JEE Main 2023 Chemistry Question Paper Apr 8 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.

1. Which of the following have same number of significant figures?
A. 0.00253
B. 1.0003
C. 15.0
D. 163

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

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2. Arrange the following gases in increasing order of van der Waals constant 'a'
A. Ar
B. CH_4
C. H_2O
D. C_6H_6

(A) A, B, C and D
(B) D, C, B and A
(C) B, C, D and A
(D) C, D, B and A

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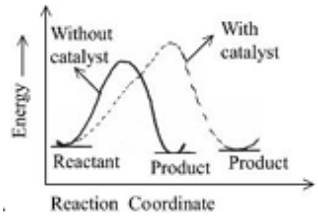
3. The correct reaction profile diagram for a positive catalyst reaction.

(A)



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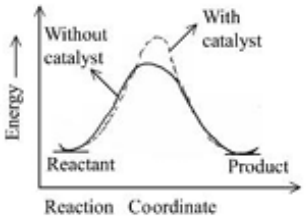

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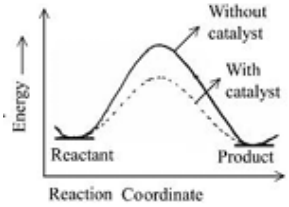

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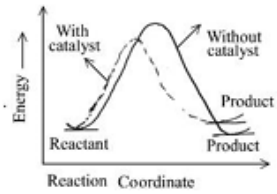

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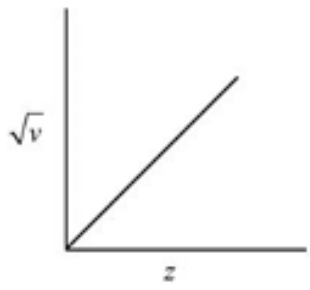
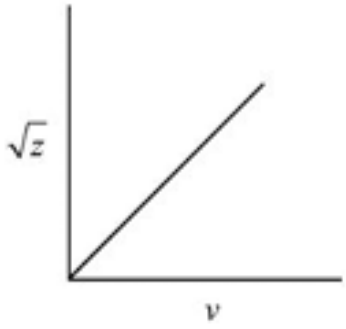
4. Henry Moseley studied characteristic X-ray spectra of elements. The graph which represents his observation correctly is

(A)



(B)



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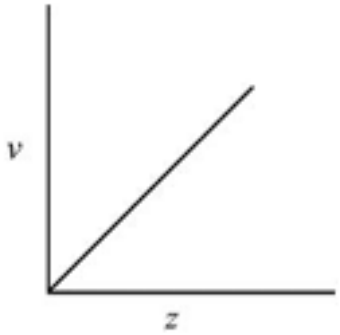

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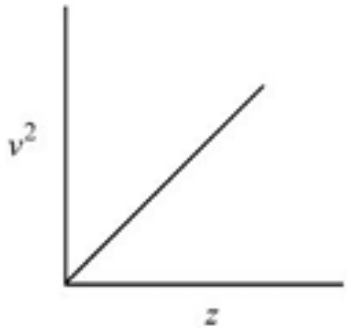

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5. In Hall - Heroult process, the following is used for reducing Al_2O_3 :-

(A) Na_3AlF_6
(B) Graphite
(C) Magnesium
(D) CaF_2

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6. Which of the following can reduce decomposition of H_2O_2 on exposure to light

(A) Alkali
(B) Urea
(C) Dust
(D) Glass containers

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7. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Sodium is about 30 times as abundant as potassium in the oceans.
Reason R : Potassium is bigger in size than sodium.
In the light of the above statements, choose the correct answer from the options given below

(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

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8. For a good quality cement, the ratio of lime to the total of the oxides of Si, Al and Fe should be as close as to

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

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9. Match List I with List II

LIST I Coordination Complex		LIST II Number of unpaired electrons	
A.	$[Cr(CN)_6]^{3-}$	I.	0
B.	$[Fe(H_2O)_6]^{2+}$	II.	3
C.	$[Co(NH_3)_6]^{3+}$	III.	2
D.	$[Ni(NH_3)_6]^{2+}$	IV.	4

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

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10. Which of these reactions is not a part of breakdown of ozone in stratosphere?

(A) $CF_2Cl_2(g) \xrightarrow{uv} \dot{C}l(g) + \dot{C}F_2Cl(g)$
(B) $\dot{C}l(g) + O_3(g) \rightarrow Cl\dot{O}(g) + O_2(g)$
(C) $Cl\dot{O}(g) + O(g) \rightarrow \dot{C}l(g) + O_2(g)$
(D) $2Cl\dot{O} \rightarrow ClO_2(g) + \dot{C}l(g)$

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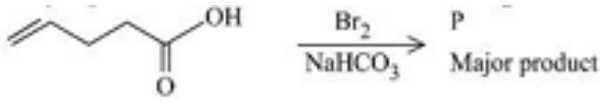
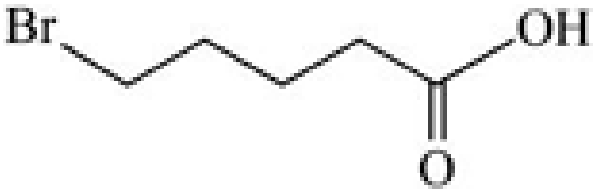
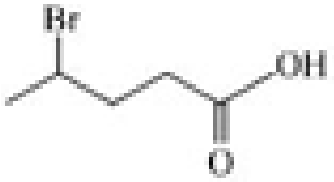
11. Major product 'P' formed in the following reaction is:





(A)



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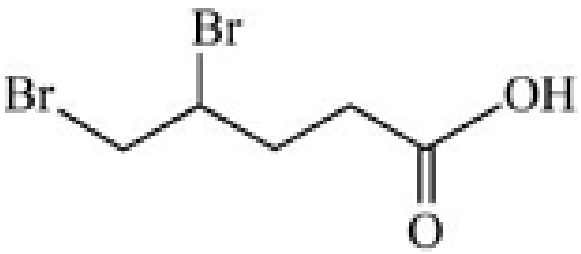

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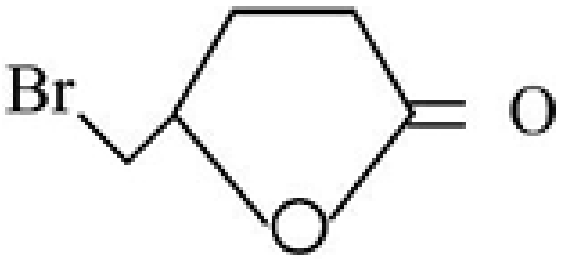

(D)

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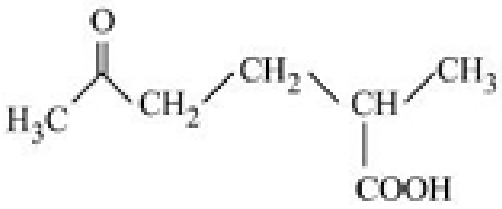
12. The correct IUPAC nomenclature for the following compound is:



(A) 2 - Formyl - 5-methylhexan-6-oic acid
(B) 5-Formyl - 2-methylhexanoic acid

(C) 5-Methyl-2-oxohexan-6-oic acid
(D) 2-Methyl-5-oxohexanoic acid

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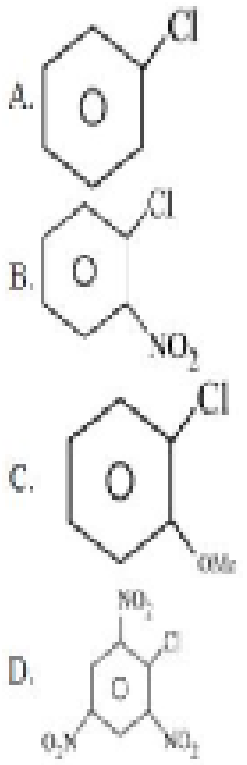
13. The correct order of reactivity of following haloarenes towards nucleophilic substitution with aqueous NaOH is



(A) A > B > D > C
(B) C > A > D > B
(C) D > C > B > A
(D) D > B > A > C

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14. The descending order of acidity for the following carboxylic acid is-
A. CH_3COOH
B. $F_3C - COOH$
C. $ClCH_2 - COOH$
D. $FCH_2 - COOH$
E. $BrCH_2 - COOH$

(A) E > D > B > A > C
(B) B > C > D > E > A
(C) D > B > A > E > C
(D) B > D > C > E > A

15. A compound 'X' when treated with phthalic anhydride in presence of concentrated H_2SO_4 yields 'Y'. 'Y' is used as an acid-base indicator. 'X' and 'Y' are respectively

(A) Anisole, methyl orange
(B) Toluidine, Phenolphthalein
(C) Salicylaldehyde, Phenolphthalein
(D) Carbolic acid, Phenolphthalein

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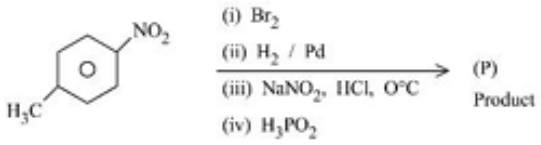
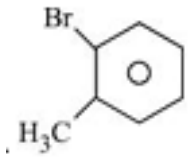
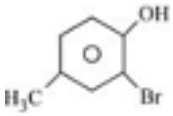
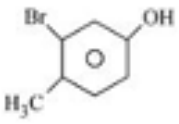
16. The product (P) formed from the following multistep reaction is:



(A) 

(B) 

(C) 

(D) 

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17. The statement/s which are true about antagonists from the following is/are:
A. They bind to the receptor site.
B. Get transferred inside the cell for their action.
C. Inhibit the natural communication of the body.
D. Mimic the natural messenger.

(A) A and B
(B) A, C and D

(C) B only
(D) A and C

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18. Match List I with List II

LIST I (Natural amino acid)	LIST II (One letter code)
A. Glutamic acid	I. Q
B. Glutamine	II. W
C. Tyrosine	III. E
D. Tryptophan	IV. Y

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

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19. Given below are two statements:
Statement I : Methyl orange is a weak acid.
Statement II : The benzenoid form of methyl orange is more intense/deeply coloured than the quinonoid form.
In the light of the above statement, choose the most appropriate answer from the options given below:

(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement 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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20. Given below are two statements:
Statement I : In redox titration, the indicators used are sensitive to change in pH of the solution.
Statement II : In acid-base titration, the indicators used are sensitive to change in oxidation potential.
In the light of the above statements, choose the most appropriate answer from the options given below

(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement 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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21. The number of atomic orbitals from the following having 5 radial nodes is ____.
7s, 7p, 6s, 8p, 8d

22. The number of species from the following carrying a single lone pair on central atom Xenon is _____.
XeF_5^+, XeO_3, XeO_2F_2, XeF_5^-, XeO_3F_2, $XeOF_4$, XeF_4

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23. For complete combustion of ethene,
$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$
the amount of heat produced as measured in bomb calorimeter is 1406 kJ mol^{-1} at 300 K. The minimum value of $T\Delta S$ needed to reach equilibrium is (− _____ kJ. (Nearest integer)
Given: R = 8.3 J K^{-1} mol^{-1}

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24. If the boiling points of two solvents X and Y (having same molecular weights) are in the ratio 2:1 and their enthalpy of vaporizations are in the ratio 1:2, then the boiling point elevation constant of X is m times the boiling point elevation constant of Y. The value of m is _____ (nearest integer).

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25. The solubility product of $BaSO_4$ is 1×10^{-10} at 298 K. The solubility of $BaSO_4$ in 0.1 M K_2SO_4 (aq) solution is _____ $\times 10^{-9}$ g L^{-1} (nearest integer).
Given: Molar mass of $BaSO_4$ is 233 g mol^{-1}

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26. The number of incorrect statements from the following is _____
A. The electrical work that a reaction can perform at constant pressure and temperature is equal to the reaction Gibbs energy.
B. E^0_{cell} is dependent on the pressure.
C. $\frac{dE^0_{\text{cell}}}{dT} = \frac{\Delta S^0}{nF}$
D. A cell is operating reversibly if the cell potential is exactly balanced by an opposing source of potential difference.

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27. Coagulating value of the electrolytes $AlCl_3$ and NaCl for As_2S_3 are 0.09 and 50.04 respectively. The coagulating power of $AlCl_3$ is x times the coagulating power of NaCl. The value of x is _____.

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28. The ratio of sigma and pi bonds present in pyrophosphoric acid is _____.

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29. The sum of oxidation state of the metals in $Fe(CO)_5$, VO^{2+} and WO_3 is _____.

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30. The observed magnetic moment of the complex $[Mn(NCS)_6]^x$ is 6.06 BM. The numerical value of x is _____.
