



General Instructions

- (i) **Duration:** The total duration of the examination is 1 hours (60 minutes).
- (ii) **Total Marks:** The complete Chemistry paper carries a maximum of 100 marks.
- (iii) **Structure:** The paper consists of two sections:
 - **Section A:** 20 Multiple Choice Questions (MCQs).
 - **Section B:** 5 Numerical Value Type Questions.
- (iv) **Compulsory Questions:** All 25 questions are compulsory.
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +4 marks.
- (vii) **Incorrect Answer:** –1 mark (Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

Chemistry Section - A

1. Number of moles and number of molecules in 1.4187 L of SO_2 at STP respectively are

- (A) 0.1266; 3.812×10^{22}
- (B) 0.0633; 3.812×10^{22}
- (C) 0.1266; 7.6238×10^{22}
- (D) 0.0633; 7.6238×10^{22}

2. What is the ratio of wave number of first line (lowest energy line) of Balmer series of H atomic spectrum to first line of its Brackett series?

- (A) 5:1
 - (B) 5:0.81
 - (C) 5:1.75
 - (D) None of the above
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3. Which of the following is correct set of 4 quantum numbers of 19th electron in Chromium (Atomic number = 24) in accordance with Aufbau principle?

- (A) $n = 3, l = 2, m = +2, s = +\frac{1}{2}$
 - (B) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$
 - (C) $n = 4, l = 1, m = 0, s = +\frac{1}{2}$
 - (D) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$
-

4. Given below are two statements:

Statement I: For an ideal gas, heat capacity at constant volume is always greater than the heat capacity at constant pressure.

Statement II: In a constant volume process, no work is produced and all the heat withdrawn goes into the chaotic motion and is reflected by a temperature increase of the ideal gas.

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

- (A) Both Statement I and Statement II are true
 - (B) Both Statement I and Statement II are false
 - (C) Statement I is true but Statement II is false
 - (D) Statement I is false but Statement II is true
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5. At T(K), the equilibrium constant of $A_2(g) + B_2(g) \rightleftharpoons C(g)$ is 2.7×10^{-5} . What is the equilibrium constant for $\frac{1}{3}A_2(g) + \frac{1}{3}B_2(g) \rightleftharpoons \frac{1}{3}C(g)$ at the same temperature?

- (A) $(2.7 \times 10^{-5})^3$
(B) 6×10^{-2}
(C) $\sqrt{2.7 \times 10^{-5}}$
(D) 3×10^{-2}
-

6. In order to oxidise a mixture of 1 mole each of FeC_2O_4 , $\text{Fe}_2(\text{C}_2\text{O}_4)_3$, FeSO_4 and $\text{Fe}_2(\text{SO}_4)_3$ in acidic medium, the number of moles of KMnO_4 required is

- (A) 3
(B) 2
(C) 5
(D) 7
-

7. Consider the first order reaction $\text{R} \rightarrow \text{P}$. The fraction of molecules decomposed in the given first order reaction can be expressed as

- (A) $1 - e^{kt}$
(B) $1 + e^{kt}$
(C) $1 + e^{-k_1 t}$
(D) $1 - e^{-k_1 t}$
-

8. A monoatomic anion (A^-) has 45 neutrons and 36 electrons. Atomic mass, group in the periodic table and physical state at room temperature of the element (A) respectively are

- (A) 80, 17, liquid
(B) 81, 16, solid
(C) 80, 16, gas
(D) 81, 15, gas
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9. Given below are two statements:

Statement I: The covalency of oxygen is generally two but it can exceed upto four. The oxidation state of oxygen in SO_2 is -2 and in OF_2 it is +2.

Statement II: The anomalous behaviour of oxygen when compared to the other elements of group 16 is due to its small size and high electronegativity.

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

- (A) Both Statement I and Statement II are true
 - (B) Both Statement I and Statement II are false
 - (C) Statement I is true but Statement II is false
 - (D) Statement I is false but Statement II is true
-

10. The correct statements among the following are,

A. Mo(VI) and W(VI) are less stable than Cr(VI).

B. Ce^{4+} and Tb^{4+} are oxidant while Eu^{2+} and Yb^{2+} are reductant.

C. Cm and Am have seven unpaired electrons.

D. Actinoid contraction is greater from element to element than lanthanoid contraction.

Choose the correct answer from the options given below:

- (A) A and B Only
 - (B) C and D Only
 - (C) B and D Only
 - (D) A and C Only
-

11. The correct statements among the following are

A. Potassium dichromate is an oxidising agent and it oxidises FeSO_4 to $\text{Fe}_2(\text{SO}_4)_3$ in acidic medium.

B. Sodium dichromate can be used as primary standard in volumetric estimation.

C. CrO_4^{2-} and $\text{Cr}_2\text{O}_7^{2-}$ are interconvertible in aqueous solution by varying the pH of the solution.

D. Cr-O-Cr bond angle in $\text{Cr}_2\text{O}_7^{2-}$ is 126° .

Choose the correct answer from the options given below:

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

12. Match the LIST-I with LIST-II

List-I Complex ion		List-II Calculated spin only magnetic moment (BM)	
A.	$[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$	I.	3.87
B.	$[\text{Co}(\text{H}_2\text{O})_6]^{2+}$	II.	5.92
C.	$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$	III.	4.90
D.	$[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$	IV.	1.73

Choose the correct answer from the options given below:

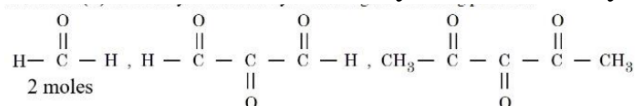
- (A) A-I, B-III, C-IV, D-II
 (B) A-II, B-I, C-III, D-IV
 (C) A-IV, B-II, C-I, D-III
 (D) A-III, B-I, C-IV, D-II

13. Increasing order of electron withdrawing power of following functional groups is:

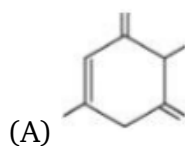
- a. $-\text{CN}$
 b. $-\text{COOH}$
 c. $-\text{NO}_2$
 d. $-\text{I}$

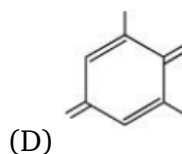
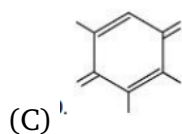
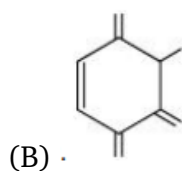
- (A) $c < b < d < a$
 (B) $c < a < b < d$
 (C) $d < b < a < c$
 (D) $a < b < c < d$

14. An alkene (X) on ozonolysis followed by reduction gives following products.



The alkene (X) is:





15. Match the LIST-I with LIST-II

List-I Name of reaction	List-II Reagent or catalyst used
A. Finkelstein reaction	I. SbF_3
B. Swarts reaction	II. Na, dry ether
C. Sandmeyer's reaction	III. NaI
D. Fittig reaction	IV. Cu_2Cl_2

Choose the *correct* answer from the options given below:

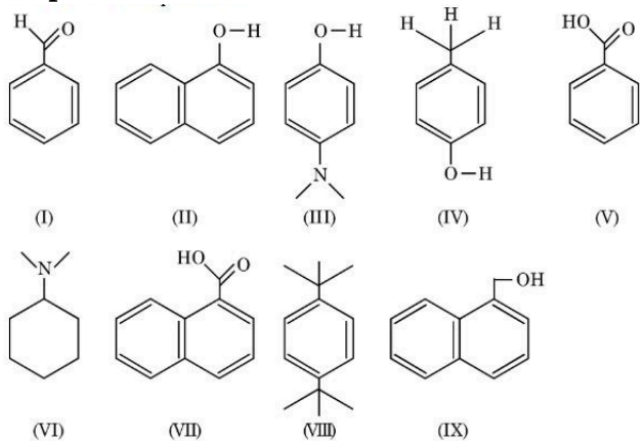
(A) A-I, B-IV, C-III, D-II

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

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

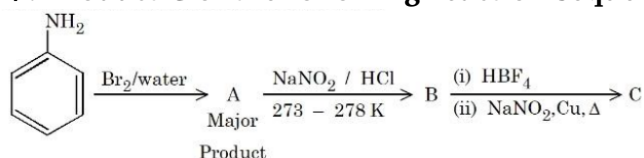
(D) A-I, B-III, C-II, D-IV

16. Amongst the following, the total number of compounds soluble in aqueous NaOH at room temperature is:



- (A) 5
(B) 6
(C) 4
(D) 3

17. Product C of the following reaction sequence will be

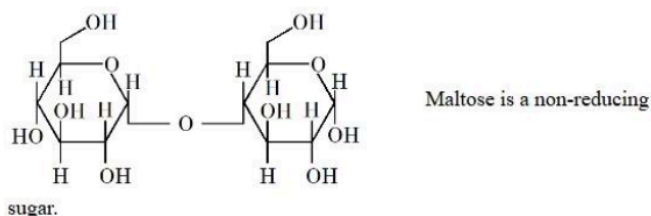


- (A) 1-Bromo-4-nitrobenzene
(B) 1, 3, 5-Tribromo-2-nitrobenzene
(C) 4-Bromo-1-nitrobenzene
(D) 1, 3, 5-Tribromobenzene

18. Given below are two statements:

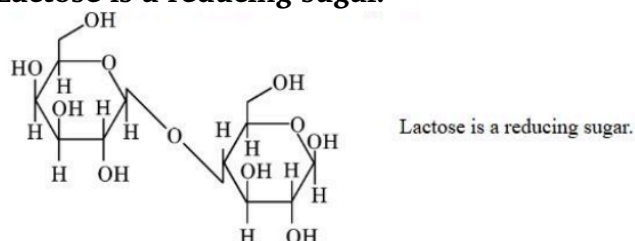
Statement I: The structure of Maltose is given below:

Maltose is a non-reducing sugar.



Statement II: The structure of Lactose is given below:

Lactose is a reducing sugar.



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

- (A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false

- (C) Statement I is true but Statement II is false
 (D) Statement I is false but Statement II is true

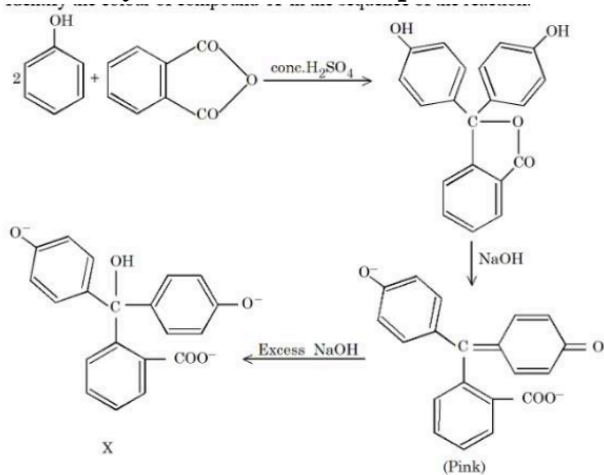
19. Match the LIST-I with LIST-II

List-I		List-II	
Name of amino acid		One letter symbol/type	
A.	Arginine	I.	D/Non-essential
B.	Aspartic acid	II.	R/Essential
C.	Lysine	III.	E/Non-essential
D.	Glutamic acid	IV.	K/Essential

Choose the **correct** answer from the options given below:

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

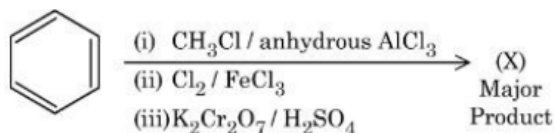
20. Identify the colour of compound 'X' in the sequence of the reaction.



- (A) Violet
 (B) Green
 (C) Red
 (D) Colourless

21. According to Lewis theory, the total number of σ bond-pairs and lone pair of electrons around the central atom of XeO_6^{4-} ion is _____.

22. Consider the following sequence of reactions to give the major product (X)



P g of the major product (X) formed is reacted with NaHCO_3 solution to liberate a gas which occupied 11.2 dm^3 at STP

P = _____ g.

(Given molar mass in g mol^{-1} H:1, C:12, O:16, Cl:35.5)

23. 2.0 g of a bromo hydrocarbon (X) was subjected to Carius analysis, gave 3.36 g of AgBr. The percentage of carbon in the compound (X) is 26.7%. Total number of carbon atoms in the empirical formula for compound (X) is _____.

(Given molar mass in g mol^{-1} H:1, C:12, Br:80, Ag:108)

24. The pH of a solution obtained by mixing 5 mL of 0.1 M NH_4OH solution with 250 mL of 0.1 M NH_4Cl solution is _____ $\times 10^{-2}$. (Nearest integer)

Given: $\text{pK}_b(\text{NH}_4\text{OH}) = 4.74$

$\log 2 = 0.30$

$\log 3 = 0.48$

$\log 5 = 0.70$

25. A non-volatile, non-electrolyte solid solute when dissolved in 40 g of a solvent, the vapour pressure of the solvent decreased from 760 mm Hg to 750 mm Hg. If the same solution boils at 320 K, then the number of moles of the solvent present in the solution is _____. (Nearest integer)

[Given: boiling point of the pure solvent = 319.5 K, K_b of the solvent = $0.3 \text{ K kg mol}^{-1}$]
