CHM 130 Practice Final Exam KEY Dr. Kim

Directions. There is only one best answer for multiple-choice questions. For calculations **you must show** all your work and the proper units if applicable. Pay attention to significant digits of course! *Good Luck.* ☺

1. Which of the following statements is false about the scientific method?
   a. You should record all observations in a lab notebook.
   b. You should develop a hypothesis.
   c. You should conduct only one experiment and never repeat it.
   d. You should examine all the data carefully.
   e. You should revise your hypothesis if needed after experimentation.

2. How many significant digits are in the following numbers?

   a. 10.504 cm ____5_____ c. 2100 g ____2_____

   b. 0.00050 mL ____2_____ d. 800.0 m ___4_____

3. Round the following numbers to three significant digits.

   a. 275,794,054 mm _____276,000,000 mm____

   b. 0.00500123 kg ____0.00500 kg_____

   c. 544.85 dL _____545 dL_____

4. A marathon is a foot race where crazy people run 26 miles. How many meters is that?

   26 mil $\left(\frac{1760\ yd}{1\ mil}\right)\left(\frac{3\ ft}{1\ yd}\right)\left(\frac{12\ in}{1\ ft}\right)\left(\frac{2.54\ cm}{1\ in}\right)\left(\frac{1\ m}{100\ cm}\right)$ = 42,000 m

5. Karen's newborn baby weighed 11.35 pounds! Ouch! How many kilograms is this?

   11.35 lb $\left(\frac{454\ g}{1\ lb}\right)\left(\frac{1\ kg}{1000\ g}\right)$ = 5.15 g

6. Which state of matter generally has the highest density? _____solid_____

7. The density of silver is 16.9 g/mL. A silversmith melted down 3.28 mL of silver and made a pendant. How much does this pendant mass?

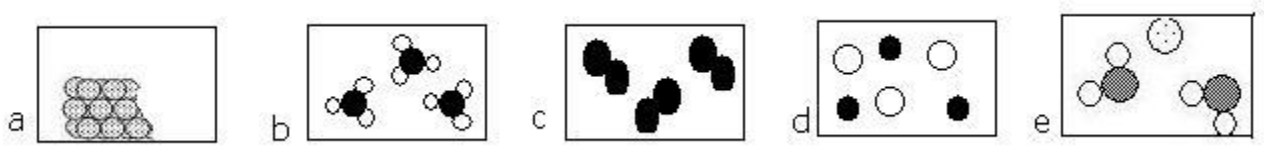
   3.28 mL $\left(\frac{16.9\ g}{1\ mL}\right)$ = 55.4 g

8. The coldest day in Tucson was –21 ^{o}C. What is that in degrees Fahrenheit?

   (1.8 x -21^{o}C) + 32 = -6^{o}F

9. Which of the following is true for the solid state?
   a. Solids have constant volume, but varying shape.
   b. Solids have constant volume and constant shape.
   c. Solids have varying volume and varying shape.
   d. Solids have varying volume, but constant shape.

10. Are the following images representing elements, compounds, or mixtures?



a. ___element_ b. ___compound__ c____element___ d. __mixture___ e. ___mixture__

11. Complete this table.

Element	Solid, liquid, gas?	Metal, Semimetal or Nonmetal?	Diatomic? Yes or No?
Iodine (I)	solid	nonmetal	yes
Polonium (Po) #84	solid	semimetal	no
Fluorine (F)	gas	nonmetal	yes
Copper (Cu) #29	solid	metal	no

12. Complete this table. Notice the first two are atoms, but the next two are **ions**.

	$^{14}_{6}C$	$^{244}_{94}Pu$	$^{19}_{9}F^{-}$	$^{25}_{12}Mg^{2+}$
# protons	6	94	9	12
# neutrons	8	150	10	13
# electrons	6	94	10	10
mass	14	244	19	25

13. When something (like steps) exist only at certain levels and it not continuous we call it:
   a. stepwise b. molecularized c. **quantized** d. photon e. bundled

14. How many sublevels are on the 4th energy level? _____4_____

15. How many electrons total can fit into the 4th energy level? _____32_____

16. What is the electron configuration for a magnesium atom? ____$1s^2 2s^2 2p^6 3s^2$_____

17. What is the electron configuration for a Cl^- ion? ____$1s^2 2s^2 2p^6 3s^2 3p^6$_____

18. What is the name of the second column in the Periodic Table (Group IIA)? _Alkaline Earth metals_

19. Which atom is the largest?
   a. P b. Cl c. Br d. **Pb** e. At

20. How many valence electrons does bromine have?

a. 4 b. 5 c. 6 d. **7** e. 8

21. Why do metals in general have low ionization energies?

a. They want to gain electrons so it takes little energy to remove one electron.
b. They want to lose electrons so it takes little energy to remove one electron.
c. They want to gain electrons so it takes little energy to add one electron.
d. They want to lose electrons so it takes little energy to add one electron.

22. What is the most likely charge for the following when they become ions?

a. Mg ___2+____ b. F ___1-__ c. N ____3-____ d. K ____1+_____

23. Which of the following is isoelectronic with Argon?

a. F^- ion b. Ne atom c. **Ca^{2+} ion** d. S^{2+} ion e. Na^+ ion

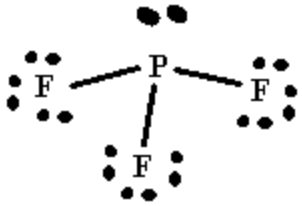
24. Which statement is true?

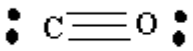
a. Metals tend to gain electrons and form cations which are smaller than the atom.
b. Metals tend to lose electrons and form anions which are larger than the atom.
c. Nonmetals tend to gain electrons and form cations which are larger than the atom.
d. Nonmetals tend to lose electrons and form anions which are smaller than the atom.
e. Metals tend to lose electrons and form cations which are smaller than the atom.

25. What type of bond involves SHARING electrons? ____Covalent_____

26. Draw the Lewis dot structure for and name the shape:

a. PF_3 b. CO





Trigonal pyramid **linear**

27. What is the shape for carbon tetrachloride, CCl_4?

a. linear b. bent c. **tetrahedral** d. trigonal planar e. trigonal pyramid

28. What is the formula for:

a. Potassium sulfate _____**K_2SO_4**_____
b. Iron(II) bromide _____**$FeBr_2$**_____
c. Carbon disulfide _____**CS_2**_____

29. What is the name for:

a. $NaNO_3$ _____**sodium nitrate**_____
b. $AuCl_3$ _____**gold(III) chloride**_____
c. P_2O_5 _____**diphosphorus pentaoxide**_____

30. In addition to mercury, there is one other liquid element at room temperature. What is it?
    a. Iodine b. Krypton c. **Bromine** d. Carbon e. Chlorine

31. Which of the following elements is NOT a gas?
    a. **Carbon** b. Nitrogen c. Chlorine d. Fluorine e. Oxygen

32. Which of the following elements is NOT diatomic?
    a. Iodine b. Hydrogen c. Nitrogen d. **Sulfur** e. Oxygen

33. Write the complete reaction, including states, for the combustion of C_2H_4 gas and then balance it.

    $C_2H_4(g) + 3\ O_2(g) \rightarrow 2\ CO_2(g) + 2\ H_2O(g)$

34. Label the following reactions as combination (C), decomposition (D), combustion (CB), single replacement (SR), double replacement (DR), or acid base neutralization (N).
    a. **DR** $K_2S(aq) + MgSO_4(aq) \rightarrow MgS(s) + K_2SO_4(aq)$
    b. **N** $HNO_3(aq) + LiOH(aq) \rightarrow H_2O(l) + LiNO_3(aq)$
    c. **C** $3\ H_2(g) + N_2(g) \rightarrow 2\ NH_3(g)$

35. Write the complete reaction, including states, for the reaction between HCl(aq) and Al(s), then balance.

    $6\ HCl(aq) + 2\ Al(s) \rightarrow 2\ AlCl_3(aq) + 3\ H_2(g)$

36. How many molecules are in 5.00 grams of ammonia, NH_3?

    $5.00\ g\ NH_3 \left(\frac{1\ mol}{17.04\ g}\right)\left(\frac{6.02 \times 10^{23}\ molecules}{1\ mol}\right) = 1.77 \times 10^{23}\ molecules\ NH_3$

37. How many liters is 2.50 grams of hydrogen cyanide gas, HCN, the gas for executions in a gas chamber, at STP?

    $2.50\ g\ HCN \left(\frac{1\ mol}{27.03\ g}\right)\left(\frac{22.4\ L}{1\ mol}\right) = 2.07\ L\ HCN$

38. Answer the following questions with this balanced reaction: $2\ P(s) + 3\ Cl_2(g) \rightarrow 2\ PCl_3(s)$
    a. How many moles of PCl_3 can be produced starting with 8.15 moles of chlorine gas?

    $8.15\ mol\ Cl_2 \left(\frac{2\ mol\ PCl_3}{3\ mol\ Cl_2}\right) = 5.43\ mol\ PCl_3$

    b. How many grams of phosphorus are needed to produce 50.0 grams of PCl_3?

    $50.0\ g\ PCl_3 \left(\frac{1\ mol\ PCl_3}{137.32\ g\ PCl_3}\right)\left(\frac{2\ mol\ P}{2\ mol\ PCl_3}\right)\left(\frac{30.97\ g\ P}{1\ mol\ P}\right) = 11.3\ g\ P$

c. How many liters of chlorine gas at STP are needed to react with 0.575 grams of phosphorus?

0.575 g P $\left(\frac{1\ mol\ P}{30.97\ g\ P}\right)\left(\frac{3\ mol\ Cl_2}{2\ mol\ P}\right)\left(\frac{22.4\ L\ Cl_2}{1\ mol\ Cl_2}\right)$ **= 0.624 L Cl_2**

39. What holds the sulfur atom to the hydrogen atoms in one molecule of hydrogen sulfide gas, H_2S, the gas partly responsible for the rotten egg smell and flatulence?
    a. Ionic bonds b. **polar covalent bonds** c. H bonds d. dipole-dipole forces e. nonpolar covalent bonds

40. Which of the following is most likely to dissolve in benzene, C_6H_6 (l)?
    a. NaCl b. **N_2** c. NH_3 d. HF e. Na_2SO_4

41. Popular as a salad dressing, vinegar and oil don't mix so we call them:
    a. soluble b. insoluble c. miscible d. **immiscible** e. undissolved

42. Calculate the molarity if 1.525 grams of magnesium oxide is dissolved in 555 mL of water.
    a. 111 M b. 0.0488 M c. 155 M d. 0.111 M e. **0.0682 M**

1.525 g MgO $\left(\frac{1\ mol}{40.31\ g}\right)$ **= 0.0378318 mol / 0.555L = 0.0682 mol/L**

43. Bases produce these ions when dissociated in water.
    a. H^+(aq) b. **OH^-(aq)** c. H_3O^+(aq) d. OH^+(aq) e. H_2^-(aq)

44. Which of the following is a strong acid?
    a. Sulfurous acid b. Acetic acid c. **Nitric acid** d. Nitrous acid e. Hydrofluoric acid

45. What is the difference between strong and weak bases?
    a. Strong bases are more concentrated than weak bases.
    b. Strong bases have more hydroxide ions than weak bases.
    c. Strong bases have less hydroxide ions than weak bases.
    d. Strong bases dissociate just a little bit while weak bases dissociate almost 100%.
    e. Strong bases dissociate about 100% while weak bases dissociate about 1-5%.

46. Circle the Arrhenius acid in this reaction: **H_2CO_3(aq)** + $Ba(OH)_2$(aq) → 2 H_2O(l) + $BaCO_3$(s)

47. When you add sodium hydroxide to a buffer solution, the pH will:
    a. increase a lot. b. decrease a lot. c. **stay about the same.** d. double

48. A weak acid is a _____ electrolyte. a. strong b. **weak** c. non

49. What is reduced in: Cu(s) + $PtCl_2$(aq) → $CuCl_2$(aq) + Pt(s) **Answer: The Pt in $PtCl_2$(aq)**