(ENGLISH VERSION)

(For Regular & External Candidates)

Time : Three Hours Fifteen Minutes

(First *fifteen* minutes for reading the question paper)

Full Marks { 90 – For Regular Candidates
100 – For External Candidates

Only the External Candidates will answer Group 'E'.
Figures in the margin indicate full marks for each question.

Group 'A'

1. Multiple choice questions. Four alternatives are given as answer for each of the following questions. Write the correct one. 1×15

1.1 Which among the following gases does not help in the depletion of ozone in the ozone layer ?

(a) NO (b) NO_2

(c) CFC (d) CO_2

1.2 What is the value of PV for 11.2 litre of an ideal gas at STP ?

(a) 2 RT (b) RT

(c) 0.5 RT (d) 11.2 RT

1.3 According to the following chemical equation

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

what volume of O_2 will be required to burn 10 mole of CH_4 at STP ?

(a) 448 L (b) 224 L

(c) 44.8 L (d) 22.4 L

1.4 Which among the following substances has the highest heat conductivity?

(a) Silver (b) Diamond

(c) Copper (d) Aluminium

1.5 If a beam of red light and a beam of violet light are incident at the same angle on the inclined surface of a prism from air medium and produce angles of refraction r and v respectively, which of the following is correct ?

(a) $r = v$ (b) $r = \frac{1}{v}$

(c) $r > v$ (d) $r < v$

1.6 A point source of light is placed at the centre of curvature of a concave mirror. The angle of deviation of the rays incident on the mirror from this source and reflected from it, is

(a) 0° (b) 180°

(c) 90° (d) 360°

1.7 Coulomb's law related to electric charges is applicable when of the two charges

(a) one is point, one is spherical

(b) both are spherical

(c) one is point, one is extended

(d) both are points

1.8 The characteristics of a fuse wire are

(a) high resistance, high melting point

(b) low resistance, low melting point

(c) low resistance, high melting point

(d) high resistance, low melting point

1.9 Present in α–particle

(a) one proton, one neutron

(b) one proton

(c) two protons, two neutrons

(d) one electron

1.10 Which of the following is not a periodic property of elements ?

(a) density (b) melting point

(c) boiling point (d) radioactivity

1.11 In which of the following compounds there is no existence of molecules ?

(a) Hydrogen chloride (b) Calcium oxide

(c) Methane (d) Ammonia

1.12 Which of the following statements is correct in case of electrolysis of $CuSO_4$ solution using Cu electrodes?

(a) the mass of cathode decreases

(b) the mass of anode increases

(c) the concentration of $CuSO_4$ in solution decreases

(d) the concentration of $CuSO_4$ in solution remains unchanged

1.13 What colour is produced when H_2S gas is passed through an alkaline aqueous solution of sodium nitroprusside?

(a) violet (b) orange

(c) deep blue (d) green

1.14 The formula of red haematite, an ore of iron, is

(a) FeO (b) Fe_2O_3

(c) Fe_3O_4 (d) $FeCO_3$

1.15 By reaction of aqueous $NaHCO_3$ with which of the following compounds CO_2 is produced ?

(a) CH_3CH_2OH (b) CH_3CHO

(c) CH_3COCH_3 (d) CH_3COOH

Group 'B'

2. Answer the following questions (alternatives are to be noted):

2.1 Which fuel gas is harvested from coal-bed ? 1

OR

Name a gas present in air, the increase in amount of which causes global warming. 1

2.2 Name an energy source which can be used for sustainable development. 1

2.3 Write whether the following statement is true or false :

The speed of the gas molecules contained in a closed vessel at fixed temperature and pressure is the same. 1

2.4 What is the nature of V versus T graph according to Charles' law. 1

2.5 Write whether the following statement is true or false :

Among copper, invar and iron the linear expansion coefficient of iron is the lowest. 1

OR

What is the unit of volume expansion coefficient? 1

2.6 What is meant by the pole of a spherical mirror ? 1

2.7 Write down one use of x-ray. 1

2.8 Name a machine where electrical energy is converted to mechanical energy. 1

2.9 Apart from the live wire, what are the two other wires in the household circuit ? 1

2.10 Which kind of nuclear reaction produces energy in a nuclear reactor ? 1

OR

Give an example of a natural radioactive element. 1

2.11 Match the right column with the left column : 1×4

	Left column	Right column
2.11.1	A transuranic element	(a) Krypton
2.11.2	A noble element	(b) Neptunium
2.11.3	Prepared by carbon reduction of the oxide of the metal	(c) Copper
2.11.4	In the alloy brass, the metal whose percentage amount is higher than that of the other metal	(d) Zinc

2.12 Between chloroform and sodium chloride which is not soluble in water ? 1

2.13 Name a metal which is extracted by the process of electrolysis. 1

OR

Which is the anode in the electroplating of silver on brass spoon ? 1

2.14 Which energy causes chemical reaction during electrolysis ? 1

2.15 Show by the help of an appropriate litmus paper that the aqueous solution of ammonia is alkaline in nature. 1

OR

Fill up the blank :

$NaOH + H_2S \longrightarrow \text{————} + H_2O$ 1

2.16 Write one use of urea. 1

2.17 Write the structural formula of propanone 1

OR

Wöhler first prepared an organic compound from an inorganic compound in the laboratory. What is the organic compound ? 1

2.18 Give an example of a biodegradable natural polymer. 1

Group 'C'

3. Answer the following questions (alternatives are to be noted) : 2×9

3.1 Write with reason in which layer among the layers of the atmosphere the pressure is the highest. 2

3.2 Find out the ratio of the volumes occupied by 32g O_2 and 44g CO_2 gases at 27°C temperature and 700 mmHg pressure. (C = 12, O = 16) 2

OR

A fixed mass of a gas occupies a volume of 520 cm^3 at –13°C temperature. Keeping the pressure unchanged, when the gas is heated the volume of the gas increases to 700 cm^3. What is the final temperature of the gas in degree celsius ? 2

3.3 Mention two features of the image formed by a simple camera. 2

OR

Where in front of a concave mirror image of an extended object placed at infinity will be formed by the mirror? Mention one feature of the image. 1+1

3.4 Mention one similarity and one dissimilarity between electromotive force and potential difference. 1+1

3.5 By giving example of an ionic compound show that its ions do not obey the octet rule. 2

OR

Explain why the melting point of sodium chloride is much greater than that of glucose. 2

3.6 Show that F forms ionic bond with Na but it forms covalent bond with H.

(The atomic numbers of H, F, and Na are 1, 9, and 11 respectively) 2

3.7 Write, with balanced chemical equation, what happens when nitrogen gas is passed over calcium carbide heated at 1100°C. 2

3.8 Write the balanced chemical equation of the reaction for the formation of metallic iron from ferric oxide by thermit process. Write an application of the process. 2

OR

Write the balanced chemical equation of the reaction that occurs when a piece of metallic iron is added to an aqueous solution of $CuSO_4$. What information is obtained from this reaction about the relative position of Cu and Fe in the activity series of metals ? 2

3.9 Select the members of a homologous series from the following compounds and arrange them in increasing order of their molecular weights:

CH_3COOH, CH_3CH_2OH, CH_3OCH_3, CH_3OH, C_2H_4, C_2H_6, $CH_3CH_2CH_2OH$, C_3H_4 2

OR

Write with an example what is meant by functional group. 2

Group 'D'

4. Answer the following questions (alternatives are to be noted):

4.1 State Avogadro's law.

At a certain fixed temperature and pressure the molar volumes (V/n) of the real gases are nearly equal and at STP the limit is 22.4 L mol^{-1}. How Avogadro's law can be arrived at from this information obtained from experiments ? 2+1

4.2 A and B react to produce C according to the following chemical equation

$$2A + B \longrightarrow 2C$$

A, B and C are the formulas for three gaseous substances. The vapour densities of A and B are 32 and 16 respectively. Find out the vapour density of C. 3

OR

According to the following chemical equation

$$2\,ZnS + 3O_2 \longrightarrow 2\,ZnO + 2\,SO_2$$

from 100 mole of ZnS

(i) how many gram of ZnO, and

(ii) how many mole of SO_2 will be produced ?

(Zn = 65.5, S = 32, O = 16) 3

4.3 Give an example of volume expansion of a liquid on heating.

The area of a solid substance at a temperature of T_1 K is A_1 sq m and that at a temperature of T_2 K is A_2 sq m. Write down the mathematical expression for the coeffecient of area expansion with unit, of that solid substance. 1+2

OR

Write down the three factors on which conduction of heat through a solid substance depends. 3

4.4 What is dispersion of light ? Will there be dispersion of white light within a glass slab after refraction when white light is incident on the glass slab at an angle of 45°? 2+1

4.5 The principal section of a prism is an equilateral triangle. If a ray of light is incident at an angle of 30° on one of the refracting surfaces and emerges at an angle of 45° from the other refracting surface, what is the angle of deviation ? 3

OR

What will be the velocity and wavelength of a light in a medium of refractive index 1.5 if the wavelength of that light is 6000Å in air medium ? 1+2

4.6 Two metallic conductors A and B of same lengths have resistivities of 1.6×10^{-8} Ωm and 3.2×10^{-8} Ωm respectively. These two conductors are separately connected to the same potential difference. What should be the ratio of their cross sections in order to have the same current flowing through each of them ? 3

OR

The series combination of two 10 ohm resistances is connected in parallel combination with a 20 ohm resistance. Determine the equivalent resistance of the final combination. 3

4.7 What is meant by electrical power ? The rating of a bulb is written as 220 V – 100 W – what is its meaning ? 1+2

4.8 From which part of the atom are the radioactive rays emitted ? Which of the radioactive rays has the highest penetrating power and which has the highest ionising power? 1+2

4.9 Mention the dissimilarity of properties of hydrogen with one property of group 1 elements and two properties of group 17 elements. 1+2

OR

Arrange as directed :

(a) Na (11), K (19), Li (3), Rb (37) belonging to Group 1 of the long periodic table according to decreasing order of atomic radius.

(b) S (16), O (8), Te (52), Se (34) belonging to Group 16 of the long periodic table according to increasing order of electronegativity.

(c) Ca (20), Be (4), Sr (38), Mg (12) belonging to Group 2 of the long periodic table according to decreasing order of reducing power.

(The atomic numbers have been given within first brackets after the symbols of the elements) 1+1+1

4.10 On what basis electrolytes have been classified as strong and weak electrolytes? Give example of a strong electrolyte. 2+1

4.11 Write mentioning the name of catalyst and condition, how nitric oxide is manufactured by oxidising ammonia with the help of aerial oxygen. Write also the balanced chemical equation of the reaction. 2+1

4.12 Two different organic compounds A and B have the same molecular formula of C_2H_6O. A reacts with metallic sodium to produce hydrogen gas but B does not react with metallic sodium. Write structural formulas of the compounds A and B. Write the balanced chemical equation of the reaction of A with metallic sodium. 2+1

OR

Write the condition for the reaction of addition of hydrogen to ethylene. Write the balanced chemical equation of the reaction.

Mention one use of CNG. 2+1

Group 'E'

(For External Candidates Only)

5. Answer the following questions (any ***four***) : 1×4

5.1 In which layer of the atmosphere convection current is seen ?

5.2 Two resistances are to be connected in which combination so that the equivalent resistance becomes less than the individual resistances ?

5.3 A fixed mass of a gas occupies a volume of 150 cm^3 at a fixed temperature and a pressure of 1 atmosphere. What volume will the gas occupy at that temperature and at a pressure of 1.5 atmosphere?

5.4 Which radioactive ray is composed of negatively charged particles ?

5.5 Mention one use of ethylene.

6 Answer the following questions (any **three**) : 2×3

6.1 Write down the difference between a semi-conductor and a superconductor on the basis of relationship between resistivity and temperature.

6.2 What is a diverging lens ?

6.3 Write, with balanced chemical equation, what happens when ammonium chloride is heated with dry slaked lime.

6.4 Write with an example what is meant by saturated hydrocarbon.