JEE (Main) 2020
COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions
Date: 06 September, 2020 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)
Duration: 3 Hours | Max. Marks: 300
SUBJECT : CHEMISTRY
1. \[ \text{O}_2\text{N}-\overset{\text{C}=\text{C}}{-}\overset{\text{OCH}_3}{-}\overset{\text{H}_2\text{SO}_4/\text{H}_2\text{O}}{\rightarrow} \text{Product is} \]

(1) \[ \text{O}_2\text{N}-\overset{\text{C}=\text{CH}}{-}\overset{\text{OCH}_3}{-}\]

(2) \[ \text{O}_2\text{N}-\overset{\text{C}=\text{CH}}{-}\overset{\text{OCH}_3}{-}\]

(3) \[ \text{NO}_2-\overset{\text{CH}=\text{C}}{-}\overset{\text{OCH}_3}{-}\]

(4) \[ \text{NO}_2-\overset{\text{CH}_2-\text{C}}{-}\overset{\text{OCH}_3}{-}\]

Ans. (4)

Sol. \[ \text{NO}_2-\overset{\text{C}=\text{C}}{-}\overset{\text{OCH}_3}{-} \]

Hydration on alkyne

\[ \text{NO}_2-\overset{\text{CH}=\text{C}}{-}\overset{\text{OCH}_3}{-} \]

Tautomerisation

\[ \text{O}_2\text{N}-\overset{\text{CH}_2-\text{C}}{-}\overset{\text{OCH}_3}{-} \]

(Final product)

2. Write down increasing order of PKb for following?

(1) \[ \text{N}(\text{CH}_3)_2 \]

(II) \[ \text{N}(\text{CH}_3)_2 \]

(III) \[ \text{N}(\text{CH}_3)_2 \]

(IV) \[ \text{N}(\text{CH}_3)_2 \]

(1) IV < III < II < I

(2) I < II < III < IV

(3) I < II < IV < III

(4) I < III < IV < II

Ans. (C)

Sol. \[ \text{PK}_b \propto \frac{1}{\text{Basic strength}(K_b)} \]

\[ K_b \propto +I, +\text{M effect (e\text{-density}}) \]

\[ K_b \propto \frac{1}{-I, -\text{M effect}} \]
3. \[ \text{CH}_3\text{-CH-C-CH}_3 \overset{(i)}{\text{BuC}^-/\Delta} \overset{(ii)}{\text{O}_3/\text{H}_2\text{O}_2} \rightarrow \text{Final product is:} \]
   
   (1) \[ \text{CHO} + \text{HCHO} \]
   
   (2) \[ \text{CH}_3\text{-CH} = \text{CH} \text{-COOH} + \text{HCHO} \]
   
   (3) \[ \text{CHO} + \text{HCHO} \]
   
   (4) \[ \text{CH}_3\text{-CH} = \text{CH} \text{-COOH} + \text{HCHO} \]

**Ans.** (C)

**Sol.** Due to bulky base at high T first reaction is E₂ and produce Hoffmann alkene which further show oxidative ozonolysis.

\[ \text{CH}_3\text{-CH-C-CH}_3 \overset{\text{O}_3/\text{H}_2\text{O}_2} \rightarrow \text{CH}_3\text{-CH} = \text{CH} \text{-COOH} + \text{HCHO} \]

Given in option (C). So answer goes to 3

4. Which can show geometrical isomer?
   (1) 4-Methylpent-1-ene
   (2) 4-Methylpent-2-ene
   (3) 3-Methylpent-1-ene
   (4) 2-Methylpent-1-ene

**Ans.** (B)

**Sol.** Can show G.I. because both doubly bonded carbon have two different groups.
5. **Statement-1**: High density polythene (HDP) is a form when addition polymerisation of ethene takes place in a hydrocarbon solvent in the presence of a catalyst Ziegler-Natta catalyst at a temperature of 333 K to 343 K and under a pressure of 6-7 atmospheres.

**Statement-2**: High density polythene (HDP) consists of linear molecules and has a high density due to closed packing and it is used for manufacturing buckets, dustbins, bottles.

Select correct option regarding these statement(s).

1. Both statements are correct, and the statement-2 is the correct explanation for the statement-1.
2. Both statements are correct, and the statement-2 is NOT a correct explanation for the statement-1.
3. The statement-1 is incorrect, but the statement-2 is correct.
4. Both statements are incorrect.

**Ans.** (1)

**Sol.** Based on NCERT-XII-II, Page No 430 (Polymer)

High density polythene: It is formed when addition polymerisation of ethene takes place in a hydrocarbon solvent in the presence of a catalyst such as triethylaluminium and titanium tetrachloride (Ziegler-Natta catalyst) at a temperature of 333 K to 343 K and under a pressure of 6-7 atmospheres. High density polythene (HDP) thus produced, consists of linear molecules and has a high density due to close packing. It is also chemically inert and more tougher and harder. It is used for manufacturing buckets, dustbins, bottles, pipes, etc.

6. If concentration of fluoride ion is up to 1 ppm, then which of the following options may be correct:

1. Good for teeth
2. Harmful for teeth and cause brown mottling of teeth.
3. Harmful for bones and teeth.
4. Harmful for the growth of children.

**Ans.** (1)

**Sol.** NCERT XI-Part-II-Page No.408 (Environmental Chemistry)

Soluble fluoride is often added to drinking water to make concentration up to 1 ppm because $F^{-}$ ions make the enamel on teeth much harder. But above 2 ppm cause brown mottling of teeth. Cause harmful effect on bones and teeth.

7. Which of the following Lanthanides element do not show stable +4 oxidation state?

1. Eu
2. Dy
3. Tb
4. Ce

**Ans.** (1)

**Sol.**

\[
\begin{align*}
Cu(z = 63) &= 4F^{16}s^2 \\
Dy(z = 66) &= 4F^{16}6s^2 \\
Tb(z = 65) &= 4F^{16}6s^2 \\
Ce(z = 58) &= 4F^{15}1s^2
\end{align*}
\]

Dy, Tb and Ce show +4 oxidation state while Eu do not show +4 oxidation state.
8. Value of Equilibrium constant at two different temperature is given as.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Equilibrium constant</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1 = 50^\circ C$</td>
<td>$k_1 = 10$</td>
</tr>
<tr>
<td>$T_2 = 100^\circ C$</td>
<td>$k_2 = 100$</td>
</tr>
</tbody>
</table>

Then the value of $\Delta H$ of reaction, $\Delta G_1$ and $\Delta G_2$ (in KJ) at temperature $T_1$ and $T_2$ respectively are:

(1) $46.14, -6.2, -14.3$
(2) $-46.14, +6.2, +14.3$
(3) $+46.14, +6.2, +14.3$
(4) $-46.14, -6.2, +14.3$

**Ans.** (1)

**Sol.**

$T_1 = 323 \text{ K}$
$T_2 = 373 \text{ K}$
$k_1 = 10$
$k_2 = 100$

$$\log \left( \frac{k_2}{k_1} \right) = \frac{\Delta H}{2.303R} \left[ \frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\log \left( \frac{100}{10} \right) = \frac{\Delta H}{2.303 \times 8.314} \left[ \frac{1}{323} - \frac{1}{373} \right]$$

$$\log 10 = \frac{\Delta H}{2.303 \times 8.314} \left[ \frac{50}{323 \times 373} \right]$$

$$\Delta H = \frac{2.303 \times 8.314 \times 323 \times 373}{50} = 46136.57 \text{ J} = 46.14 \text{ KJ}$$

At $T_1 = 50^\circ C = 323 \text{ K}$, $K_1 = 10$

$$\Delta G = -2.303 \times \frac{R}{T_1} \times \log K_1$$
$$= -2.303 \times 8.314 \times 323 \times \log(10)$$
$$= -2.303 \times 8.314 \times 323 \times 1$$
$$= -6184.5 \text{ KJ}$$

At $T_2 = 100^\circ C = 373 \text{ K}$, $K_2 = 100$

$$\Delta G = -2.303 \times \frac{R}{T_2} \times \log K_2$$
$$= -2.303 \times 8.314 \times 373 \times \log(10)^2$$
$$= -2.303 \times 2 \times 8.314 \times 373 \times 1$$
$$= -14283.7 \text{ J}$$

$$= -14.3 \text{ KJ}$$

9. Identify correct set of Atomic numbers belongs to transition elements series.

(1) 9, 21, 25, 72  
(2) 21, 25, 29, 57  
(3) 21, 25, 30, 57  
(4) 29, 48, 57, 72

**Ans.** (2)

**Sol.** A transition element is defined as the one which has incompletely filled d orbitals in its ground state or in any one of the oxidation state.

Zn($z = 30$), Cd($z = 48$), Hg($z = 80$) are not transition element.
10. Micelles formation takes place.
   (1) below kraft temperature.  (2) above kraft temperature
   (3) below critical micelles concentration (CMC)  (4) have no relation with kraft temperature.
Ans. (2)
Sol. (i) Micelles formation take place only above a particular temperature called as kraft temperature (T_k)
(ii) Concentration above which micelle formation become appreciable is critical micelles concentration.

11. Following graph is obtained for four different reactions

\[ \text{log(Rate)} \]
\[ \text{log(conc)} \]

On the basis of above graph, correct increasing order of order of reaction is.
(1) A < B < C < D  (2) D < C < B < A  (3) A < B < D < C  (4) D < C < A < B
Ans. (1)
Sol. \[ \text{Rate} = K[\text{Conc}]^\text{order} \]
\[ \text{logRate} = \log K + \text{order log[conc]} \]
so slope of graph is order of reaction.
greater the slope greater is order of reaction
so order of reaction \(\Rightarrow A < B < C < D\)

12. Which of the following complex show magnetic moment (spin only) = 5.91 BM
(1) \([\text{Ni(CO)}_4]^-\)  (2) \([\text{FeFe}]^{3-}\)  (3) \([\text{Fe(CN)}_4]^{3-}\)  (4) \([\text{Cr(H}_2\text{O})_6]^{3+}\)
Ans. (2)
Sol. \[ \mu = 5.91 \text{ BM so unpaired } e^- = 5 \]

<table>
<thead>
<tr>
<th>Complex</th>
<th>Electronic configuration</th>
<th>Unpaired e-</th>
</tr>
</thead>
<tbody>
<tr>
<td>([\text{Ni(CO)}_4]^-)</td>
<td>(\varepsilon_\text{Ni} = 3d^84s^2)</td>
<td>0</td>
</tr>
<tr>
<td>([\text{FeFe}]^{3-})</td>
<td>(\text{Fe}^{3+} = 3d^6 \Rightarrow t_{2g}^{4} t_{1g} )</td>
<td>5</td>
</tr>
<tr>
<td>([\text{Fe(CN)}_4]^{3-})</td>
<td>(\text{Fe}^{3+} = 3d^6 \Rightarrow t_{2g}^{2} t_{1g} ), (e_g^{3})</td>
<td>1</td>
</tr>
<tr>
<td>([\text{Cr(H}_2\text{O})_6]^{3+})</td>
<td>(\text{Cr}^{3+} = 3d^3 \Rightarrow t_{2g}^{1} t_{1g} )</td>
<td>3</td>
</tr>
</tbody>
</table>

13. Which of the following is not correct for alloys.
(1) German Silver  Cu, Zn, Ni
(2) Brass  Cu, Zn, Ni
(3) Bronze  Cu, Sn
(4) Bell Metal  Cu, Sn
Ans. (2)
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Alloy</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bronze</td>
<td>Cu (75 – 90%) + Sn (10, 25%)</td>
</tr>
<tr>
<td>2.</td>
<td>Brass</td>
<td>Cu (60 – 80%) + Zn (20 – 40%)</td>
</tr>
<tr>
<td>3.</td>
<td>German Silver</td>
<td>Cu (50 – 62%) + Zn (17 – 19 %) + Ni (21 – 30 %)</td>
</tr>
<tr>
<td>4.</td>
<td>Bell Metal</td>
<td>Cu (80%) + Sn (20%)</td>
</tr>
</tbody>
</table>

14. How many total no of “Cl = O” bond are present in structure of perchloric acid.

**Ans.** 03.00

**Sol.** Perchloric acid $\rightarrow$ HClO$_4$

\[
\begin{array}{c}
H-\overset{\equiv}{O}\\\overset{\equiv}{O}\\\overset{\equiv}{O}
\end{array}
\]

Total Cl = O bonds = 3