JEE MAIN 2023
JAN ATTEMPT
PAPER-1 (B.Tech / B.E.)

QUESTIONS & SOLUTIONS
Reproduced from Memory Retention

📅 24 JANUARY, 2023
⏰ 9:00 AM to 12:00 Noon

SHIFT - 1

Duration : 3 Hours
Maximum Marks : 300

SUBJECT - CHEMISTRY

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1. \([\text{Co(NH}_3\text{)}_5\text{Cl}]\text{Cl}_2\) primary and secondary valency will be:  
\[\text{Coordination compound}\]

Sol. 3, 6

2. \(\text{CoCl}_4^{2-}\) electronic configuration \(\rightarrow e^m t^2_n\).
Calculate \(m + n\). \(n = \text{number of unpaired electrons}\)

Ans. 7  
\[\text{Coordination compound}\]

Sol. 3d\(^7\) WFL
EC \(\rightarrow e^4 t^3\)
\(m = 4, \text{no. of unpaired electron} = 3\)

3. Graph of X-ray frequency \((v)^n\) v/s atomic number \((Z)\) is linear. Find the value of \(n\).

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

Ans. (1)  
\[\text{Periodic properties}\]

Sol. \(v^n \propto Z\)
\[\sqrt{v} = a(Z - b)\]
\[\therefore \quad n = \frac{1}{2}\]

4. The wavelength of first line of paschen series is 720 nm, then calculate wavelength of second line of paschen series?

Ans. 492.1875 nm  
\[\text{Atomic Structure}\]

Sol. Paschen series first line: 4 \(\rightarrow\) 3
\[
\frac{1}{\lambda_1} = R_H^2 Z^2 \left(\frac{1}{9} - \frac{1}{16}\right)
\]
\[\frac{1}{720} = R_H^2 Z^2 \left(\frac{7}{16 \times 9}\right) \quad \ldots \quad \text{(i)}
\]

Paschen series second line: 5 \(\rightarrow\) 3
\[
\frac{1}{\lambda_2} = R_H^2 Z^2 \left(\frac{1}{9} - \frac{1}{25}\right)
\]
\[\frac{1}{\lambda_2} = R_H^2 Z^2 \left(\frac{16}{9 \times 25}\right) \quad \ldots \quad \text{(ii)}
\]
\[
eq \text{eq. (i) / (ii)}
\]
\[
\frac{\lambda_2}{720} = \left(\frac{7}{16 \times 9}\right) \times \left(\frac{9 \times 25}{16}\right)
\]
\[\lambda_2 = 492.1875 \text{ nm}\]
5. Find correct order of covalent character:
   (A) KF < KI
   (B) CuCl > NaCl
   (C) LiF > KF
   (1) A & B only  (2) A & C only  (3) A, B & C  (4) B & C only
   Ans. (3)  [Chemical bonding]

6. Freezing point of solution is less than that of pure solvent, which of the following statements are correct?
   (A) Vapour pressure of solution is less than that of pure solvent
   (B) Vapour pressure of solution is greater than that of pure solvent
   (C) Only solvent molecules will freeze
   (D) Only solute molecules will freeze
   (1) A & B only  (2) A & C only  (3) C & D only  (D) A, B & D only
   Ans. (2)  [Solution & colligative properties]

7. For which of the following aqueous ion, spin only magnetic moment is 3.87 BM?
   (1) Ti^{2+}  (2) V^{2+}  (3) Cr^{2+}  (4) Mn^{2+}
   Ans. (2)  [d & f-block]
   Sol. V^{2+} = 3d^3 4s^0

8. Correct order of strength of H-bond in the following:
   (A) Liquid water  (B) Ice  (C) Impure water
   (1) A > B > C  (2) A < B < C  (3) B > A > C  (4) A = B > C
   Ans. (3)  [Hydrogen]

9. How many reactions are nonspontaneous at 300 K. For independent reaction \( \Delta H \) & \( \Delta S \) values are given
   (1) \( \Delta H = -25 \text{ kJ/mole}, \Delta S = -80 \text{ J/mole} \)
   (2) \( \Delta H = +25 \text{ kJ/mole}, \Delta S = -50 \text{ J/mole} \)
   (3) \( \Delta H = 22 \text{ kJ/mole}, \Delta S = +50 \text{ J/mole} \)
   (4) \( \Delta H = -22 \text{ kJ/mole}, \Delta S = 80 \text{ J/mole} \)
   Ans. (2)  [Thermodynamics-2 (2nd law & 3rd law)]
   Sol. (1) Spontaneous
   (2) Non-Spontaneous
   (3) Non spontaneous
   (4) Spontaneous
10. Buffer solution of pH = 5 prepared by mixing 25 ml, 0.2M CH₃COONa and 25 ml, 0.02M CH₃COOH, if Ka of CH₃COOH = x × 10⁻⁵ find x.

Ans. (10)

Sol. \[ pH = pK_a + \log \frac{0.1}{0.01} \]

\[ 5 = pK_a + \log 10 \]

pKa = 4

\[ Ka = 10^{-4} = 10 \times 10^{-5} = 10 \]

---

11. Column-I Column-II
(A) Zone refining (P) pig iron
(B) Electrolysis (Q) Al
(C) Reverberatory furnace (R) Si
(D) Blast furnace (S) Cu

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

Ans. (1)

[Metallurgy]

12. How many statements are correct regarding Arrhenius equation? \( K = Ae^{-E_a/RT} \)

(I) Slope of graph between ln K v/s \( \frac{1}{T} \) is \( \frac{-E_a}{R} \)

(II) On increasing \( E_a \), rate constant decreases

(III) On increasing temperature, temperature coefficient decreases

(IV) On increasing activation energy fraction of molecules crossing energy barrier increases

Ans. (3)

[Chemical Kinetics]

Sol. (I), (II) & (III) are correct.

13. 5g of NaOH is mixed with 450 ml of de-ionized water to form stock solution. What volume of this stock solution is used to prepare 500 ml, 0.1M solution.

Ans. 180 ml

Sol. \[ M_1V_1 = M_2V_2 \]

\[ \frac{5 \times 1000}{40} \times V = 0.1 \times 500 \]

\[ V = \frac{0.1 \times 500 \times 40 \times 450}{5 \times 1000} \]

\[ V = 180 \text{ ml} \]
14. Final product is:

[Carbonyl compounds]

(i) KCN/H⁺
(ii) 2MeMgBr
(iii) H⁺/H₂O

An. (2)

Sol.

15. Products A and B are respectively

[Alcohols, Phenols & Ethers]

An. (2)

Sol.
16. Which of the following is correct stability order of the given resonance structures?

\[ \text{[GOC-1]} \]

(a) \[ \text{MeO} \quad \text{NH}_2 \quad \text{MeO} \quad \text{NH}_2 \]

(b) \[ \text{MeO} \quad \text{NH}_2 \quad \text{MeO} \quad \text{NH}_2 \]

(c) \[ \text{MeO} \quad \text{NH}_2 \quad \text{MeO} \quad \text{NH}_2 \]

(d) \[ \text{MeO} \quad \text{NH}_2 \quad \text{MeO} \quad \text{NH}_2 \]

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

Ans. \( (3) \)

17. Mass percentage of nitrogen in uracil is

\[ \text{[Biomolecules]} \]

\[
\text{Uracil} \quad \text{NH} \quad \text{O} \\
\text{N} \quad \text{H} \quad \text{O}
\]

Ans. 25

Sol. Molecular formula of uracil is \( \text{C}_4\text{H}_4\text{N}_2\text{O}_2 \)
Molecular mass of uracil is 112
\[
\% \, \text{of N in uracil} = \frac{28}{112} \times 100 = 25
\]

18. Compound (X)

\[ \text{[Carbonyl compounds]} \]

X will be:

(1) \( \text{CH}_3-\text{CHO} \)

(2) \( \text{CH}_3-\text{CH}–\text{CHO} \)

(3) \( \text{CH}_3-\text{CH}–\text{CHO} \)

(4) \( \text{CH}_3-\text{C}–\text{CH}_3 \)

Ans. (2)

Sol.

\[
\text{CH}_3-\text{CHO} \xrightarrow{\text{Aldol reaction}} \text{CH}_3-\text{CHO} \quad \xrightarrow{\text{HCHO, OH}} \text{CH}_3-\text{CHO} \quad \xrightarrow{\text{KCN/H}^+} \text{CH}_3-\text{CHO} \quad \xrightarrow{\text{H}_2\text{O}^+} \text{CH}_3-\text{CHO}
\]
19. Major product of the given reaction will be:

\[
\text{[Hydrocarbons]}
\]

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

**Ans.** (1)

**Sol.**

\[
\begin{align*}
& \quad \text{HBr} \\
& \quad \text{Br} \\
& \quad \text{H}\quad \text{Br} \\
\end{align*}
\]

\[
\text{Major product}
\]

20. Which of the following statements is correct?

\[
\text{[Haloalkanes & Haloarenes]}
\]

(1) All radicals are known as freons.

(2) Freons cause skin cancer.

(3) Freons are chlorofluoro carbon.

(4) Freons are used in sunscreen lotion.

**Ans.** (3)

**Sol.** Freons are chlorofluoro carbon. Other given statements are wrong.

21. How many moles of AgCl are formed in the given reaction?

\[
\text{[Haloalkanes & Haloarenes]}
\]

\[
\text{Cl} \quad \text{Cl} \quad \text{C} = \text{C} \quad \text{Cl} \\
\text{CH}_2\text{Cl} \\
1 \text{ Mole} \\
\text{AgNO}_3 \\
\]

**Ans.** (1)

**Sol.**

\[
\begin{align*}
\text{Cl} & \quad \text{Cl} \\
\text{Cl} & \quad \text{C} = \text{C} \quad \text{Cl} \\
\text{CH}_2\text{OH} \\
1 \text{ Mole} \\
\end{align*}
\]

Only chlorine atom attached with sp\(^3\) hybrid carbon (haloalkane) in given molecule reacts with AgNO\(_3\) and produces white ppt of AgCl, so only one mole AgCl is formed.
22. **Statement-I**
Noradrenaline is one of the neurotransmitter.

**Statement-II**
Low level of noradrenaline is not cause of depression in humans.

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

Ans. (3)
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