COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions

Date: 26 July, 2022 (SHIFT-2)  |  TIME: (3.00 p.m. to 6.00 p.m)
Duration: 3 Hours  |  Max. Marks: 300

SUBJECT: CHEMISTRY

Resonance Eduventures Ltd.
Reg. Office & Corp. Office: CG Tower, A-46 & S2, IPAA, Near City Mall, Balasore Road, Kolkata (West) - 700098
Ph. No.:+91-33-27772222  |  Fax No.:+91-33-27773333

To Know more:  |  Website: www.resonance.ac.in  |  E-mail: contact@resonance.ac.in
|  CIN: U80302WB2007PLC024029

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6. In the following reaction sequence:

\[
\text{PCl}_3 + \text{C}_2\text{H}_5\text{OH} \rightarrow A
\]
A + PCl\text{\textsubscript{3}} \rightarrow B

How many non-ionisable H atom are present in B.

Ans. (2)

Sol. 3\text{C}_2\text{H}_5\text{OH} + \text{PCl}_3 \rightarrow 3\text{C}_2\text{H}_4\text{Cl} + \text{H}_3\text{PO}_3
\text{H}_3\text{PO}_3 + \text{PCl}_3 \rightarrow \text{H}_3\text{P}_2\text{O}_5
Pyrophosphorous acid

\[
\Delta l_x = k_x \times m
\]

\[
\frac{3}{6} = \frac{k_b}{k_r} \times \frac{1}{2}
\]

\[
k_b = 1
k_r = 1
\]

\[
S_0 \times x = 1
\]
7. Identify diamagnetic species from following.

(1) \( \text{K}_2\text{[Cu(CN)]}_4 \)   (2) \( \text{K}_2\text{[Cu(CN)]}_3 \)   (3) \( \text{K}_2\text{[Fe(CN)]}_4 \)   (4) \( \text{K}_4\text{[FeCl]}_6 \)

**Ans.** (1)

**Sol.**

<table>
<thead>
<tr>
<th>Complex</th>
<th>No. of unpaired electrons</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) ( \text{K}_2\text{[Cu(CN)]}_4 )</td>
<td>( \text{Cu}^{2+} = 3d^{10} )</td>
</tr>
<tr>
<td>(ii) ( \text{K}_2\text{[Cu(CN)]}_3 )</td>
<td>( \text{Cu}^{2+} = 3d^{9} )</td>
</tr>
<tr>
<td>(iii) ( \text{K}_2\text{[Fe(CN)]}_4 )</td>
<td>( \text{Fe}^{3+} = 3d^{5} )</td>
</tr>
<tr>
<td>(iv) ( \text{K}_4\text{[FeCl]}_6 )</td>
<td>( \text{Fe}^{3+} = 3d^{5} )</td>
</tr>
</tbody>
</table>

8. We have to prepare a buffer solution of NH\(_3\) and NH\(_4\)Cl which have pH = 8.26. For this initially we have 1 litre 0.2 M ammonia solution, then how much amount of NH\(_4\)Cl in gram is added for this (\( pK_a = 4.74 \) & GMM of NH\(_4\)Cl = 53.5 g)

**Ans.** (107)

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**Resonance Eduventures Ltd.**

Reg. Office & Corp. Office: CG Tower, A-46 & 52, IPIA, Near City Mall, Jalahwar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777777 | FAX No.: +91-022-39167222

To Know more: svr RESO at 56577 | Website: www.resonance.ac.in | E-mail: contact@resonance.ac.in | CIN: U8530223007PL0024029

Toll Free: 1800 258 5559 | 784 001 9333

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9. A compound \( AB_2 \) dissociate with half-life 200 sec and half-life is independent of concentration of \( AB_2 \), find time taken for 80% dissociation of \( AB_2 \): (1) 467 sec (2) 100 sec (3) 326 sec (4) 587 sec

**Ans.** (1)

**Sol.**

As \( \frac{x}{2} \) is independent an initial concentration so reaction is 1st order.

\[
t = \frac{\log \left( \frac{100}{100-x} \right)}{k} \]

\[
t = \frac{2.303 \times 200 \times \log\left(\frac{100}{x}\right)}{0.693}
\]

\[
t = \frac{2.303 \times 200 \times \log(100)}{0.693}
\]

\[
t = 664.66 \times 0.7 = 468.66 \approx 467 \text{ sec}
\]

10. Find correct order of covalent character in \( \text{CaF}_2, \text{CaCl}_2, \text{CaBr}_2, \text{CaI}_2 \)

(1) \( a < b < c < d \) (2) \( b < c < a < d \) (3) \( c < c < b < a \) (4) \( d < c < a < b \)

**Ans.** (1)

**Sol.**

As per Fajan rule as the size of anion increases covalent character increase.

So order of covalent character is -> \( \text{CaF}_2 < \text{CaCl}_2 < \text{CaBr}_2 < \text{CaI}_2 \)

11. **Assertion**: LiF is less soluble in water

**Reason**: Li\(^+\) has small size, thus it has very low hydration enthalpy.

(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, Reason is False

(4) Assertion is False, Reason is False

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No. of non-ionisable hydrogen atoms are two.
12. **Assertion**: Boric acid is a weak acid.
   **Reason**: Boric acid does not release its own $H^+$ but it accepts $OH^-$ from water and releases $H^+$ from water.
   
   (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.** (1)

   **Sol.** It is a weak monobasic acid, soluble in water and in aqueous solution the boron atom completes its octet by accepting $OH^-$ from water molecules:
   $B(OH)_3(aq) + 2H_2O(l) \rightarrow [B(OH)]_2^+(aq) + H_2O^+(aq) \quad \text{pK}_a \approx 2.5$
   It therefore, functions as a Lewis acid and not as a proton donor like most acids.
   Since $B(OH)_3$ only partially reacts with water to form $H_2O^+$ and $[B(OH)]_2^+$, it behaves as a weak acid.

13. For three compounds of Mn
   $\text{Mn}_2\text{O}_3$, $\text{Mn}_3\text{O}_4$, $\text{Mn}_4\text{O}_7$
   Find magnetic moment (Spin only) for the compound which has highest oxidising tendency.
   [Report your answer to nearest integer]

   **Ans.** (5)

   **Sol.** The change from $\text{Mn}^{2+}$ to $\text{Mn}^{4+}$ results in the half-filled (d$^3$) configuration which has extra stability.
   So, $\text{Mn}_3\text{O}_4$ has most oxidising tendency.
   $\text{Mn}_3\text{O}_4 \rightarrow \text{Mn}^{4+} \rightarrow 3d^4 \quad n = 4$
   $\mu = \sqrt[4]{4 \times 2} = 2.24 \text{ BM} = 4.89 \text{ BM} \approx 5 \text{ BM}$

14. **Assertion**: Finely divided gold particles are red in colour as concentration increase colour changes from purple to blue and finally golden.
   **Reason**: The colour particle depends on wavelength of light scattered.
   
   (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.** (1)

   **Sol.** The colour of colloidal solution depends on the wavelength of light scattered by the dispersed particles.
   The wavelength of light further depends on the size and nature of the particles. The colour of colloidal solution also changes with the manner in which the observer receives the light. For example, a mixture of milk and water appears blue when viewed by the reflected light and red when viewed by the transmitted light. Finest gold sol is red in colour, as the size of particles increases, it appears purple, then blue and finally golden.

15. **Assertion**: Phenolphthalein is a pH dependent indicator which is colourless in acidic medium and changes its colour to pink in basic medium.
   **Reason**: Phenolphthalein is weak acid that does not dissociate in basic medium.
   
   (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.
16. 10 ml of CuSO₄ solution is treated with excess of KI solution, thus the liberated I₂ required 20 ml, 0.02 M hypo solution find the molarity of CuSO₄ solution using following reactions.

\[ 2Cu^{2+} + 4I^- \rightarrow Cu_2I_2 \]
\[ I_2 + 2S_2O_3^{2-} \rightarrow 2I^- + S_4O_6^{2-} \]

Then molarity of CuSO₄ solution is \( 1 \times 10^{-4} \) M

17. Match the following

| (1) Plant Nutrient | (A) Domestic sewage |
| (2) Heavy toxic metals | (B) Chemical fertilizers |
| (3) Microbes | (C) Chemical factory |
| (4) Sediments | (D) Strip mining |

Answers:
(1) (B) (2) (A) (3) (B) (4) (C)

18. The reagents required for the following conversions is

(1) HNO₂, KI, Fe³⁺, HNO₂, Warm water
(2) KI, HNO₂, Fe³⁺, HNO₂, Warm water
(3) Na₂O₂, KI, HNO₂, Warm water
(4) KI, Na₂O₂, KI, HNO₂, Warm water

Answers:
(1) (2) (3) (4)
20. Which is not a benzenoid compound

(1) (2) (3) (4)

Ans. (1)
Sol. (1) is not a benzenoid compound

21. on hydrolysis produce carboxylic acid.

(1) Cumene
(2) Benzene diazonium chloride
(3) Benzyl chloride
(4) Ethyl ketal

Ans. (2)
Sol. 

22. Methylcyclohexane on mono-chlorination gives how many product (including stereoisomers).

Ans. (12)
Sol. 

23. Ethylmagnesium bromide with methanol gives 2.24 ml gas at STP. Weight of the gas in mg.

Ans. (3)
Sol. 

24. How many of the given is a broad spectrum antibiotic.

Penicillin G, Ofloxacin, Terpinol, Salvarsan

Ans. (1)
Sol. Ofloxacin is a broad spectrum antibiotic.

25. Which of the following is animal starch:

(1) Glycogen (2) Amylose (3) Amylopectin (4) Cellobiose

Ans. (1)
Sol. Glycogen is an animal starch.

26. Which is correct order of priority of functional groups as per IUPAC

(1) RSOH > RCOOR > ROCH2 > RCONH2 (2) RCOOR > RCONH2 > RSOH > RCOCl
(3) RCOOH > ROCH2 > NH2 > C=O (4) RCOOR > RSOH > RCOCI > RCONH2
Ans. (2)

27. Which process takes place in vulcanisation of rubber
   (1) Neoprene is heated with sulphur
   (2) Isoprene is heated with sulphur
   (3) Isoprene is heated with styrene
   (4) Neoprene is heated with Styrene

Ans. (2)
Scholarship upto 100% on the basis of JEE (Main) Percentile Score

Resonance Eduventures Ltd.
Kota Study Centre & Registered Corporate Office: CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005
Tel. No.: 0744-2777777, 2777700 | CIN: U80302RJ2007PLC024029 | www.resonance.ac.in | contact@resonance.ac.in

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