MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The wavelength of blue light is 0.00000045 m. Express this wavelength in scientific notation. 1) _______
   A) $4.5 \times 10^7$
   B) $4.5 \times 10^6$
   C) $4.5 \times 10^5$
   D) $0.45 \times 10^{-7}$
   E) $4.5 \times 10^7$

2) There are exactly 2.54 centimeters in 1 inch. When using this conversion factor, how many significant figures are you limited to? 2) _______
   A) 1
   B) 3
   C) ambiguous
   D) infinite number of significant figures

3) Determine the answer for the equation below with correct number of significant figures:
   $3.215 \times 13.2 \div 0.218 = \_\_\_\_\_
   A) 194.669
   B) 195
   C) 194.67
   D) 194.7

4) What is the standard SI unit for length?
   A) centimeter
   B) foot
   C) meter
   D) mile

5) Which of the following sets of units is not in the order of increasing size?
   A) $\mu g < g < kg$
   B) $\mu mol < mmol < mol$
   C) $cm < \mu m < km$
   D) $mL < dL < L$
   E) $ns < ms < s$
6) A popular science demonstration is to take several liquids that will not mix together and "stack" these liquids in a tall glass cylinder. Suppose the following three liquids were placed in the same tall, narrow glass cylinder:

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>DENSITY g/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>vinegar</td>
<td>1.01</td>
</tr>
<tr>
<td>motor oil</td>
<td>0.87</td>
</tr>
<tr>
<td>corn syrup</td>
<td>1.36</td>
</tr>
</tbody>
</table>

These liquids would stack in which order?
A) motor oil on top, vinegar in the middle, corn syrup on the bottom
B) vinegar on top, motor oil in the middle, corn syrup on the bottom
C) corn syrup on top, vinegar in the middle, motor oil on the bottom
D) corn syrup on top, motor oil in the middle, vinegar on the bottom
E) motor oil on top, corn syrup in the middle, vinegar on the bottom

7) Which state of matter has indefinite shape and is compressible?
A) plasma
B) liquid
C) solid
D) gas

8) Which of the following items is a chemical property?
A) the melting and boiling point
B) the paint color on a new red Corvette
C) the odor of spearmint gum
D) the tarnishing of a copper statue

9) The boiling point of water is
   (1) 212°F (2) 0°C (3) 373 K
A) 2 and 3 only
B) 1 and 2 only
C) 1 and 3 only
D) all of 1, 2, and 3

10) In calculating the relationship between the amount of heat added to a substance and the corresponding temperature change, the specific heat capacity is usually represented by which symbol?
A) ΔT
B) q
C) C
D) m
11) Consider the following specific heats of metals.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Specific Heat (J/g·°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>0.903</td>
</tr>
<tr>
<td>Copper</td>
<td>0.385</td>
</tr>
<tr>
<td>Gold</td>
<td>0.128</td>
</tr>
<tr>
<td>Iron</td>
<td>0.449</td>
</tr>
<tr>
<td>Silver</td>
<td>0.235</td>
</tr>
</tbody>
</table>

If the same amount of heat is added to 50.0 g samples of each of the metals, which are all at the same temperature, which metal will reach the highest temperature?

A) copper  B) iron  C) silver  D) aluminum  E) gold
Short Answer Problems. Show ALL calculations

1. A thief uses a bag of sand to replace a gold statue that sits on a weight sensitive, alarmed pedestal (will be affected by changes in weight). The bag of sand and the statue have exactly the same volume, 1.75 L. (assume that the mass of the bag is negligible).
   a. Calculate the mass of each object. (density of gold = 19.3 g/cm$^3$; density of sand = 3.00 g/cm$^3$).
   b. Did the thief set off the alarm? Explain.
2. A pure gold ring with a volume of 1.57 cm$^3$ is initially 11.4 °C. When it is put on, it warms to 29.5 °C. How much heat did the ring absorb? (density of gold = 19.3 g/cm$^3$, specific heat of gold = 0.128 J/g°C).
3. Complete the table below with the appropriate temperature conversions.

<table>
<thead>
<tr>
<th>Kelvin</th>
<th>Fahrenheit</th>
<th>Celsius</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 K</td>
<td></td>
<td>-273.0 °C</td>
</tr>
<tr>
<td></td>
<td>82.5 °F</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.5 °C</td>
</tr>
</tbody>
</table>
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. An American nickel five cent coin has a mass of approximately 5 grams. Five grams is equivalent to which term?
   A) 5000 kilograms
   B) 5000 milligrams
   C) 50 centigrams
   D) 5000 micrograms

2. The common English unit in which the speed of an automobile is expressed is miles/hr. What is the set of standard SI units for speed?
   A) mile/s
   B) km/hr
   C) km/s
   D) m/s

3. Given the following list of densities, which materials would float in a molten vat of lead provided that they do not themselves melt? Densities (g/mL): lead = 11.4, glass = 2.6, gold = 19.3, charcoal = 0.57, platinum = 21.4.
   A) gold and platinum
   B) glass and charcoal
   C) gold, platinum, glass and coal
   D) gold and charcoal

4. The correct scientific notation for the number 0.00050210 is:
   A) 5.0210×10⁻⁴
   B) 5.021×10⁻⁴
   C) 5.021×10⁴
   D) 5.0210×10⁻⁴

5. How many significant digits should be reported in the answer to the following calculation?
   \((4.3 - 3.7) \times 12.3 =\)
   A) 1
   B) 2
   C) 3
   D) 4
6. Which of the following items is a physical property?

A) the corrosive action of acid rain on granite  
B) the odor of spearmint gum  
C) the combustion of gasoline  
D) the tarnishing of a copper statue

7. Which of the following items is not a common unit of energy?

A) joule  
B) torr  
C) calorie  
D) kilowatt-hour

8. In order, what is the freezing point, room temperature and boiling point of water according to the Fahrenheit scale?

A) 32-75-212  
B) 0-75-100  
C) 0-25-100  
D) 0-298-373

9. From the following list of substances and heat capacities, choose the one that will have the lowest temperature after absorbing 100.0 kJ of heat. Assume identical masses of each substance start at the same initial temperature.

A) Lead – 0.128 J/g°C  
B) Copper – 0.385 J/g°C  
C) Ethanol – 2.42 J/g°C  
D) Water – 4.18 J/g°C

10. What is the value of 335 K on the Celsius temperature scale?

A) 62  
B) 167  
C) 608  
D) 66.4

11. When methane is burned with oxygen the products are carbon dioxide and water. If you produce 36 grams of water and 44 grams of carbon dioxide from 16 grams of methane, how many grams of oxygen were needed for the reaction?

A) 32  
B) 80  
C) 96  
D) 64
1. Diamonds are a crystalline form of carbon and are measured in carats, where 1 carat = 0.200 grams. The density of diamond is 3.51 g/cm³. What is the volume of a 5.0-carat diamond?

2. The speed needed to escape the pull of Earth's gravity is 11.3 km/s. What is this speed in mi/h? (1 mile = 1609 m)
3. A block of aluminum with a volume of 98.5 cm$^3$ absorbs 67.4 J of heat. If its initial temperature was 32.5 °C, what is its final temperature? (density of aluminum = 2.70 g/cm$^3$)

**Bonus Question (5 pts.)**

Calculate the number of cubic inches in 1.00 liter?