

JEE Main 2023 Jan 25 Shift 1 Chemistry Question Paper

Time Allowed :3 Hour	Maximum Marks :300	Total Questions :90
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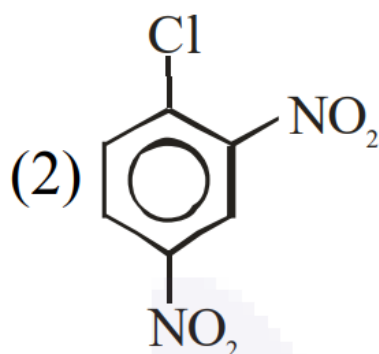
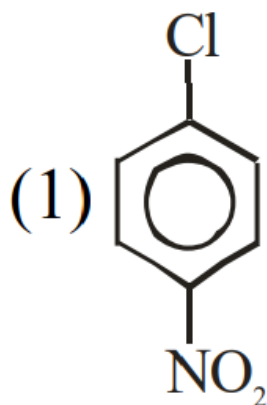
General Instructions

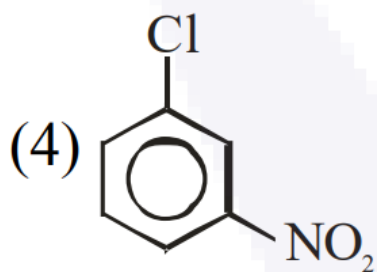
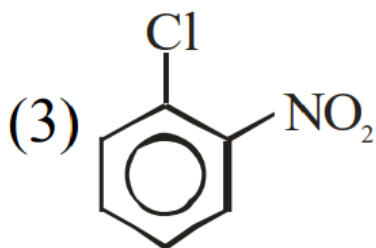
Read the following instructions very carefully and strictly follow them:

- (A) The test is of 3 hours duration.
- (B) The question paper consists of 90 questions. The maximum marks are 300.
- (C) There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
- (D) Each part (subject) has 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. In Section-B, attempt any five questions out of 10. 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.

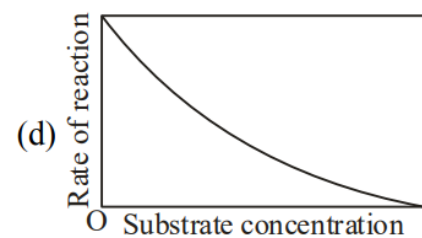
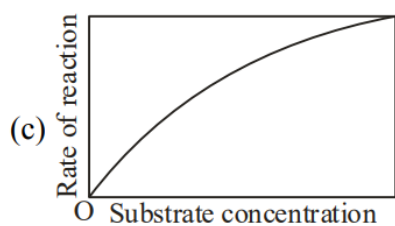
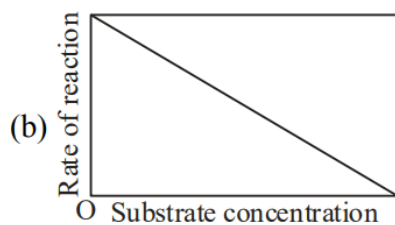
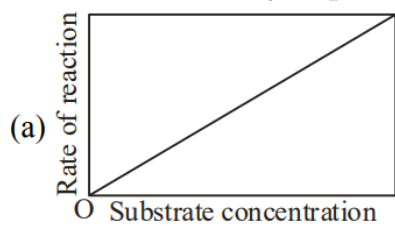
Section-A

1. The compound which will have the lowest rate towards nucleophilic aromatic substitution on treatment with OH^- is:





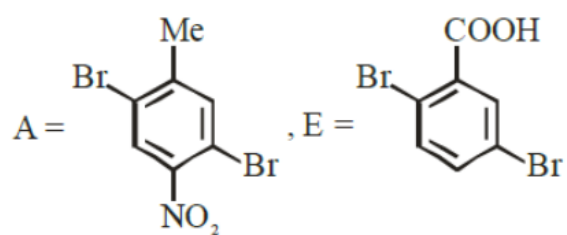
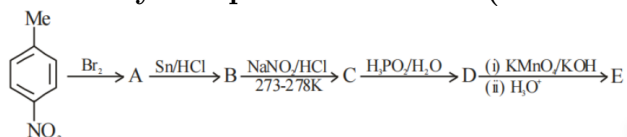
2. The variation of the rate of an enzyme-catalyzed reaction with substrate concentration is correctly represented by which graph?



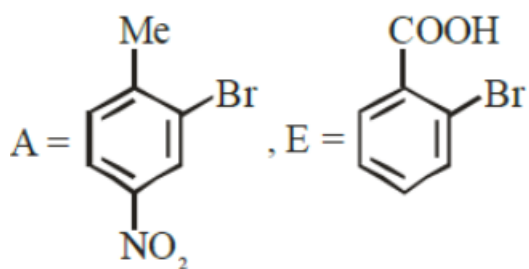
Options:

1. a
2. b.
3. c.
4. d.

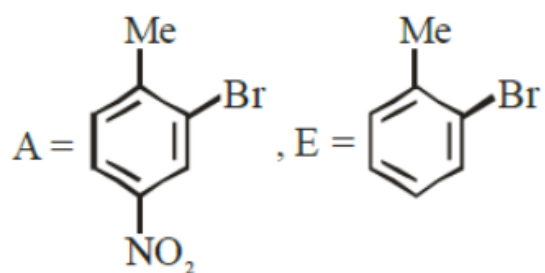
3. Identify the product formed (A and E) in the following reaction sequence:



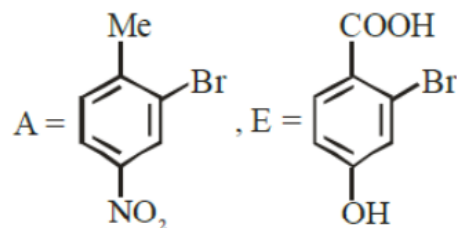
(A)



(B)



(C)



(D)

4. Match List I with List II and choose the correct answer from the options given below:

List I (Elements)	List II (Colour imparted to the flame)
K	Brick Red
Ca	Violet
Sr	Apple Green
Ba	Crimson Red

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

5. Reaction of thionyl chloride with white phosphorus forms a compound [A], which on hydrolysis gives [B], a dibasic acid. [A] and [B] are respectively:

- (A) P_4O_6 and H_3PO_3
(B) PCl_3 and H_3PO_3
(C) PCl_5 and H_3PO_4
(D) $POCl_3$ and H_3PO_4
-

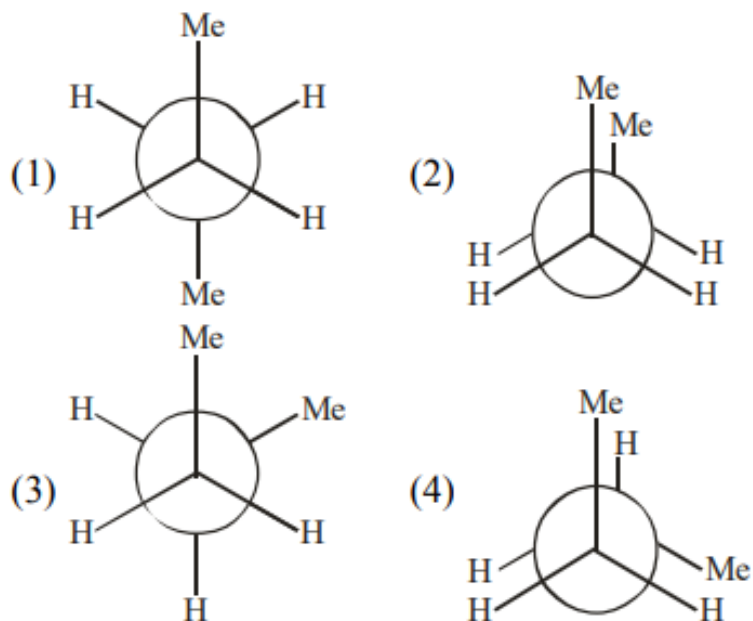
6. A cubic solid is made up of two elements X and Y. Atoms of X are present on every alternate corner and one at the center of the cube. Y is at $\frac{1}{4}$ of the total faces. The empirical formula of the compound is:

- (A) $X_2Y_{1.5}$
(B) $X_{2.5}Y$
(C) $XY_{2.5}$
(D) $X_{1.5}Y_2$
-

7. The radius of the 2^{nd} orbit of Li^{2+} is x. The expected radius of the 3^{rd} orbit of Be^{3+} is:

- (A) $\frac{9}{4}x$
(B) $\frac{4}{9}x$
(C) $\frac{27}{16}x$
(D) $\frac{16}{27}x$
-

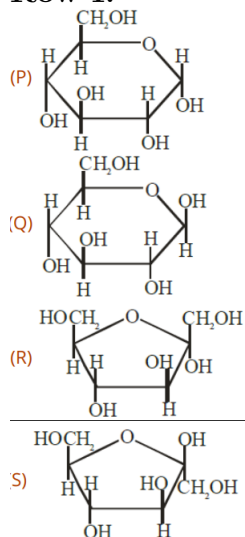
8. Which of the following conformations will be the most stable?



- (A) (1)
(B) (2)
(C) (3)
(D) (4)

9. Match items of Row I with those of Row II:

Row I:



Row II:

- (A) [(i)] α -D-(-)-Fructofuranose
(B) [(ii)] β -D-(-)-Fructofuranose
(C) [(iii)] α -D-(+)-Glucopyranose
(D) [(iv)] β -D-(+)-Glucopyranose

(A) (1) $P \rightarrow \text{iv}$, $Q \rightarrow \text{iii}$, $R \rightarrow \text{i}$, $S \rightarrow \text{ii}$
 (B) (2) $P \rightarrow \text{i}$, $Q \rightarrow \text{ii}$, $R \rightarrow \text{iii}$, $S \rightarrow \text{iv}$
 (C) (3) $P \rightarrow \text{iii}$, $Q \rightarrow \text{iv}$, $R \rightarrow \text{ii}$, $S \rightarrow \text{i}$
 (D) (4) $P \rightarrow \text{iii}$, $Q \rightarrow \text{iv}$, $R \rightarrow \text{i}$, $S \rightarrow \text{ii}$

(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

(A) $\text{Xe} < \text{Kr} < \text{Ne} < \text{He}$
 (B) $\text{He} < \text{Ne} < \text{Kr} < \text{Xe}$
 (C) $\text{He} < \text{Xe} < \text{Kr} < \text{Ne}$
 (D) $\text{He} < \text{Kr} < \text{Xe} < \text{Ne}$

(A) $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$
 (B) $2\text{FeS} + 3\text{O}_2 \rightarrow 2\text{FeO} + 2\text{SO}_2$
 (C) $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$
 (D) $\text{FeO} + \text{SiO}_2 \rightarrow \text{FeSiO}_3$

$$\text{P} \xrightarrow{\quad ? \quad} \text{Q} + \text{R}$$

- (A) (i) CrO_3 , 770 K, 20 atm; (ii) CrO_2Cl_2 , H^+ ; (iii) NaOH ; (iv) H_3O^+
(B) (i) CrO_2Cl_2 , H_3O^+ ; (ii) CrO_3 , 770 K, 20 atm; (iii) NaOH ; (iv) H_3O^+
(C) (i) KMnO_4 , OH^- ; (ii) MoO_3 , Δ ; (iii) NaOH ; (iv) H_3O^+
(D) (i) MoO_3 , Δ ; (ii) CrO_2Cl_2 , H_3O^+ ; (iii) NaOH ; (iv) H_3O^+
-

14. The correct order in aqueous medium of basic strength in case of methyl-substituted amines is:

- (A) $\text{Me}_2\text{NH} > \text{MeNH}_2 > \text{Me}_3\text{N} > \text{NH}_3$
(B) $\text{Me}_2\text{N} > \text{Me}_3\text{NH} > \text{MeNH}_2 > \text{NH}_3$
(C) $\text{NH}_3 > \text{Me}_3\text{N} > \text{MeNH}_2 > \text{Me}_2\text{NH}$
(D) $\text{Me}_3\text{N} > \text{Me}_2\text{NH} > \text{MeNH}_2 > \text{NH}_3$
-

15. 25-volume hydrogen peroxide means:

- (A) 1 L marketed solution contains 250 g of H_2O_2
(B) 1 L marketed solution contains 75 g of H_2O_2
(C) 1 L marketed solution contains 25 g of H_2O_2
(D) 1 L marketed solution contains 25 g of H_2O
-

16. Which of the following statements is incorrect for antibiotics?

- (A) An antibiotic must be a product of metabolism.
(B) An antibiotic is a synthetic substance produced as a structural analogue of naturally occurring antibiotic.
(C) An antibiotic should promote the survival of microorganisms.
(D) An antibiotic should be effective in low concentrations.
-

17. Compound A reacts with NH_3Cl and forms B and C. Compound B reacts with H_2O and CO_2 to form C. The compounds A, B, and C are:

- (A) CaCl_2 , NH_3 , NH_4HCO_3
(B) CaCl_2 , NH_4^+ , $(\text{NH}_4)_2\text{CO}_3$
(C) $\text{Ca}(\text{OH})_2$, NH_3 , NH_4HCO_3
(D) $\text{Ca}(\text{OH})_2$, NH_4^+ , $(\text{NH}_4)_2\text{CO}_3$
-

18. Some reactions of NO_2 relevant to photochemical smog formation are:



Identify A, B, X, and Y:

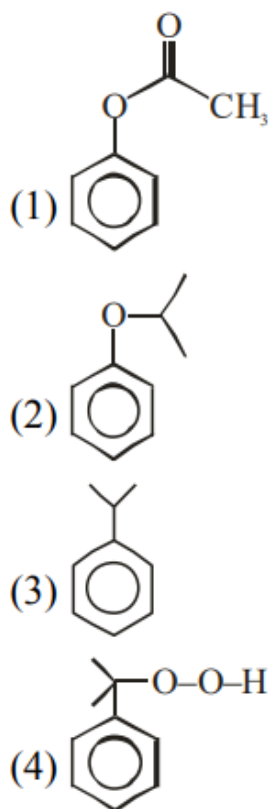
- (A) X = O, Y = NO, A = O₂, B = O₃
 (B) X = N₂O, Y = O, A = O₃, B = NO
 (C) X = $\frac{1}{2}$ O₂, Y = NO₂, A = O₃, B = O₂
 (D) X = NO, Y = O, A = O₂, B = N₂O₃
-

19. Match the List-I with List-II:

Cations (List-I)	Group Reaction (List-II)
P → Pb ²⁺ , Cu ²⁺	(i) H ₂ S gas in presence of dilute HCl
Q → Al ³⁺ , Fe ³⁺	(ii) (NH ₄) ₂ CO ₃ in presence of NH ₄ OH
R → Co ²⁺ , Ni ²⁺	(iii) NH ₄ OH in presence of NH ₄ Cl
S → Ba ²⁺ , Ca ²⁺	(iv) H ₂ S in presence of NH ₄ OH

- (1) P → i, Q → iii, R → ii, S → iv
 (2) P → iv, Q → ii, R → iii, S → i
 (3) P → iii, Q → i, R → iv, S → ii
 (4) P → i, Q → iii, R → iv, S → ii
-

20. In the cumene to phenol preparation in the presence of air, the intermediate is:



Section B

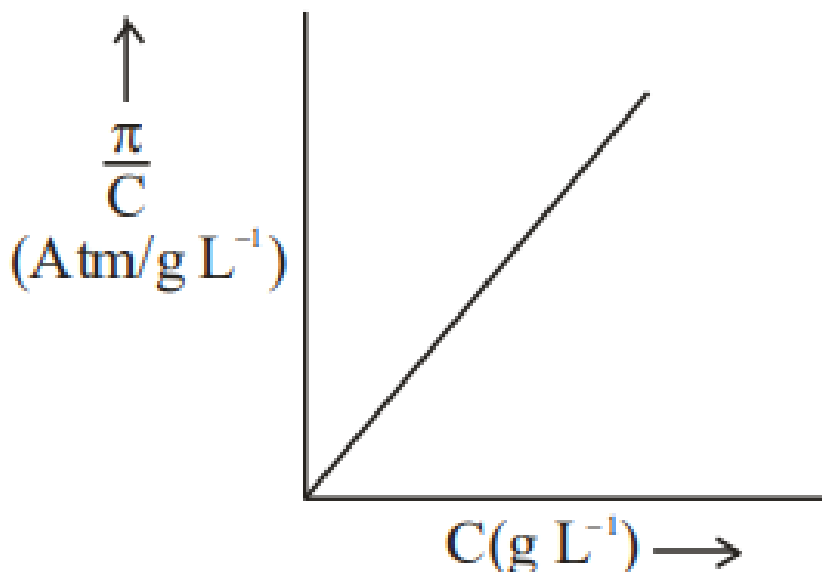
21. An athlete is given 100 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) for energy, which is equivalent to 1800 kJ of energy. If 50% of this energy is utilized for activities, the weight of extra water needed to perspire is _____ g. (Nearest integer)

Given: Enthalpy of evaporation of water = 45 kJ/mol; molar masses: C = 12 g/mol, H = 1 g/mol, O = 16 g/mol.

22. A litre of buffer solution contains 0.1 mole of each NH_3 and NH_4Cl . On addition of 0.02 mole of HCl, the pH of the solution is found to be _____ $\times 10^{-3}$ (Nearest integer).

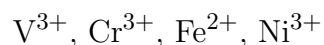
Given: $\text{pK}_b(\text{NH}_3) = 4.745$; $\log 2 = 0.301$; $\log 3 = 0.477$; $T = 298 \text{ K}$.

23. The osmotic pressure of solutions of PVC in cyclohexanone at 300 K are plotted on the graph. The molar mass of PVC is _____ g mol^{-1} (Nearest integer).



Given: $R = 0.083 \text{ L atm K}^{-1} \text{ mol}^{-1}$

24. How many of the following metal ions have a similar value of spin-only magnetic moment in the gaseous state?



Given: Atomic numbers: V = 23, Cr = 24, Fe = 26, Ni = 28.

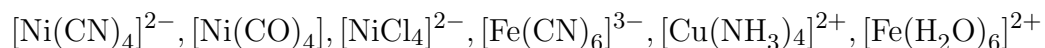
25. The density of a monobasic strong acid (Molar mass 24.2 g mol^{-1}) is 1.21 kg L^{-1} . The volume of its solution required for the complete neutralization of 25 mL of 0.24 M NaOH is $\text{-----} \times 10^{-3} \text{ mL}$ (Nearest integer).

26. For the first-order reaction $A \rightarrow B$, the half-life is 30 min . The time taken for 75% completion of the reaction is ----- min (Nearest integer).

27. The total number of lone pairs of electrons on oxygen atoms of ozone is ----- .

28. In sulphur estimation, 0.471 g of an organic compound gave 1.4439 g of barium sulphate. The percentage of sulphur in the compound is _____ (Nearest Integer).
Given: Atomic masses: Ba = 137, S = 32, O = 16.

29. The number of paramagnetic species from the following is _____.



30. Consider the cell:



Given: $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.771 \text{ V}$, $E^\circ_{\text{H}^+/\text{H}_2} = 0 \text{ V}$, $T = 298 \text{ K}$.

If the potential of the cell is 0.712 V, the ratio of concentration of Fe^{2+} to Fe^{3+} is _____ (Nearest integer).
