Section A:

1. What are the conditions of rtp?

   Tick one box.

   Room temperature (22 °C) and 2 atm of pressure ☐

   Room temperature (22°C) and 1 atm of pressure ☐

   Room temperature (20 °C) and 1 atm of pressure ☐

2. What is the molar volume of a gas at rtp?

   Tick one box.

   20 dm^3 ☐

   22 dm^3 ☐

   24 dm^3 ☐

3. In the box below, write the equation that links number of moles, volume and molar volume.

   ☐

4. State the two factors that must remain constant for 1 mole of two different gases to occupy the same volume.

   _____

   _____

Section B

Use a periodic table and show all working for the following questions:

5. Assuming rtp, calculate the volume of:
   a. 2 mol of CO_2.

   b. 0.25 mol of ammonia (NH_3).

6. Assuming rtp, calculate the amount of substance present in:.
   a. 0.75 dm^3 of steam.

   b. 200 cm^3 of hydrogen.

7. A scientist reacts hydrochloric acid with lithium hydroxide.
   a. Name the salt that would be formed in this reaction.

   b. Write a balanced symbol equation for this reaction.

   c. Describe a method that could be used to obtain crystals of the salt produced in this reaction.

d. The scientist then makes zinc chloride by heating zinc in chlorine gas. The equation for the reaction is shown below:

$$Zn\ (s) + Cl_2\ (g) \rightarrow ZnCl_2\ (s)$$

Calculate the volume of chlorine needed to react completely with 11 g of zinc.

8. Aluminium oxide can be electrolysed according to the following equation:

$$2\ Al_2O_3\ (s) \rightarrow 4\ Al\ (s) + 3\ O_2\ (s)$$

a. Calculate the mass of aluminium that would be produced when 800 kg of aluminium is completely electrolysed.

b. Calculate the volume of oxygen that would be produced when 800 kg of aluminium is completely electrolysed.

Section C

9. Avogadro's law states that equal volumes of gases, at the same temperature and pressure, have the same number of molecules.
    a. State molar volume at rtp.
    b. Compare the movement of particles in a solid and in a gas.
    c. Explain what causes gas pressure.
    d. Describe and explain the relationship between temperature of a gas and pressure.
    e. Describe and explain the relationship between volume of a gas and pressure.
    f. 2 dm^3 of oxygen gas at 27 Pa of pressure is compressed to a quarter of its original volume. Calculate the pressure at the new volume.