



Class: 2nd stage

Subject: Physical Chemistry



**Ministry of Higher Education and Scientific Research
Al-Mustaqbal University College**

**Chemical engineering and petroleum industries
(Physical Chemistry lab)**

**Experiment No.1
(Determination of density of liquids)**

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Determination of density of liquids

The absolute density of a liquid or solution is the mass of unit volume of the substance. The relative density at a given temperature is the density relative to that of a standard substance (water). It is easily determined by means of a vessel of accurately definite volume, called Ostwald's pycnometer.

Aim: to find the density of liquids

Apparatus: pycnometer, balance, alcohol, thermometer.

Procedure:

- 1- Wash the pycnometer with chromic acid and distilled water.
- 2- For drying the pycnometer wash it with alcohol followed by ether, then pass a current of dry air through it by attaching one of its ends to a water suction pump.
- 3- Weigh the pycnometer empty with its caps on.
- 4- Fill the pycnometer with freshly boiled and cooled distilled water by sucking gently through a rubber tube fitted to the end of limb, while the other end of limb dips in the water.
- 5- Adjust the thermostat at the required temperature to within 0.1 °C. as shown by a thermostat immersed in the bath.





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6- Suspend the pyknometer in the thermostat and leave it to acquire the temperature of the bath (15-20 minutes). The amount of water in the pyknometer must be adjusted so that it fills it from the end up to the mark on the limb. If there is too little water it is completed by touching the end by a glass rod or a tube carrying a drop of water. If too much water, a filter paper is used to absorb the excess. These adjustments must be done while the pyknometer is in the thermostat. It must be noted that air bubbles should not be present within the pyknometer from the end up to the mark.

7- Remove the pyknometer from the bath, dry it well with a filter paper and weigh it.

8- Remove the water from the pyknometer, and rinse with the liquid or solution, then repeat steps (4) , (5) , (6) and (7) using the given unknown.

Calculations:

Let W_1 be the weight of liquid (or solution) that fills the pyknometer; its density d_1 and let W_2 and d_2 be the weight and density of water.

If V is the volume of the pyknometer, then

$$d_1 = \frac{W_1}{V}$$

$$\text{and } d_2 = \frac{W_2}{V}$$



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$$\frac{d_1}{d_2} = \frac{W_1}{W_2}$$

The ratio $\frac{d_1}{d_2}$ is known as the relative density, the density of the liquid with respect to water at the given temperature. If d_2 is known, the absolute d_1 can be calculated.

Discussion

- 1- What is the density?
- 2- What is the importance of measuring the density?