JEE Main 2023 1 Feb Shift 1 Chemistry Question Paper

Time Allowed :3 Hours	**Maximum Marks :**300	**Total Questions :**90

General Instructions

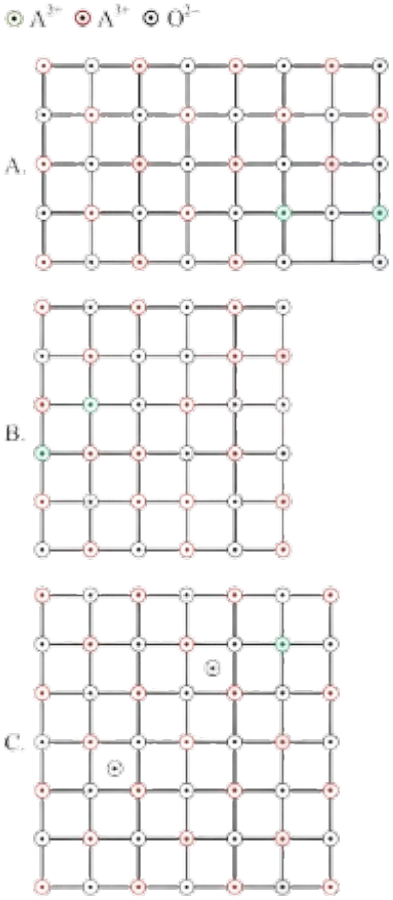
Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 90 questions, out of which 75 are to attempted. The maximum marks are 300.
3. There are three parts in the question paper consisting of Physics, Chemistry and Mathematics having 30 questions in each part of equal weightage.
4. 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

CHEMISTRY

Section-A

1. Which of the following represents the lattice structure of $A_{0.95}O$ containing A^{2+}, A^{3+} and O^{2-} ions?



(1) B and C only

(2) B only

(3) A and B only

(4) A only

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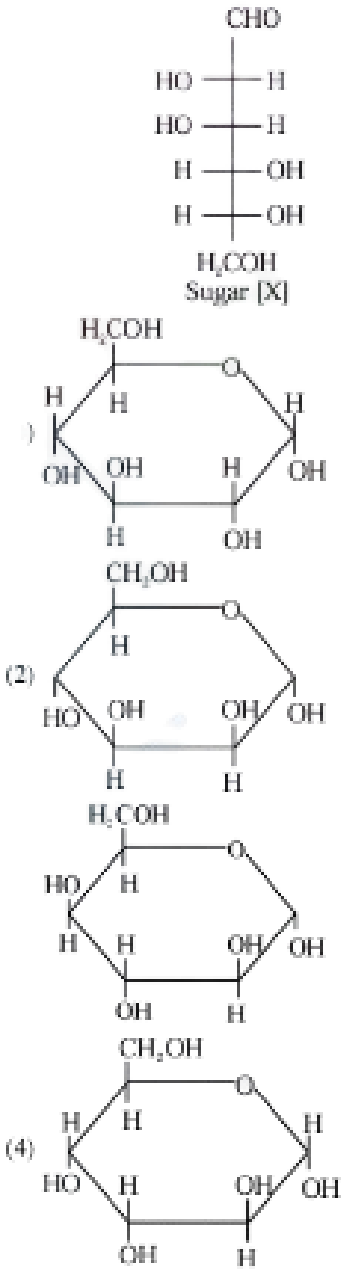
2. The correct representation in six-membered pyranose form for the following sugar $[X]$ is:



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3. Highest oxidation state of Mn is exhibited in Mn_2O_7. The correct statements about Mn_2O_7 are:

(A) Mn is tetrahedrally surrounded by oxygen atoms

(B) Mn is octahedrally surrounded by oxygen atoms

(C) Contains Mn-O-Mn bridge

(D) Contains Mn-Mn bond

Choose the correct answer from the options given below:

(1) A and C only

(2) A and D only

(3) B and D only

(4) B and C only

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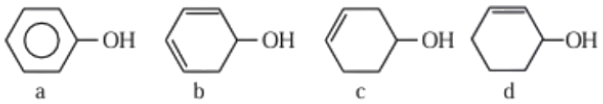
4. Decreasing order of dehydration of the following alcohols is:



(1) $a > d > b > c$

(2) $b > d > c > a$

(3) $b > a > d > c$

(4) $d > b > c > a$

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5. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Amongst He, Ne, Ar, and Kr; 1 g of activated charcoal adsorbs more of Kr.

Reason R: The critical volume V_c (cm^3 mol^{-1}) and critical pressure P_c (atm) is highest for Krypton but the compressibility factor at critical point Z_c is lowest for Krypton. In the light of the above statements, choose the correct answer from the options given below:

(1) A is true but R is false

(2) A is false but R is true

(3) Both A and R are true but R is NOT the correct explanation of A

(4) Both A and R are true and R is the correct explanation of A

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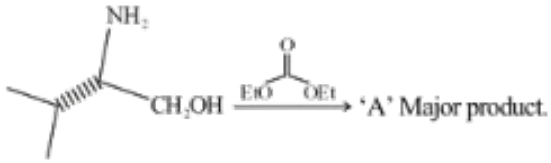
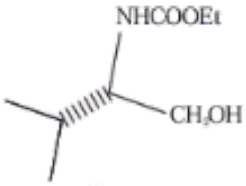
6. In the following reaction, 'A' is:



(1)



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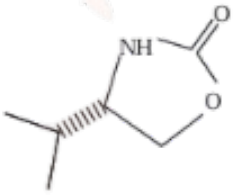

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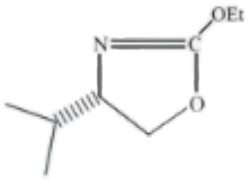

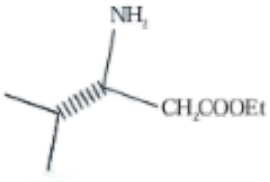

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7. Match List I with List II.

List-I	List-II
(A) Tranquilizers	(I) Anti blood clotting
(B) Aspirin	(II) Salvarsan
(C) Antibiotic	(III) Antidepressant drugs
(D) Antiseptic	(IV) Soframicine

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

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

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

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

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8. Given below are two statements:

Statement I: Chlorine can easily combine with oxygen to form oxides; and the product has a

tendency to explode.

Statement II: Chemical reactivity of an element can be determined by its reaction with oxygen and halogens.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both the statements I and II are true

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both the Statements I and II are false

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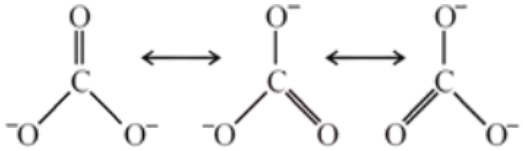
9. Resonance in carbonate ion (CO_3^{2-}) is:



Which of the following is true?

(1) All these structures are in dynamic equilibrium with each other.

(2) Each structure exists for equal amount of time.

(3) CO_3^{2-} has a single structure i.e., resonance hybrid of the above three structures.

(4) It is possible to identify each structure individually by some physical or chemical method.

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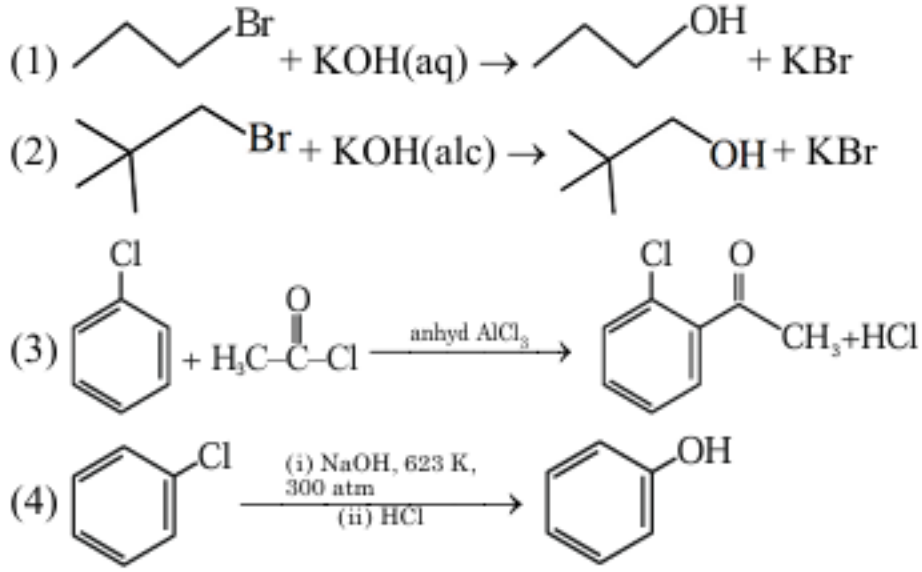
10. Identify the incorrect option from the following:



11. A solution of $FeCl_3$, when treated with $K_4[Fe(CN)_6]$, gives a prussian blue precipitate due to the formation of:

(1) $K_3[Fe(CN)_6]$

(2) $Fe[Fe(CN)_6]$

(3) $Fe_3[Fe(CN)_6]_2$

(4) $Fe_4[Fe(CN)_6]_3$

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12. Which of the following are examples of double salts?

(A) $FeSO_4.(NH_4)_2SO_4.6H_2O$

(B) $CuSO_4.4NH_3.H_2O$

(C) $K_2SO_4.Al_2(SO_4)_3.24H_2O$

(D) $Fe(CN)_2.4KCN$

Choose the correct answer:

(1) A and C only

(2) A and B only

(3) A, B and D only

(4) B and D only

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13. Which of the following complex will show largest splitting of d-orbitals?

(1) $[Fe(C_2O_4)_3]^{3-}$

(2) $[Fe_6(CN)_6]$

(3) $[Fe(CN)_6]^{3-}$

(4) $[Fe(NH_3)_6]^{3+}$

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14. How can photochemical smog be controlled?

(1) By using tall chimneys

(2) By complete combustion of fuel

(3) By using catalytic converters in the automobiles/industry

(4) By using catalyst

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15. Match List I with List II.

List I	List II
(A) Slaked lime	(I) NaOH
(B) Dead burnt plaster	(II) $Ca(OH)_2$
(C) Caustic soda	(III) $Na_2CO_3.10H_2O$
(D) Washing soda	(IV) $CaSO_4$

Choose the correct answer from the options given below:

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

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

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

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

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16. Choose the correct statement(s): A. Beryllium oxide is purely acidic in nature.

B. Beryllium carbonate is kept in the atmosphere of CO_2.

C. Beryllium sulphate is readily soluble in water.

D. Beryllium shows anomalous behavior.

Choose the correct answer from the options given below:

(1) A, B and C only

(2) B, C and D only

(3) A and B only

(4) A only

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17. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: In an Ellingham diagram, the oxidation of carbon to carbon monoxide shows a negative slope with respect to temperature.

Reason R: CO tends to get decomposed at higher temperature.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both A and R are correct and R is the correct explanation of A

(2) Both A and R are correct but R is NOT the correct explanation of A

(3) A is false but R is true

(4) A is correct but R is incorrect

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18. But-2-yne is reacted separately with one mole of Hydrogen as shown below:

$$B \xrightarrow{\text{Na, liquid } NH_3} CH_3C \equiv CH + H_2 \xrightarrow{Pd/C} A$$

A. A is more soluble than B.

B. The boiling point & melting point of A are higher and lower than B respectively.

C. A is more polar than B because dipole moment of A is zero.

D. Br_2 adds easily to B than A.

Identify the incorrect statements from the options given below:

(1) B and C only

(2) B, C and D only

(3) A, C and D only

(4) A and B only

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19. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: Hydrogen is an environment friendly fuel.

Reason R: The atomic number of hydrogen is 1 and it is a very light element.

In the light of the above statements, choose the correct answer from the options given below:

(1) A is true but R is false

(2) Both A and R are true but R is NOT the correct explanation of A

(3) A is false but R is true

(4) Both A and R are correct and R is the correct explanation of A

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20. Match List I with List II.

List I	List II
(A) Molisch's Test	(I) Peptide
(B) Biuret Test	(II) Carbohydrate
(C) Carbamine Test	(III) Primary amine
(D) Schiff's Test	(IV) Aldehyde

Choose the correct answer from the options given below:

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

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

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

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

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21. The density of 3 M solution of NaCl is 1.0 g mL^{-1}. Molality of the solution is ___ $\times 10^{-2}$ m. (Nearest integer)

Given: Molar mass of Na and Cl is 23 and 35.5 g mol^{-1} respectively.

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22. Electrons in a cathode ray tube have been emitted with a velocity of 1000 ms^{-1}. The number of following statements which is/are true about the emitted radiation is —.

Given: $h = 6 \times 10^{-34}$ Js, $m_e = 9 \times 10^{-31}$ kg.

(1) The deBroglie wavelength of the electron emitted is 666.67 nm.

(2) The characteristic of electrons emitted depend upon the material of the electrodes of the cathode ray tube.

(3) The cathode rays start from cathode and move towards anode.

(4) The nature of the emitted electrons depends on the nature of the gas present in cathode ray tube.

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23. Sum of oxidation states of bromine in bromic acid and perbromic acid is —.

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24. At what pH, given half cell MnO_4^- (0.1 M) — Mn^{2+} (0.001 M) will have electrode potential of 1.282 V? ____ (Nearest Integer)

Given $E^{\circ}_{MnO_4^-/Mn^{2+}} = 1.54\,\text{V}$, $\frac{2.303RT}{F} = 0.059V$

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25. Number of isomeric compounds with molecular formula C_9H_10O which (i) do not dissolve in NaOH (ii) do not dissolve in HCl. (iii) do not give orange precipitate with 2, 4 - DNP (iv) on hydrogenation give identical compound with molecular formula C_9H_12O is ____.

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26. (i) X(g) $\rightleftharpoons$ Y(g) + Z(g), $K_{p1} = 3$

(ii) A(g) $\rightleftharpoons$ 2B(g), $K_{p2} = 1$

If the degree of dissociation and initial concentration of both the reactants X(g) and A(g) are equal, then the ratio of the total pressure at equilibrium $\left(\frac{P_1}{P_2}\right)$ is equal to x : 1. The value of x is ____(Nearest integer)

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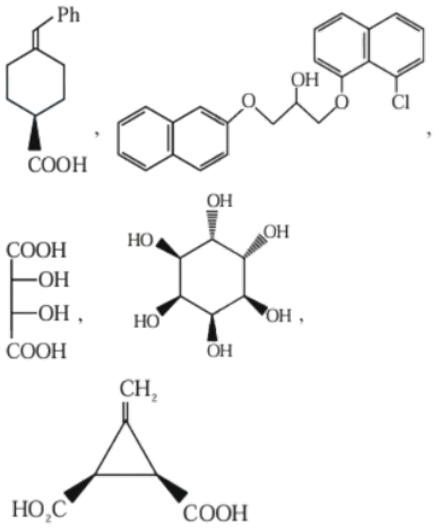
27. The total number of chiral compound/s from the following is _____ .



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28. A and B are two substances undergoing radioactive decay in a container. The half-life of A is 15 min and that of B is 5 min. If the initial concentration of B is 4 times that of A and they both start decaying at the same time, how much time will it take for the concentration of both of them to be same? _____ min.

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29. At 25°C, the enthalpy of the following processes are given:

$$\mathrm{H_2}(g) + \mathrm{O_2}(g) \rightarrow 2\mathrm{OH}(g)\, \Delta H^\circ = 78\,\mathrm{kJ\ mol^{-1}}$$

$$\mathrm{H_2}(g) + \frac{1}{2}\mathrm{O_2}(g) \rightarrow \mathrm{H_2O}(g)\, \Delta H^\circ = -242\,\mathrm{kJ\ mol^{-1}}$$

$$\mathrm{H_2}(g) \rightarrow 2\mathrm{H}(g)\, \Delta H^\circ = 436\,\mathrm{kJ\ mol^{-1}}$$

$$\frac{1}{2}\mathrm{O_2}(g) \rightarrow \mathrm{O}(g)\, \Delta H^\circ = 249\,\mathrm{kJ\ mol^{-1}}$$

What would be the value of X for the following reaction?

$$\mathrm{H_2O}(g) \rightarrow \mathrm{H}(g) + \mathrm{OH}(g)\, \Delta H^\circ = X\,\mathrm{kJ\ mol^{-1}}$$

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30. 25 mL of an aqueous solution of KCl was found to require 20 mL of 1 M $\mathrm{AgNO_3}$ solution when titrated using $\mathrm{K_2CrO_4}$ as an indicator. What is the depression in freezing point of KCl solution of the given concentration? _____ (Nearest integer).

(Given: $K_f = 2.0\,\mathrm{K\ kg\ mol^{-1}}$) Assume 1) 100% ionization and 2) density of the aqueous solution as 1 g $\mathrm{mL^{-1}}$
