Density of liquids lab report paper

Science, Physics

GENERAL CHEMISTRY EXPERIMENT

DENSITY OF LIQUIDS PREPARED BY BURAK COBAN PURPOSE

In this experiment we will learn how can we find the density of liquids and liquids of density how change effect of temperature, pressure, mass, volume and concentration. For this reason we will take NaCI solutions with different concentrations and we will measure their densities, so we will find out the effects of concentration on density of solutions.

THEORY: Density is a physical property obtained by dividing the mass of a material or object by its volume (i. . , mass per unit volume). Here is an old riddle:” What weighs more, a ton of bricks or a ton of feathers? ” if you answer that they weigh the same, you demonstrate a clear understanding of the meaning of mass- a measure of quantity of matter. Anyone who answers that the bricks weigh more than the feathers has confused the concepts of mass and density. Matter in a bricks is more concentrated than in a feather – that is, the matter in brick is confined to a smaller volume. Bricks are denser than feathers. Density is the ratio of mass to volume.

Density= Mass (m) / Volume (V)

Density of matter	d	g/ml
Mass of matter	m	g

Volume of matter	V	ml

The SI base unit of mass and volume are kilograms and cubic meters, respectively, but chemists generally express mass in grams and volume in cubic centimetres or millilitres. The most commonly encountered density unit, then, is grams per cubic centimetre (g/cm3), or the identical grams per millilitre (g/ml).

The mass of 1. 000 L of water at 4 0C is 1. 000 kg. The density of water at 40C is 1000g/1000 ml= 1. 000 g/ml. At 20 0 C, the density of water is 0. 9982 g/ml. Density is a function of temperature because volume varies with temperature whereas mass remains constant. One reason whyglobal warmingis a concern is because if the average temperature of seawater increases, the water becomes less dense. Because the mass of water does not change, its volume must increase and sea level rises- all before any ice melts at the polar caps.

In addition to temperature, the state of matter affects the density of a substance. In general, solids are denser than liquids and both are than gases. There are significant overlaps, however. The following are some observations about the numerical values of densities that should prove useful in problem solving situations. Solid densities: from about 0. 2 g/cm3 to 20 g/cm3. Liquid densities: from about 0. 5 g/ml to 3-4 g/ml. Gas densities: mostly in the range of a few grams per liter. In general, densities of liquids are known more precisely than those of solids.

Also, densities of elements and compounds are known more precisely than densities of materials with variable compositions (such as wood or robber). An important consequence of the differing densities of solids and liquids is that liquids and solids of lower density will float on a liquid of higher density (so long as the liquids and solids do not form solutions with each other).

MATERIALS: We used these materials in the experiment. Graduated cylinder Distilled water Thermometer NaCI solutions with different concentrations (4, 8, 12, 16% NaCI by weight.)

PROCEDURE: The mass of the empty graduated cylinder was measured and the mass was written. 20 ml. Distilled water was added into the cylinder. Graduated cylinder and distilled water were measured and was written. The temperature of the water was made note. The density of the water that we had known its mass and volume. Was calculated. After finish this part. We were started second part. We were added NaCI solutions (their concentrations; 4, 8, 12, 16 %) one by one. The masses of the solutions were determined and were made note respectively.

The densities of the NaCI solutions were calculated. And then a sample of NaCI solution, which we didn’t know its concentration, was added to the empty graduated cylinder. Mass of the unknown solution (U1) was found. Finally Density of the unknown solution was calculated.

RESULTS (DATA): a) Density of water; Temperature of water: 24 0C Mass of graduated cylinder (m1) : 29, 95 g Volume of water: 20 ml. Mass of water + graduated cylinder: 49, 90 g Mass of water: 19, 95g Density= (19, 95)/ 20= 0, 9975 g/ml Formula of Percent Error: | T. V. E. V. | _____ *(100) | T.

V. | T. V. = Theoretical value. E. V. = Experimental value. Percent Error: (| 0, 9964- 0, 9975| / 0, 9964)*100= 0, 11% b) Density of solutions: Volume of solution: 20 ml 4% concentration =((50, 91-29, 95)/ 20)= 1, 048 g/ml 8% concentration =((51, 18-29, 95)/20)= 1, 0615 g/ml 12% concentration =((51, 47-29, 95)/20)= 1, 076 g/ml 16% concentration =((51, 95-29, 95)/20)= 1, 10 g/ml Unknown concentration (U1): U1 ((50, 60-29, 95)/20)= 1, 0325 g/ml

DISCUSSION: In this Experiment, We were learned how can we find the density of the liquids, by using the formula. But we found different results some of them. For example density of water is 0, 9964g/ml at 240C temperature but we found 0, 9975 g/ml I think that change may be, temperature wasn't determined well or we washed the graduated cylinder with distilled water and we didn't dry well. So that these factors changed the results. On the other hand, If we had taken 30 ml water instead of 20 ml of water.

The density would have been same. Because according to the increase in volume, mass would increase too. This experiment showed us that density is temperature and concentration dependent, but mass and volume independent.

REFERENCES: General chemistry, page 15-16, Ralph PETRUCCI & William HARWOOD. PRELAB QUESTIONS 1. Density: Density is a physical property obtained by dividing the mass of a material or object by its volume (i. e. , mass per unit volume). a) Effect Of Temperature: If temperature increases volume increases.

Because molecular blanks increases so that Density of liquids decrease when temperature increases. On the other hand, temperature decreases volume will decrease for this reason density of liquids increase when temperature decreases. Effect Of Pressure: density of liquids cannot change with pressure. If we use very big pressure. Density of liquids change very small amount. b) Because there are very small blanks between molecules so that we need a great pressure to change density of liquids. c) Of course No, if we have gas sample.

We can use pressure to change density Because gas molecules have very big blanks one to another and we can change density very easily. d) We cannot change density of solid with pressure. Because nearly molecules don’t have blanks. (See figure 1. 1) Solid molecules Liquid molecules Gas molecules 2. (| (0, 9972-0, 9948)| / 0, 9972) *100 = 0, 24 % d = m / V d = 41, 052 / 41, 2 = 0, 9964 Percent Error : (| 0, 9955 –0, 9964| / 0, 9955) *100 = 0, 09 % 3. At 160C= 0, 9978 g/ml. , 210C = 0, 9970 g/ml. , 230C = 0, 9966 g/ml. , 250C = 0, 9961 g/ml.

Calibration: Calibration method’s aim to find unknown value with using known values. For this reason we have to draw calibration curve using known values and then we can find unknown values.