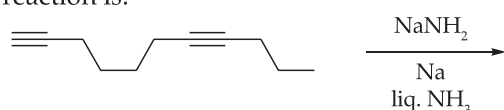


SECTION-I

General Instructions:

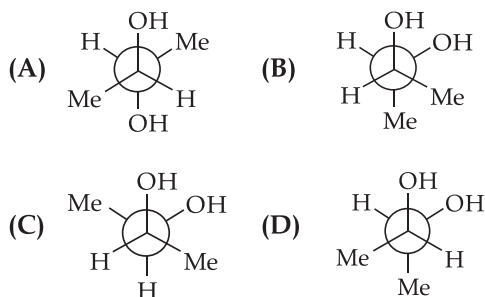
- This section contains **FOUR (4)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
- Full Marks : +3 If **ONLY** the correct option is chosen;
- Zero Marks : 0 If none of the options is chosen (i.e., the question is unanswered);
- Negative Marks : -1 In all other cases.

Q. 1. The major product formed in the following reaction is:

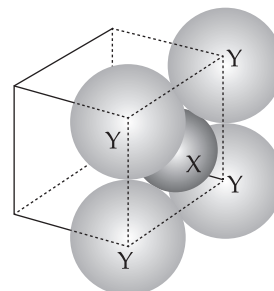


- (A)
- (B)
- (C)
- (D)

Q. 2. Among the following, the conformation that corresponds to the most stable conformation of *meso*-butane-2, 3-diol is:



Q. 3. For the given close packed structure of a salt made of cation X and anion Y shown below (ions of only one face are shown for clarity), the packing fraction is approximately (packing fraction = $\frac{\text{Packing efficiency}}{100}$)



- (A) 0.74 (B) 0.63
(C) 0.52 (D) 0.48

Q. 4. The calculated spin only magnetic moments of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CuF}_6]^{3-}$ in BM, respectively, are:

(Atomic numbers of Cr and Cu are 24 and 29, respectively).

- (A) 3.87 and 2.84
(B) 4.90 and 1.73
(C) 3.87 and 1.73
(D) 4.90 and 2.84

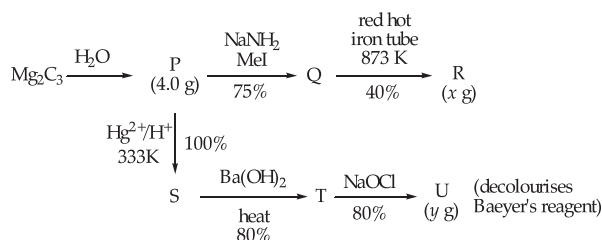
SECTION-II

General Instructions:

- This section contains **THREE (3)** question stems.
- There are **TWO (2)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
Full Marks : +2 if ONLY the correct numerical value is entered at the designated place;
Zero Marks : 0 In all other cases.

Question Stem for Questions 5 and 6**Question Stem**

For the following reaction scheme, percentage yields are given along the arrow:



x g and y g are mass of R and U, respectively.

(Use: Molar mass (in g mol^{-1}) of H, C and O as 1, 12 and 16, respectively)

Q. 5. The value of x is _____.

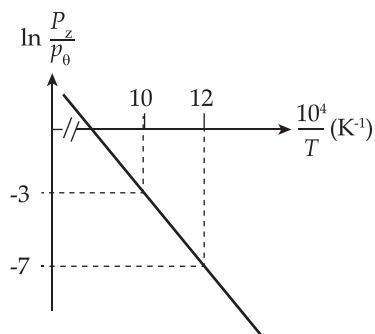
Q. 6. The value of y is _____.

Question Stem for Question Nos. 7 and 8**Question Stem**

For the reaction, $\text{X(s)} \rightleftharpoons \text{Y(s)} + \text{Z(g)}$, the plot of

$\ln \frac{p_z}{p^\circ}$ versus $\frac{10^4}{T}$ is given below (in solid line),

where p_z is the pressure (in bar) of the gas Z at temperature T and $p^\circ = 1$ bar.



(Given, $\frac{d(\ln K)}{d(1/T)} = -\frac{\Delta H^\circ}{R}$, where the

equilibrium constant, $K = \frac{p_z}{p^\circ}$ and the gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Q. 7 The value of standard enthalpy, ΔH° (in kJ mol^{-1}) for the given reaction is _____.

Q. 8 The value of ΔS° (in $\text{J K}^{-1} \text{ mol}^{-1}$) for the given reaction, at 1000 K is _____.

Question Stem for Questions 9 and 10**Question Stem**

The boiling point of water in a 0.1 molal silver nitrate solution (solution A) is x °C. To this solution A, an equal volume of 0.1 molal aqueous barium chloride solution is added to make a new solution B. The difference in the boiling points of water in the two solutions A and B is $y \times 10^{-2}$ °C.

(Assume: Densities of the solutions A and B are the same as that of water and the soluble salts dissociate completely.)

Use: Molal elevation constant (Ebullioscopic Constant), $K_b = 0.5 \text{ K kg mol}^{-1}$; Boiling point of pure water = 100°C.)

Q. 9 The value of x is _____.

Q. 10 The value of $|y|$ is _____.

SECTION-III

General Instructions:

- This section contains **SIX (6)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
- Full Marks : +4 If only (all) the correct option(s) is(are) chosen;
- Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen;
- Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct;
- Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option;
- Zero Marks : 0 If unanswered;
- Negative Marks : -2 In all other cases.
- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then

Choosing **ONLY** (A), (B) and (D) will get +4 marks;

Choosing **ONLY** (A) and (B) will get +2 marks;

Choosing **ONLY** (A) and (D) will get +2 marks;

Choosing **ONLY** (B) and (D) will get +2 marks;

Choosing **ONLY** (A) will get +1 mark;

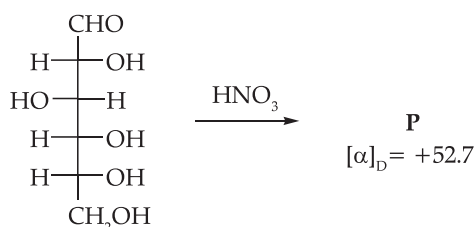
Choosing **ONLY** (B) will get +1 mark;

Choosing **ONLY** (D) will get +1 mark

Choosing no option(s) (i.e., the question is unanswered) will get 0 marks and

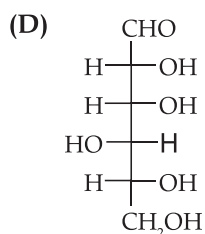
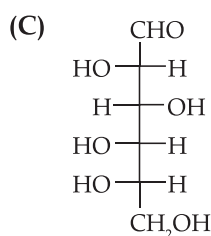
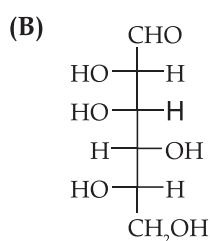
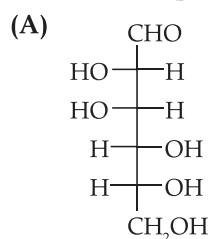
Choosing any other option(s) will get -2 marks.;

Q. 11. Given

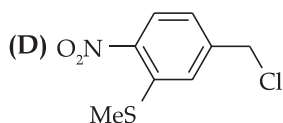
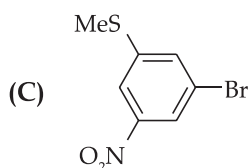
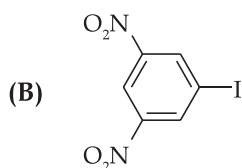
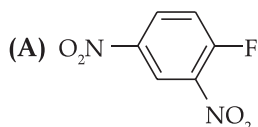


D-Glucose

The compound(s), which on reaction with HNO_3 will give the product having degree of rotation, $[\alpha]_D = -52.7^\circ$ is(are)



Q. 12. The reaction of Q with PhSNa yields an organic compound (major product) that gives positive Carius test on treatment with Na_2O_2 followed by addition of BaCl_2 . The correct option(s) for Q is(are)

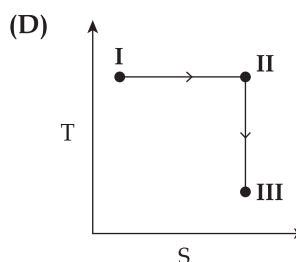
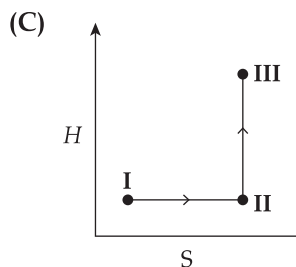
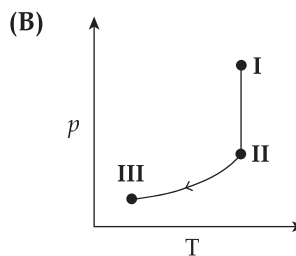
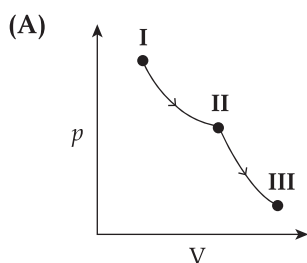


Q. 13. The correct statement(s) related to colloids is(are):

- (A) The process of precipitating colloidal sol by an electrolyte is called peptization.
- (B) Colloidal solution freezes at higher temperature than the true solution at the same concentration.
- (C) Surfactant form micelle above critical micelle concentration (CMC) depends on temperature.
- (D) Micelles are macro-molecular colloids.

Q. 14. An ideal gas undergoes a reversible isothermal expansion from state I to state II followed by a reversible adiabatic expansion from state II to state III. The correct plot(s) representing the changes from state I to state III is(are):

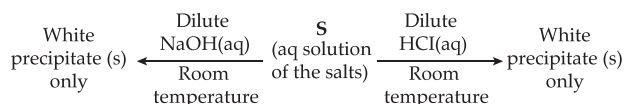
(p: pressure, V: volume, T: temperature, H: enthalpy, S: entropy)



Q. 15. The correct statement(s) related to the metal extraction processes is(are)

- (A) A mixture of PbS and PbO undergoes self-reduction to produce Pb and SO_2 .
- (B) In the extraction process of copper from copper pyrites, silica is added to produce copper silicate.
- (C) Partial oxidation of sulphide ore of copper by roasting, followed by self-reduction produces blister copper.
- (D) In cyanide process, zinc powder is utilized to precipitate gold from $\text{Na}[\text{Au}(\text{CN})_2]$.

Q. 16. A mixture of two salts is used to prepare a solution S, which gives the following results:



The correct option(s) for the salt mixture is(are):

- (A) $\text{Pb}(\text{NO}_3)_2$ and $\text{Zn}(\text{NO}_3)_2$
- (B) $\text{Pb}(\text{NO}_3)_2$ and $\text{Bi}(\text{NO}_3)_3$
- (C) AgNO_3 and $\text{Bi}(\text{NO}_3)_3$
- (D) $\text{Pb}(\text{NO}_3)_2$ and $\text{Hg}(\text{NO}_3)_2$

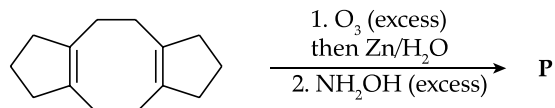
SECTION-IV

General Instructions:

- This section contains **THREE (03)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:
 Full Marks : +4 If **ONLY** the correct integer is entered;
 Zero Marks : 0 In all other cases.

Q. 17. The maximum number of possible isomers (including stereo isomers) which may be formed on mono-bromination of 1-methylcyclohex-1-ene using Br_2 and UV light is _____.

Q. 18. In the reaction given below, the total number of atoms having sp^2 hybridization in the major product P is _____.



Q. 19. The total number of possible isomers for $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Br}_2$ is _____.

Finished Solving the Paper ?
Time to evaluate yourself !

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For elaborate Solutions



Answers

| Q. No. | Answer | Topic Name | Chapter Name |
|--------|-----------|---|--|
| 1 | (B) | Reduction of Alkynes | Preparation, Properties and Reactions of Alkenes and Alkynes |
| 2 | (B) | Conformations of Butane and its Derivatives | General Organic Chemistry |
| 3 | (B) | Packing in FCC, BCC and HCP Lattices | Solid State |
| 4 | (A) | Spin Only Magnetic Moment | Transition Elements (3D Series) |
| 5 | [1.62] | Acidity of Alkynes, Preparation of Alkynes, Cyclic Polymerization | Preparation and Properties of Alkynes |
| 6 | [3.9] | Aldol Condensation, Acid Catalysed Hydration of Alkynes, Haloform Reaction | Hydrocarbon |
| 7 | [166.28] | Significance of Standard Gibbs Free Energy in Chemical Equilibrium, Entropy and Free Energy | Chemical Equilibrium, Energetics |
| 8 | [141.34] | Significance of Standard Gibbs Free Energy in Chemical Equilibrium, Entropy and Free Energy | Chemical Equilibrium, Energetics |
| 9 | [100.10] | Depression of Freezing Point | Solutions |
| 10 | [2.5] | Depression of Freezing Point | Solutions |
| 11 | (C, D) | Oxidation of Glucose, Optical Isomerism of Compounds Containing Asymmetric Centres | General Organic Chemistry, Carbohydrates |
| 12 | (A, D) | Nucleophilic Substitution Reaction | General Organic Chemistry |
| 13 | (B, C) | Colloids: General Properties, Surfactant and Micelles | Surface Chemistry |
| 14 | (A, B, D) | Internal Energy as a State of System | Thermodynamics |
| 15 | (A, C, D) | Self Reduction Method (Lead and Copper), Cyanide Process of Gold, Extraction of Copper | Extractive Metallurgy |
| 16 | (A, B) | Group I To V (Only Pb^+ , Ag^+ , Zn^{2+} , Hg^{2+} , Bi^{2+}) | Principles of Qualitative Analysis |
| 17 | [13] | Alkene | Hydrocarbon |
| 18 | [8] | Ozonolysis of Alkenes, Oximes | Preparation and Properties of Alkenes, Aldehydes and Ketones |
| 19 | [6] | Geometrical Isomerism (<i>cis</i> , <i>trans</i>), Ionization Isomerism | Transition Elements (3D) |