Chemistry
CHM 130 Exam
August 25, 2009

Name ____________________________  Chapters 1-2

$D = \frac{m}{V}$  \hspace{1cm} °F = $1.8^\circ C + 32$  \hspace{1cm} \frac{°C}{1.8} = \frac{°F - 32}{1.8}$  \hspace{1cm} K = °C + 273.15

Multiple Choice

1) Which of the following is the simplest form of matter?
   a) Mixtures  \hspace{1cm} d) Elements  \hspace{1cm} e) Compounds
   b) Solutions  \hspace{1cm}  
   c) Products

2) The symbol “C” represents which of the following elements?
   a) Californium  \hspace{1cm}  
   b) Chromium  \hspace{1cm}  
   c) Copper  \hspace{1cm}  
   d) Carbon  \hspace{1cm}  
   e) Constructivism

3) Which of the following is NOT a metric system measurement?
   a) Celsius  \hspace{1cm}  
   b) Liter  \hspace{1cm}  
   c) Gram  \hspace{1cm}  
   d) Ounce  \hspace{1cm}  
   e) Micrometer

4) Which of the following is a measurement of volume in the metric system?
   a) Liter  \hspace{1cm}  
   b) Meter  \hspace{1cm}  
   c) Gram  \hspace{1cm}  
   d) Ton  \hspace{1cm}  
   e) Gallon
5) Which of the following is an elemental substance?
   a) Hydrogen Peroxide (H₂O₂)
   b) Carbon dioxide (CO₂)
   c) Mercury (Hg)
   d) Air
   e) Hydrogen (H₂)

6) Which one of the following substances is a pure compound?
   a) Sulfur
   b) Sodium
   d) Magnesium
   e) Carbon Dioxide
   c) Oxygen

7) Which one of the following is a physical change?
   a) A candle burning
   d) Fireworks Exploding
   b) Silverware tarnishing
   e) None of the Above
   c) Ice cream melting

8) Convert 5.3 x 10⁻³ meters to millimeters and express the answer in standard notation using the correct number of significant figures.
   a) 5.3 mm
   b) 5.30 mm
   c) 5.300 mm
   d) 530 nm
   e) 5300 mm

9) Which of the following statements concerning the phase diagram below is CORRECT?
   Moving from point a temperature of -124°C at a pressure of 0.50 atm to a temperature of
   -115°C at a pressure of 0.50 atm results in a phase transition from
   a) liquid to gas.
   b) solid to gas.
   c) Solid to liquid
   d) solid to liquid to gas
   e) gas to liquid to solid

[Phase diagram image]
Classify the following changes as physical or chemical.

10) Wood burns to ashes.
   a) physical change               b) chemical change  

11) Water begins to boil.
    a) physical change            b) chemical change  

12) A rock is crushed to powder.
    a) physical change            b) chemical change  

Classify the following as an element, a compound, or a mixture.

13) Sodium chloride (NaCl)
   a) Element                  b) Compound                c) Mixture  

14) Copper
    a) Element                  b) Compound                c) Mixture  

15) Air
    a) Element                  b) Compound                c) Mixture  

16) Ocean
    a) Element                  b) Compound                c) Mixture  

Significant Digits:
State the number of significant digits in each of the following measurements.

17) The number 20,500
    a) One (1)                  d) Four (4)  
    b) Two (2)                  e) Five (5)  
    c) Three (3)               

18) The number 0.0004020
    a) One (1)                  d) Four (4)  
    b) Two (2)                  e) Five (5)  
    c) Three (3)               

19) The number 3.050
    a) One (1)                  d) Four (4)  
    b) Two (2)                  e) Five (5)  
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MULTIPLE CHOICE – Select the best answer for each problem.

20) What is a controlled investigation that is used to collect data?
   a) Experiment
   b) Hypothesis
   c) Theory
   d) Natural law

21) If 25.0 mL of a liquid substance has a mass of 22.5 g what is the liquid substance’s density in g/mL?
   a) 0.900
   b) 1.11
   c) 2.5
   d) 563

22) Which of the following is a heterogeneous mixture?
   a) Salt water
   b) A copper pipe
   c) Meat Lovers Pizza
   d) Sucrose (pure cane sugar)
   e) Water, H₂O

23) In which of the following is the metric unit paired with its correct abbreviation?
   a) milliliter - ml
   b) gram - gr
   c) centimeter - ctm
   d) kilogram - kg
   e) celsius - °C

24) The formation of a gas from a liquid due to heating is referred to as
   a) boiling
   b) melting
   c) sublimation
   d) deposition
   e) freezing

25) Which of the following phase changes occurs during melting?
   a) Solid to liquid
   b) Liquid to gas
   c) Solid to gas
   d) Gas to liquid
   c) Gas to solid

26) Which of the following does not involve a change of state?
   a) melting ice
   b) sublimation of dry ice
   c) boiling water
   d) determining the density of aluminum
   e) evaporating alcohol
27) Which is larger: 2.0 micrometers or 2.0 millimeters?
   a) 2.0 millimeters
   b) 2.0 micrometers

28) Which is the correct method of determining the number of liters of fuel required to fill an automobile’s 15 gallon tank? (1.000 L = 1.057 quarts, 4 quarts = 1 gallon)
   a) \[ 15 \text{ gallons} \left( \frac{4 \text{ quarts}}{1 \text{ gallon}} \right) \left( \frac{1 \text{ liter}}{1.057 \text{ quarts}} \right) = \]
   b) \[ 15 \text{ gallons} \left( \frac{1 \text{ gallon}}{4 \text{ quarts}} \right) \left( \frac{1 \text{ liter}}{1.057 \text{ quarts}} \right) = \]
   c) \[ 15 \text{ gallons} \left( \frac{1 \text{ gallon}}{4 \text{ quarts}} \right) \left( 1.057 \text{ quarts} \right) = \]
   d) \[ 15 \text{ gallons} \left( \frac{1 \text{ gallon}}{4 \text{ quarts}} \right) \left( \frac{1 \text{ liter}}{1.057 \text{ quarts}} \right) = \]

29) Which of the following observations of aluminum is a chemical property?
   a) Aluminum reacts with hydrochloric acid, forming hydrogen gas.
   b) Aluminum melts at 660°C.
   c) The density of aluminum is 2.70 g/mL.
   d) Aluminum is a shiny metal.

30) Bromine melts at 265.95 K and boils at 331.95 K. What is the physical state of bromine at 95°C? (Hint: Convert Celsius to Kelvin or Kelvin to Celsius and then compare.
   a) Solid
   b) Liquid
   c) Gas
   d) Plasma

Problems
31) Round 86.048 to three significant digits.
   \[ 86.0 \]

32) Write 0.03420 in scientific notation, maintaining the same number of significant figures.
   \[ 3.420 \times 10^{-2} \]

33) Convert 0.075 kilograms to milligrams.
   \[ 0.075 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1000 \text{ mg}}{1 \text{ g}} = \boxed{75,000 \text{ mg}} \]

34) Convert 25.8 micrograms to milligrams.
   \[ 25.8 \text{ \mu g} \times \frac{1 \text{ mg}}{1000 \text{ \mu g}} = \boxed{0.0258 \text{ mg}} \]
Perform the following calculations and round to the proper number of significant figures.

35) \( (41.40 \text{ cm})(0.70 \text{ cm}) = \frac{737.5 \text{ g}}{25.4 \text{ mL}} = \boxed{29.035} \) g/cm

36) Quinidine is an antiarrhythmic agent. It is prescribed for an adult patient weighing 110 lbs. at a dosage of 25 mg/day per kilogram of body weight. How many mg should one dose contain?

\[
\frac{25 \text{ mg}}{\text{day}} \times \frac{1 \text{ kg}}{2.2 \text{ lb}} = 41.94 \text{ mg} 
\]

37) Calculate the average and % error for Trial 1. The true value for the density of this substance is 0.529 g/mL.

<table>
<thead>
<tr>
<th>Density Set</th>
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<tr>
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</tr>
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<td>C</td>
<td>0.530</td>
</tr>
<tr>
<td>D</td>
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Average density = 0.5275 g/mL

% error = \( \frac{|0.529 - 0.5275|}{0.5275} \times 100 = 0.18\% \)

38) You need 4.00 ounces of a steroid ointment. If there are 16 oz in 1 lb, how many grams of ointment does the pharmacist need to prepare for you? (1 lb = 454 g)

\[
\frac{1 \text{ lb}}{16 \text{ oz}} \times \frac{454 \text{ g}}{1 \text{ lb}} = \boxed{113.5 \text{ g}}
\]
39) Circle the **area of the graph** below that could be representative of a melting point.

40) Determine the volume in each of the following graduated cylinders to the accuracy of the measuring device.

\[
\begin{align*}
14.0 \text{ mL} & \quad \frac{1}{2} \\
84.0 \text{ mL} & \quad \frac{1}{2}
\end{align*}
\]
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\[ D = \frac{m}{V} \quad {}^\circ F = 1.8{}^\circ C + 32 \quad {}^\circ C = \frac{{}^\circ F - 32}{1.8} \quad K = {}^\circ C + 273.15 \]

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![Graph Image]

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![Cylinder Images]