

JEE Main 2023 Chemistry Question Paper Jan 31 Shift 1

Time Allowed :3 Hour	Maximum Marks :120	Total Questions :30
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 30 questions. The maximum marks are 120.
3. The question paper consists of topics from Chemistry, having two sections.
 - (i) Section-A: This section 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.
 - (ii) Section-B: This section contains 10 questions. The answer to each of the questions is a numerical value. Each question carries 4 marks for correct answer and -1 mark for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

1. The correct order of basicity of oxides of vanadium is

- (A) $V_2O_3 > V_2O_5 > V_2O_4$
(B) $V_2O_3 > V_2O_4 > V_2O_5$
(C) $V_2O_5 > V_2O_4 > V_2O_3$
(D) $V_2O_4 > V_2O_3 > V_2O_5$

2. Match List I with List II

List-I		List-II	
A.	XeF_4	I.	See-saw
B.	SF_4	II.	Square planar
C.	NH_4^+	III.	Bent T- shaped
D.	BrF_3	IV.	Tetrahedral

- (A) A- IV, B-I, C-II, D- III
(B) A-II, B-I, C-IV, D-III
(C) A-II, B-I, C-III, D-IV
(D) A-IV, B-III, C-II, D-I

3. Choose the correct set of reagents for the following conversion
 $\text{Trans (Ph-CH=CH-CH}_3) \rightarrow \text{cis(Ph-CH=CH-CH}_3)$

- (A) Br_2 , alc.KOH, NaNH_2 , $\text{Na}(\text{LiqNH}_3)$
 - (B) Br_2 , aq. KOH, NaNH_2 , H_2 Lindlar Catalyst
 - (C) Br_2 , aq.KOH, NaNH_2 , $\text{Na}(\text{LiqNH}_3)$
 - (D) Br_2 , alc.KOH, NaNH_2 , H_2 Lindlar Catalyst
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4. Which of the following artificial sweeteners has the highest sweetness value in comparison to cane sugar?

- (A) Aspartame
 - (B) Saccharin
 - (C) Alitame
 - (D) Sucralose
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5. Consider the following reaction

Propanal + Methanal $\xrightarrow{\text{(i) dil NaOH, (ii) } \Delta, \text{ (iii) NaCN, (iv) H}_3\text{O}^+}$ Product B. The correct statement for product B is. It is

- (A) Racemic mixture and is neutral
 - (B) Racemic mixture and give a gas with saturated NaHCO_3 solution
 - (C) Optically active and adds one mole of bromine
 - (D) Optically active alcohol and is neutral
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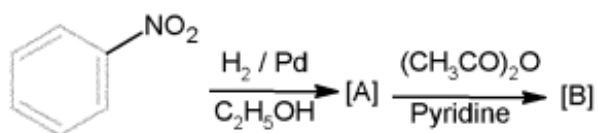
6. The methods NOT involved in concentration of ore are

- A. Liquation
- B. Leaching
- C. Electrolysis
- D. Hydraulic washing
- E. Froth flotation

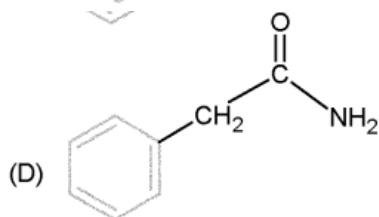
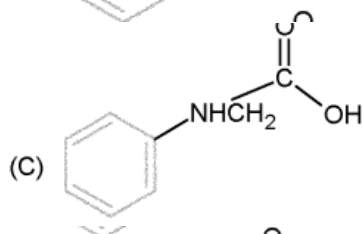
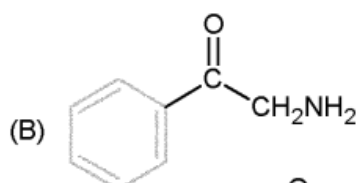
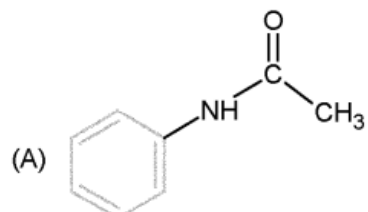
Choose the correct answer from the options given below :

- (A) A and C only
 - (B) B, D and E only
 - (C) B, D and C only
 - (D) C, D and E only
-

7.



Consider the above reaction and identify the product B.



8. A protein 'X' with molecular weight of 70,000 u, on hydrolysis gives amino acids. One of these amino acids is

- (A) $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH}$
 (B) $\text{CH}_3\text{C}(\text{CH}_3)(\text{NH}_2)\text{CH}_2\text{CH}_2\text{COOH}$
 (C) $\text{NH}_2\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{COOH}$
 (D) $\text{CH}_3\text{CH}(\text{NH}_2)\text{CH}(\text{CH}_3)\text{CH}_2\text{COOH}$
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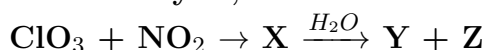
9. The correct increasing order of the ionic radii is

- (A) $\text{K}^+ < \text{S}^{2-} < \text{Ca}^{2+} < \text{Cl}^-$
 (B) $\text{Ca}^{2+} < \text{K}^+ < \text{Cl}^- < \text{S}^{2-}$
 (C) $\text{Cl}^- < \text{Ca}^{2+} < \text{K}^+ < \text{S}^{2-}$
 (D) $\text{S}^{2-} < \text{Cl}^- < \text{Ca}^{2+} < \text{K}^+$

10. Which one of the following statements is correct for electrolysis of brine solution?

- (A) H_2 is formed at anode
- (B) O_2 is formed at cathode
- (C) Cl_2 is formed at cathode
- (D) OH^- is formed at cathode

11. Identify X,Y and Z in the following reaction (Equation not balanced)



- (A) $\text{X} = \text{ClNO}_2$, $\text{Y} = \text{HCl}$, $\text{Z} = \text{HNO}_3$
- (B) $\text{X} = \text{ClNO}_3$, $\text{Y} = \text{Cl}_2$, $\text{Z} = \text{NO}_2$
- (C) $\text{X} = \text{ClONO}_2$, $\text{Y} = \text{HOCl}$, $\text{Z} = \text{NO}_2$
- (D) $\text{X} = \text{ClONO}_2$, $\text{Y} = \text{HOCl}$, $\text{Z} = \text{HNO}_3$

12. Cobalt chloride when dissolved in water forms pink colored complex X which has octahedral geometry. This solution on treating with conc. HCl forms deep blue complex Y which has a Z geometry. X, Y and Z, respectively, are

- (A) $\text{X} = [\text{Co}(\text{H}_2\text{O})_6]^{2+}$, $\text{Y} = [\text{CoCl}_4]^{2-}$, $\text{Z} = \text{Tetrahedral}$
- (B) $\text{X} = [\text{Co}(\text{H}_2\text{O})_4\text{Cl}_2]^+$, $\text{Y} = [\text{CoCl}_4]^{2-}$, $\text{Z} = \text{Tetrahedral}$
- (C) $\text{X} = [\text{Co}(\text{H}_2\text{O})_6]^{2+}$, $\text{Y} = [\text{CoCl}_6]^{4-}$, $\text{Z} = \text{Octahedral}$
- (D) $\text{X} = [\text{Co}(\text{H}_2\text{O})_6]^{2+}$, $\text{Y} = [\text{CoCl}_6]^{4-}$, $\text{Z} = \text{Octahedral}$

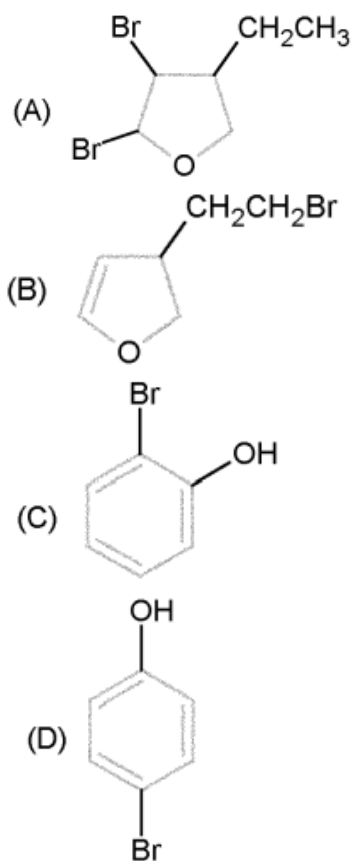
13. Which transition in the hydrogen spectrum would have the same wavelength as the Balmer type transition from $n = 4$ to $n = 2$ of He^+ spectrum

- (A) $n = 2$ to $n = 1$
- (B) $n = 1$ to $n = 2$
- (C) $n = 1$ to $n = 3$
- (D) $n = 3$ to $n = 4$

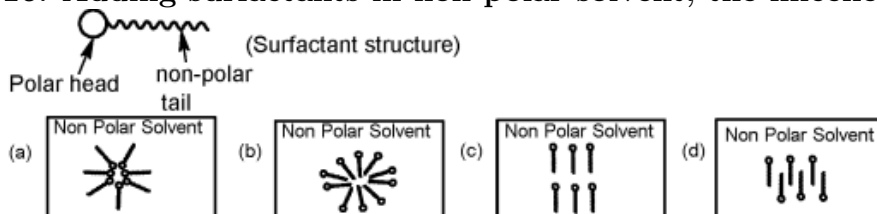
14. $\text{Nd}^{2+} =$

- (A) $4f^4$
- (B) $4f^2 6s^2$
- (C) $4f^4 6s^2$
- (D) $4f^3$

15. An organic compound 'A' with empirical formula C_6H_6O gives sooty flame on burning. Its reaction with bromine solution in low polarity solvent results in high yield of B. B is



16. Adding surfactants in non polar solvent, the micelles structure will look like



- (A) d
- (B) b
- (C) c

(D) a

17. H_2O_2 acts as a reducing agent in

- (A) $2\text{NaOCl} + \text{H}_2\text{O}_2 \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{O}_2$
(B) $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{MnO}_2 + 2\text{H}^+$
(C) $2\text{Fe}^{2+} + 2\text{H}^+ + \text{H}_2\text{O}_2 \rightarrow 2\text{Fe}^{3+} + 2\text{H}_2\text{O}$
(D) $\text{Na}_2\text{S} + 4\text{H}_2\text{O}_2 \rightarrow \text{Na}_2\text{SO}_4 + 4\text{H}_2\text{O}$

18. Match items of column I and II

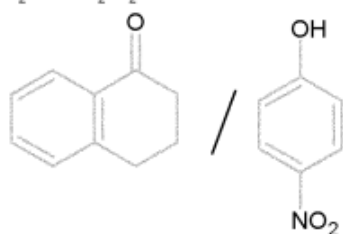
Column-I (Mixture of compounds)

Column-II (Separation Technique)

A. $\text{H}_2\text{O} / \text{CH}_2\text{Cl}_2$

i. Crystallization

B.



ii. Differential solvent extraction

C. Kerosene / Naphthalene

iii. Column chromatography

D. $\text{C}_6\text{H}_{12}\text{O}_6 / \text{NaCl}$

iv. Fractional Distillation

Correct match is:

- (A) A- i, B-iii, C-ii, D- iv
(B) A-iii, B-iv, C-ii, D-i
(C) A-ii, B-iii, C-iv, D-i
(D) A-ii, B-i, C-iii, D-iv

19. The correct order of melting points of dichlorobenzenes is

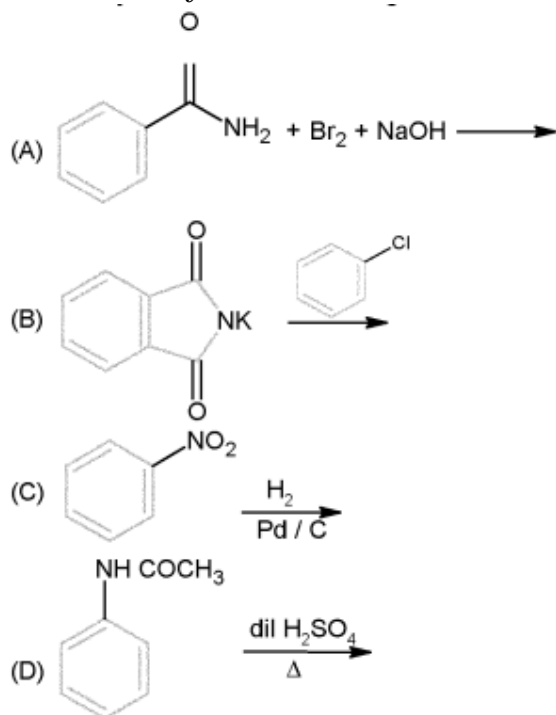
- (A) $p > o > m$
(B) $o > m > p$
(C) $p > m > o$
(D) $m > p > o$

20. When Cu^{2+} ion is treated with KI, a white precipitate, X appears in solution. The solution is titrated with sodium thiosulphate, the compound Y is formed. X

and Y respectively are.

- (A) $X = \text{Cu}_2\text{I}_2$, $Y = \text{Na}_2\text{S}_4\text{O}_6$
(B) $X = \text{CuI}_2$, $Y = \text{Na}_2\text{S}_4\text{O}_6$
(C) $X = \text{CuI}_2$, $Y = \text{Na}_2\text{S}_2\text{O}_3$
(D) $X = \text{Cu}_2\text{I}_2$, $Y = \text{Na}_2\text{S}_4\text{O}_5$
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21. How many of the transformations given below would result in aromatic amines?



22. On complete combustion, 0.492 g of an organic compound gave 0.792 g of CO_2 . The % of carbon in the organic compound is (Nearest integer)

23. The total pressure of a mixture of non-reacting gases X (0.6g) and Y (0.45g) in a vessel is 740 mm of Hg. The partial pressure of the gas X is mm of Hg. (Nearest Integer)

(Given: molar mass X = 20 and Y = 45 g mol^{-1})

24. The oxidation state of phosphorous in hypophosphoric acid is +

25. For reaction: $\text{SO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightleftharpoons \text{SO}_3(\text{g})$ $K_p = 2 \times 10^{12}$ at 27°C and 1 atm pressure. The K_c for the same reaction is _____ $\times 10^{13}$ (Nearest integer)
(Given $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

26. At 27°C , a solution containing 2.5g of solute in 250.0 mL of solution exerts an osmotic pressure of 400 Pa. The molar mass of the solute is _____ g mol^{-1} (Nearest integer)
(Given: $R = 0.083 \text{ L bar K}^{-1} \text{ mol}^{-1}$)

27. $\text{A} \rightarrow \text{B}$

The rate constants of the above reaction at 200 K and 300K are 0.03 min^{-1} and 0.05 min^{-1} respectively. The activation energy for the reaction is _____ J (Nearest integer)
(Given: $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$, $\ln 10 = 2.3$, $\log 5 = 0.70$, $\log 3 = 0.48$, $\log 2 = 0.30$)

28. Zinc reacts with hydrochloric acid to give hydrogen and zinc chloride. The volume of hydrogen gas produced at STP from the reaction of 11.5 g of zinc with excess HCl is _____ L (Nearest integer)
(Given: Molar mass of Zn is 65.4 g mol^{-1} and Molar volume of H_2 at STP = 22.7L)

29. The logarithm of equilibrium constant for the reaction $\text{Pd}^{2+} + 4\text{Cl}^- \rightleftharpoons \text{PdCl}_4^{2-}$ is _____ (Nearest integer)

Given: $\frac{2.303RT}{F} = 0.06 \text{ V}$

$\text{Pd}_{(aq)}^{2+} + 2\text{e}^- \rightleftharpoons \text{Pd(s)} \quad E^\circ = 0.83 \text{ V}$

$\text{PdCl}_{4(aq)}^{2-} + 2\text{e}^- \rightleftharpoons \text{Pd(s)} + 4\text{Cl}_{(aq)}^- \quad E^\circ = 0.65 \text{ V}$

30. The enthalpy change for the conversion of $\frac{1}{2}\text{Cl}_2(\text{g})$ to $\text{Cl}^-(\text{aq})$ is (-)_____ kJ mol^{-1} (Nearest integer)

Given: $\Delta_{\text{dis}} H_{\text{Cl}_2(\text{g})}^\ominus = 240 \text{ kJ mol}^{-1}$, $\Delta_{\text{eg}} H_{\text{Cl}(\text{g})}^\ominus = -350 \text{ kJ mol}^{-1}$

$\Delta_{\text{hyd}} H_{\text{Cl}^-(\text{g})}^\ominus = -380 \text{ kJ mol}^{-1}$
