

JEE Advanced 2019 Answer Key

Chemistry - Paper 1

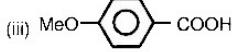
1. Which of the following set represent correct formula for Malachite, Magnetite, Calamine & Cryolite ?

- (A) CuCO_3 , Fe_2O_3 , ZnO , Al_2O_3
- (B) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$, Fe_3O_4 , ZnCO_3 , Na_3AlF_6
- (C) CuCO_3 , Fe_3O_4 , ZnCO_3 , Al_2O_3
- (D) $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$, Fe_2O_3 , ZnCO_3 , Na_3AlF_6

Ans. (B)

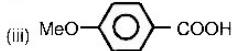
Sol. Malachite, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
Magnetite, Fe_3O_4
Calamine, ZnCO_3
Cryolite, Na_3AlF_6

2. Find the correct acidic strength order :

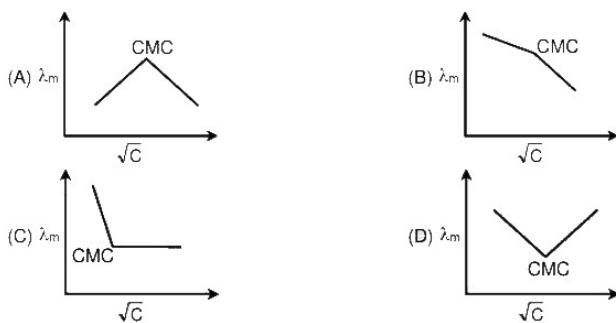
- | | |
|---|---|
| (i) $\text{HC}\equiv\text{C}-\text{COOH}$ | (ii) $\text{H}_2\text{C}=\text{CH}-\text{COOH}$ |
| (iii)  | (iv) $\text{CH}_3-\text{CH}_2-\text{COOH}$ |
| (A) (i) > (ii) > (iv) > (iii) | (B) (i) > (ii) > (iii) > (iv) |
| (C) (iii) > (ii) > (i) > (iv) | (D) (iii) > (i) > (iv) > (ii) |

Ans. (B)

Sol.

	pKa
(i) $\text{HC}\equiv\text{C}-\text{COOH}$	1.89
(ii) $\text{H}_2\text{C}=\text{CH}-\text{COOH}$	4.3
(iii) 	4.5
(iv) $\text{CH}_3-\text{CH}_2-\text{COOH}$	4.87

3. Sodium stearate is a strong electrolyte. Which of the following plot is correct regarding its conductance :

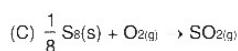
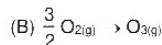
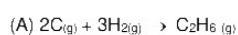


Ans. (B)

4. Which green coloured compound of chromium is formed in borax bead test ?

- (A) $\text{Cr}(\text{BO}_2)_3$ (B) Cr_2O_3 (C) CrB (D) CrBO_3
- Ans.** (A)
- Sol.** $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O} \xrightarrow{\Delta} \text{Na}_2\text{B}_4\text{O}_7 \xrightarrow{\Delta} \text{NaBO}_2 + \text{B}_2\text{O}_3$
 $\text{Cr}_2\text{O}_3 + \text{B}_2\text{O}_3 \xrightarrow{\Delta} \text{Cr}(\text{BO}_2)_3$

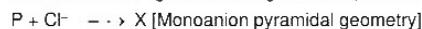
5. Choose the reaction, for which the standard enthalpy of reaction is equal to the standard enthalpy of formation :



Ans. (BC)

Sol. Standard enthalpy of formation : "The standard enthalpy of formation of a compound is the change in the standard enthalpy when one mole of the compound is formed starting from the requisite amounts of elements in their stable state of aggregation".

6. A Tin-chloride 'P' gives following reaction (unbalanced reaction)

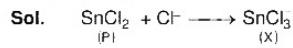


Then which of the following is/are correct.

(A) Y contains co-ordinate bond. (B) X is sp^3 hybridised.

(C) Oxidation state of Sn in X is +1. (D) X contain lone pair on central atom.

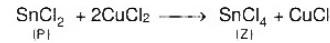
Ans. (ABD)



$\{\text{X}\}$



$\{\text{Y}\}$



$\{\text{Z}\}$

7. $^{238}_{92}\text{U} \xrightarrow{x_1} {}^{234}_{90}\text{Th} \xrightarrow{x_2} {}^{234}_{91}\text{Pa} \xrightarrow{x_3} {}^{234}_{92}\text{Z} \xrightarrow{x_4} {}^{230}_{90}\text{Th}$

x_1, x_2, x_3, x_4 , are either particles or radiation. Then

(A) x_1 is deflected toward negatively charged plate.

(B) x_2 is β - particle.

(C) x_3 is γ -radiation.

(D) Z is isotope of ^{238}U

Ans. (ABD)

Sol. $x_1 = \alpha$

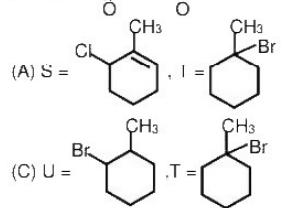
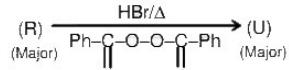
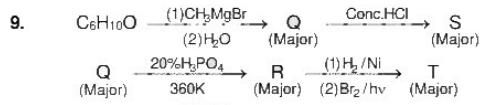
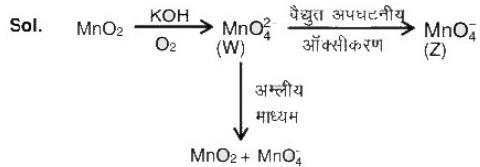
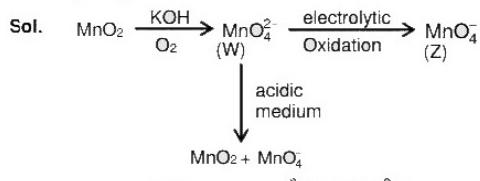
$x_2 = \beta$

$x_3 = \beta$

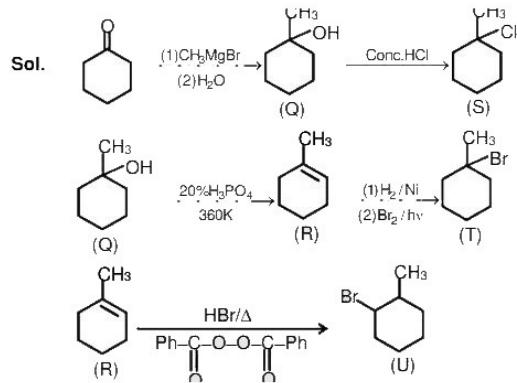
$x_4 = \alpha$

8. Fusion of MnO_2 along with KOH and O_2 forms X. Electrolytic oxidation of X yields Y. X undergoes disproportionation reaction in acidic medium to MnO_2 and Y. The Manganese in X and Y is in the form W & Z respectively, then
 (A) W & Z are coloured
 (B) W is diamagnetic and Z is paramagnetic
 (C) Both W & Z are tetrahedral in shape
 (D) Both W & Z involve $p\pi-d\pi$ bonding for π bond

Ans. (ACD)



Ans. (CD)

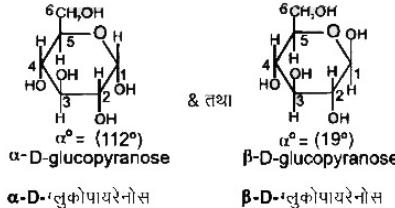
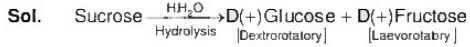


10. Which of the following are true .
(A) Monosaccharides can not be hydrolysed to give polyhydroxy aldehydes and ketones.
(B) Hydrolysis of sucrose gives dextrorotatory glucose and laevorotatory fructose
(C) Oxidation of glucose with bromine water gives glutamic acid.
(D) The two six membered hemiacetal form of D (+) glucose are anomers.

निम्न में से कौनसा कथन सत्य है।

- (A) मोनोसेरैकाइड जल अपवर्णन पर यॉनीहाइड्रोकार्पी एलिंडाइड एवं कीटोन नहीं देते है।
(B) सुकोस जलअपवर्णन पर दक्षिणावर्ती ध्रुणक ग्नुकोस तथा बामावर्ती ध्रुणक फ्रक्टोस देता है।
(C) 'लुकोस का ऑक्सीकरण ब्रोमीन जल के साथ कराने पर रुटुडायिक अम्ल प्राप्त होता है।
(D) D (+) ग्नुकोस का छ: सदस्यी हेमीऐसीटेल रूप ऐनोमर होता है।

Ans. (ABD)



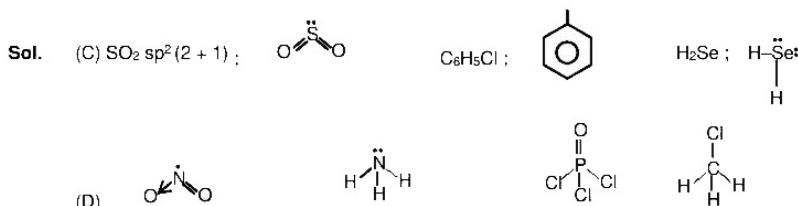
an anomers of each other. (एक दूसरे के एनोमर हैं)

11. Identify the option where all four molecules possess permanent dipole moment at room temperature.

वह विकल्प पहचानिए जहाँ सभी चारों अणु कमरे के ताप पर स्थायी द्विघुल आघूर्ण रखते हैं।

- (A) BF_3 , O_3 , SF_6 , XeF_6 (B) BeCl_2 , CO_2 , BCl_3 , CHCl_3
 (C) SO_2 , $\text{C}_6\text{H}_5\text{Cl}$, H_2Se , BrF_5 (D) NO_2 , NH_3 , POCl_3 , CH_3Cl

Ans. (CD)



12. Which of the following is/are correct regarding root mean square speed (U_{rms}) & average translation K.E. (E_{av}) of molecule in a gas at equilibrium.

- (A) E_{av} is doubled when its temperature is increased 4 times
 (B) U_{rms} is inversely proportional to the square root of its molecular mass
 (C) E_{av} at a given temperature doesn't depend on its molecular mass
 (D) U_{rms} is doubled when its temperature is increased 4 times

साधा पर गैस के अप के वर्ण सभी मूल देख (U_{rms}) तथा औसत स्थानतरण ऊर्जा K

कौनसा/कौनसे कथन सही है/हैं?

- (A) E_{av} दुगनी हो जाती है जब इसके तापमान में 4 गुना वृद्धि की जाती है।

(B) U_{rms} इसके आपूर्विक द्रव्यमान के वर्गमूल के व्युक्तिमानुपाती होता है।

(C) दिये गये तापमान पर E_{av} इसके आपूर्विक द्रव्यमान पर निर्भर नहीं करती है।

(D) U_{rms} दुगनी हो जाती है जब इसके तापमान में 4 गुना वृद्धि की जाती है।

Ans. (BCD)

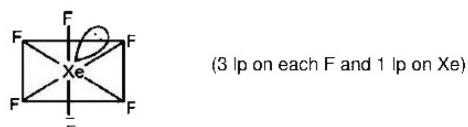
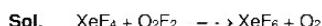
Sol. $E_{av} = \frac{3}{2}RT$ $U_{rms} = \sqrt{\frac{3RT}{M}}$ & $U_{rms} \propto \frac{1}{\sqrt{M}}$

E_{AV} doesn't depend on its molecular mass

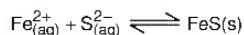
EAV इसके आण्विक द्रव्यमान पर निर्भर नहीं करती है।

13. $\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow$ product. The total number of lone pairs on the xenon containing product is : (I)
 $\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow$ असाधु जीवन्त यथा असाधु पर कल पक्की ग्रामों की संख्या है-

Ans (19)



14. For the following reaction, equilibrium constant K_c at 298 K is 1.6×10^{17}



When equal volume of 0.06 M Fe^{2+} and 0.2 M S^{2-} solution are mixed, then equilibrium concentration of Fe^{2+} is found to be $Y \times 10^{-17}$ M. Y is :

Ans. (8.92 & 8.93)

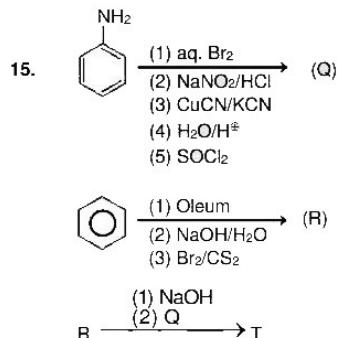
Sol.	$\text{Fe}^{2+}_{(\text{aq})}$	+	$\text{S}^{2-}_{(\text{aq})}$	\rightleftharpoons	FeS(s)	$K_c = 1.6 \times 10^{17}$
	0.06 M		0.2 M			
After mixing	0.03 M		0.1 M			
	?		0.07 M			

$$1.6 \times 10^{17} = \frac{1}{[\text{Fe}^{2+}] \times 0.07}$$

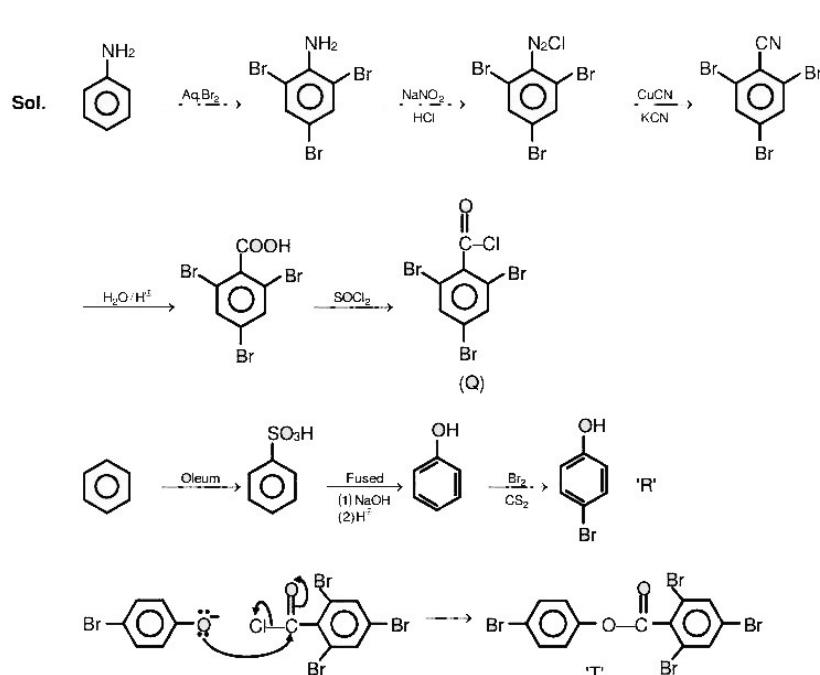
$$\text{or } [\text{Fe}^{2+}] = \frac{10^{-17}}{1.6 \times 0.07} = \frac{10^{-15}}{11.2} = \frac{100}{11.2} \times 10^{-17} = 8.928 \times 10^{-17} = Y \times 10^{-17}$$

Answer after rounding off is = 8.93

Answer after truncation of is = 8.92



Ans. (4)

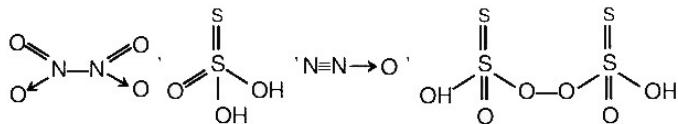


16. Which of the following compounds contain bond between same type of atoms.



Ans. (4)

Sol. N_2O_4 , $\text{H}_2\text{S}_2\text{O}_3$, N_2O , $\text{H}_2\text{S}_2\text{O}_8$



17. $\text{A} + \text{B} + \text{C} \rightarrow \text{Product}$

Ex. No	[A]	[B]	[C]	Rate of reaction
1.	0.2	0.1	0.1	6×10^{-5}
2.	0.2	0.2	0.1	6×10^{-5}
3.	0.2	0.1	0.2	1.2×10^{-4}
4.	0.3	0.1	0.1	9×10^{-5}

When $[A] = 0.15$

$[B] = 0.25$

$[C] = 0.15$

Rate of reaction is $Y \times 10^{-5}$ M/s Find Y.

Ans. (6.75)

Sol. $r = k [A]^a [B]^b [C]^c$

by experiment no. 1 & 2 $b = 0$

by experiment no. 1 & 3 $c = 1$

by experiment no. 1 & 4 $a = 1$

$r = K [A]^1 [B]^0 [C]^1$

From Ex. no.1 $6 \times 10^{-5} = K (0.2) (0.1)$

$K = 3 \times 10^{-3}$

Given $[A] = 0.15$

$[B] = 0.25$

$[C] = 0.15$

$r = K [A]^1 [B]^0 [C]^1$

$= 3 \times 10^{-3} \times 0.15 \times 1 \times 0.15$

$= 3 \times 0.025 \times 10^{-3}$

$= 6.75 \times 10^{-5} \text{ mol L}^{-1} \text{ sec}^{-1}$

$Y = 6.75$

18. On dissolving 0.5 g of non-volatile, non-ionic solute to 39 g of benzene, its vapour pressure decreases from 650 mm of Hg to 640 mm of Hg. The depression of freezing point of benzene (in K) upon addition of the solute is _____.

[Given data : Molar mass & molar freezing point depression of benzene is 78 g mol⁻¹ & 5.12 K Kg mol⁻¹]

Ans. (1.02)

Sol.
$$\frac{P^0 - P_s}{P_s} = i \left[\frac{n_{\text{solute}}}{n_{\text{solvent}}} \right]$$

$$\frac{650 - 640}{640} = 1 \times \frac{0.5 \times 78}{M \times 39} \Rightarrow M_{\text{solute}} = 64 \text{ gm}$$

$$\Delta T_f = K_f \times m = 5.12 \times \frac{0.5 \times 1000}{64 \times 39}$$

$$\Rightarrow \Delta T_f = 1.02$$