

CHEMISTRY 123-01

Practice exam #1

September 04, 2007

The total number of points in this exam is 75. The total exam time is 50 min.

PART I: MULTIPLE CHOICE (Each multiple choice question is worth 2 pts)

- The freezing point and boiling point of water are often used to calibrate thermometers. Give those temperatures in degrees Celsius.
 - 32 and 212
 - 0 and 100
 - 273 and 373
 - 100 and 273
 - 0 and 373
- Which of the following is not a physical property of water?
 - Water boils at 100 °C.
 - Water freezes at 32 °F.
 - Water can be broken down into hydrogen gas and oxygen gas.
 - Water is a liquid at room temperature.
 - Water dissolves sugar.
- Which of the following describes a chemical change?
 - Ethanol boils when heated.
 - Ethanol is a clear, colorless liquid.
 - Ethanol mixes with water.
 - Ethanol can be produced by the fermentation of grapes.
 - Ethanol evaporates quickly at room temperature.
- In a chemical reaction, 36 g of water is broken down to yield 32 g of oxygen gas and 4 g of hydrogen gas. This is an example of:
 - The Law of Conservation of Energy
 - The Law of Conservation of Mass
 - Dalton's Atomic Theory
 - The Law of Constant Composition
 - The Law of Multiple Proportions
- Which of the following is not the symbol of an element?
 - CO
 - Ag
 - Cu
 - C
 - Ni
- Which of the following is a metal?
 - Hydrogen (H, atomic number 1)
 - Carbon (C, atomic number 6)
 - Boron (B, atomic number 5)
 - Iridium (Ir, atomic number 77)
 - Radon (Rn, atomic number 86)
- Which statement about electrons is false?
 - All atoms have electrons as part of their structure.
 - Electrons have much less mass than any atom.
 - Electrons are found in the nucleus of the atom.
 - Electrons are negatively charged.
 - Electrons are attracted to positively charged electrodes.
- Rutherford's gold foil experiment used alpha particles to reveal that:
 - Isotopes exist
 - Atoms have electrons
 - Atoms have neutrons

- d. Atoms are radioactive
- e. Atoms have a nucleus

9. Which metric prefix means 1×10^{-9} ?

- a. kilo
- b. nano
- c. pico
- d. micro
- e. milli

10. Which of the following is incorrect?

- a. ^{63}Cu has 29 protons, 29 electrons and 34 neutrons
- b. ^{55}Mn has 25 protons, 25 electrons and 30 neutrons
- c. ^{37}Cl has 20 protons, 20 electrons and 20 neutrons
- d. ^{74}Se has 34 protons, 34 electrons and 40 neutrons
- e. ^{40}Ar has 18 protons, 18 electrons and 22 neutrons

11. An element containing 32 protons, 32 electrons and 41 neutrons will have the symbol:

- a. ^{73}Ta
- b. ^{41}Ge
- c. ^{41}Nb
- d. ^{73}Nb
- e. ^{73}Ge

12. Which of the following statements about two isotopes is false?

- a. They will have the same atomic numbers.
- b. They will have the same atomic weights.
- c. They will have the same charge on the nucleus.
- d. They will have different numbers of neutrons.
- e. They will have essentially the same chemical reactivity.

13. Which element can be classified as a noble gas?

- a. O
- b. Na
- c. Kr
- d. Ti
- e. P

14. Which element can be classified as an alkaline earth metal?

- a. Ag
- b. Au
- c. Na
- d. Al
- e. Mg

15. The chemical compound $\text{C}_6\text{H}_4(\text{COOH})_2$ can also be represented as:

- a. $\text{C}_7\text{H}_6\text{O}_2$
- b. $\text{C}_7\text{H}_5\text{O}_2$
- c. $\text{C}_7\text{H}_5\text{O}_4$
- d. $\text{C}_8\text{H}_6\text{O}_2$
- e. $\text{C}_8\text{H}_6\text{O}_4$

16. Which compound is not organic?

- a. $\text{C}_2\text{H}_6\text{O}$
- b. $\text{C}_6\text{H}_{12}\text{O}_6$
- c. C_4H_{10}
- d. NH_4NO_3
- e. $\text{C}_6\text{H}_5\text{OH}$

17. Which formula-name combination is incorrect?

- a. SeCl_4 selenium trifluoride
- b. N_2O_3 dinitrogen trioxide
- c. P_4O_{10} tetraphosphorus decaoxide
- d. AsF_5 arsenic pentafluoride
- e. SF_6 sulfur hexafluoride

18. Find the correct combination of protons and electrons below for the magnesium ion.

- a. 12 protons and 10 electrons
- b. 12 protons and 12 electrons
- c. 12 protons and 14 electrons
- d. 24 protons and 24 electrons
- e. 24 protons and 22 electrons

19. Which of the following is not an ionic compound?

- a. MgCl_2
- b. H_2S
- c. NaF
- d. AlCl_3
- e. CaO

20. Give the formula for the ionic compound that forms between magnesium and nitrogen.

- a. MgN
- b. Mg_2N
- c. Mg_3N
- d. MgN_2
- e. Mg_3N_2

21. Which ion is incorrectly named?

- a. K^+ potassium ion
- b. Cr^{4+} chromium(IV) ion
- c. Ba^{2+} barium ion
- d. Al^{3+} aluminum(III) ion
- e. Ni^{2+} nickel(II) ion

22. Which compound is incorrectly named?

- a. MgO magnesium(II) oxide
- b. Fe_2O_3 iron(III) oxide
- c. CsCl cesium chloride
- d. K_2S potassium sulfide
- e. Na_3N sodium nitride

PART II: NOMENCLATURE OF MOLECULAR AND IONIC COMPOUNDS.

23. (7 pts) Name the following compounds:

- a. Cu_2SO_4 ;
- b. PN ;
- c. NBr_3 ;
- d. H_3PO_3 ;
- e. $\text{Ni}(\text{CN})_2$
- f. KH_2PO_4 ;
- g. $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$;

24. (8 pts) Write the correct molecular formula for each of the following compounds:

- h. Strontium perbromate (Strontium = Sr);
- i. Copper(II) Sulfite;
- j. Barium Permanganate;
- k. Phosphoric acid

25. (4 pts) Provide structural formulas for propane and butane.

PART III: CALCULATION PROBLEMS (Show your work in its entirety. Do not provide just a single number! Pay attention to significant figures!).

26. (4 pts) In a laboratory sample of boron the isotopic ratio of the two boron isotopes ^{10}B (10.013 amu) and ^{11}B (11.009 amu) has been altered from the ratio found in nature, and the sample contains 48.73% ^{10}B . Determine the average atomic weight of the sample of boron.
27. (4 pts) How many atoms are in a 25.0 g sample of beryllium?
28. (4 pts) An average cup of coffee contains about 125 mg of caffeine (Molecular formula: $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$).
- How many moles of caffeine are in a cup?
 - How many molecules of caffeine are in a cup?