

JEE Main 2023 Chemistry Question Paper Jan 24 Shift 1

Time Allowed :3 Hour	Maximum Marks :120	Total Questions :30
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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. The magnetic moment of a transition metal compound has been calculated to be 3.87 B.M. The metal ion is

- (1) V^{2+}
- (2) Ti^{2+}
- (3) Cr^{2+}
- (4) Mn^{2+}

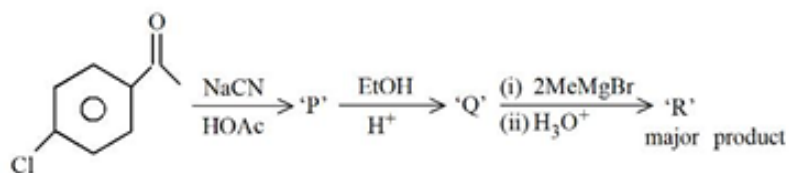
2. Assertion A : Hydrolysis of an alkyl chloride is a slow reaction but in the presence of NaI, the rate of the hydrolysis increases.

Reason R : I^- is a good nucleophile as well as a good leaving group.

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 true and R is the correct explanation of A

3. 'R' formed in the following sequence of reactions is :



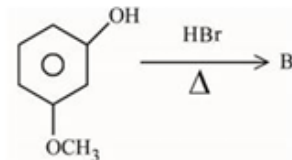
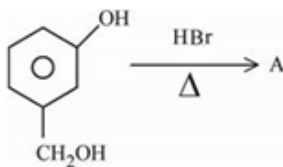
- (1)
- (2)
- (3)
- (4)

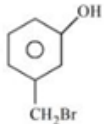
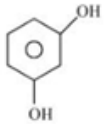
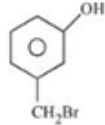
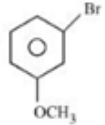
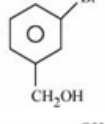
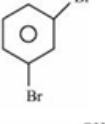
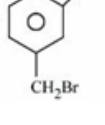
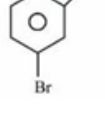
4. Statement I : For colloidal particles, the values of colligative properties are of small order as compared to values shown by true solutions at same concentration.
 Statement II : For colloidal particles, the potential difference between the fixed layer and the diffused layer of same charges is called the electrokinetic potential or zeta potential.

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

- (1) Both Statement I and Statement II are false
 (2) Statement I is true but Statement II is false
 (3) Statement I is false but Statement II is true
 (4) Both Statement I and Statement II are true

5. 'A' and 'B' formed in the following set of reactions are:



- (1) A = , B = 
- (2) A = , B = 
- (3) A = , B = 
- (4) A = , B = 

6. Given below are two statements:

Statement I : Noradrenaline is a neurotransmitter.

Statement II : Low level of noradrenaline is not the cause of depression in human.

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

- (1) Statement I is correct but Statement II is incorrect
 (2) Both Statement I and Statement II are incorrect
 (3) Both Statement I and Statement II are correct
 (4) Statement I is incorrect but Statement II is correct

7. Reaction of BeO with ammonia and hydrogen fluoride gives A which on thermal decomposition gives BeF_2 and NH_4F . What is 'A' ?

- (1) $(\text{NH}_4)\text{BeF}_3$
 (2) $(\text{NH}_4)\text{Be}_2\text{F}_5$
 (3) H_3NBeF_3
 (4) $(\text{NH}_4)_2\text{BeF}_4$

8. Order of Covalent bond;

- A. $KF > KI; LiF > KF$
B. $KF < KI; LiF > KF$
C. $SnCl_4 > SnCl_2; CuCl > NaCl$
D. $LiF > KF; CuCl < NaCl$
E. $KF < KI; CuCl > NaCl$

Choose the correct answer from the options given below:

- (1) B, C, E only
(2) C, E only
(3) B, C only
(4) A, B only

9. Which of the following is true about freons?

- (1) All radicals are called freons
(2) These are chlorofluorocarbon compounds
(3) These are radicals of chlorine and chlorine monoxide
(4) These are chemicals causing skin cancer

10. An ammoniacal metal salt solution gives a brilliant red precipitate on addition of dimethylglyoxime. The metal ion is:

- (1) Cu^{2+}
(2) Fe^{2+}
(3) Ni^{2+}
(4) Co^{2+}

11. Which of the Phosphorus oxoacid can create silver mirror from $AgNO_3$ solution?

- (1) $H_4P_2O_5$
(2) $H_4P_2O_7$
(3) $(HPO_3)_n$
(4) $H_4P_2O_6$

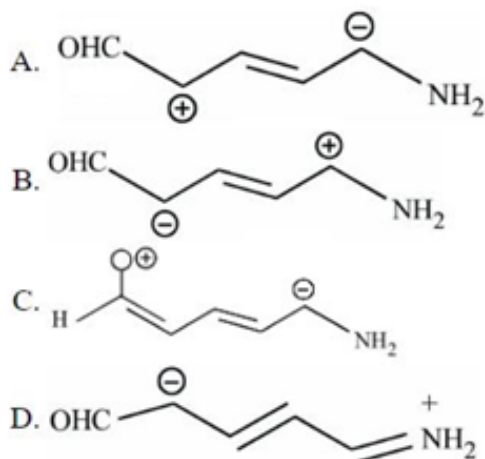
12. Match List I with List II

LIST I	LIST II
A. Chlorophyll	I. Na_2CO_3
B. Soda ash	II. $CaSO_4$
C. Dentistry, Ornamental work	III. Mg^{2+}
D. Used in white washing	IV. $Ca(OH)_2$

Choose the correct answer from the options given below:

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

13. Increasing order of stability of the resonance structures is:



Choose the correct answer from the options given below:

- (1) C, D, B, A
 - (2) D, C, A, B
 - (3) D, C, B, A
 - (4) C, D, A, B
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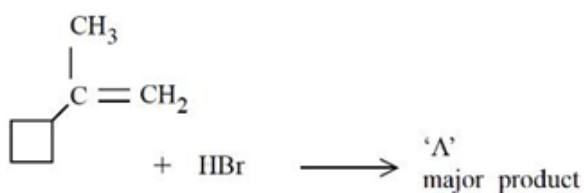
14. Match List I with List II

LIST I	LIST II
A. Reverberatory furnace	I. Pig Iron
B. Electrolytic cell	II. Aluminum
C. Blast furnace	III. Silicon
D. Zone Refining furnace	IV. Copper

Choose the correct answer from the options given below:

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

15. In the following given reaction, 'A' is:



- (1)
- (2)
- (3)
- (4)

16. Decreasing order of the hydrogen bonding in following forms of water is correctly represented by

- A. Liquid water
B. Ice
C. Impure water

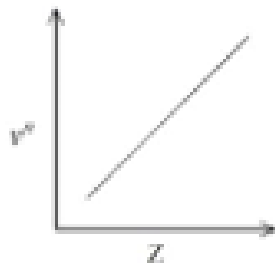
Choose the correct answer from the options given below:

- (1) $A > B > C$
(2) $C > B > A$
(3) $A \approx B > C$
(4) $B > A > C$

17. The primary and secondary valencies of cobalt respectively in $[Co(NH_3)_5Cl]Cl_2$ are:

- (1) 3 and 5
(2) 2 and 8
(3) 3 and 6
(4) 2 and 6

18. It is observed that characteristic X-ray spectra of elements show regularity. When frequency to the power " n " i.e. ν^n of X-rays emitted is plotted against atomic number " Z ", following graph is obtained.



The value of " n " is

- (1) 2
- (2) $\frac{1}{2}$
- (3) 3
- (4) 1

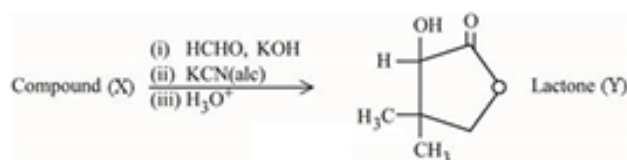
19. In the depression of freezing point experiment

- A. Vapour pressure of the solution is less than that of pure solvent
- B. Vapour pressure of the solution is more than that of pure solvent
- C. Only solute molecules solidify at the freezing point
- D. Only solvent molecules solidify at the freezing point

Choose the most appropriate answer from the options given below:

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

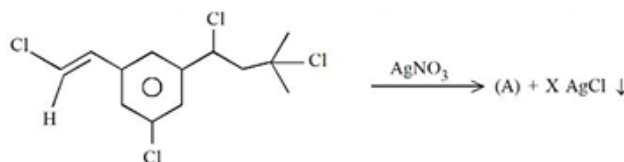
20. Compound (X) undergoes following sequence of reactions to give the Lactone (Y).



Compound (X) is:

- (1)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{HOH}_2\text{C}-\text{C}-\text{CHO} \\ | \\ \text{CH}_3 \end{array}$$
- (2)
$$\begin{array}{c} \text{H}_2\text{C}-\text{CH}_2-\text{CHO} \\ | \\ \text{CH}_3 \end{array}$$
- (3)
$$\begin{array}{c} \text{H}_2\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CHO} \\ | \\ \text{OH} \end{array}$$
- (4)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{CHO} \\ | \\ \text{CH}_3 \end{array}$$

21. Number of moles of AgCl formed in the following reaction is



22. 5 g of NaOH was dissolved in deionized water to prepare a 450 mL stock solution. What volume (in mL) of this solution would be required to prepare 500 mL of 0.1 M solution?

Given: Molar Mass of Na, O and H is 23, 16 and 1 g mol⁻¹ respectively.

23. The number of correct statement/s from the following is

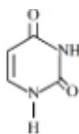
- A. Larger the activation energy, smaller is the value of the rate constant.
- B. The higher is the activation energy, higher is the value of the temperature coefficient.
- C. At lower temperatures, increase in temperature causes more change in the value of k than at higher temperature.
- D. A plot of $\ln k$ vs $\frac{1}{T}$ is a straight line with slope equal to $-\frac{E_a}{R}$.

24. At 298 K, a 1 litre solution containing 10 mmol of $\text{Cr}_2\text{O}_7^{2-}$ and 100 mmol of Cr^{3+} shows a pH of 3.0.

Given: $\text{Cr}_2\text{O}_7^{2-} \rightarrow \text{Cr}^{3+}$; $E^\circ = 1.330\text{V}$ and $\frac{2.303RT}{F} = 0.059\text{ V}$.

The potential for the half cell reaction is $x \times 10^{-3}\text{ V}$. The value of x is

25. Uracil is a base present in RNA with the following structure. % of N in uracil is _____



Given: Molar mass N = 14 g mol^{-1} , O = 16 g mol^{-1} , C = 12 g mol^{-1} , H = 1 g mol^{-1} .

26. The dissociation constant of acetic acid is $x \times 10^{-5}$. When 25 mL of 0.2 M CH_3COONa solution is mixed with 25 mL of 0.02 M CH_3COOH solution, the pH of resultant solution is found to be equal to 5. The value of x is _____.

27. For independent processes at 300 K

Process	$\Delta H/\text{kJ mol}^{-1}$	$\Delta S/\text{J K}^{-1}$
A	-25	-80
B	-22	40
C	25	-50
D	22	20

The number of non-spontaneous processes from the following is _____.

28. When $\text{Fe}_{0.93}\text{O}$ is heated in presence of oxygen, it converts to Fe_2O_3 . The number of correct statement/s from the following is _____

- A. The equivalent weight of $\text{Fe}_{0.93}\text{O}$ is $\frac{\text{Molecular weight}}{0.79}$
- B. The number of moles of Fe^{2+} and Fe^{3+} in 1 mole of $\text{Fe}_{0.93}\text{O}$ is 0.79 and 0.14 respectively
- C. $\text{Fe}_{0.93}\text{O}$ is metal deficient with lattice comprising of cubic closed packed arrangement of O^{2-} ions
- D. The % composition of Fe^{2+} and Fe^{3+} in $\text{Fe}_{0.93}\text{O}$ is 85% and 15% respectively

29. If wavelength of the first line of the Paschen series of hydrogen atom is 720 nm, then the wavelength of the second line of this series is _____ nm. (Nearest integer)

30. The d-electronic configuration of $[\text{CoCl}_4]^{2-}$ in tetrahedral crystal field is $e^m t_2^n$. Sum of "m" and "number of unpaired electrons" is _____.

