Determination of the Atomic Weight of Magnesium ASTR 101

Jordan Ell

September 11, 2012

Date Performed: 1/1/2012 Partner: James Smith
Instructor: Mary Jones

1 Objective

To be introduced to the essential object of astronomy which are: planets, stars, galaxies, nebulae, and telescope. This is achived through observation of the night sky.

2 Equipment

For this lab, we will be using a telescope with a mirror 10 cm in radius, magnify at about 45 times and have a filed of view of 1 degree. The telescope is mounted on a GoTo mount which is an electronic mount with a library of predefined celestial objects which can be used for quicker navigation of the stars.

Below is a sketch of the telescope being used for the lab in figure 1. The path of light has been shown in the diagram as well as having all major componenets of the telescope labeled. Explain telescope parts here.

3 Observations

3.1 The Moon

The moon was observed on September 10 2012 at the time 00:00:00. Below is a sketch of the moon through unaided visual observation () as well as through the lab telescope ().

3.2 The Constellations

3.3 The Planets

3.4 The Stars

3.5 Deep-Sky Objects: Star Clusters, Nebulae, Galaxies

Mass of magnesium metal	= 8.59 g - 7.28 g
	= 1.31 g
Mass of magnesium oxide	= 9.46 g - 7.28 g
	= 2.18 g
Mass of oxygen	= 2.18 g - 1.31 g
	= 0.87 g

Because of this reaction, the required ratio is the atomic weight of magnesium: 16.00g of oxygen as experimental mass of Mg: experimental mass of oxygen or $\frac{x}{1.31} = \frac{16}{0.87}$ from which, atomic weight of magnesium = 16.00 $\times \frac{1.31}{0.87} = 24.1 =$ 24 g/mol (to two significant figures).

4 Results and Conclusions

The atomic weight of magnesium is concluded to be 24 g/mol, as determined by the stoichiometry of its chemical combination with oxygen. This result is in agreement with the accepted value.

5 Discussion of Experimental Uncertainty

The accepted value (periodic table) is 24.3 g/mol [**?**]. The percentage discrepancy between the accepted value and the result obtained here is 1.3%. Because only a single measurement was made, it is not possible to calculate an estimated standard deviation.

The most obvious source of experimental uncertainty is the limited precision of the balance. Other potential sources of experimental uncertainty are: the reaction might not be complete; if not enough time was allowed for total oxidation, less than complete oxidation of the magnesium might have, in part, reacted with nitrogen in the air (incorrect reaction); the magnesium oxide might have absorbed water from the air, and thus weigh "too much." Because the result obtained is close to the accepted value it is possible that some of these experimental uncertainties have fortuitously cancelled one another.

6 Answers to Definitions

a. The *atomic weight of an element* is the relative weight of one of its atoms compared to C-12 with a weight of 12.0000000…, hydrogen with a weight of 1.008, to oxygen with a weight of 16.00. Atomic weight is also the average weight of all the atoms of that element as they occur in nature.

b. The *units of atomic weight* are two-fold, with an identical numerical value. They are g/mole of atoms (or just g/mol) or amu/atom.

c. *Percentage discrepancy* between an accepted (literature) value and an experimental value is $\frac{|experimentalresult - acceptedresult|}{acceptedresult}$.

References

[1] Smith, J. M. and Jones, A. B. (2012). *Chemistry.* Publisher, City, 7th edition.