JEE Main 2023 Chemistry Question Paper Jan 29 Shift 2

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

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.

Chemistry Section - A

1. An indicator 'X' is used for studying the effect of variation in concentration of iodide on the rate of reaction of iodide ion with H_2O_2 at room temp. The indicator 'X' forms blue colored complex with compound 'A' present in the solution. The indicator 'X' and compound 'A' respectively are

(A) Starch and iodine
(B) Starch and H_2O_2
(C) Methyl orange and iodine
(D) Methyl orange and H_2O_2

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2. Match List I and List II

List I	List II
A. Osmosis	I. Solvent molecules pass through semi permeable membrane towards solvent side.
B. Reverse osmosis	II. Movement of charged colloidal particles under the influence of applied electric potential towards oppositely charged electrodes.
C. Electro osmosis	III. Solvent molecules pass through semi permeable membrane towards solution side.
D. Electrophoresis	IV. Dispersion medium moves in an electric field.

Choose the correct answer from the options given below:

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

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3. The concentration of dissolved Oxygen in water for growth of fish should be more than X ppm and Biochemical Oxygen Demand in clean water should be less than Y ppm. X and Y in ppm are, respectively.

(A) 6 and 5
(B) 4 and 15
(C) 4 and 8
(D) 6 and 12

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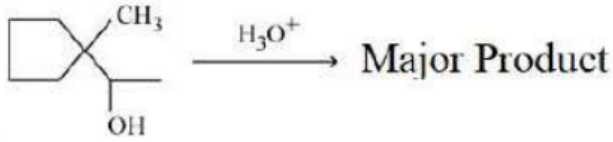
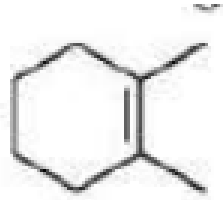
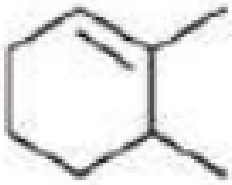
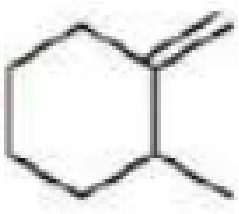
4. Find out the major product for the following reaction.



(A) 

(B) 

(C) 

(D) 

5. The major component of which of the following ore is sulphide based mineral?

(A) Malachite
(B) Calamine
(C) Sphalerite
(D) Siderite

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6. Given below are two statements: Statement I: The decrease in first ionization enthalpy from B to Al is much larger than that from Al to Ga. Statement II: The d orbitals in Ga are completely filled. In the light of the above statements, choose the most appropriate answer from the options given below

(A) Statement I is incorrect but statement II is correct
(B) Both the statements I and II are incorrect
(C) Both the statements I and II are correct
(D) Statement I is correct but statement II is incorrect

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7. A solution of Co(II) in amyl alcohol has a _____ colour.

(A) Yellow
(B) Green
(C) Blue
(D) Orange-Red

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8. Which of the following relations are correct ?
(A) $\Delta U = q + p\Delta V$
(B) $\Delta G = \Delta H - T\Delta S$
(C) $\Delta S = \frac{q_{rev}}{T}$
(D) $\Delta H = \Delta U - \Delta nRT$
Choose the most appropriate answer from the options given below:

(A) B and D Only
(B) C and D Only
(C) B and C Only
(D) A and B Only

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9. Correct order of spin only magnetic moment of the following complex ions is: (Given At.no. Fe: 26, Co:27)
$[FeF_6]^{3-}, [CoF_6]^{3-}, [Co(C_2O_4)_3]^{3-}$

(A) $[Co(C_2O_4)_3]^{3-} > [CoF_6]^{3-} > [FeF_6]^{3-}$
(B) $[FeF_6]^{3-} > [Co(C_2O_4)_3]^{3-} > [CoF_6]^{3-}$
(C) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Co(C_2O_4)_3]^{3-}$
(D) $[CoF_6]^{3-} > [FeF_6]^{3-} > [Co(C_2O_4)_3]^{3-}$

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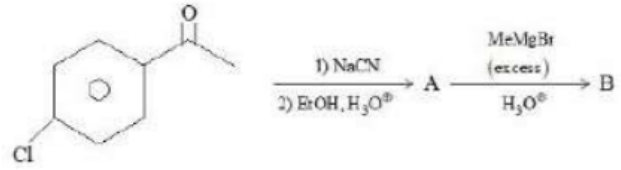
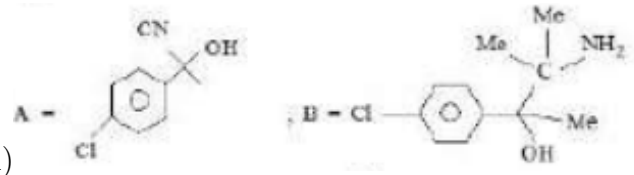
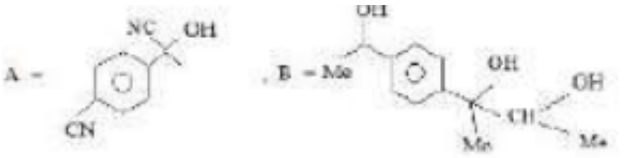
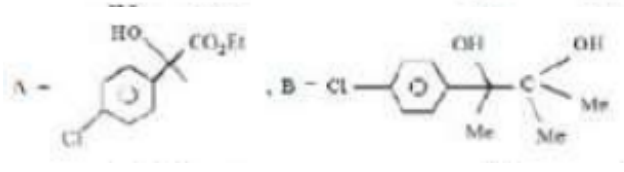
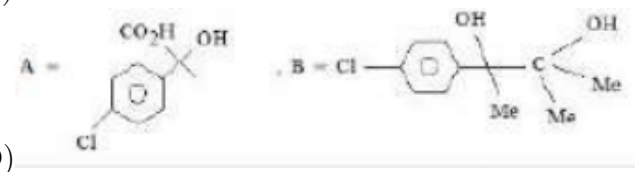
10. Find out the major products from the following reaction sequence.



(A) 

(B) 

(C) 

(D) 

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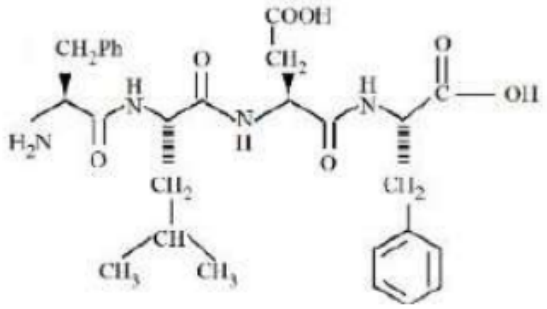
11. When a hydrocarbon A undergoes combustion in the presence of air, it requires 9.5 equivalents of oxygen and produces 3 equivalents of water. What is the molecular formula of A?

(A) C_9H_6
(B) C_8H_6
(C) C_6H_6
(D) C_9H_8

12. Following tetrapeptide can be represented as



(F, L, D, Y, I, Q, P are one letter codes for amino acids)

(A) YQLF
(B) FIQY
(C) PLDY
(D) FLDY

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13. Reaction of propanamide with Br_2/KOH(aq) produces:

(A) Ethylnitrile
(B) Propylamine
(C) Propanenitrile
(D) Ethylamine

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14. Match List I with List II

List I	List II
A. van't Hoff factor, i	I. Cryoscopic constant
B. k_f	II. Isotonic solutions
C. Solutions with same osmotic pressure	III. $\frac{\text{Normal molar mass}}{\text{Abnormal molar mass}}$
D. Azeotropes	IV. Solutions with same composition of vapour above it

Choose the correct answer from the options given below:

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

15. A doctor prescribed the drug Equanil to a patient. The patient was likely to have symptoms of which disease?

(A) Stomach ulcers
(B) Hyperacidity
(C) Anxiety and stress
(D) Depression and hypertension

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16. The one giving maximum number of isomeric alkenes on dehydrohalogenation reaction is (excluding rearrangement)

(A) 2-Bromopropane
(B) 1-Bromo-2-methylbutane
(C) 2-Bromopentane
(D) 2-Bromo-3,3-dimethylpentane

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17. Match List I with List II

List I	List II
A. Elastomeric polymer	I. Urea formaldehyde resin
B. Fibre Polymer	II. Polystyrene
C. Thermosetting Polymer	III. Polyester
D. Thermoplastic Polymer	IV. Neoprene

Choose the correct answer from the options given below:

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

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18. Given below are two statements:
Statement I: Nickel is being used as the catalyst for producing syn gas and edible fats.
Statement II: Silicon forms both electron rich and electron deficient hydrides.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Statement I is correct but statement II is incorrect
(B) Statement I is incorrect but statement II is correct
(C) Both the statements I and II are correct
(D) Both the statements I and II are incorrect

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19. The set of correct statements is:
(i) Manganese exhibits +7 oxidation state in its oxide.
(ii) Ruthenium and Osmium exhibit +8 oxidation in their oxides.
(iii) Sc shows +4 oxidation state which is oxidizing in nature.
(iv) Cr shows oxidising nature in +6 oxidation state.

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

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20. According to MO theory the bond orders for O_2^{2-}, CO and NO^+ respectively, are

(A) 1, 3 and 2
(B) 2, 3 and 3
(C) 1, 3 and 3
(D) 1, 2 and 3

Chemistry Section - B

21. The volume of HCl, containing 73 g L^{-1}, required to completely neutralise NaOH obtained by reacting 0.69 g of metallic sodium with water, is _____ mL. (Nearest Integer) (Given: molar Masses of Na, Cl, O, H, are 23, 35.5, 16 and 1 g mol^{-1} respectively)

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22. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO_2 was produced. The molar mass of compound is _____ g mol^{-1} (Nearest integer).

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23. For conversion of compound A $\rightarrow$ B, the rate constant of the reaction was found to be 4.6×10^{-5} L mol^{-1} s^{-1}. The order of the reaction is _____.

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24. On heating, $LiNO_3$ gives how many compounds among the following? Li_2O, N_2, O_2, $LiNO_2$, NO_2

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25. A metal M forms hexagonal close-packed structure. The total number of voids in 0.02 mol of it is _____ $\times 10^{21}$ (Nearest integer). (Given $N_A = 6.02 \times 10^{23}$)

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26. Total number of acidic oxides among
N_2O_3, NO_2, N_2O, Cl_2O_7, SO_2, CO, CaO, Na_2O and NO is _____.

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27. At 298 K
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3$ (g), $K_1 = 4 \times 10^5$
$N_2(g) + O_2(g) \rightleftharpoons 2NO$ (g), $K_2 = 1.6 \times 10^{12}$
$H_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons H_2O$ (g), $K_3 = 1.0 \times 10^{-13}$
Based on above equilibria, the equilibrium constant of the reaction,
$2NH_3$ (g) + $\frac{5}{2}O_2$ (g) $\rightleftharpoons$ 2NO (g) + $3H_2O$ (g) is _____ $\times 10^{-33}$ (Nearest integer).

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28. The denticity of the ligand present in the Fehling's reagent is _____.

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29. The equilibrium constant for the reaction
$Zn(s) + Sn^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Sn(s)$ is 1×10^{20} at 298 K. The magnitude of standard electrode potential of Sn/Sn^{2+} if $E^\circ_{Zn^{2+}/Zn}$ = -0.76 V is _____ $\times 10^{-2}$ V. (Nearest integer).
(Given: $\frac{2.303RT}{F} = 0.059$ V)

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30. Assume that the radius of the first Bohr orbit of hydrogen atom is 0.6 Å. The radius of the third Bohr orbit of He^+ is _____ picometer. (Nearest Integer)
