Memory Based Questions & Solutions

PAPER (पेपर)- 2  |  SUBJECT : CHEMISTRY

PAPER-2 : INSTRUCTIONS TO CANDIDATES

- Question paper-2 has three (03) parts : Physics, Chemistry and Mathematics.
- Each part has a total of eighteen (18) questions divided into three (03) sections (Section-1, Section-2 and Section-3).
- Total number of questions in Question Paper-2 are : Fifty Four (54) and Maximum Marks are One Hundred Eighty Six (186).

Type of Questions and Marking Schemes

SECTION 1 (Maximum Marks : 32)

- This section contains EIGHT (08) questions.
- Each question has FOUR options ONE OR MORE THAN ONE of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
  - Full Marks : +4 If only (all) the correct option(s) is(are) chosen.
  - Partial Marks : +3 If all the four options are correct but ONLY three options are chosen.
  - Partial Marks : +2 If three or more options are correct but ONLY two options are chosen and both of which are correct.
  - Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option.
  - Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
  - Negative Marks : −1 In all other cases.

SECTION 2 (Maximum Marks : 18)

- This section contains SIX (06) questions. The answer to each question is a NUMERICAL VALUE.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
  - Full Marks : +3 If ONLY the correct numerical value is entered.
  - Zero Marks : 0 In all other cases.

SECTION 3 (Maximum Marks : 12)

- This section contains TWO (02) List-Match sets.
- Each List-Match set has TWO (02) Multiple Choice Questions.
- Each List-Match set has two lists : List-I and List-II.
- List-I has Four entries (I), (II), (III) and (IV) and List-II has Six entries (P), (Q), (R), (S), (T) and (U).
- FOUR options are given in each Multiple Choice Question based on List-I and List-II and ONLY ONE of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme:
  - Full Marks : +3 If ONLY the option corresponding to the correct combination is chosen.
  - Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
  - Negative Marks : −1 In all other cases.
Answering Questions:

- To select the option(s), use the mouse to click on the corresponding button(s) of the option(s).
- To deselect the chosen option(s) for the questions of SECTION-1 click on the button(s) of the chosen option(s) again or click on the Clear Response button to clear all the chosen options.
- To deselect the chosen option for the questions of SECTION-3, click on the button of the chosen option again or click on the Clear Response button to clear the chosen option.
- To change the option(s) of a previously answered question of SECTION-1 and SECTION-3 first deselect as given above and then select the new option(s).
- To answer questions of SECTION-2 use the mouse to click on numbers (and or symbols) on the on-screen virtual numeric keypad to enter the numerical value in the space provided for answer.
- To change the answer of a question of SECTION-2 first click on the Clear Response button to clear the correct answer and then enter the new numerical value.
- To mark a question ONLY for review (i.e. without answering it), click on the Mark for Review & Next button.
- To mark a question for review (after answering it), click on Mark for Review & Next button - the answered question which is also marked for review will be evaluated.
- To save the answer click on the Save & Next button, the answered question will be evaluated.
PART-I : CHEMISTRY

SECTION 1 (Maximum Marks : 32)

- This section contains EIGHT (08) questions.
- Each question has FOUR options: ONE OR MORE THAN ONE of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme.
  - Full Marks : +4 If only (all) the correct option(s) is (are) chosen.
  - Partial Marks : +3 If all the four options are correct but ONLY three options are chosen.
  - Partial Marks : +2 If three or more options are correct but ONLY two options are chosen and both of which are correct.
  - Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option.
  - Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
  - Negative Marks : -1 In all other cases.

1. With reference to aqua regia, choose the correct option(s):
   (A) Aqua regia is prepared by mixing conc. HCl and conc. HNO₃ in 3 : 1 molar ratio.
   (B) Reaction of gold with aqua regia produces an anion having Au⁺ in +3 oxidation state.
   (C) Reaction of gold with aqua regia produces NO₂ in the absence of air.
   (D) The yellow colour of aqua regia is due to the presence of NOCl and Cl₂.

Ans. (ABD)

Sol. Au + 4H⁺ + NO₃⁻ + 4Cl⁻ → [AuCl₄]⁻ + NO + 2H₂O
   (A) Fact.
   (B) [AuCl₄]⁻ gets formed: Au⁺(3).
   (C) NOCl/NO is formed.
   (D) Fact.

Sol. Au + 4H⁺ + NO₃⁻ + 4Cl⁻ → [AuCl₄]⁻ + NO + 2H₂O
   (A) तथ्य
   (B) [AuCl₄]⁻- कलरता है: Au⁺(3).
   (C) NOCl/NO- कलरता है।
   (D) तथ्य
2. Choose the correct option that gives aromatic compound as major product:

(A) ![Image](image1.png) \( \text{NaOH} \) → (CH\_3\_CH\_2\_Br) \( \text{Br} \)

(B) ![Image](image2.png) \( \text{CH\_3\_C\_H\_2\_Br} \) \( \text{KOH, NaNH\_3} \) (ii) Red hot iron tube 873 K

(C) ![Image](image3.png) \( \text{Br} \) \( \text{NaOH} \) → (D) ![Image](image4.png) \( \text{Br} \) \( \text{UV 500 K} \)

**Ans. (AB)**

**Sol.**

(A) ![Image](image5.png) \( \text{NaOH} \) → (B) ![Image](image6.png) \( \text{CH\_3\_C\_H\_2\_Br} \) \( \text{KOH, NaNH\_3} \) (ii) Red hot iron tube 873 K

3. Which of the following reaction produce propane as major product?

**Ans. (CD)**

**Sol.**

(A) ![Image](image7.png) \( \text{CH\_2\_COONa} \) \( \text{Electrolysis} \) \( \text{Reduction} \)

(B) ![Image](image8.png) \( \text{Br} \) \( \text{Zn} \)

(C) ![Image](image9.png) \( \text{Cl} \) \( \text{Zn, \text{ethane}} \) \( \text{Zn, \text{ethane}} \)

(D) ![Image](image10.png) \( \text{Zn, \text{ethane}} \) \( \text{Zn, \text{ethane}} \)
4. Which of the following is / are Correct
(A) Teflon is formed by polymerization of tetrafluoroethylene.
(B) Natural rubber is the trans from of polyisoprene.
(C) Cellulose contains only α-D-glucose linkage
(D) Nylon-6 contains amide linkage.

Ans. (AD)

5. 

\[ \text{MeO} \]
\[ \text{Q} \]
\[ \text{OH} \]
\[ \text{MeO} \]
\[ \text{R} \]
\[ \text{S} \]
\[ \text{MeO} \]
\[ \text{MeO} \]
\[ \text{O} \]

(A) Q = \text{MeO}

(B) R = \text{MeO}

(C) R = \text{MeO}

(D) Q = \text{MeO}

Ans. (AB)
6. Consider the following reaction (unbalanced)
Zn + Hot conc. H₂SO₄ → G + R + X
Zn + conc. NaOH → T + Q
G + H₂S + NH₃(aq) → Z precipitate + X + Y
Choose the correct option(s)
(A) R is a V-shaped molecule
(B) Z is dirty white in colour
(C) Bond order of Q is 1 in its ground state
(D) The oxidation state of Zn in T is +1.

\[ \text{Ans. (ABC)} \]

\[ \text{Sol.} \]
\[
\begin{align*}
\text{Zn} &+ \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{SO}_2 + \text{H}_2\text{O} \\
\text{Zn} &+ \text{conc. NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2 \\
\text{ZnSO}_4 + \text{H}_2\text{S} + \text{NH}_3(\text{aq}) &\rightarrow \text{ZnS}↓ + (\text{NH}_4)_2\text{SO}_4 + \text{H}_2\text{O}
\end{align*}
\]

---

7. In the Mac. Arthur process of extraction

\[ \text{Au} \rightarrow \text{NaCN-} \rightarrow \text{R} \xrightarrow{\text{extracted with } Y} \text{Z} \]

(A) R is [Au(CN)₄]⁺
(B) Z is [Zn(CN)₂]⁻
(C) Q is O₂
(D) Y is Zn

\[ \text{Ans. (BCD)} \]

\[ \text{Sol.} \]
\[
\begin{align*}
\text{Au} &\rightarrow \text{NaCN-} \rightarrow [\text{Au(CN)}]^{10} \rightarrow [\text{Zn(CN)}]^{2-} + \text{Au}
\end{align*}
\]

---

8. For He⁺ the electron is in orbit with energy equal to 3.4eV. The azimuthal quantum number for that orbit is 2 and magnetic quantum number is 0. Then which of the following is/ are correct.

(A) The subshell is 4d.
(B) The number of angular nodes in it is 2.
(C) The numbers of radial nodes in it is 3.
(D) The nuclear charge experienced in n = 4 is 2e less than that in n = 1, where e is electronic charge.

He⁺ के लिए एक इलेक्ट्रॉन क्रीडा का अंतर्गत दायरा क्रेडा 2 है तथा गिय्स्मेट न्युक्लिय नंबर 0 है तथा भूमिका 1 में क्रीडे क्रेडा 3 है।

\[ \text{Ans. (AB)} \]

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9. Calculate the total number of cyclic ether (including stereo) having formula C₆H₆O₃

\[ \text{C₆H₆O₃} \] can have two cyclic ethers (inversion symmetry). Thus, the total number of cyclic ethers is 2.

Ans. (10)

Sol.

(R,S) \quad (R,S) \quad (R,R), (S,S) \quad (R,S) = (S,R)

= 10

10. 1 mole of Rhombic sulphur is treated with conc. HNO₃. Find the mass of H₂O formed.

1 mole of Rhombic sulphur can react with conc. HNO₃ to form H₂O. The reaction is as follows:

\[ 32\text{H}_2\text{O} + \text{S}_8 \rightarrow 8\text{H}_2\text{SO}_4 + 48\text{H}^+ + 48\text{e}^- \]

Sol.

\[ 32\text{H}_2\text{O} + \text{S}_8 \rightarrow 8\text{H}_2\text{SO}_4 + 48\text{H}^+ + 48\text{e}^- \]

\[ \text{mass of H}_2\text{O formed} = (16)(18)\text{g} = 288 \text{ g} \]

\[ \text{H}_2\text{O} \text{ formed is } (16)(18)\text{g} = 288 \text{ g} \]

11. Mole fraction of urea in 900 gram water is 0.05. Find molarity of solution.

900 g water + 900 g urea = 1800 g

\[ \text{molarity of solution} = \frac{0.05}{0.005} = 1.2 \text{ g/cm}^3 \]

Ans. (2.98 OR 2.99)

Sol.

\[ \text{mole fraction of urea} = \frac{900}{18} = 50 \]

Let moles of urea be \( x \), water be \( y 

\[ x_{\text{urea}} = \frac{y}{50} = 0.05 \]
\[ V = \frac{50}{19} \times 60 = \frac{3000}{19} \]

\[ W_{\text{solution}} = \frac{3000}{19} = 900 \times \frac{(201)}{19} \times 100 \]

\[ \text{Density} = 1.2 \text{ g/cm}^3 \]

\[ V_{\text{solution}} = \frac{wt}{\rho} = \left( \frac{201}{19} \right) \times 100 \times 1.2 \]

\[ M_{\text{max}} = \frac{n_{\text{max}} \times 1000}{V_{\text{sol}}} = \left( \frac{50}{19} \right) \times 1000 \times \frac{(201)}{19} \times 1.2 \]

\[ = \frac{600}{201} \approx 2.985 \]

Answer after rounding off = 2.98
Answer after truncation = 2.98

12. Number of hydroxyl group in compound \( Y \) is:

Answer: 2

Sol.

\[ \text{In following reaction the value of } K \text{ is } 5 \times 10^{-2} \text{ S}^{-1}. \]

\[ 2 \text{NO}_2 \text{O} \xrightarrow{273 K} 2 \text{NO}_2 + O_2 \]

Initial pressure was 1 atm, while the final pressure was 1.45 atm at time \( y \times 10^6 \text{ sec} \) calculate \( y \).

\[ \text{K is } \text{ reaction is first order} \]

\[ K = 2 \text{NO}_2 \xrightarrow{273 K} 2 \text{NO}_2 + O_2 \]

Number of hydroxyl group in compound \( Y \) is:

Answer: 2

Sol.
t = 0
1 atm 0 0

\[
t = t \quad \left(1 - \frac{P}{P_c}\right) \\
= \infty \
0 \quad 1 \text{ atm} \quad 0.5 \text{ atm}
\]

\[
P_i = 1 \text{ atm,} \quad P_i = 1.45 \text{ atm,} \quad P_a = 1.5 \text{ atm}
\]

\[
t = \frac{\left(\frac{P}{P_i} - \frac{P_a}{P_i}\right)}{2k}
\]

\[
t = \frac{2.303}{2 \times 10^{-5}} \log \left(\frac{1.5 - 1}{1.5 - 1.45}\right)
\]

\[
t = 2.303 \times 10^3 = y \times 10^2
\]

so \(y = 2.303\)

Answer after rounding off & truncation = 2.30.

14. Number of N–Mn–Cl bonds [N–Mn bond is cis to Mn–Cl bond] in cis [Mn\(\text{en}_2\)Cl\(2\)] are

\[\text{Ans.} \quad (6)\]

\[\text{Sol.}\]

\[\begin{array}{ccccc}
\text{Cl} & \text{Cl} \\
\text{Cl} & \text{Cl}
\end{array}\]

\[\text{Cl} & \text{Cl} \\
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\text{Cl} & \text{Cl}
\]
15. Which of the following is correct

\[
\begin{array}{|c|c|}
\hline
R & \text{गणना कज्जा} \\
\hline
S & \text{सिफारिश कज्जा} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{III} & n^2 \\
\hline
\text{IV} & n^2 \\
\hline
\end{array}
\]

(A) P I (B) P II (C) P V (D) P III

**Ans.** (C)

16. Which of the following is correct

\[
\begin{array}{|c|c|}
\hline
R & \text{गणना कज्जा} \\
\hline
S & \text{सिफारिश कज्जा} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{I} & n^2 \\
\hline
\text{II} & Z^2 \\
\hline
\end{array}
\]

(A) S IV (B) R I (C) R II (D) S III

**Ans.** (C)

**Sol.**

\[
r_f = 0.529 \left( \frac{n^2}{Z} \right) \Rightarrow r_f \propto n^2
\]

Angular momentum कोणीय संतर्पण (l) = \( \frac{nh}{2\pi} \) \Rightarrow l \propto n^1

\[
\text{K.E.} = \frac{1}{2} mv^2 = \frac{1}{2} m \left( 2.18 \times 10^8 Z^2 \right) \left( \frac{n}{2} \right)
\]

\[\Rightarrow \text{K.E.} \propto Z^2 \propto n^2 \]

\[
\text{P.E.} = -2\text{K.E.} \Rightarrow \text{P.E.} \propto Z^2 \propto n^2
\]

\[\Rightarrow \text{P.E.} \propto n^2\]

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**Answer the Question No. 17 & 18 on the basis of information given in Column-I & Column-II.**

Match the reactant in column-I with the possible intermediates and products of column-II.

**Column-I (लक्ष-I)**

1. (P)  
2. (Q)  
3. (R)  
4. (S)  

**Column-II (लक्ष-II)**

1. (I)  
2. (II)  
3. (III)  
4. (IV)  

**Solution:**

Choose the correct pairings between the reactants in Column-I and the possible intermediates/products in Column-II based on the given reactions and mechanisms.
17. Which of the following is correct?
(A) P-II, III, S- II, III
(B) P-II, IV, S- II, III
(C) P-III, VI, S- II, III
(D) P-II, III, S- IV, V
Ans. (A)

18. Which of the following is correct?
(A) Q-I, IV, VI; R- II, III, V
(B) Q-I, III, VI; R- II, IV, V
(C) Q-I, II, VI; R- II, III, VI
(D) Q-I, IV, V; R- III, I, V
Ans. (A)

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