

Q. 1. LPG and CNG are the well-known names to all. Gases cylindered have also been used as a fuel. Gases are cylindered by applying high pressure. Sometimes the leakage of cylinder takes place causing a fire.

a. What are the elaborations of the terms “LPG and CNG”? **1.0**

*Liquefied petroleum gas and concentrated natural gas*

b. How can a gas be liquefied? **1.5**

*By a sudden and large expansion of highly pressurized gas*

c. What are relation between the total kinetic energy of gas and absolute temperature? **1.0**

*Directly proportional*

d. What is the appropriate term used to define the situation of the leakage of highly pressurized gas kept in a cylinder? **1.0**

*Effusion*

e. Define the standard temperature and pressure and what are the volumes of 22.4 moles of O<sub>2</sub> and He gases at this condition. **1.5**

*298 K and 1 atm (760 mm Hg). Both are same as 501.76 L*

f. Calculate the density of CO<sub>2</sub> kept in a cylinder at pressure and temperature of 1.05 atm and 308 K, respectively. **2.0**

*1.827 g/L*

g. Write down the equations that express the relations among pressure, volume and temperature of ideal and real gases. **2.0**

$$PV = nRT \quad \text{and} \quad \left(P + \frac{a}{V^2}\right)(V - b) = nRT$$

Q. 2. On the Earth, the matters generally exist as gas, liquid and solid. With some exceptions, gases can be liquefied and then solidified by decreasing temperature and *vice versa*. Densities of matters do not *always* increase by decreasing temperature. Proper matching of solvent-solute pair is the prerequisite for solubility of matters.

- a. Water holds three states mentioned above, while .....( $I_2$ , *naphthalene* )..... does **2.0**  
have liquid state. Increasing temperature the event of transformation of solid to liquid is called .....(*melting*)..... and solid to gas is ...(*sublimation*).....
- b. Ionic compounds can be solubilized in water, but not in .....(*Oil*)..... **1.0**
- c. The boiling point of  $H_2O$  is higher than  $H_2S$  due to .....(*H-bonding*)..... **1.0**
- d. Example of decrease of density with the decrease of temperature is...(*water in ice*)..... **1.0**
- e. Is it possible to make a solid-solid solution? Given an example **2.0**  
*Yes. Example- Brass (Cu and Zn), Steel (Fe, Cr, C etc.)*
- f. Comment on the freezing point of water containing sodium chloride. **1.0**  
*Decrease in freezing point of water*
- g. What is the effect of pressure on the solubility of a gas in a liquid? Why we are **2.0**  
generally experienced a sound when the cork of a soft drink's bottle is opened?  
*Solubility of gas is increased by increasing the pressure.*  
*Due to the release of gases kept by applying high pressure in the bottle*