

## Test Review No 2

**Significant Figures.** The accuracy of measurement is limited by the tools we use. Measuring devices are often marked off in divisions of equal size. The things we measure often fall between these marks. For this reason, it is necessary to estimate one place beyond the smallest measurement of any measuring device. The last digit of any measured value, therefore, can be considered estimated. No more than one estimated digit can be included in any measurement or calculation done with the measurement. This is ensured by keeping track of significant figures. The trailing zeros (zeros at the end of the number) in numbers without an expressed decimal, are place holders and are not significant figures. The leading zeros (zeros before the first nonzero digit) in numbers with an expressed decimal, are place holders and are not significant figures. The number 0.00250 has three significant figures.

There are rules to keep extra uncertain numbers from cropping up in your calculations.

***multiplication and division*** - the number of significant figures in a product or quotient is the same as the measurement with the smaller number of significant figures.

**Problem**

$$3.1415 \times 2.25 = 7.068375$$

Correct number of Significant Figures = 3

Solution 7.07

***addition and subtraction*** - the number of decimal places in the sum or difference is equal to the number of decimal places in the measured quantity with the smallest number of decimal places

**Problem**

$$6.357 - 2.4 = 3.957$$

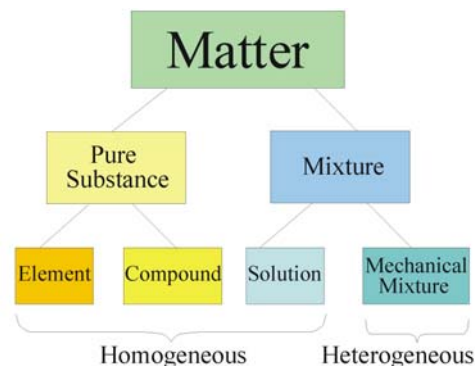
Correct number of Decimal Places = 1

Solution 4.0

**Percentage Error.** The actual size of the error – the difference between the observed value and the true value – is known as the **absolute error**. The sign of the absolute error is not important. The size of the error is more important than whether the value is over or under. The real measure of how far off a value is, is the percentage error. It is the size of the error, the absolute error, compared to the true value.

$$\text{Percent error} = \frac{|\text{observed value} - \text{true value}|}{\text{true value}} \times 100\%$$

**Matter.** Matter is anything that has mass and takes up space. Pure matter can be classified as elements or compounds. Elements are simple substances that can't be broken down by chemical means. Gold is an example. Compounds are composed of two or more elements chemically combined. The properties of elements are not retained when they combine to form a compound. Mixtures are composed of two or more substances blended together. A solution is a homogeneous mixture. A mechanical mixture has two or more phases. The properties of the substances in a mixture are retained. This fact is useful for separating a mixture. For example, a mixture of iron and sand can be separated using a magnet, because the iron is still magnetic.



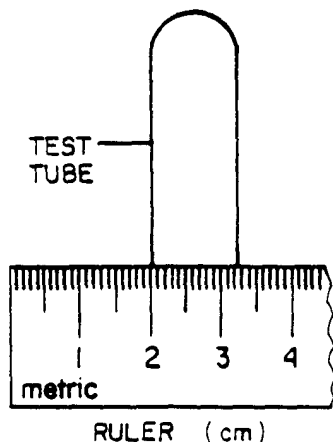
**Answer the questions below by circling the number of the correct response**

- According to an accepted chemistry reference, the heat of vaporization of water is 540. calories per gram. A student determined in the laboratory that the heat of vaporization of water was 620. calories per gram. The student's results had a percent error of (1) 12.9, (2) 80.0, (3) 14.8, (4) 87.1
- In an experiment the gram atomic mass of magnesium was determined to be 24.7. Compared to the accepted value 24.3, the percent error for this determination was (1) 0.400, (2) 24.7, (3) 1.65, (4) 98.4
- A student determined the melting point of a substance to be 55.2°C. If the accepted value is 50.1°C the percent error in her determination is (1) 5.10, (2) 10.2, (3) 9.24, (4) 12.0
- In an experiment, a student found that the percent of oxygen in a sample of  $\text{KClO}_3$  was 42.3%. If the accepted value is 39.3%, the experimental percent error is

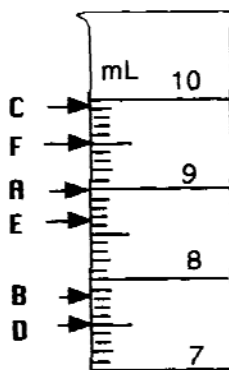
$$(1) \frac{42.3}{39.3} \times 100\% \quad (3) \frac{3.0}{42.3} \times 100\%$$

$$(2) \frac{39.3}{42.3} \times 100\% \quad (4) \frac{3.0}{39.3} \times 100\%$$

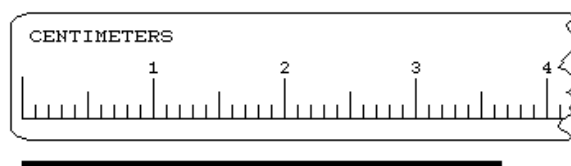
- A student has to measure the diameter of a test tube in order to calculate the tube's volume. Based on the diagram at the right, the tube's diameter is closest to  
(1) 1.25 cm  
(2) 2.32 cm  
(3) 3.25 cm  
(4) 12.5 cm



- A graduated cylinder is filled to the level shown by the arrow labeled "E," in the diagram to the right. After standing for several days, enough water evaporates for the water level to drop to the arrow labeled "D." How much water has evaporated?  
(1) 1.2 mL (2) 1.15 mL (3) 8.65 mL (4) 8.7 mL



- Which measurement contains a total of three significant figures?  
(1) 0.0100 g (2) 0.01 g (3) 0.010 g (4) 0.01000 g
- Using the rules for significant figures, the sum of 0.027 gram and 0.0023 gram should be expressed as (1) 0.0293 gram, (2) 0.03 gram, (3) 0.029 gram, (4) 0.030 gram
- How many significant figures are in 3100 mg? (1) 1 (2) 2 (3) 3 (4) 4
- The drawing to the right shows a line below a portion of a ruler. Based on the drawing, which of the following is an appropriate value for the length of the line? (1) 3.652 cm (2) 3.65 cm (3) 3.7 cm (4) 4 cm



- A block of wood has the following dimensions: 2.1 cm; 3.2 cm, and 4.5 cm. What is its volume ( $V = L \times W \times H$ ) to the correct number of significant figures? (1) 30.24  $\text{cm}^3$  (2) 30.2  $\text{cm}^3$  (3) 30.  $\text{cm}^3$  (4) 30  $\text{cm}^3$
- Which of the following is NOT matter? (1) a chair (2) air (3) light (4) water
- Which of the following is NOT a property of matter? (1) inertia (2) occupies space (3) composed of elements (4) weightlessness
- Which of the following may be heterogeneous? (1) elements only (2) compounds only (3) mixtures only (4) elements and compounds
- Which of the following is pure? (1) elements only (2) compounds only (3) mixtures only (4) both elements and compounds
- Which of the following consists of more than one substance? (1) elements only (2) compounds only (3) mixtures only (4) both elements and compounds
- Which of the following are types of matter? (1) elements only (2) compounds only (3) mixtures only (4) all of these
- Which of the following is a type of mixture? (1) elements only (2) compounds only (3) solutions only (4) elements and compounds
- Which of the following is matter? (1) love (2) ideas (3) rock (4) heat
- The tendency of matter to maintain its state of motion is known as (1) density, (2) inertia, (3) mass, (4) volume.

REVIEW

21. Which of the following is NOT composed of two or more types of atoms? (1) element (2) compound (3) solution (4) mechanical mixture
22. Which represents a homogeneous mixture? (1)  $\text{CuSO}_4(\text{s})$  (2)  $\text{NaCl}(\text{aq})$  (3)  $\text{Br}_2(\text{l})$  (4)  $\text{CO}_2(\text{g})$
23. Which substance can be decomposed by a chemical change? (1) ammonia (2) iron (3) argon (4) helium

- |       |       |      |
|-------|-------|------|
| 17. 4 | 9. 2  | 1. 3 |
| 18. 3 | 10. 2 | 2. 3 |
| 19. 3 | 11. 3 | 3. 2 |
| 20. 2 | 12. 3 | 4. 4 |
| 21. 1 | 13. 4 | 5. 1 |
| 22. 2 | 14. 3 | 6. 2 |
| 23. 1 | 15. 4 | 7. 1 |
|       | 16. 3 | 8. 3 |

**Answers**