

24/01/2025

Morning



Aakash

Medical | IIT-JEE | Foundations

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18, Udyog Vihar,
Gurugram, Haryana-122018

Memory Based Answers & Solutions

Time : 3 hrs.

for

M.M. : 300

JEE (Main)-2025 (Online) Phase-1

(Physics, Chemistry and Mathematics)

IMPORTANT INSTRUCTIONS:

- (1) The test is of **3 hours** duration.
- (2) This test paper consists of 75 questions. Each subject (PCM) has 25 questions. The maximum marks are 300.
- (3) This question paper contains **Three Parts**. **Part-A** is Physics, **Part-B** is Chemistry and **Part-C** is **Mathematics**. Each part has only two sections: **Section-A** and **Section-B**.
- (4) **Section - A** : Attempt all questions.
- (5) **Section - B** : Attempt all questions.
- (6) **Section - A (01 – 20)** contains 20 multiple choice questions which have **only one correct answer**. Each question carries **+4 marks** for correct answer and **-1 mark** for wrong answer.
- (7) **Section - B (21 – 25)** contains 5 **Numerical value** based questions. The answer to each question should be rounded off to the **nearest integer**. Each question carries **+4 marks** for correct answer and **-1 mark** for wrong answer.

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CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

- Which of the following is the strongest oxidising agent?
 (1) Eu^{2+}
 (2) Ce^{2+}
 (3) Ce^{4+}
 (4) Eu^{3+}

Answer (3)

Sol. $\text{Ce}^{4+}/\text{Ce}^{3+} \Rightarrow 1.74 \text{ V}$, Ce^{4+} is strong oxidising agent where as Eu^{2+} is strong reducing agent as it converts to Eu^{3+} . Since oxidising agent itself gets reduced, Ce^{4+} is most easily reduced among these.

- The difference in melting point and boiling point of oxygen and sulphur can be explained by
 (1) Electronegativity
 (2) Electron gain enthalpy
 (3) Atomicity
 (4) Ionisation energy

Answer (3)

Sol. It can be explained on basis of Atomicity as oxygen exists as O_2 while sulphur as S_8 .

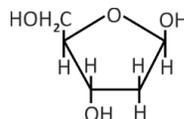
- Ribose present in DNA is
 (A) A pentose sugar
 (B) Present in pyranose form
 (C) α anomeric carbon is present
 (D) Present in D configuration
 (E) A reducing sugar in free form

Choose the correct statement :

- (1) A, C & E only
 (2) A, D & E only
 (3) A, B, C, D & E
 (4) A & E only

Answer (2)

Sol. Structure of Ribose is

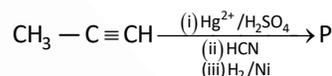


β -D-2 deoxyribose

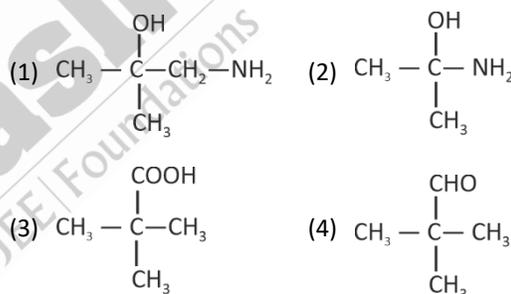
Statement A, D & E are correct

It is present in furanose form & β -anomeric C is present

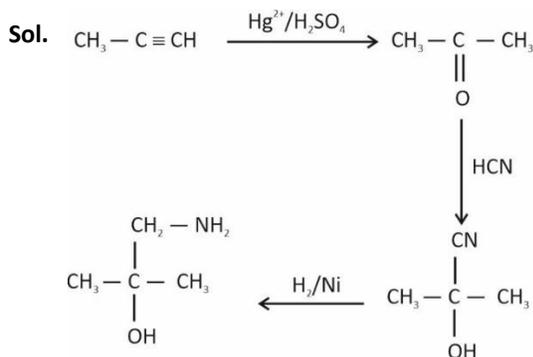
- Consider the following reaction



Product P is



Answer (1)



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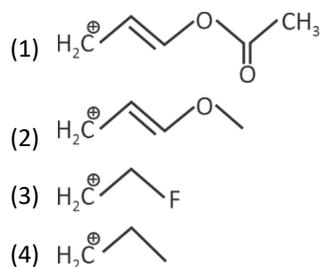
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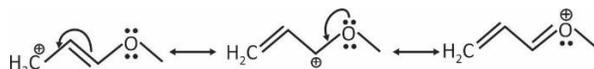
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5. The most stable carbocation among the following is.



Answer (2)

Sol. Among the given carbocations, the following carbocation is most stable due to extended conjugation and there is no destabilising factor.

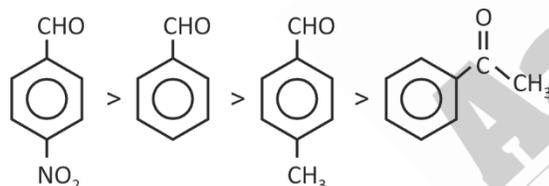


6. Which of the following is most reactive towards nucleophilic addition reaction.

- (1) Para-nitro benzaldehyde
- (2) Para-methyl benzaldehyde
- (3) Benzaldehyde
- (4) Acetophenone

Answer (1)

Sol. The order of reactivity will be dependent on hinderance and e^- deficiency (δ^+) on carbonyl carbon.



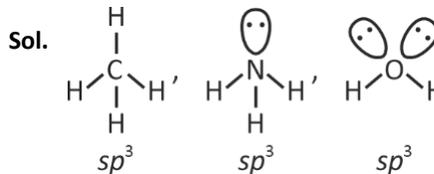
7. Consider the following statements about H_2O , NH_3 and CH_4

- (A) All central atoms are sp^3 hybridised
- (B) Order of dipole moment is $CH_4 < NH_3 < H_2O$
- (C) NH_3 in H_2O is basic in nature, NH_3 and H_2O are Bronsted-Lowry acid and base respectively
- (D) Bond angle of H_2O , NH_3 and CH_4 respectively are 104.5° , 107° and 109.5°

Which of the above statements are correct

- (1) A and B only
- (2) A, B and C only
- (3) A, B, C and D
- (4) A, B and D only

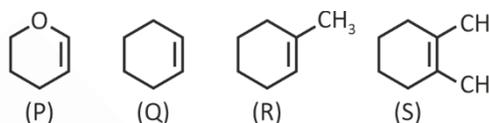
Answer (4)



Dipole moment of $H_2O > NH_3 > CH_4$

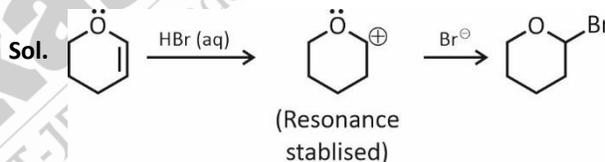
Bond angle of $CH_4 > NH_3 > H_2O \rightarrow 109.5 > 107^\circ > 104.5^\circ$

8. Which of the following is most reactive towards aq. HBr ?



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

Answer (1)



9. At the freezing point of water, process is non spontaneous, it becomes spontaneous at boiling point (Temperature varies linearly with pressure). The correct option is

- (1) $\Delta H = +ve$
 $\Delta S = +ve$
- (2) $\Delta H = -ve$
 $\Delta H = -ve$
- (3) $\Delta H = +ve$
 $\Delta S = -ve$
- (4) $\Delta H = -ve$
 $\Delta S = +ve$

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Answer (1)

Sol. $\Delta G = \Delta H - T\Delta S$

For process to be spontaneous $\Delta G < 0$

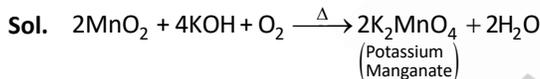
The given process becomes spontaneous on increasing temperature

So $\Delta H > 0$ and $\Delta S > 0$

10. In the preparation of potassium permanganate from pyrolusite ore (MnO_2), the fusion of pyrolusite ore is done with an alkali metal hydroxide like KOH in the presence of air or an oxidising agent like KNO_3 , which first produces.

- (1) K_2MnO_6
- (2) K_2MnO_4
- (3) $KMnO_4$
- (4) K_2MnO

Answer (2)



Potassium Manganate (K_2MnO_4) is produced.

11. S-I : Duma's method is used for estimation of nitrogen
 S-II : In Duma's method N present in compound is converted to $(NH_4)_2SO_4$

- (1) S-I is correct statement.
S-II is incorrect statement
- (2) S-I is incorrect statement
S-II is also incorrect statement
- (3) S-I is correct statement
S-II is also correct statement
- (4) S-I is incorrect statement
S-II is correct statement

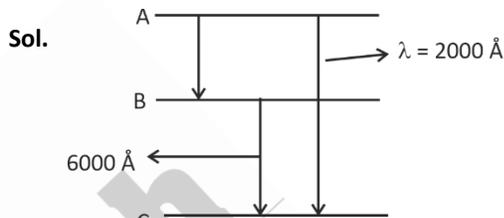
Answer (1)

Sol. Estimation of N is done by Dumas and Kjeldahl method. In Dumas method N is organic compound is converted to free N_2 when compound is heated with CuO in atmosphere of CO_2 . Released N_2 is collected over an aqueous solution of KOH.

12. An electron jumps from A \rightarrow C by emitting a wavelength of 2000 \AA and also jumps from B \rightarrow C by emitting a wavelength of 6000 \AA , then wavelength of that electron; if it jumps from A \rightarrow B

- (1) 4000 \AA
- (2) 3000 \AA
- (3) 8000 \AA
- (4) 5000 \AA

Answer (2)



$$\left(\frac{hc}{\lambda}\right)_{AC} = \left(\frac{hc}{\lambda}\right)_{AB} + \left(\frac{hc}{\lambda}\right)_{BC}$$

$$\left(\frac{1}{\lambda}\right)_{AC} = \left(\frac{1}{\lambda}\right)_{AB} + \left(\frac{1}{\lambda}\right)_{BC}$$

$$\frac{1}{2000} = \frac{1}{\lambda_{AB}} + \frac{1}{6000}$$

$$\frac{1}{\lambda_{AB}} = \frac{1}{2000} - \frac{1}{6000}$$

$$\frac{1}{\lambda_{AB}} = \frac{6000 - 2000}{6000 \times 2000}$$

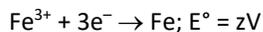
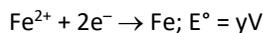
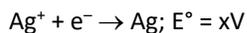
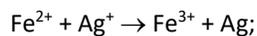
$$\frac{1}{\lambda_{AB}} = \frac{4000}{12 \times 10^6}$$

$$\frac{1}{\lambda_{AB}} = \frac{1}{3000}$$

$$\lambda_{AB} = 3000 \text{ \AA}$$

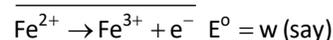
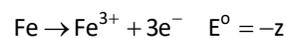
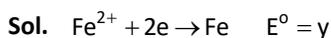
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13. Calculate the value of E°_{cell} for given cell based on given information



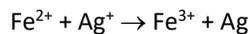
- (1) $x + y - z$
- (2) $x + 3y - 2z$
- (3) $y - 2x$
- (4) $x - 3z + 2y$

Answer (4)



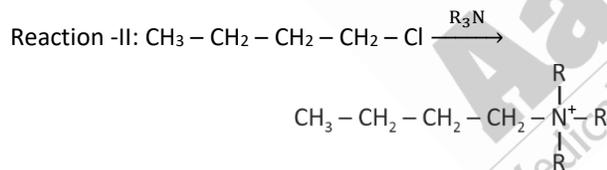
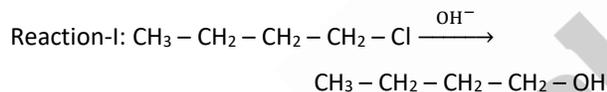
$$1 \times w = 2 \times y - 3z$$

$$w = 2y - 3z$$



$$E^\circ_{\text{Cell}} = E^\circ_{\text{Fe}^{2+}/\text{Fe}^{3+}} + E^\circ_{\text{Ag}^+/\text{Ag}} = 2y - 3z + x$$

14. Consider the given reactions and choose proper solvent.

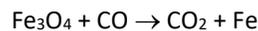


- (1) Reaction-I : polar protic, Reaction-II : polar aprotic
- (2) Reaction-I : polar aprotic, Reaction-II : polar protic
- (3) Reaction-I : polar aprotic, Reaction-II : polar aprotic
- (4) Reaction-I : polar protic, Reaction-II : polar protic

Answer (3)

Sol. Both reactions proceeds through $\text{S}_\text{N}2$ mechanism and most suitable solvent would be polar aprotic solvent.

15. 2.32×10^3 kg of Fe_3O_4 reacts with 2.8×10^3 kg of CO according to the following reaction :

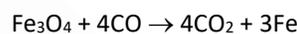


If x kg of Fe is formed. Find the value of x?

- (1) 2000 kg
- (2) 1680 kg
- (3) 2780 kg
- (4) 1500 kg

Answer (2)

Sol. Balanced reaction



Given mass of $\text{Fe}_3\text{O}_4 = 2.32 \times 10^3$ kg

Mol. Mass of $\text{Fe}_3\text{O}_4 = 232 \text{ gm} = 0.232 \text{ kg}$

$$\text{Moles of } \text{Fe}_3\text{O}_4 = \frac{2.32 \times 10^3}{0.232} = 10^4 \text{ mol}$$

Given mass of CO = 2.8×10^3 kg

Mol. Mass of CO = 28 gm = 0.028 kg

Moles of CO = 10^5 mol

According to balanced reaction

1 mol Fe_3O_4 requires 4 mol CO

$\therefore 10^4$ mol Fe_3O_4 requires 4×10^4 mol CO

\therefore CO is in excess

1 mol Fe_3O_4 gives 3 mol Fe

10^4 mol Fe_3O_4 will gives 3×10^4 mol Fe

$$\therefore \text{Mass of Fe formed} = 3 \times 10^4 \times \frac{56}{1000} = 1680 \text{ kg}$$

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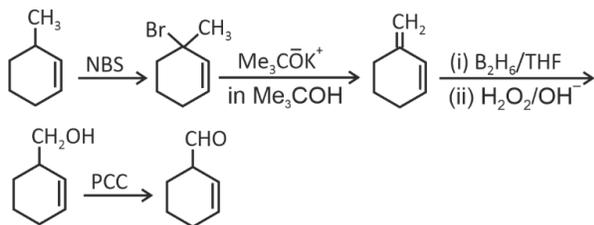
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Sol. 3-methylcyclohexene is likely to be the most appropriate reactant for the synthesis of the given compound.



19. Select the incorrect statements about the modern periodic table.

- (1) The Physical and chemical properties of elements are periodic function of their atomic weight
- (2) The Physical and chemical properties of elements are periodic function of their atomic numbers
- (3) Non-metallic elements are lesser in number than metallic elements
- (4) In periodic table, 18 groups are present

Answer (1)

Sol. According to modern periodic law, the physical and chemical properties of elements are periodic function of their atomic numbers.

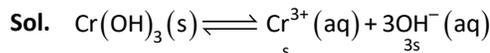
20.

SECTION - B

Numerical Value Type Questions: This section contains 5 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. If the K_{sp} of $\text{Cr}(\text{OH})_3$ is $1.6 \times 10^{-30} \text{ M}^4$. The molar solubility of salt in water is 1.56×10^{-x} , then value of x is

Answer (8)



$$K_{sp} = s^1(3s)^3$$

$$K_{sp} = 27s^4$$

$$s^4 = \frac{1.6}{27} \times 10^{-30} \text{ M}^4$$

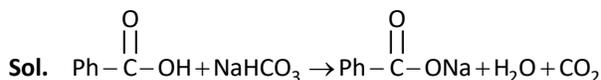
$$s^4 = \frac{160}{27} \times 10^{-32} = 5.92 \times 10^{-32}$$

$$s = 1.56 \times 10^{-8}$$

$$x = 8$$

22. When x g of Benzoic acid reacts with NaHCO_3 , 11.2 L of CO_2 is released at 273 K and 1 atm pressure, calculate mass of benzoic acid in gram?

Answer (61)



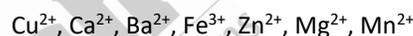
$$\text{Moles of } \text{CO}_2 = \frac{11.2}{22.4} = 0.5 \text{ mol}$$

$$\text{Moles of Benzoic acid} = 0.5 \text{ mol}$$

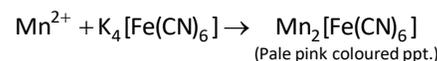
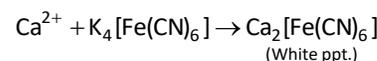
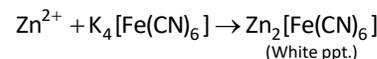
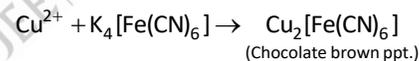
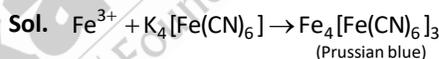
$$\text{Mass of benzoic acid} = 0.5 \times 122 \text{ g}$$

$$= 61 \text{ g}$$

23. How many of the following cation shows characteristic coloured ppt. with $\text{K}_4[\text{Fe}(\text{CN})_6]$?



Answer (3)



24.

25.

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