Resonance®
Educating for better tomorrow

PAPER-1 (B.E./B. TECH.)

JEE (Main) 2020

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 05 September, 2020 (SHIFT-2)  |  TIME : (03.00 p.m. to 06.00 p.m)

Duration: 3 Hours  |  Max. Marks: 300

SUBJECT : CHEMISTRY
1. Which of the following compound will show geometrical isomerism?

   (1) H\(\text{C}Cl\)  (2) H\(\text{O}\text{C}Cl\)  (3) H\(\text{C}H\)  (4) H\(\text{C}Cl\)

   Ans. (1)

   Sol. Geometrical isomerism arises due to

   (1) The presence of a restricted rotation (double bond or a ring structure).

   (2) Two different groups should be attached to any two carbon atoms of restricted rotation.

2. The product will be:

   (1) CH\(_3\)CH\(=\text{CH}-\text{CH}-\text{CH}_3\)  (2) CH\(_3\)CH\(_2\)CH\(=\text{CH}-\text{CH}_3\)  (3) CH\(_3\)CH\(_2\)CH\(=\text{CH}-\text{Br}\)  (4) CH\(_3\)CH\(=\text{CH}-\text{Br}\)

   Ans. (3)

   Sol. CH\(_2\text{=}\text{CH}-\text{CH}_2\text{CH}_3\) → CH\(_3\)CH\(\text{C}\text{H}_3\) (Hydrogen shift)

   CH\(_2\text{=}\text{CH}-\text{CH}_2\text{CH}_3\) → CH\(_3\)CH\(_2\text{C}\text{H}_3\) Br

3. Which is not a condensation polymer?

   (1) Nylon-6  (2) Nylon-6,6  (3) Buna-N  (4) Bakelite

   Ans. (3)
4. What is the use of Brompheniramine?

(1) Antidepressant  (2) Antihistamines
(3) Antiseptic     (4) Analgesic

Ans. (2)
Sol. Synthetic drugs, brompheniramine (Dimetapp) act as antihistamines.
5.

Product 'C' will be:

Ans. (2)

6.

Which is the correct order of boiling point of given compounds?

(i) \( \text{OH} \)
(ii) \( \text{NH}_2 \)
(iii) \( \text{NO}_2 \)
(iv) \( \text{OCH}_3 \)

(1) (ii) > (i) > (iv) > (iii)
(2) (ii) > (i) > (iv) > (iii)
(3) (i) > (iii) > (ii) > (iv)
(4) (i) > (iii) > (ii) > (iv)

Ans. (1)

(i) B.P → 202°C
(ii) B.P → 284°C
(iii) B.P → 279°C
(iv) B.P → 243°C
7. Total number of chiral carbon atoms present in sucrose is ___.

Sol. 9

8. The minimum distance between the center of two octahedral voids in FCC lattice in terms of edge length is:

(1) $a$
(2) $\frac{a}{2}$
(3) $\frac{a}{\sqrt{2}}$
(4) $\sqrt{2}a$

Ans. (3)

Sol. In FCC octahedral voids are present at the edge centers and body center.

Minimum distance between centers of two octahedral voids

$$x = \sqrt{\left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2} = \sqrt{\frac{a^2}{4} + \frac{a^2}{4}} = \frac{a}{\sqrt{2}}$$

9. Which of the following statement is correct regarding probability density (except infinity)

(1) For 2p can not be zero
(2) For 3p can be zero
(3) For 1s can be zero
(4) For 2s never be zero

Ans. (2)

Sol. From the following $\psi^2$ function graph ($\psi^2$ = probability density)

$\psi^2$ can be zero for 3p orbital other than infinity.
10. Using following graph find activation energy (in kJ)

\[ \ln k = \ln A - \left( \frac{E_a}{R} \right) \frac{1}{T} \]

\[ \ln k = \ln A - \left( \frac{E_a}{R \times 10^3} \right) \frac{10^3}{T} \]

Slope of graph \( \frac{E_a}{R \times 10^3} \) = \(-\frac{10}{5}\)

\[ E_a = 2R \times 10^3 \text{J} \]

\[ E_a = 2R \text{kJ} \]

Ans. (3)

Sol. \( k = Ae^{-\frac{E_a}{RT}} \)

11. Which of the following graph between \( \frac{x}{m} \) Vs P is correct?

(1) \( x/m \) Vs P

- \( T_1 = 250K \)
- \( T_2 = 270K \)
- \( T_3 = 280K \)
- \( T_4 = 260K \)

(2) \( x/m \) Vs P

- \( T_1 = 250K \)
- \( T_2 = 260K \)
- \( T_3 = 270K \)
- \( T_4 = 280K \)

Ans. (2)
Sol. From Freundlich adsorption isotherm

\[ \frac{x}{m} \propto P \text{ (At low pressure)} \]

\[ \frac{x}{m} \propto P^n \text{ (At high pressure)} \]

→ On increasing temperature physical adsorption decreases.

12. A diatomic gas expands adiabatically so that final density is 32 times the initial density. Final pressure becomes N times of initial pressure. The value of N is :

(1) 128  (2) \( \frac{1}{32} \)  (3) 32  (4) \( \frac{1}{128} \)

Ans. (1)

Sol. 1. Since the data of temperature is not given. It should be reversible Adiabatic process.

2. Since it is a diatomic gas, we can take degree of freedom = 5

\[ \gamma = \frac{f + 2}{f} = \frac{7}{5} \]

3. Use PV^n = K

\[ \frac{P_1V_1}{m} = \frac{P_2V_2}{m} \]

\[ \frac{P_2}{P_1} = \left( \frac{V_1}{V_2} \right)^\gamma \]

Given \( \frac{d_2}{d_1} = 32 \) \( \frac{v_2}{v_1} = 32 \)

\[ \frac{P_2}{P_1} = (32)^\gamma = (2^5)^7 = 2^7 \]

\[ \Rightarrow \frac{P_2}{P_1} = 128 \Rightarrow P_2 = 128P_1 \]
13. Following graph is observed for which of the electrolytic solution.

\[ \lambda_m \]

\[ \sqrt{C} \]

(1) CH₃COOH  (2) HCl  (3) KNO₃  (4) NaCl

Ans. (1)

Sol. Graph represent variation of \( \lambda_m \) with respect to \( \sqrt{C} \) for weak electrolyte.

14. The products formed by reaction of ammonia with excess of Chlorine are:

(1) \( \text{NH}_3 \text{Cl} + \text{HCl} \)  (2) \( \text{NCl}_3 + \text{N}_2 \)  (3) \( \text{NCl}_3 + \text{HCl} \)  (4) \( \text{NH}_4\text{Cl} + \text{N}_2 \)

Ans. (3)

Sol. \( \text{NH}_3 + 3\text{Cl}_2 \rightarrow \text{NCl}_3 + 3\text{HCl} \)

limiting excess

\( 8\text{NH}_3 + 3\text{Cl}_2 \rightarrow 6\text{NH}_4\text{Cl} + \text{N}_2 \)

excess limiting

15. \( (A) = \text{cis}[\text{Co(en)}_2\text{Cl}_2]^+ \) & \( (B) = \text{trans}[\text{Co(en)}_2\text{Cl}_2]^+ \)

Which of the above complexes is optically active?

(1) Only A  (2) Only B  (3) Both  (4) None

Ans. Have Plane of symmetry so will be optically inactive.

\( \text{cis-[Co(en)Cl}_2]^+ \rightarrow \text{optically active without plane of symmetry.} \)
16. Correct arrangement of following species in the increasing order of their size is:
N³⁻, O²⁻, F⁻, Na⁺, Mg²⁺, Al³⁺
(1) Al³⁺, Mg²⁺, Na⁺, F⁻, O²⁻, N³⁻  
(2) N³⁻, O²⁻, F⁻, Na⁺, Mg²⁺, Al³⁺
(3) Al³⁺, Mg²⁺, Na⁺, N³⁻, O²⁻, F⁻  
(4) Na⁺, Mg²⁺, Al³⁺, F⁻, O²⁻, N³⁻
Ans.  (1)
Sol. Al³⁺ < Mg²⁺ < Na⁺ < F⁻ < O²⁻ < N³⁻.

17. Which of the following has maximum bond angle [consider C, N, O, S as central atom]
(1) H₂O  
(2) H₂S  
(3) NH₃  
(4) CH₄
Ans.  (4)
Sol.

\[ \text{H} \quad \text{H} \]

\[ \text{sp}^3 \]  \[ r \cdot p = 2, \text{B.A.} = 109^\circ 28' \]

\[ \text{H₂S} \rightarrow \text{No hybridisation [Drago's rule], bond angle} = 92^\circ \]

\[ \text{NH}_3 \text{ sp}^3 \]  \[ r \cdot p = 1, \text{B.A.} = 107^\circ \]

\[ \text{CH}_4 \text{ sp}^3 \]  \[ r \cdot p = 0, \text{B.A.} = 109^\circ 28' \]

18. In pure form H₂O₂ is found as:
(1) Linear, Blue colour  
(2) Linear, Colourless  
(3) Planar, Blue colour  
(4) Non-planar, Blue colour
Ans.  (4)
Sol. Structure of H₂O₂ is of open book shape. It is a colour less viscous liquid but in large quantity appears blue in colour.

19. Pure boron and silicon can be obtained by
(1) Electrolytic refining  
(2) Vapour phase refining  
(3) Zone refining  
(4) Mond’s process
Ans.  (3)
Sol. Germanium, Silicon, Boron, Gallium and Indium can be obtained in pure state by zone refining process.

Integer

20. 0.02 M K₂Cr₂O₇ is treated with 0.288 gram of Ferrous oxalate. How much volume (in mL) of K₂Cr₂O₇ is required?
Ans. 100.00
21. For the reaction, \(2A(g) \longrightarrow A_2(g)\) following data is obtained at 298 K. \(\Delta U = -20 \text{ kJ}, \Delta S = -30 \text{ J}\) then find \(\Delta G\) (in kJ).

\[\text{Ans.} \ -13.5\]

\[\text{Sol.} \quad \Delta H = \Delta U + \Delta nRT\]
\[\Delta H = -20 \times 1000 \times -1 \times 8.314 \text{ J/mol.K} \times 298 \text{ K} = -22477.572 \text{ J}\]
\[\Delta G = \Delta H - T\Delta S\]
\[= -13537.572 \text{ J}\]
\[= -13.5 \text{ kJ}\]

22. For the reaction, \(x + y \rightleftharpoons 2z\) initially 1 mol of \(x\), 1.5 mole of \(y\) and 0.5 mole \(z\) are taken, then at equilibrium 1 mole of \(z\) is obtained.

If \(k_{eq} = \frac{x}{15}\) then, find the value of 'X'.

\[\text{Ans.} \ 16.00\]

\[\text{Sol.} \quad \begin{array}{c|c|c|c}
\text{t=0} & x & y & 2z \\
1 \text{ mol} & 1.5 \text{ mol} & 0.5 \text{ mol}
\end{array}\]

Since moles of \(z\) are increased at equilibrium therefore reaction goes in forward direction to attain the equilibrium.

\[\begin{array}{c|c|c|c}
\text{t=eq} & x & y & 2z \\
1-a & 1.5 - a & 0.5 + 2a = 1 \text{ mole}
\end{array}\]

\[\Rightarrow a = 0.25\]

\[\begin{array}{c|c|c|c}
0.75 & 1.25 & 1 \text{ mol}
\end{array}\]

\[k_{eq} = \frac{[z]^2}{[x][y]} = \frac{1}{0.75 \times 1.25} = \frac{X}{15}\]

\[X = \frac{15}{(0.75 \times 1.25)} = 16\]