



CHUMEY HIGHER SECOUNDARY SCHOOL  
BUMTHANG  
TRIAL EXAMINATION 2022



**CHEMISTRY**

**Total Marks: 100**

**CLASS – ‘X’**

**Date: 6<sup>th</sup> December**

**Time: 2 Hours**

**Index Number.....**

**Directions:**

- The first fifteen minutes of the examination are for reading the paper only. Students must **NOT** start writing during this time.
- This paper has two sections A and B.
- **Section A:** All questions are compulsory.
- **Section B:** Answer any **Six** out of **Seven** questions.
- The intended marks for each question are given in brackets [ ].
- This Booklet paper consist of 18 pages.

**SECTION A [40 MARKS]  
ANSWER ALL QUESTIONS**

**Question 1**

**Directions:** For each question, there are four alternatives A, B, C and D. Choose the correct alternatives (A, B, C and D) and circle it. Do not circle more than ONE alternative. If there are more than one choice circled, NO score will be awarded. [25]

I. The commercial alcohols which are sold in the bars and restaurants belongs to which of the following category of alcohol from the homologous series?

- |             |              |
|-------------|--------------|
| A. Ethanol. | C. Propanol. |
| B. Butanol. | D. Methanol. |

II. Moni Kumar of class X conducted an experiment on one of the gas laws and recorded his findings as follows;

| Experiment | Pressure (Atm.) |       | Volume (mL) |       |
|------------|-----------------|-------|-------------|-------|
|            | Initial         | Final | Initial     | Final |
| Day 1      | 20              | 10    | 40          | 80    |
| Day 2      | 60              | 120   | 100         | 50    |
| Day 3      | 40              | 20    | 70          | 140   |

His finding expresses the

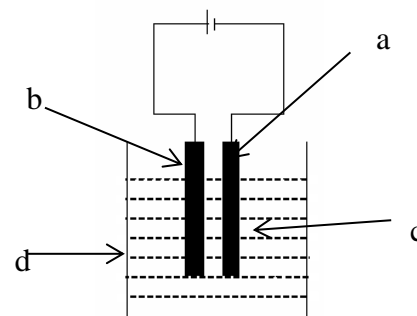
- A. Boyles Law. C. Ideal gas Law.  
 B. Charles' Law. D. Avogadro's Law.

III. Heating an ore in the absence of air below its melting point is called

- A. roasting. C. smelting.  
 B. leaching. D. calcination

IV. In the diagram shown alongside, the parts labelled correctly is

- A. a – cathode, b – anode, c – electrolytic cell, d – electrolyte.  
 B. a – cathode, b – anode, c – electrolyte, d – electrolytic cell.  
 C. a – anode, b – cathode, c – electrolyte, d – electrolytic cell.  
 D. a – anode, b – cathode, c – electrolytic cell, d – electrolyte.



V. The flow chart below shows the sequence of steps involved in extraction of a metal from its ores.

| Set 1  | Set 2  | Set 3  | Set 4   |
|--|--|--|---|
| a. Refining of metal<br>b. reduction of metal oxide<br>c. purification of ores<br>d. concentration of ores | a. purification of ores<br>b. reduction of metal oxide<br>c. refining of metal<br>d. concentration of ores | a. Reduction of metal oxide<br>b. refining of metal<br>c. purification of ores<br>d. concentration of ores | a. Concentration of ores<br>b. purification of ore<br>c. reduction of metal oxide<br>d. refining of metal |

From the given sets of steps, identify the correct sequence involved in the extraction of metal.

- A. Set 1. C. Set 3.  
 B. Set 2. D. Set 4.

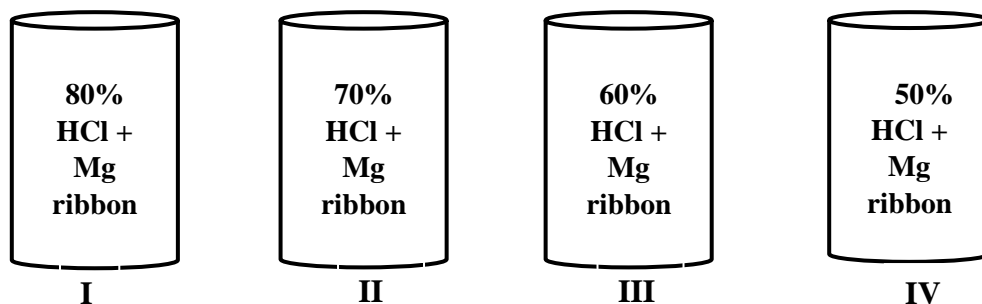
VI. Tshomo added a substance 'X' from halogen group in a beaker of water. Then she observed that the solution has turned to pale green colour. Identify the substance 'X'.

- A. Iodine. C. Fluorine.  
 B. Chlorine. D. Bromine.

VII. Chlorine is used in water treatment plant and swimming pool. The main advantage of adding chlorine to water is to

- A. disinfect the water. C. improve the taste of water.  
 B. remove algae from water. D. decrease the density of water.

VIII. Study the figure below and answer the question.



In which case will the magnesium ribbon take the **LEAST** time to react?

- A. Set up I C. Set up III  
 B. Set up II D. Set up IV

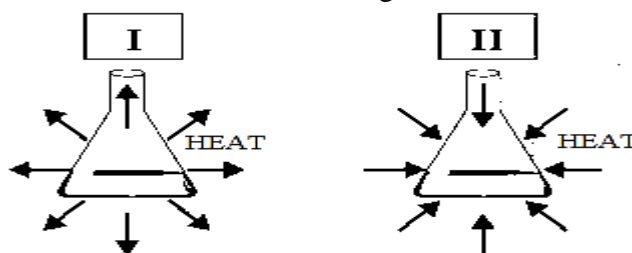
IX. Halogens are found in the oxidation state of

- A. -4 C. -2  
 B. -3 D. -1

X. Silver and gold can retain their lustre for long period of time and they are very expensive. What is the reason?

- A. They are light. C. Highly reactive.  
 B. They are heavy. D. Less reactive.

XI. The diagram given below represents the thermochemical reaction. Study the diagram carefully and identify which is correct about the diagram.



- A. I-endothermic and II-exothermic. C. Both endothermic.  
 B. I-exothermic and II-endothermic. D. Both exothermic.

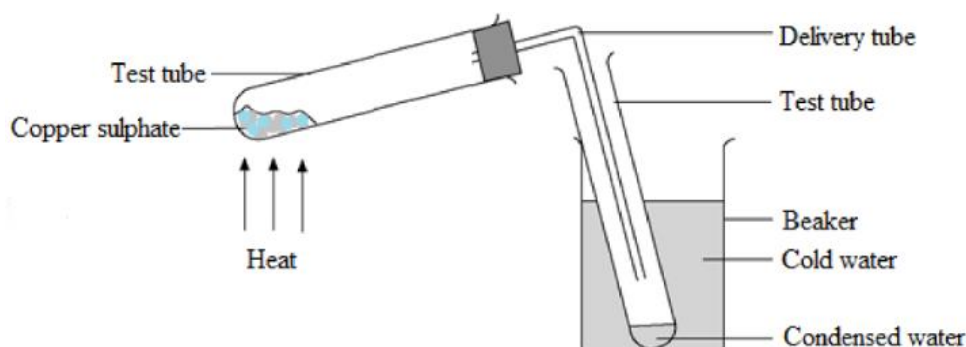
XII. The correct order of increasing reactivity of halogens is

- A.  $F < Cl < I < Br$ . C.  $I < Cl < Br < F$ .  
 B.  $F < Cl < Br < I$ . D.  $I < Br < Cl < F$ .

XIII. Jigsel wanted to find out the product formed when chemical 'A' reacts with 'B'. However, she found that the reaction was too slow. Which of the following conditions would help her to increase the rate of reaction?

- A. Using a catalyst.
- B. Using a promoter.
- C. Decreasing the temperature.
- D. Decreasing the concentration.

XIV. Mr. Lhagyal a chemistry teacher demonstrated an experiment as shown in the figure below;



Copper sulphate turns white on heating. How can you regain the blue colour of the copper sulphate?

- A. By cooling.
- B. By adding oil.
- C. By adding water.
- D. By heating further.

XV. Which of the following sequence is correct for the oxidation of alcohol?

- A. ethanol  $\rightarrow$  ethanal  $\rightarrow$  ethanoic acid.
- B. ethanol  $\rightarrow$  ethanoic acid  $\rightarrow$  ethanal.
- C. ethanal  $\rightarrow$  ethanol  $\rightarrow$  ethanoic acid.
- D. ethanal  $\rightarrow$  ethanoic acid  $\rightarrow$  ethanol.

XVI. Look at the functional group is present in  $\text{CH}_3\text{CH}_2\text{OH}$  carefully and identify to which homologous series does this compound belongs to?

- A. Alcohol.
- B. Ketone.
- C. Aldehyde.
- D. Carboxylic acid.

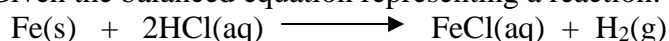
XVII. Yeschi Chopel was experimenting on the solubility of the alcohols and he found out that the alcohols are soluble in water but he didn't really know the reason behind. The solubility of alcohol is due to

- A. low density of alcohol.
- B. volatile nature of alcohol.
- C. ionization.
- D. hydrogen bonding.

XVIII. One mole of a substance contains

- A.  $10 \times 6^{23}$  particles of that substance.
- B.  $6.2 \times 10^{32}$  particles of that substance.
- C.  $6.23 \times 10^{23}$  particles of that substance.
- D.  $6.023 \times 10^{23}$  particles of that substance.

XIX. Given the balanced equation representing a reaction:



This reaction occurs more quickly when powdered iron is used instead of a single piece of iron of the same mass because the powdered iron

- A. has a greater surface area than the single piece of iron.
- B. acts as a better catalyst than the single piece of iron.
- C. absorbs less energy than the single piece of iron.
- D. is more metallic than the single piece of iron.

XX. How many litres of steam will be formed from 2L of H<sub>2</sub> and 1L of O<sub>2</sub>, if all volumes are measured at same temperature and pressure?

- A. 1L
- B. 2L.
- C. 3L.
- D. 4L.

XXI. Which of the following is correct electron configuration for chloride ion?

- A. 2, 8, 8.
- B. 2, 8, 9.
- C. 2, 8, 7.
- D. 2, 8, 8, 1.

XXII. A sealed, rigid 1.0-liter cylinder contains He gas at STP. An identical sealed cylinder contains Ne gas at STP. According to Avogadro, these two cylinders contain the same number of

- A. atoms.
- B. ions.
- C. electrons.
- D. protons.

XXIII. Which statement describes the particles of an ideal gas according to the kinetic molecular theory?

- A. The gas particles are strongly attracted to each other.
- B. The gas particles are arranged in a regular geometric pattern.
- C. The gas particles are in random, constant, straight-line motion.
- D. The gas particles are separated by very small distances, relative to their sizes.

XXIV. Which class of compounds contains at least one element from Group 17 of the Periodic Table?

- A. Ester.
- B. Amine.
- C. Halide.
- D. Aldehyde.

XXV. In a propanol molecule, an oxygen atom is bonded with a carbon atom by a covalent bond. How many pairs of electrons is shared between carbon and oxygen atom?

- A. 1
- B. 2
- C. 3
- D. 4

**b) Fill in the blanks with appropriate word (s)**

**[1x5=5]**

- i. Due to toxic nature of halogens, they are stored in a ..... container.
- ii. The formula that can give the simple whole number ratio of an atom is.....formula.
- iii. The number of atoms or ions surrounding a central metal atom in a complex ion by means of a coordinate bond is called..... number.
- iv. Among all the elements in periodic table.....has the highest electronegativity.
- v. The effective nuclear charge experienced by the electron of neon atom in K shell will be .....

**c) State whether the following statements are TRUE or FALSE.**

**[1x5=5]**

- i. D-block elements has incompletely filled d-orbital.
- ii. An alcohol on combustion produces CO<sub>2</sub> and H<sub>2</sub>O.
- iii. 2 moles of electrons mean  $6.023 \times 10^{23}$  electrons.
- iv. Complex ions are often coloured.
- v. Fluorine is used in manufacturing a tough non-stick plastic called Teflon to coat cooking pans.

**d) Match each item under Column A with the item in Column B. Rewrite the correct pairs by writing the alphabet/word(s) against the number in the answer sheet. [1 x 5 = 5]**

| Column A                | Column B            | Answer |
|-------------------------|---------------------|--------|
| i. Endothermic reaction | a. Bleaching agent. | i      |
| ii. Tooth paste         | b. 22.4 L.          | ii.    |
| iii. Molar volume       | c. $\Delta H > 0$ . | iii.   |
| iv. Copper              | d. Colouring agent. | iv.    |
| v. Chlorine             | e. Fluorine.        | v.     |
|                         | f. Electrodes.      |        |
|                         | g. 44.8 L.          |        |

**Section B (60 Marks)**  
*Attempt any SIX Questions*

**Question 2**

a) Explain heat of solution in your own words? [1]

b) At what temperature will 20g of Nitrogen dioxide occupy 600mL at a pressure 650mmHg?  
( $R=0.0821\text{Latm/Kmol}$ ) [2]

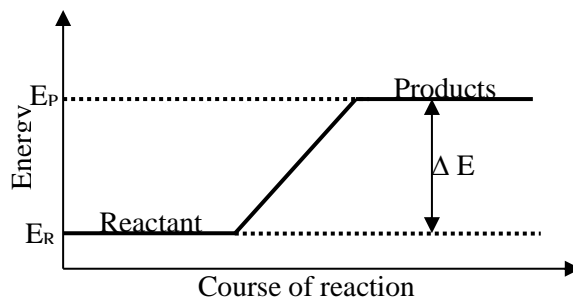
c) Answer the following questions.

i) Complete the table given below which summarizes the effect of adding sodium hydroxide on various salt solutions. [0.5x4=2]

| Salt solution                          | Salt Formed. | Metal Reduced |
|--|--------------|---------------|
| 1. Copper Sulphate ( $\text{CuSO}_4$ ) |              |               |
| 2. Zinc Sulphate ( $\text{ZnSO}_4$ )   |              |               |

ii) Write the balanced chemical equation between copper sulphate and zinc sulphate? [1]

d) Study the diagram given below and answer the questions that follows;



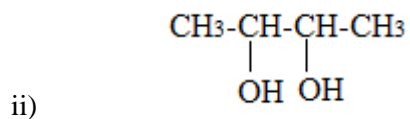
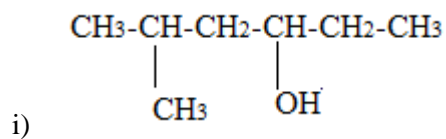
i) What type of thermochemical reaction the above graph represents? [1]

ii) What does  $E_R$  and  $E_P$  represent? [0.5x2=1]

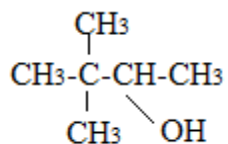
iii) Mention any **TWO** suitable examples of such reaction in your daily lives? [2]

### Question 3

a) Write the IUPAC names; [3]







iii)

b) Draw the structure of the following alcohols. [3]

i. 2,3 – dimethyl pent-2-ol.

ii. 2,2 – Propandiol.

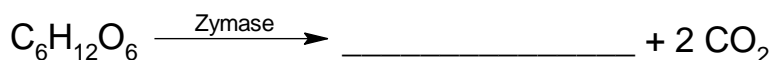
iii. Pent-3-ene-2-ol.

c) Robert Boyle and J.A. Charles performed a series of experiments to examine the effect of pressure on the volume of a gas at constant temperature. Derive the combined mathematical expression derived from their laws. [2]

d) Why alcohols are not used as a fuel though they are considered as ecofriendly biofuel? [2]

**Question 4**

a) Complete the equation given below: [1]

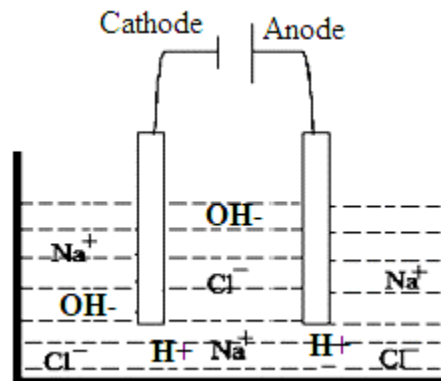


b) During Sonam Phuntsho's Birthday, the biggest balloon inside the room was filled with 6L of CO<sub>2</sub> gas at initial room temperature 25°C. What was the volume of the gas inside the balloon when the temperature of the room increased to 35°C due to congestion? [3]

c) The diagram given below shows the electrolysis of concentrated solution sodium chloride. Answer the questions that follow:

i) Name the ions which will migrate to the cathode and anode respectively. [0.5x4=2]

ii) Write the reaction at the cathode and the anode. [2]



d) Study the table given below and provide the appropriate answers. [2]

| Mole(s) | Molecules               | Volume at S.T.P (L) |
|---------|-------------------------|---------------------|
| 2       | $12.046 \times 10^{23}$ | A _____             |
| B _____ | $9.034 \times 10^{23}$  | 33.6 L              |

### Question 5

a. A compound of carbon, hydrogen and oxygen is found to contain 40% of carbon, 6.7% of hydrogen and 53.3% of oxygen. If its Vapour Density is 30, find:

i) Empirical formula. [2]

ii) Molecular formula. [2]

b. Calculate the following based on the given equation:



i) The volume of  $\text{CO}_2$  gas that will be produced from 80g of  $\text{Fe}_2\text{O}_3$  at STP. [2]

ii) The percentage of oxygen in the compound  $\text{Fe}_2\text{O}_3$ . [2]

c. Define the following [2]  
i) Boyle's law.

ii) Ores.

**Question 6**

a. Study this complex ion  $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$  and answer the following questions. [3]

(i) Identify the transition metal.

(ii) Figure out the ligands from the given example.

(iii) Find the coordination number.

b. Give *two* environmental impacts of extracting metal. [1]

c. Calculate the effective nuclear charge experienced by the electrons of chlorine atom in;

i. first shell [1]

ii. valence shell. [1]

d. The elements of group 17 of modern periodic table are listed below. Study the data carefully and answer the questions that follow:

| <b>Group 17 element</b> | <b>F</b> | <b>Cl</b> | <b>Br</b> | <b>I</b> | <b>At</b> |
|-------------------------|----------|-----------|-----------|----------|-----------|
| <b>Atomic number</b>    | 9        | 17        | 35        | 53       | 85        |

(i) Name the volatile liquid and radioactive solid. [2]

(ii) An element with four isotopes. [1]

(iii) An element, which bursts into flames if bubbled through water. [1]

### Question 7

The Table given below shows the behaviour of a gas at constant temperature. Study it carefully and answer the following questions.

| <b>Volume (L)</b> | <b>Pressure (atm)</b> |
|-------------------|-----------------------|
| 2                 | 4                     |
| 4                 | 3                     |
| 6                 | 2                     |
| 8                 | 1                     |

(i) What happens to the volume of the gas as the pressure increases? [1]

(ii) Write down the relationship between pressure and volume at constant temperature. [1]

a. At what temperature will 0.005 mole of gas occupy 600 mL at a pressure of 750 mm Hg? [2]

b. Name the transition metal(s) used in [2]

(i) Haber-Bosch process

(ii) Galvanization of iron

c. Give reason for the following: [2 x 2=4]

(i) Entropy of the gas system is more than the solid system.

(ii) In electrolytic refining impure metal is always assigned as an anode.

### Question 8

a. The figure shows the periodic table highlighting transition elements.

| Group | 1 | 2 | Transition elements |    |    |    |    |    |    |    |    |    | 13 | 14 | 15 | 16 | 17 | 18 |
|-------|---|---|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|       |   |   | 3                   | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |    |    |    |    |    |    |
|       |   |   | Sc                  | Ti | V  | Cr | Mn | Fe | Co | Ni | Cu | Zn |    |    |    |    |    |    |
|       |   |   | Y                   | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd |    |    |    |    |    |    |
|       |   |   | La                  | Hf | Ta | W  | Re | Os | Ir | Pt | Au | Hg |    |    |    |    |    |    |
|       |   |   | Ac                  | Rf | Db | Sg | Bh | Hs | Mt | Ds | Rg | Cn |    |    |    |    |    |    |

With reference to transition elements, answer the questions that follow.

- (i) Why d-block elements are called transition elements? [1]
- (ii) State *one* similarity of silver and cadmium [1]
- (iii) Write the electronic configuration of Sc in s, p, d, f notation. The atomic number of Sc is 21. [1]
- (iv) What is its magnetic behaviour and why? [1]

b. Answer the following questions in reference to the unknown element 'X' with its electronic configuration 2,7.

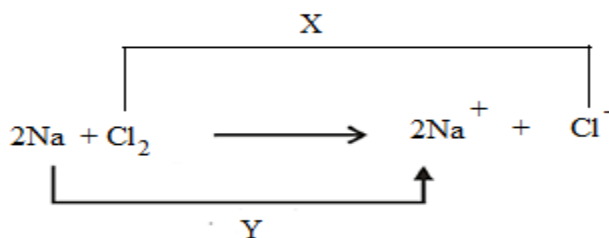
(i) To which period and group does the element 'X' belong? Why? [1]

(ii) Is the element 'X' electropositive or electronegative? Why? [1]

(iii) Complete the following table with regards to the periodic table trends in physical properties. [2]

|                      | Across the period | Down the group |
|----------------------|-------------------|----------------|
| 1. Electronegativity | 1. _____          | 2. _____       |
| 2. Nuclear charge    | 3. _____          | 4. _____       |

c. The reaction of sodium with chlorine to form sodium chloride is an example of redox reaction. Use the chemical reaction given below to answer the following questions: [2]



(i) Identify the process X and Y.

(ii) Name the final product formed.



### Question 9

a. Although transition metals and their compounds can be toxic, some are essential and are used in everyday products.

(i) Name the metals used for artificial hip joints? Give one advantage and disadvantage. [3]

(ii) Tungsten is used in light bulb filament. Give reason. [1]

b. The diagram below showing reaction of magnesium ribbon with sulphuric acid. Answer the questions based on the illustration.



(i) Name the gas evolved during the process. [1]

(ii) Write the balanced chemical equation for the reaction. [1]

c. (i) How many atoms of oxygen are present in 255g of  $\text{NaNO}_3$ . [2]

d. (ii) Define shielding effect? [2]