

JEE Main 2023 April 12 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. A metal chloride contains 55.0% of chlorine by weight. 100 mL vapours of the metal chloride at STP weigh 0.57 g. The molecular formula of the metal chloride is (Given: Atomic mass of chlorine is 35.5u)

- (A) MCl
(B) MCl_2
(C) MCl_3
(D) MCl_4

2. The bond order and magnetic property of acetylide ion are same as that of

- (A) O_2^+
(B) N_2^+
(C) NO^+
(D) O_2^-

3. For lead storage battery pick the correct statements

- A. During charging of battery, $PbSO_4$ on anode is converted into PbO_2
B. During charging of battery, $PbSO_4$ on cathode is converted into PbO_2
C. Lead storage battery consists of grid of lead packed with PbO_2 as anode
D. Lead storage battery has ~ 38% solution of sulphuric acid as an electrolyte
Choose the correct answer from the options given below:

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

4. Four gases A, B, C and D have critical temperatures 5.3, 33.2, 126.0 and 154.3 K respectively. For their adsorption on a fixed amount of charcoal, the correct order is:

- (A) $D > C > B > A$
 (B) $D > C > A > B$
 (C) $C > D > B > A$
 (D) $C > B > D > A$

5. The density of alkali metals is in the order

- (A) $K < Na < Rb < Cs$
 (B) $Na < K < Cs < Rb$
 (C) $K < Cs < Na < Rb$
 (D) $Na < Rb < K < Cs$

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

Assertion A: In the Ellingham diagram, a sharp change in slope of the line is observed for $Mg \rightarrow MgO$ at $\sim 1120^\circ C$.

Reason R: There is a large change of entropy associated with the change of state
 In the light of the above statements, choose the correct answer from the options given below

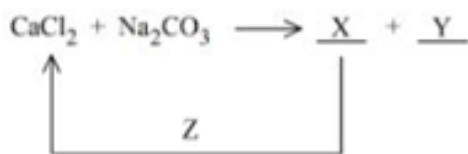
- (A) Both A and R are true and R is the correct explanation of A
 (B) Both A and R are true but R is NOT the correct explanation of A
 (C) A is true but R is false
 (D) A is false but R is true

7. Match List I with List II

LIST I Type of Hydride		LIST II Example	
A.	Electron deficient hydride	I.	MgH_2
B.	Electron rich hydride	II.	HF
C.	Electron precise hydride	III.	B_2H_6
D.	Saline hydride	IV.	CH_4

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

8. In the given reaction cycle:



X, Y and Z respectively are

- (A) $X = \text{CaO}$, $Y = \text{NaCl} + \text{CO}_2$, $Z = \text{NaCl}$
 - (B) $X = \text{CaO}$, $Y = \text{NaCl} + \text{CO}_2$, $Z = \text{KCl}$
 - (C) $X = \text{CaCO}_3$, $Y = \text{NaCl}$, $Z = \text{HCl}$
 - (D) $X = \text{CaCO}_3$, $Y = \text{NaCl}$, $Z = \text{KCl}$
-

9. Given below are two statements:

Statement I: Boron is extremely hard indicating its high lattice energy.

Statement II: Boron has highest melting and boiling point compared to its other group members.

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
-

10. Given below are two statements:

Statement I: SbCl_5 is more covalent than SbCl_3 .

Statement II: The higher oxides of halogens also tend to be more stable than the lower ones.

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
-

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

Assertion A: 5f electrons can participate in bonding to a far greater extent than 4f electrons

Reason R: 5f orbitals are not as buried as 4f orbitals

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

12. Match List I with List II

LIST I Complex		LIST II CFSE (Δ_0)	
A.	$[\text{Cu}(\text{NH}_3)_6]^{2+}$	I.	-0.6
B.	$[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	II.	-2.0
C.	$[\text{Fe}(\text{CN})_6]^{3-}$	III.	-1.2
D.	$[\text{NiF}_6]^{4-}$	IV.	-0.4

Choose the correct answer from the options given below:

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

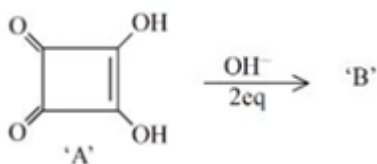
13. Match List I with List II

LIST I		LIST II	
A.	Nitrogen oxides in air	I.	Eutrophication
B.	Methane in air	II.	pH of rain water becomes 5.6
C.	Carbon dioxide	III.	Global warming
D.	Phosphate fertilisers in water	IV.	Acid rain

Choose the correct answer from the options given below:

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

14. Correct statements for the given reaction are:



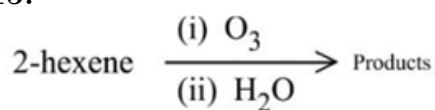
- A. Compound 'B' is aromatic
 B. The completion of above reaction is very slow
 C. 'A' shows tautomerism
 D. The bond lengths of C-C in compound B are found to be same

Choose the correct answer from the options given below:

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

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

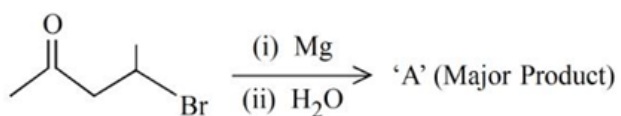
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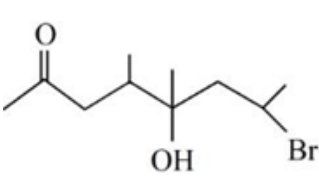
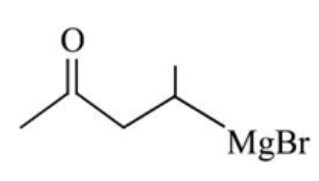
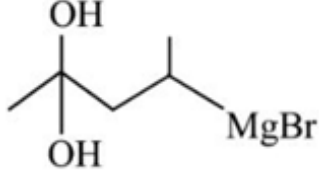
The two products formed in above reaction are -

- (A) Butanoic acid and acetic acid
(B) Butanal and acetaldehyde
(C) Butanoic acid and acetaldehyde
(D) Butanal and acetic acid
-

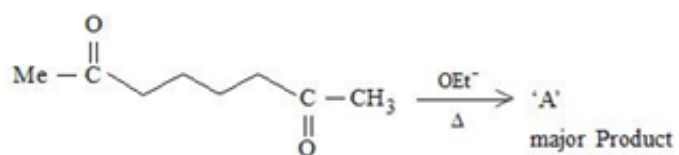
16. In the following reaction:



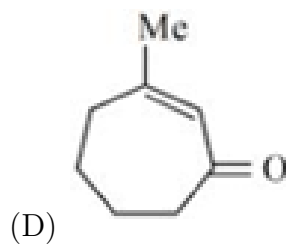
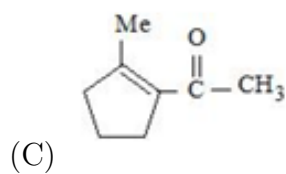
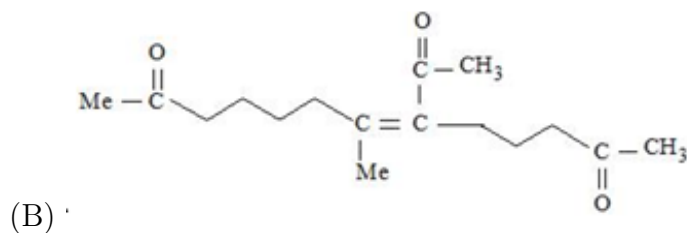
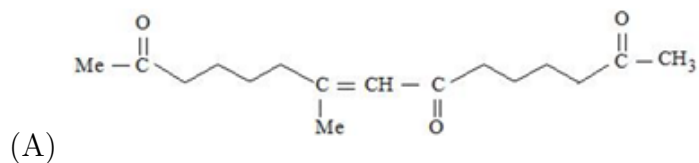
'A' (Major Product) is:

- (A) 
- (B) 
- (C) 
- (D) 
-

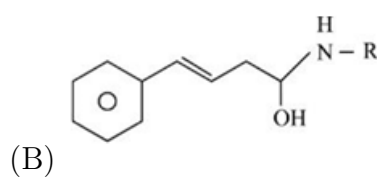
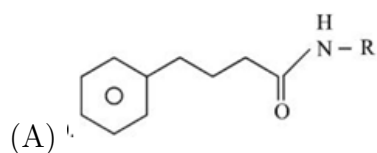
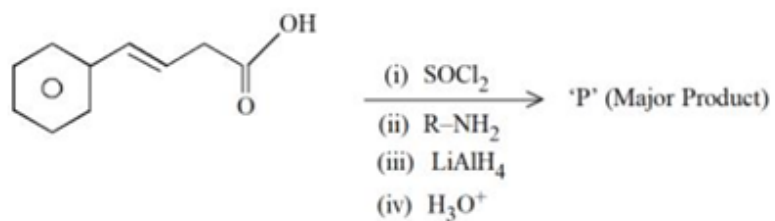
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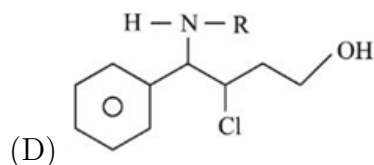
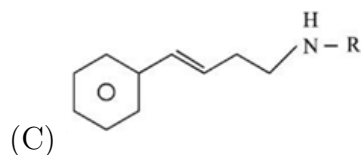


A in the above reaction is:

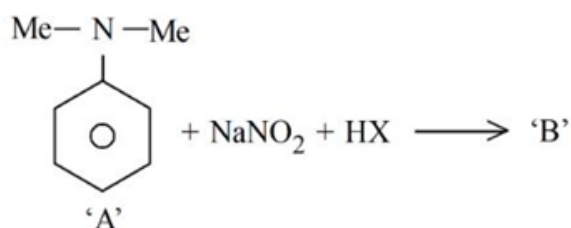


18. The major product 'P' formed in the following sequence of reactions is:





19. The incorrect statement regarding the reaction given below is:



- (A) The product 'B' formed is a p-nitroso compound at low temperature
 (B) The reaction occurs at low temperature
 (C) The electrophile involved in the reaction is NO^+
 (D) 'B' is N-nitroso ammonium compound

20. Match List I with List II

LIST I (Examples)		LIST II (Type)	
A.	2-chloro-1,3-butadiene	I.	Biodegradable polymer
B.	Nylon 2-nylon 6	II.	Synthetic Rubber
C.	Polyacrylonitrile	III.	Polyester
D.	Dacron	IV.	Addition Polymer

Choose the correct answer from the options given below:

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

21. At 600K, the root mean square (rms) speed of gas X (molar mass = 40) is equal to the most probable speed of gas Y at 90K. The molar mass of the gas Y is _____ g mol^{-1} . (Nearest integer)

22. Values of work function (W_0) for a few metals are given below

Metal	Li	Na	K	Mg	Cu	Ag
W_0/eV	2.42	2.3	2.25	3.7	4.8	4.3

The number of metals which will show photoelectric effect when light of wavelength 400nm falls on it is _____

Given: $h = 6.6 \times 10^{-34} \text{ J s}$

$c = 3 \times 10^8 \text{ m s}^{-1}$

$e = 1.6 \times 10^{-19} \text{ C}$

23. One mole of an ideal gas at 350K is in a 2.0 L vessel of thermally conducting walls, which are in contact with the surroundings. It undergoes isothermal reversible expansion from 2.0L to 3.0L against a constant pressure of 4 atm. The change in entropy of the surroundings (ΔS) is _____ J K^{-1} . (Nearest integer)

Given: $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$.

24. 80 mole percent of MgCl_2 is dissociated in aqueous solution. The vapour pressure of 1.0 molal aqueous solution of MgCl_2 at 38°C is _____ mm Hg. (Nearest integer)

Given : Vapour pressure of water at 38°C is 50 mm Hg

25. An analyst wants to convert 1L HCl of $\text{pH} = 1$ to a solution of HCl of $\text{pH} 2$. The volume of water needed to do this dilution is _____ mL. (Nearest integer)

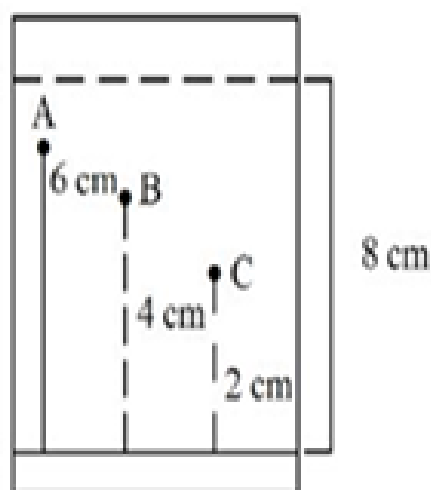
26. The reaction $2\text{NO} + \text{Br}_2 \rightarrow 2\text{NOBr}$ takes places through the mechanism given below:

$\text{NO} + \text{Br}_2 \rightleftharpoons \text{NOBr}_2$ (fast)

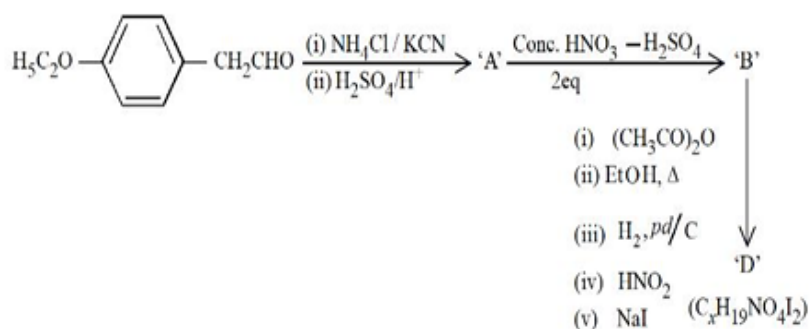
$\text{NOBr}_2 + \text{NO} \rightarrow 2\text{NOBr}$ (slow)

The overall order of the reaction is _____.

27. Three organic compounds A, B and C were allowed to run in thin layer chromatography using hexane and gave the following result (see figure). The R_f value of the most polar compound is _____ $\times 10^{-2}$.



28. The value of x in compound 'D' is ____.



29. In an oligopeptide named Alanylglycylphenylalanysoleucine, the number of sp^2 hybridised carbons is ____.

30. The mass of NH_3 produced when 131.8 kg of cyclohexanecarbaldehyde undergoes Tollen's test is ____ kg. (Nearest Integer)

Molar Mass of C = 12g/mol, N = 14g/mol, O = 16g/mol