \( \frac{1}{2} \) O2(g) \( \rightarrow \) C2H5OH \( \Delta H = ? \)

given
(i) C(s) + O2(g) \( \rightarrow \) CO2(g) \( \Delta H_1 = -393.5 \text{ KJ/Mole} \)
(ii) H2(g) + \( \frac{1}{2} \) O2(g) \( \rightarrow \) H2O(l) \( \Delta H_2 = -249 \text{ KJ/Mole} \)
(iii) C2H5OH + 3O2(g) \( \rightarrow \) 2CO2(g) + 3H2O \( \Delta H = -1367 \text{ KJ/Mole} \)

Target eq. = 2 x eq. I + 3 eq. II – eq. III
\[ 2(-393.5) + 3(-249) -(-1367) \]
\[ = -787 -747 + 1367 \]
\[ = 167 \text{ KJ/Mole} \]

10. How many of the following colloids have liquid dispersion medium.
- Paints
- Milk
- Froth
- Butter
- Jellies
- Mist
- Fog
Ans. 3
Sol. Paints, Milk and Froth have liquid dispersion medium.

11. How many of the following species are square planer
- XeF4
- [BeF2]2-
- [BF4]3-
- [Cr(NH3)6]3+
- SiF4
- SF6
- Ni(CO)4
- [PCl3]2
Ans. 2
Sol. Compound Structure Shape

(i) XeF4 - Square Planer

(ii) [BeF2]2- - Tetrahedral

(iii) [BF4]3- - Tetrahedral
12. How many metal can oxidise by $\text{NO}_3^-$, if $\text{NO}_3^-$ reduce to $\text{NO}$ according to

$$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightarrow \text{NO} + 2\text{H}_2\text{O}$$  

(a) $E^o = 0.97 \text{V}$  
(b) $E^o = -1.19 \text{V}$  
(c) $E^o = 0.04 \text{V}$  
(d) $E^o = 0.80 \text{V}$  
(e) $E^o = 1.40 \text{V}$  

**Ans.** 3  
**Sol.** $\text{NO}_3^-$ can oxidise $\text{V}, \text{Fe}, \text{Ag}$.  

13. Oxidation number of Mn is $\text{KMnO}_4$ change by 3 unit in which medium.

(a) Strongly Basic  
(b) Strongly acidic  
(c) Aqueous neutral  
(d) Weakly acidic  

**Ans.** (3)  
**Sol.** In neutral or Faintely alkaline solution

$$\text{MnO}_4^- \rightarrow \text{MnO}_4^2^- + 2\text{H}_2\text{O}$$  

14. In solid, liquid and at high temperature $\text{BeCl}_2$ compound exist in following form

<table>
<thead>
<tr>
<th>Solid State</th>
<th>Liquid State</th>
<th>High Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dimeric</td>
<td>Monomer</td>
<td>I</td>
</tr>
<tr>
<td>2 Dimeric</td>
<td>Polymer</td>
<td>II</td>
</tr>
<tr>
<td>3 Monomeric</td>
<td>Polymer</td>
<td>III</td>
</tr>
<tr>
<td>4 Polymeric</td>
<td>Dimeric</td>
<td>IV</td>
</tr>
</tbody>
</table>

**Ans.** (4)  
**Sol.** $\text{BeCl}_2$ in solid state exist as polymeric structure while in liquid state exist as dimeric molecule and in vapour state II exist as linear monomer molecule.
15. If $a_0$ is the radius of the Hydrogen atom, de-Broglie wavelength of electron in 3rd orbit of Li$^+$ ion is $x$, then value of $x$ is ________

An. 2
Sol. $n\lambda = 2na_0$  
$\Rightarrow n\lambda = \frac{2\pi n^2}{Z}$  
$\Rightarrow 3\lambda = \frac{2\pi \cdot 3^2}{3}$  
$\lambda = 2na_0$  
Hence $x = 2$

16. Which of the following is not obtained by electrolysis of brine solution.
(1) Na  (2) H$_2$  (3) Cl$_2$  (4) NaOH

An. (1)
Sol. Brine solution $\Rightarrow$ NaCl (aq)

NaCl(aq) $\rightarrow$ Na$^+$ (aq) + Cl$^-$ (aq)
cathod reaction 2H$_2$O(l) + 2e$^-$ $\rightarrow$ H$_2$(g) + 2OH$^-$ (aq)
anode reaction 2Cl$^-$ $\rightarrow$ Cl$_2$(g) + 2e$^-$
so Na is not obtained by electrolysis of Brine solution.

17. Which of the following have highest hydration enthalpy.
(1) Be$^{2+}$  (2) Mg$^{2+}$  (3) Sr$^{2+}$  (4) Ba$^{2+}$

An. (1)
Sol. hydration enthalpy $\alpha$ = $\frac{1}{\text{Size of Ion}}$

18. Correct match is:

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Alanine</td>
<td>I</td>
</tr>
<tr>
<td>B Aspartic Acid</td>
<td>II</td>
</tr>
<tr>
<td>C Arginine</td>
<td>III</td>
</tr>
<tr>
<td>D Asparagine</td>
<td>IV</td>
</tr>
</tbody>
</table>


An. (1)
19. Which of the following is present in pesticide?
(1) Sodium chlorate and sodium sulphate
(2) Sodium chlorate, sodium arsenate and Aldrane
(3) Sodium sulphate
(4) Sodium sulphate and sodium arsenate
Ans. (2)
Sol. Based on facts.

20. Which of the following is most acidic?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OH</td>
</tr>
<tr>
<td>2</td>
<td>OH</td>
</tr>
<tr>
<td>3</td>
<td>NO₂</td>
</tr>
<tr>
<td>4</td>
<td>Cl</td>
</tr>
</tbody>
</table>

Ans. (1)
Sol. Strong - I of -NO₂ group present at meta position increases the stability of phenoxide ion than –Cl and –CH₃

---

21. **Statement-I**: Morphine is an analgesic and narcotic in nature. It reduces pain without causing much sleep.
**Statement-II**: Morphine is derived from opium poppy.

(1) Statement-I is incorrect and statement-II is incorrect.
(2) Statement-I is incorrect and statement-II is correct.
(3) Statement-I is correct and statement-II is incorrect.
(4) Statement-I is correct and statement-II is correct.

Ans. (3)
Sol. Morphine is analgesic and narcotic inducing sleep. It is obtained from opium poppy.

22. Total number of aromatic isomers possible with molecular formula C₆H₄N, which can be formed by Gabriel pthalimide reaction is:

Ans. (5)
Sol. C₆H₄N
DU = 4

Aromatic =

Formed by:
- Gabriel pthalimide = Only primary aliphatic amine.
23. \( \text{Major product:} \)

(1) \( \text{Ans. (2)} \)

(2)

(3)

(4)

Sol.

\( \text{H}^+ \)

\[
\begin{align*}
\text{(3)} & \quad \rightarrow \\
\text{(4)} & \quad \rightarrow \\
\text{(2)} & \quad \rightarrow \\
\text{(1)} & \quad \rightarrow
\end{align*}
\]

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24. 1. MeMgBr, CuI
2. \( nPrI \)  \( \text{Major Product} \)

(1)

(2)

(3)

(4)

(3) \( \text{Ans. (3)} \)

Sol. \( \text{MeMgBr, CuI} \)

\[
\begin{align*}
\text{(3)} & \quad \rightarrow \\
\text{(4)} & \quad \rightarrow \\
\text{(2)} & \quad \rightarrow \\
\text{(1)} & \quad \rightarrow
\end{align*}
\]

\( nPrI \)
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