JEE Main 2023 April 11 Shift 1 Chemistry Question Paper

Time Allowed :1 Hour	Maximum Marks :100	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 90 questions. 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.

1. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R :
Assertion A : In the photoelectric effect, the electrons are ejected from the metal surface as soon as the beam of light of frequency greater than threshold frequency strikes the surface.
Reason R : When the photon of any energy strikes an electron in the atom, transfer of energy from the photon to the electron takes place.
In the light of the above statements, choose the most appropriate answer from the options given below :
(A) Both A and R are correct and R is the correct explanation of A
(B) Both A and R are correct but R is NOT the correct explanation of A
(C) A is correct but R is not correct
(D) A is not correct but R is correct

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2. Match List-I with List-II :

List-I Species	List-II Geometry/Shape
A. H_3O^+	I. Tetrahedral
B. Acetylide anion	II. Linear
C. NH_4^-	III. Pyramidal
D. ClO_2^-	IV. Bent

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

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3. 25 mL of silver nitrate solution ($1M$) is added dropwise to 25 mL of potassium iodide ($1.05M$) solution. The ion(s) present in very small quantity in the solution is/are :
(A) I^- only
(B) Ag^+ and I^- both
(C) K^+ only
(D) NO_3^- only

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4. For elements B, C, N, Li, Be, O and F, the correct order of first ionization enthalpy is :
(A) $Li < Be < B < C < N < O < F$
(B) $Li < B < Be < C < O < N < F$
(C) $B > Li > Be > C > N > O > F$
(D) $Li < Be < B < C < O < N < F$

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5. In the extraction process of copper, the product obtained after carrying out the reactions:
(i) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$
(ii) $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$ **is called :**
(A) Copper matte
(B) Copper scrap
(C) Blister copper
(D) Reduced copper

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6. Given below are two statements:
Statement-I : Methane and steam passed over a heated Ni catalyst produces hydrogen gas.
Statement-II : Sodium nitrite reacts with NH_4Cl to give H_2O, N_2 and $NaCl$.
In the light of the above statements, choose the most appropriate answer from the options given below :
(A) Both the statements I and II are correct
(B) Both the statements I and II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

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7. Match List-I with List-II :

List-I	List-II
A. K	I. Thermonuclear reactions
B. KCl	II. Fertilizer
C. KOH	III. Sodium potassium pump
D. Li	IV. Absorbent of CO_2

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

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8. For compound having the formula $GaAlCl_4$, the correct option from the following is :
(A) Oxidation state of Ga in the salt $GaAlCl_4$ is +3.
(B) Ga is coordinated with Cl in $GaAlCl_4$
(C) Ga is more electronegative than Al and is present as a cationic part of the salt $GaAlCl_4$
(D) Cl forms bond with both Al and Ga in $GaAlCl_4$

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9. Which of the following complex has a possibility to exist as meridional isomer ?
(A) $[Co(NH_3)_3(NO_2)_3]$
(B) $[Co(en)_3]$
(C) $[Co(en)_2Cl_2]$
(D) $[Pt(NH_3)_2Cl_2]$

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10. The set which does not have ambidentate ligand(s) is :
(A) $EDTA^{4-}, NCS^-, C_2O_4^{2-}$
(B) $NO_2^-, C_2O_4^{2-}, EDTA^{4-}$
(C) $C_2O_4^{2-}$, ethylene diammine, H_2O
(D) $C_2O_4^{2-}, NO_2^-, NCS^-$

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11. Given below are two statements:
Statement I: If BOD is 4 ppm and dissolved oxygen is 8 ppm, then it is a good quality water.
Statement II: If the concentration of zinc and nitrate salts are 5 ppm each, then it can be a good quality water.
In the light of the above statements, choose the most appropriate answer from the options given below :
(A) Both the statements I and II are correct
(B) Both the statements I and II are incorrect

(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

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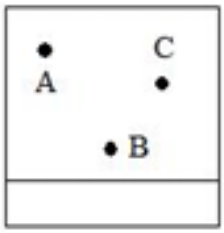
12. Thin layer chromatography of a mixture shows the following observation:



The correct order of elution in the silica gel column chromatography is :
(A) B, C, A
(B) A, C, B
(C) C, A, B
(D) B, A, C

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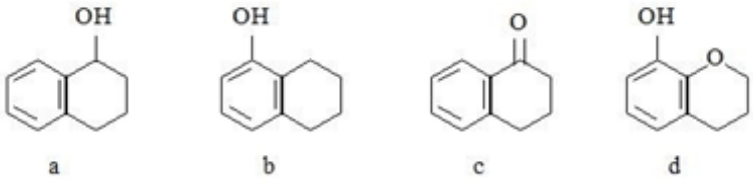
13. Arrange the following compounds in increasing order of rate of aromatic electrophilic substitution reaction :



(A) c, a, b, d
(B) b, c, a, d
(C) d, b, c, a
(D) d, b, a, c

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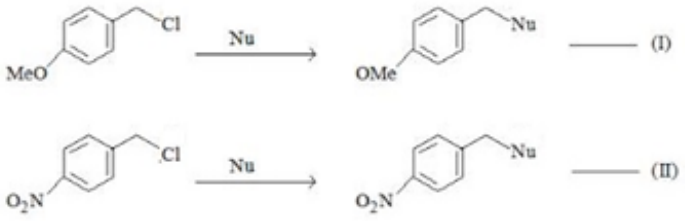
14. Find out the correct statement from the options given below for the following 2 reactions:



Where Nu = Nucleophile

Reaction (I): p-chloroanisole + Nu; Reaction (II): p-chloronitrobenzene + Nu.
(A) Reaction (I) is of 1^{st} order and reaction (II) is of 2^{nd} order
(B) Reactions (I) and (II) both are of 1^{st} order
(C) Reactions (I) and (II) both are of 2^{nd} order
(D) Reaction (I) is of 2^{nd} order and reaction (II) is of 1^{st} order

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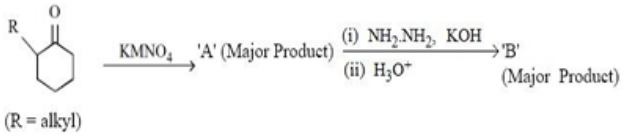
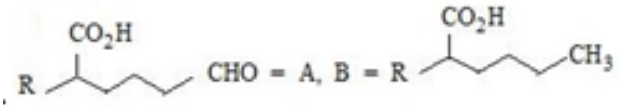
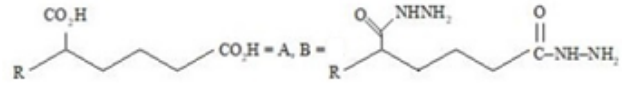
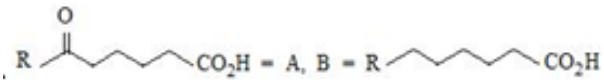
15. In the following reaction sequence:

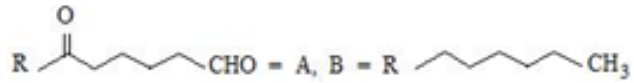


(R = alkyl)

(A) 

(B) 

(C) 

(D) 

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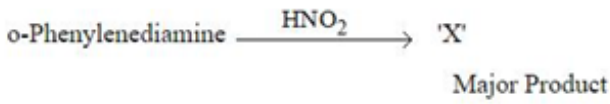
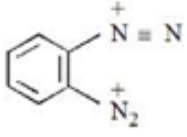
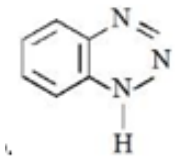
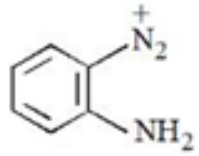
16. The complex that dissolves in water is :
(A) $[Fe_3(OH)_2(OAc)_6]Cl$
(B) $K_3[Co(NO_2)_6]$
(C) $Fe_4[Fe(CN)_6]_3$
(D) $(NH_4)_3[As(Mo_3O_{10})_4]$

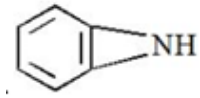


17.
'X' is :

(A) 

(B) 

(C) 

(D) 

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18. The polymer X - consists of linear molecules and is closely packed. It is prepared in the presence of triethylaluminium and titanium tetrachloride under low pressure. The polymer X is-

(A) Polytetrafluoroethane
(B) Polyacrylonitrile
(C) High density polythene
(D) Low density polythene

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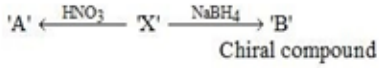
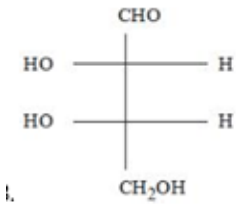
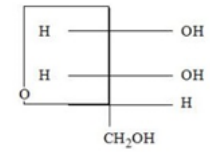
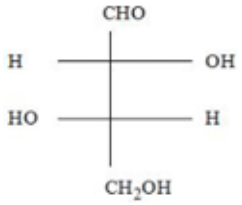
19. L-isomer of tetrose X ($C_4H_8O_4$) gives positive Schiff's test and has two chiral carbons. On acetylation, 'X' yields triacetate. 'X' also undergoes following reactions:



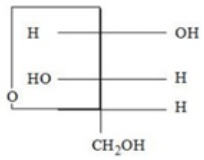
(A) 

(B) 

(C)



(D)



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20. When a solution of mixture having two inorganic salts was treated with freshly prepared ferrous sulphate in acidic medium, a dark brown ring was formed whereas on treatment with neutral $FeCl_3$, it gave deep red colour which disappeared on boiling and a brown red ppt was formed. The mixture contains :
(A) $C_2O_4^{2-}$ & NO_3^-
(B) CH_3COO^- & NO_3^-
(C) SO_3^{2-} & CH_3COO^-
(D) SO_3^{2-} & $C_2O_4^{2-}$

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21. A solution of sugar is obtained by mixing 200g of its 25% solution and 500g of its 40% solution (both by mass). The mass percentage of the resulting sugar solution is ____ (Nearest integer)

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22. An atomic substance A of molar mass 12 g mol^{-1} has a cubic crystal structure with edge length of 300 pm. The no. of atoms present in one unit cell of A is ____ (Nearest integer). Given the density of A is 3.0 g mL^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1}

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23. Solid fuel used in rocket is a mixture of Fe_2O_3 and Al (in ratio 1:2). The heat evolved (kJ) per gram of the mixture is ____ (Nearest integer). Given: $\Delta H_f^\circ(Al_2O_3) = -1700$ kJ mol^{-1}; $\Delta H_f^\circ(Fe_2O_3) = -840$ kJ mol^{-1}. Molar mass of Fe, Al and O are 56, 27 and 16 g mol^{-1} respectively.

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24. 0.004 M K_2SO_4 solution is isotonic with 0.01 M glucose solution. Percentage dissociation of K_2SO_4 is ____ (Nearest integer)

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25. A mixture of 1 mole of H_2O and 1 mole of CO is taken in a 10 litre container and heated to 725 K. At equilibrium 40% of water reacts with carbon monoxide according to the equation: $CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$. The equilibrium constant $K_c \times 10^2$ for the reaction is ____. (Nearest integer)

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26. In an electrochemical reaction of lead, at standard temperature, if $E^\circ(Pb^{2+}/Pb) = m$ Volt and $E^\circ(Pb^{4+}/Pb) = n$ Volt, then the value of $E^\circ(Pb^{2+}/Pb^{4+})$ is given by $m - xn$. The value of x is ____. (Nearest integer)

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27. $KClO_3 + 6FeSO_4 + 3H_2SO_4 \rightarrow KCl + 3Fe_2(SO_4)_3 + 3H_2O$
The above reaction was studied at 300 K by monitoring the concentration of $FeSO_4$ in which initial concentration was 10 M and after half an hour became 8.8 M. The rate of production of $Fe_2(SO_4)_3$ is ____ $\times 10^{-6}$ mol L^{-1} s^{-1}. (Nearest integer)

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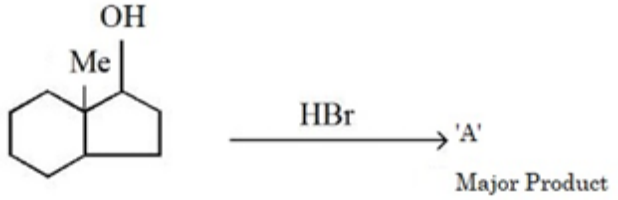
28. The ratio of spin-only magnetic moment values $\mu_{eff}[Cr(CN)_6]^{3-}/\mu_{eff}[Cr(H_2O)_6]^{3+}$ is ____.

29.



The number of hyperconjugation structures involved to stabilize the carbocation formed in the above reaction is ____.

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30. The ratio x/y on completion of the reaction between a hydroxy-aldehyde and MeMgBr as shown in the provided scheme is ____.