Exam 1
Cem 151
September 22, 2010
150 points total

Name___________________
Section__________________
PID_____________________

Choose the best answer (6 points each)
1. Which of the following is/are homogeneous?
   a. The air in the classroom
   b. A beaker containing water and sand.
   c. A beaker containing sodium sulfate dissolved in water reacting with magnesium chloride dissolved in water to produce solid magnesium sulfate.
   d. Crystals of pure sodium chloride in a saturated solution of sodium chloride and water
   e. All of the above
   f. None of the above
   g. c and d.
   h. a, c and d
   i. a and d

2. -273 °C represents
   a. Absolute 0
   b. The temperature that water freezes
   c. The temperature at which the kinetic energy is 0
   d. An arbitrary value
   e. All of the above
   f. None of the above
   g. a and c
   h. a, b and c

3. A certain substance has a density of 7.9 g/mL. What would be the mass of 0.05 L of it?
   a. Cannot determine without more information
   b. 395 Kg
   c. 400 g
   d. 0.395 g
   e. 40 g
   f. 800 g
   g. None of the above.

4. Which of the following is a hypothesis.
   a. A large explosion of some sort occurred on the Russian Tundra.
b. Trees were flattened radiating outward from a single location.
c. The event may have been caused by a comet.
d. A search for the elements present around the site compared to sites nearby give important insight about the origin of the event.
e. All of the above.
f. None of the above.

5. How many significant figures in the number 1,820,100?
a. 3 b. 4 c. 5 d. 6 e. 7 f. None of the above.

6. A fire house sprays 10 L of water (d = 1g/mL) per minute. How many grams of water was sprayed in an hour?
a. 600 g d. 4000 kg
b. 600 kg e. 4000 g
c. 360 kg f. None of the above

7. Miliken’s oil drop experiment succeeded in:
   a. Discovering the nucleus
   b. Measuring the charge of the electron
   c. Discovering the neutron
   d. Measuring the mass of the neutron
   e. Measuring the mass of the proton
   f. Measuring the charge of the proton
   g. Measuring the charge to mass ratio of the electron
   h. All of the above
   i. None of the above

8. Ernest Rutherford discovered three types of radiation coming from radioactive materials. Which was the least massive (lightest).
   a. α radiation
   b. β radiation
   c. γ radiation
   d. Protons
   e. Neutrons
   f. positrons
   g. None of the above
   h. All of the above.

9. Which of the following observations of Rutherford’s Gold Foil Experiment was critical in discovering the nucleus?
   a. Most of the particles went straight through the foil
   b. Some were deflected very slightly
   c. Some were scattered widely.
   d. None of the radiation was scattered
   e. The Gold foil gave off nuclei.
10. Which of the following symbols correctly represents a common isotope of bromine?
   a. $^{79}\text{Br}$  c. $^{86}\text{Br}$  e. all of the above  g. a, b and c  i. None of the above
   b. $^{81}\text{Br}$  d. $^{80}\text{Br}$  f. a and b  h. a, b and d.

11. Which of the following elements are an alkali metal, non metal, Nobel gas and an element very commonly found in living organisms, respectively:
   a. Cl, Na, N$_2$, O  d. O, Ca, S, C  g. None of the above  j. c, d and e.
   b. Li, S, He, C  e. Mg, Cl, Ar, O  h. a, b and c
   c. Na, F, O$_2$, O$_2$  f. All of the above  i. a, c and e.

12. Which is the correct formula for potassium chlorite?
   a. KClO$_4$  c. PCIO$_4$  e. PCIO$_3$  g. KCl
   b. KClO$_3$  d. KCLO$_2$  f. KCLO  h. None of the above

13. Which of the following formulas corresponds to nitric acid?
   a. HNO$_4$  c. H$_2$NO$_4$  e. HNO$_3$  g. H$_2$NO$_3$
   b. H$_2$NO$_2$  d. N$_2$  f. None of the above  h. HNO$_2$

Solve the following. Show your work, remember significant figures (12 points each)

14. Chlorine has an average atomic mass of 35.453. It has two stable isotopes, one of which weighs 34.96885268 while the other weighs 36.96590259. What is the natural abundance of each isotope (lightest first, heaviest second)?
   a. 50%, 50%  c. 75.756%, 24.243%  f. %, 34.969%, 36.966%
   b. 81.245%, 18.755%  d. 24.243%, 75.756%  g. 34.969%, 65.031%
   c. 18.755%, 81.245%  e. 36.966%, 34.969%  h. 65.031%, 34.969%

15. Methamphetamine, a dangerously addictive stimulant has the molecular structure shown below. It has the molecular formula C$_9$H$_{13}$N.
   a. What is the empirical formula?
b. What is the percent composition by weight of each element in methamphetamine?

16. In a standard combustion reaction 200 g of butane \( (\text{C}_4\text{H}_{10}) \) is reacted.
   a. Write a balanced chemical reaction for the process.

   b. Give the molecular weight of butane

   c. Predict the number of moles of each product produced.

   d. Predict the number of grams of each product produced.

   e. After the reaction was complete, it was found that only 300 g of total product was produced (when the amounts of all products are added together). What was the percent yield for this reaction?

17. Lithium metal and Nitrogen gas react to form lithium nitride \( (\text{Li}_3\text{N}) \).
   a. Write a balanced equation for the reaction.

   b. How much lithium nitride is produced when 28 g of each reactant are reacted?
18. a. How much lithium nitride would be produced from part b if the actual yield of the reaction was 70.0%?

b. How many atoms of Li$^+$ are produced in part a?

19. Give the formulas for the following compounds:
   a. Ammonium carbonate
   b. Sodium sulfite
   c. Potassium perchlorate
   d. Tetraphosphorous decoxide
   e. Rubidium hydroxide