Tishk International University
Faculty of Applied Science
Department of Nutrition & Dietetics
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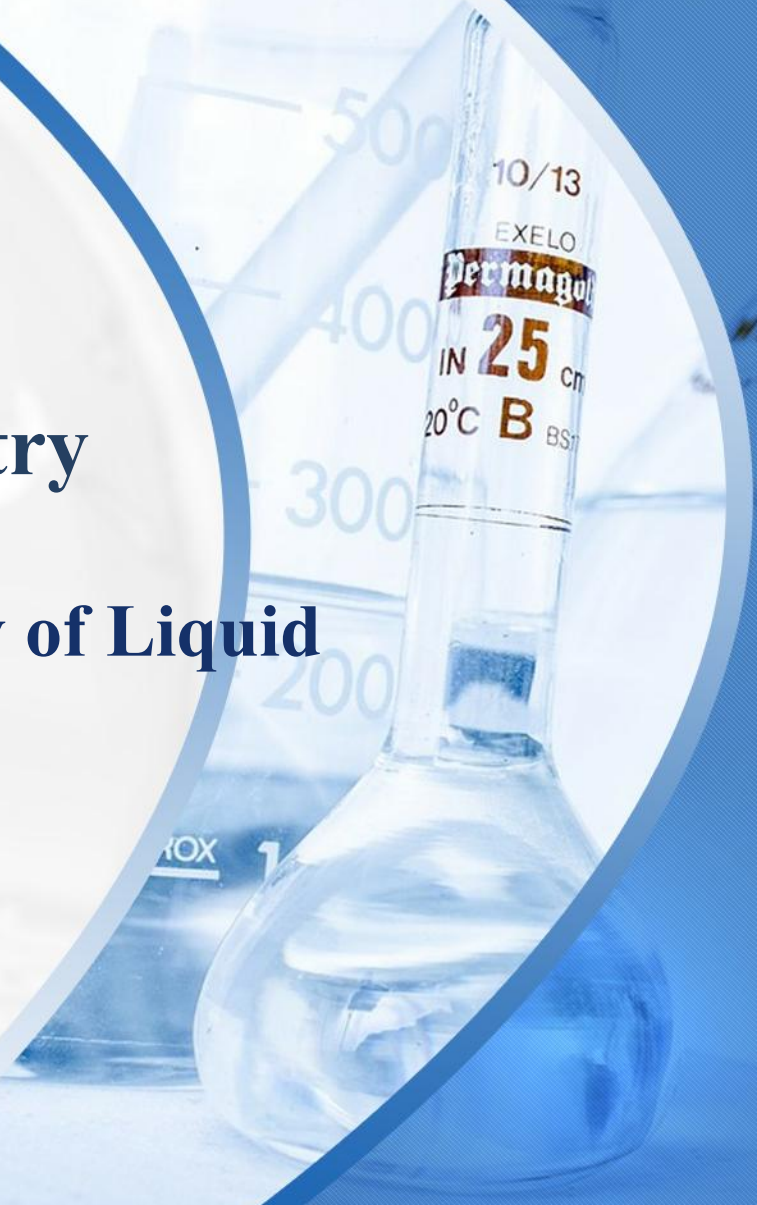

General Chemistry

Exp. 4: Measuring Density of Liquid Compounds

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Theory:

Density is an intensive property of a substance that doesn't depend on the amount of substance present.

The density of a substance is the ratio of its mass to its volume.

At constant temperature and pressure, the density of a substance is constant.

d= mass (weight) / volume

Unit of d = g/ml or g/cm^3

Kg/L or Kg/m^3

To measure the density of a sample of a substance, it is necessary to measure its mass and volume.

Mass is typically measured using an analytical balance, a precise instrument that relies on the force exerted by

the sample due to gravity.

The container to hold the sample (also used to measure volume) is weighed and tared (i.e. make it zero), so only the sample mass appears on the balance display when the sample is added to the container.

In the case of liquids, a **volumetric flask** is commonly used as the container due to its precise calibration to a specific volume, marked by a single line.

To determine the liquid's density, the empty flask is first tared, then filled to the calibration mark with the liquid sample and weighed.

The density is subsequently calculated as the ratio of the measured mass to the known volume indicated on the flask.

Gases generally exhibit significantly lower densities compared to condensed phases (liquids and solids). While most substances have a lower density in the liquid phase than in the solid phase, this is not universally true.

For instance, water is an exception, as its liquid form is denser than its solid form. This anomaly causes ice to float on water.

Density of a liquid depends on temperature and pressure. Temperature is related to the average kinetic energy of the atoms or molecules within the substance. The density of water decreases from 0.9970 g/mL to 0.9718 as it is heated.

This makes sense because, as heat is added to the liquid water, there is greater kinetic energy of the molecules and there are also more vibrations of the water molecules.

Together these mean that each H_2O unit in liquid water takes up more space as the temperature increases.

Pure ethanol, CH_3CH_2OH, is another pure liquid. It is similar to water in that it is polar, with a permanent dipole moment, and forms hydrogen bonds with itself.

Changes in pressure have very little effect on the volume of a liquid.

Liquids are relatively incompressible because any increase in pressure can only slightly reduce the distance between the closely packed molecules.

If the pressure above a liquid is increased sufficiently, the liquid forms a solid.
If the pressure above a liquid is decreased sufficiently, the liquid forms a gas.

Procedure:

1- Place a clean and dry 50-mL volumetric flask on an analytical balance.

2- Press the “Tare” or “Zero” button on the balance. The balance should read 0.000 g.

3- Use a burette funnel to add 45 mL of liquid ethanol to the volumetric flask.

4- Use a Pasteur pipette to add the final 5 mL of liquid, just until the bottom of the liquid’s meniscus touches the marking on the flask.

5- Weigh the volumetric flask again and record the mass of the ethanol.

6- For best results, repeat steps 1 - 5 twice more to obtain two additional density measurements.

Results and calculations:

Trial	Mass of Ethanol (g)	Volume of Ethanol (ml)	Density (g/ml)

THANK YOU