Summer Practice Test Ch 1 (vA pg 1 of 5) **Matter and Measurement**

Name_______________Per_____

You should NOT use a calculator except for #21. This practice test should be in your 3 ring notebook on the first day of school.

1. Which of the following states are significantly compressible?
   a. gases only
   b. liquids only
   c. solids only
   d. liquids and gases
   e. solids and liquids

2. If matter is uniform throughout and cannot be separated into other substances by physical means, it must be
   a. a compound
   b. either an element or a compound
   c. a homogeneous mixture
   d. a heterogeneous mixture
   e. a solution

3. Which of the following is an illustration of the *law of constant composition*?
   a. water boils at 100ºC at 1 atm pressure
   b. water is 11% hydrogen and 89% oxygen by mass
   c. water can be separated into other substances by a chemical process
   d. water and salt have different boiling points
   e. water is a compound

4. Which one of the following is an *intensive* property?
   a. mass
   b. temperature
   c. heat content
   d. volume
   e. number of moles

5. Which one of the following is the highest temperature?
   a. 28º F
   b. 28º C
   c. 28 K
   d. the freezing point of water
   e. none of the above, they are all the same

6. The temperature of 25ºC is _____ in Kelvins
   a. 103 K
   b. 138 K
   c. 166 K
   d. 248 K
   e. 298 K

7. 3.2 cm^3 = _____ L
   a. 32 L
   b. 0.32 L
   c. 0.032 L
   d. 0.0032 L
   e. 3.2×10^{-6} L

8. 3.337 g/cm^3 = _____ kg/m^3
   a. 3.337×10^{-9} kg/m^3
   b. 3.337 kg/m^3
   c. 3337 kg/m^3
   d. 0.3337 kg/m^3
   e. 333.7 kg/m^3

9. The mass of a sphere is 1.36 kg. What is the maximum volume that the sphere can be and still be able to sink in liquid mercury (density of Hg = 13.6 g/ml)
   a. 100. ml
   b. 18.0 ml
   c. 10.0 ml
   d. 0.100 ml
   e. 0.0100 ml

10. How many significant figures in the measurement 0.00230 g?
    a. 2
    b. 3
    c. 4
    d. 5
    e. 6

11. Circle the best answer to the following calculation:

$$\frac{1.5}{0.04306} = 34.835114$$

    a. 34.835114
    b. 34.8351
    c. 34.84
    d. 34.8
    e. 35

12. Using the following equalities and any other that you may need choose the dimensional analysis scheme that allows you to correctly determine the mass of a gallon of gasoline.

    1 gal = 4 qt   1 qt = 1.057 L   1 ml = 0.67 g

    a. $(1gal)\left(\frac{4qt}{1gal}\right)\left(\frac{1.057L}{1qt}\right)\left(\frac{0.67g}{1ml}\right) =$
    b. $(1gal)\left(\frac{4qt}{1gal}\right)\left(\frac{1.057L}{1qt}\right)\left(\frac{1000ml}{1L}\right)\left(\frac{0.67g}{1ml}\right) =$
    c. $(1gal)\left(\frac{4qt}{1gal}\right)\left(\frac{1.057L}{1qt}\right)\left(\frac{0.67g}{1ml}\right)(1L) =$
    d. $\left(\frac{1gal}{4qt}\right)\left(\frac{1qt}{1gal}\right)\left(\frac{1.057L}{1qt}\right)\left(\frac{0.67g}{1ml}\right)(1L) =$
    e. $(1gal)\left(\frac{1gal}{4qt}\right)\left(\frac{1qt}{1.057L}\right)\left(\frac{1L}{1000ml}\right)\left(\frac{0.67g}{1ml}\right) =$

13. A combination of sugar and water is an example of a(n)
    a. heterogeneous mixture
    b. element
    c. solution
    d. compound
    e. pure substance

14. Convert 35.6 nm to meters.
    - a. 3.56×10^{-10} m
    - b. 3.56×10^{-9} m
    - c. 3.56×10^{-8} m
    - d. 3.56×10^{9} m
    - e. 3.56×10^{10} m

15. Which would be bigger in size, 5.0 g of lead or 5.0 g of aluminum?
    - a. The lead would be bigger because it is more dense.
    - b. The aluminum would be bigger because it is less dense.
    - c. They would be the same size because they are the same mass.

16. A student measures a cube of lead with a dimension of 2.0 cm on each side to be 80.0 g. The literature value for the density of lead is 11.34g/cm³. What is the percent error for this student's calculated density?
    - a. $\left(\frac{|10.-11.34|}{11.34}\right)\times 100 =$
    - b. $\left(\frac{|10.-11.34|}{10.0}\right)\times 100 =$
    - c. $\left(\frac{|80.0-11.34|}{11.34}\right)\times 100 =$
    - d. $\left(\frac{|10.-11.34|}{80.0}\right)\times 100 =$
    - e. $\left(\frac{|10.-2.00|}{11.34}\right)\times 100 =$

17. The mass of a beaker was 126.81 g and the mass of the beaker with liquid in it was 129.61 g. The mass of the liquid in the beaker should be reported to how many significant figures?
    - a. 1
    - b. 2
    - c. 3
    - d. 4
    - e. 5

18. The answer of the calculation in question #16 should be reported with how many significant figures?
    - a. 1
    - b. 2
    - c. 3
    - d. 4
    - e. 5

19. The following data were collected from two different experiments in which Avogadro's number can be experimentally determined.

experiment 1 Avogadro's number (atoms mol^{-1})	**experiment 2 Avogadro's number (atoms mol^{-1})**
6.171×10^{23}	6.0212×10^{23}
6.171×10^{23}	6.0232×10^{23}
6.171×10^{23}	6.0233×10^{23}
6.171×10^{23}	6.0240×10^{23}

Which of the following statements is true in relation to these data?
    - a. The data in experiment 1 is more precise, but less accurate than those in experiment 2.
    - b. The data in experiment 1 is more precise, and more accurate than those in experiment 2.
    - c. The data in experiment 1 is less precise, and less accurate than those in experiment 2.
    - d. The data in experiment 1 is less precise, but more accurate than those in experiment 2.
    - e. The data in each experiment are equally precise but more accurate in experiment 2

20. Read the graduated cylinder below, and on the line below, record the volume of fluid represented.

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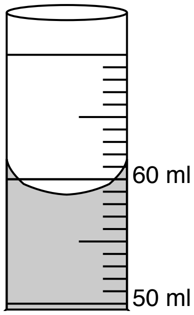


Note: The entire cylinder is not shown. Assume that it extends to 0

21. A 15.0 cm long cylindrical glass tube, sealed at one end, is filled with ethanol at room temperature. The mass of the ethanol needed to fill the tube is measured to be 21.56 g. The density of ethanol at room temperature is 0.789 g/ml. Calculate the inner diameter of the tube in centimeters. Volume of a cylinder = $\pi r^2 h$
Y*ou must show your work to receive any credit.*

22. Make filled-in circles for a model to represent atoms one type of element and open circles to represent atoms of a different element to illustrate the following gaseous situations. If the circles are touching, it will be assumed that the atoms are bonded.

a. atoms of an element

b. molecules of an element

c. molecules of a compound

d. a mixture of a compound and an element

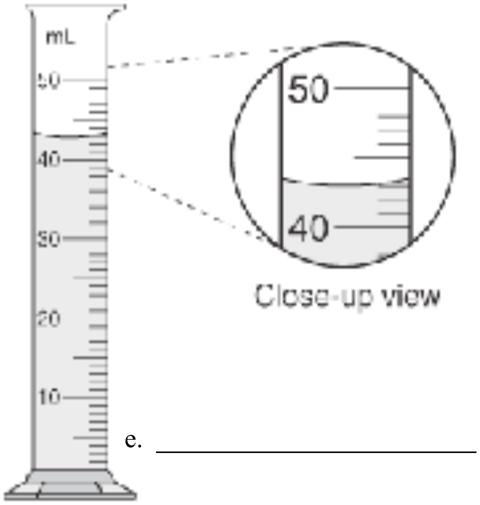
23. What are the names of the common lab supplies below? (These images are not necessarily to scale with each other.) *Look them up on the interned if you need to.*

a. ________________________

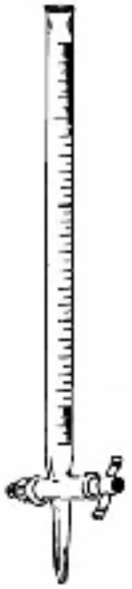
b. ________________________

c. ________________________

d. ________________________

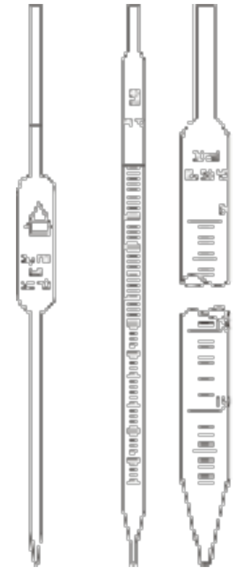


e. ________________________



f. ________________________

g. ________________________



h. ________________________

i. ________________________

1. a Liquids and solids are practically incompressible because their molecules are touching. Liquids and solids are often called the “condensed phases.”
2. b To separate a compound into its constituent elements, you would need to effect a chemical reaction. A mixture can be separated by physical means.
3. b The Law of Constant Composition (aka Law of Definite Proportions) states that the elemental composition of a pure compound is always the same regardless of the quantity, how much you have, or how it was formed, or whether it is Tuesday or Wednesday. The mass ratio and the mole ratio will both always be constant.
4. b Temperature is a property that does *not change* for a particular material at a particular moment *regardless of the amount* of material that you measure. Other examples of intensive properties would be color, density, boiling or melting temps. Intensive properties are sometimes called characteristic properties. An extensive property will change with varying quantities of a particular material. Examples of extensive properties would be mass, volume, heat content, or length.
5. b As you should know (since you live in the United States, one of only 3 countries that has not officially metrified) 28ºF is below freezing temp of water and 28 K is nearly absolute zero, thus 28ºC is the warmest, *in fact if the sun were out, it would be a good day at the beach. I hope you have enjoyed some beach time this summer.*
6. e ºC + 273 = K
7. d You should know that 1 cm^3 = 1 ml, and of course that 1000 ml = 1 L
8. c Unit conversions can be tricky with compound and derived units. $\left(\frac{3.337g}{cm^3}\right)\left(\frac{1kg}{1000g}\right)\left(\frac{100cm}{1m}\right)\left(\frac{100cm}{1m}\right)\left(\frac{100cm}{1m}\right)=$

   which you can condense to $\left(\frac{3.337g}{cm^3}\right)\left(\frac{kg}{10^3g}\right)\left(\frac{10^6cm^3}{1m^3}\right)=$ and thus $\left(\frac{3.337\times10^3kg}{m^3}\right)=$
9. a $D=\left(\frac{m}{V}\right)$ solve for $V=\left(\frac{m}{D}\right)$ Note that the mass is given in kilograms, convert to grams and solve. Resist reaching for your calculator and get comfortable doing this without one. A 1,360 g sphere with a volume of 100 ml will have exactly the same density as mercury, and thus with a push downward, would sink to the bottom. Thus a sphere of any volume *larger* than 100 ml will have a density less than that of mercury, and would float in mercury.
10. b Only the italicized digits are significant: 0.00*230* Leading zeros (to the left of the number) are simply placeholders. Note, if you changed to standard scientific notation $2.30\times10^{-}$ you would have to include the trailing zero, but you would not include the leading zeros. In standard scientific notation, all digits are significant.
11. e Since the operation is division (same for multiplication) the 1.5 has only 2 sig figs, the answer to this quotient must be rounded off to only two significant figures. (The rule is different for addition/subtraction.)
12. b Using dimensional analysis, starting with the 1 gallon, convert it to grams using the conversion factors. Watch to be sure that the unit labels cancel out and grams remain.
13. c Dissolved sugar in water would be a homogeneous mixture also known as a solution.
14. c You **should know** that there are 1×10^9 nanometers in every meter, thus $35.6nm\left(\frac{1m}{10^9nm}\right)$ which is equal to 35.6×10^{-9} m, which you should convert to standard scientific notation for 3.56×10^{-8} m
15. b More dense materials pack more mass in a smaller space, thus the more dense lead is smaller and the less dense aluminum would be larger in size.
16. a Percent error is the difference between the theoretical (literature) value and the experimental value divided by the theoretical value. Sometimes we report the answer as an absolute value, or you could opt to report the answer in this case as negative to indicate the experimental value is below the theoretical value. Percent yield is simply the experimental value divided by the theoretical value. Note that the experimental value is rounded to 10. (with the decimal) to indicate two significant figures as caused by the volume of 8.0 cm^3.
17. c 129.61 − 126.81 = 2.80 There are only 3 sig figs in this answer. Watch out! Sig figs can be lost during subtraction or gained during addition.
18. a As you were instructed in problem #17, there can be a loss of significant figures when subtracting. 11.34 − 10. = 1.34 which must be rounded to 1, due to the 10. with sig figs only to the 1‘s place. After performing the division, the answer would need to be rounded to one sig fig. While this may seem picky, it was worth one point out of 46 possible points on the 2015 AP Free Response.
19. a Experiment 1 values are all the same, making these values incredibly (maybe impossibly) precise, yet they are not so close to the actual value, and thus not so accurate since the known value is 6.0221415×10^{23}. The second set of values have some variation, and thus are not so precise, although the second set of values are much more accurate.

20. 59.0 ml or 58.9 or 59.1 etc (not 58 ml since the increments on the cylinder are 1's, you must record the answer to the 10ths) Also please take note that the volume should not be reported as 60.5 ish as you must read the bottom of the meniscus not the top. (This too, may seem picky, but was worth one point out of 46 on the 2016 Free Response;)

21. There are many ways you could go about this problem. Consider solving the equations literally first (using just variables, isolating the diameter.)

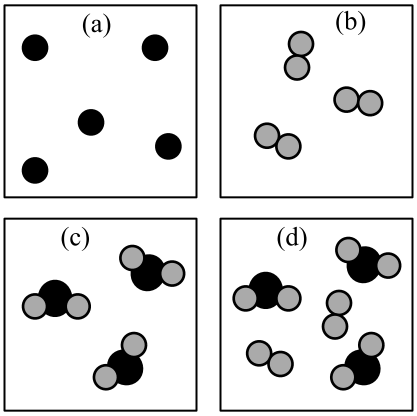
    $V = \pi r^2 h$ Recall the density equation $Dens = \frac{m}{V}$ solve for $V = \frac{m}{Dens}$ which you can substitute it back into the original equation listed. Also, you know the relationship between radius and diameter $r = \frac{Diameter}{2}$ which you can also substitute back into the original equation. Thus $\frac{m}{Den} = \pi \left(\frac{Diameter}{2} \right)^2 h$ then use your algebra to solve for diameter

    $Diameter = \sqrt{\frac{4m}{\pi h Den}}$ $Diameter = \sqrt{\frac{4 \times 21.56g}{3.14 \times 15\text{cm} \times 0.789\text{g/cm}^3}}$ and solve for

    Diameter = 1.52 cm

22. models of atoms and molecules
    a. any amount of single circles
    b. two or more of the same circle touching (since we will use touching circles to symbolize bonded atoms)
    c. two (or more) different circles touching
    d. c and either a or b in the same box

These are examples. There are an infinite number of correct ways you could model the problem.



23. Labware – *Yes you are expected to know what all of these items are, and for what types of lab activities would you choose each particular one.*
    a. beaker (useful for *containing* liquids and only *approximate* volume measuring. A beaker should never be used to measure accurate quantities of fluid.)
    b. Erlenmeyer flask (useful for *containing* liquids and only *approximate* volume measuring. An Erlenmeyer flask should never be used to measure accurate quantities of fluid.)
    c. test tube (useful for chemical reactions or heating liquids, not measuring)
    d. volumetric flask (on page 17 in text – useful for very accurate measurement of one predetermined volume)
    e. graduated cylinder (useful for measuring various volumes of liquids – not quite as accurate as a buret. Not used to perform reactions in, only used as a measuring device.)
    f. buret (on page 17 in text – useful for very accurate measurement of various volume quantities)
    g. evaporating dish (You may remember that you used this first year chemistry for heating chemicals to dryness such as hydrates – able to withstand high temperatures.)
    h. pipet (on page 17 in text – useful for very accurate measurement of one predetermined volume)
    i. crucible (You may remember that you used this first year chemistry for burning magnesium – able to withstand very high temperatures.)