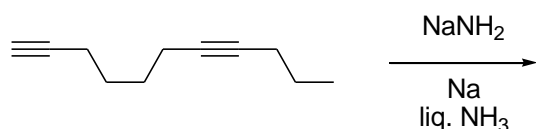


SECTION 1

- This section contains **FOUR (04)** 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)

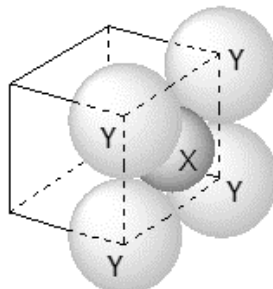
Q.1. PROVISIONAL ANSWER: B

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

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

Q.2. PROVISIONAL ANSWER: B

- 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.3. PROVISIONAL ANSWER: B

- 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

Q.4. PROVISIONAL ANSWER: A

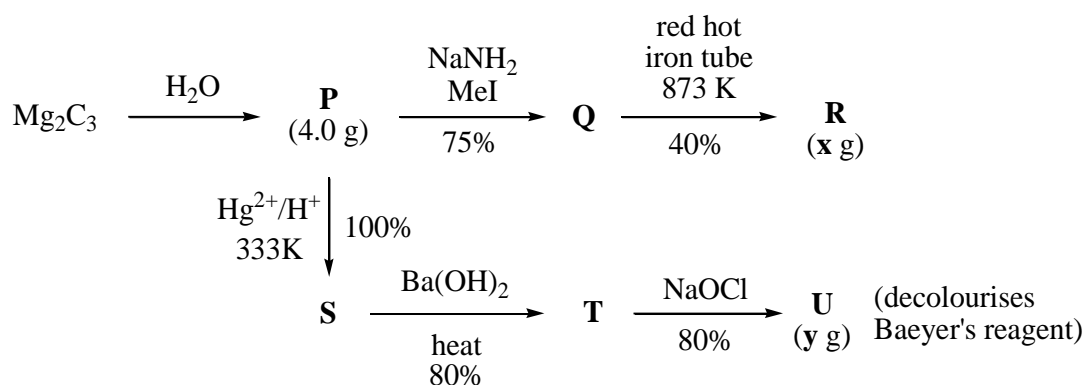
SECTION 2

- This section contains **THREE (03)** question stems.
- There are **TWO (02)** 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 Question Nos. 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.5. PROVISIONAL RANGE OF ANSWER: [1.62 to 1.62]

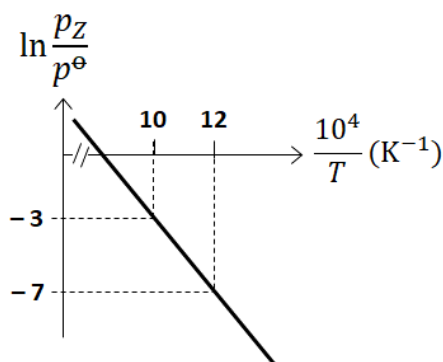
Q.6 The value of **y** is ____.

Q.6. PROVISIONAL RANGE OF ANSWER: [3.20 to 3.20] OR [3.90 to 3.91]

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 $\ln \frac{p_{\text{Z}}}{p^{\ominus}}$ 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 $p^{\ominus} = 1$ bar.



(Given, $\frac{d(\ln K)}{d(\frac{1}{T})} = -\frac{\Delta H^{\ominus}}{R}$, where the equilibrium constant, $K = \frac{p_{\text{Z}}}{p^{\ominus}}$ and the gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

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

Q.7. PROVISIONAL RANGE OF ANSWER: [166.20 to 166.30]

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

Q.8. PROVISIONAL RANGE OF ANSWER: [141.00 to 142.00]

Question Stem for Question Nos. 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 as 100 °C.)

Q.9 The value of x is ____.

Q.9. PROVISIONAL RANGE OF ANSWER: [100.10 to 100.10]

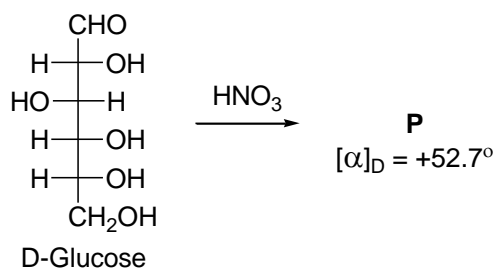
Q.10 The value of $|y|$ is ____.

Q.10. PROVISIONAL RANGE OF ANSWER: [2.50 to 2.50]

SECTION 3

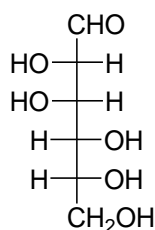
- This section contains **SIX (06)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will 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:

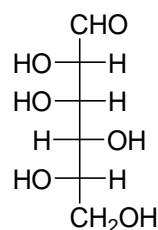


The compound(s), which on reaction with HNO_3 will give the product having degree of rotation, $[\alpha]_{\text{D}} = -52.7^\circ$ is(are)

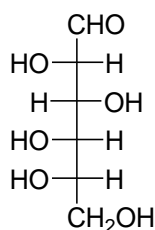
(A)



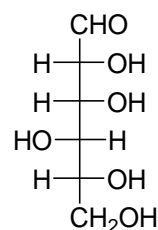
(B)



(C)



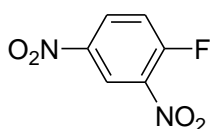
(D)



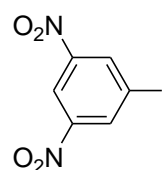
Q.11. PROVISIONAL ANSWER: C, D

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)

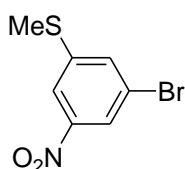
(A)



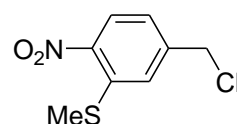
(B)



(C)



(D)



Q.12. PROVISIONAL ANSWER: A, D

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

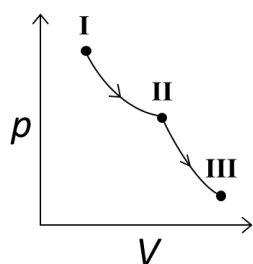
- (A) The process of precipitating colloidal sol by an electrolyte is called peptization.
- (B) Colloidal solution freezes at higher temperature than the true solution at the same concentration.
- (C) Surfactants form micelle above critical micelle concentration (CMC). CMC depends on temperature.
- (D)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

Q.13. PROVISIONAL ANSWER: B, C

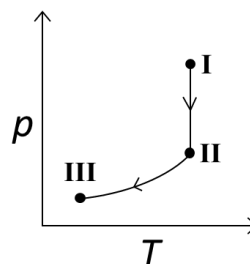
Q.14 An ideal gas undergoes a reversible isothermal expansion from state **I** to state **II** followed by a reversible adiabatic expansion from state **II** to state **III**. The correct plot(s) representing the changes from state **I** to state **III** is(are)

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

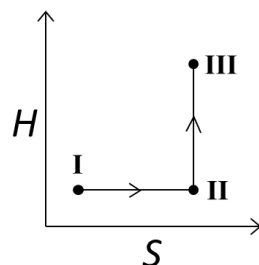
(A)



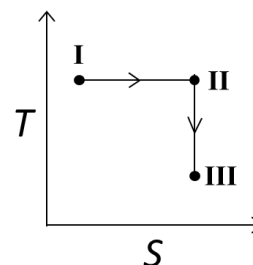
(B)



(C)



(D)



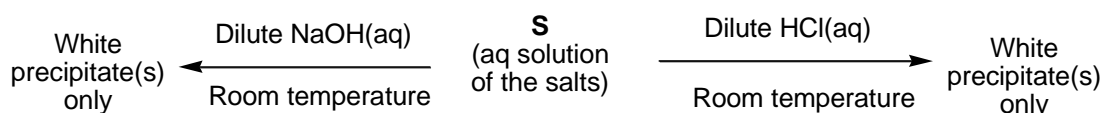
Q.14. PROVISIONAL ANSWER: A, B, D

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 SO₂.
- (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 Na[Au(CN)₂].

Q.15. PROVISIONAL ANSWER: A, C, D

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) Pb(NO₃)₂ and Zn(NO₃)₂ (B) Pb(NO₃)₂ and Bi(NO₃)₃
- (C) AgNO₃ and Bi(NO₃)₃ (D) Pb(NO₃)₂ and Hg(NO₃)₂

Q.16. PROVISIONAL ANSWER: A, B

SECTION 4

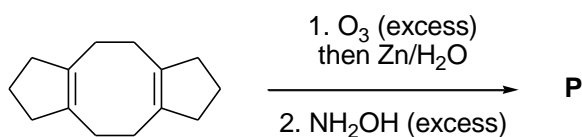
- This section contains **THREE (03)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each 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 stereoisomers) which may be formed on *mono*-bromination of 1-methylcyclohex-1-ene using Br_2 and UV light is ____.

Q.17. PROVISIONAL ANSWER: 9

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



Q.18. PROVISIONAL ANSWER: 8

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

Q.19. PROVISIONAL ANSWER: 6

END OF THE QUESTION PAPER