Chemistry Final Exam Part I
5-31-07

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ **1.** Matter includes all of the following *except*
a. air. **c.** smoke.
b. light. **d.** water vapor.

____ **2.** Quantitative observations are recorded using
a. numerical information. **c.** non-numerical information.
b. a control. **d.** a system.

____ **3.** Which of the following does *not* describe a unit?
a. A unit compares what is being measured with a previously defined size.
b. A unit is usually preceded by a number.
c. A unit is not needed to find a solution to a problem.
d. The choice of unit depends on the quantity being measured.

____ **4.** All of the following are examples of units *except*
a. weight. **c.** gram.
b. kilometer. **d.** teaspoon.

____ **5.** The abbreviation mm represents
a. micrometer. **c.** milliliter.
b. millimeter. **d.** meter.

____ **6.** When density is measured,
a. a balance is always used.
b. the units are always kg/m^3.
c. the temperature should be specified.
d. the mass and volume do not need to be measured.

____ **7.** The energy that results from the breaking or formation of chemical bonds is
a. temperature. **c.** chemical energy.
b. potential energy. **d.** kinetic energy.

____ **8.** The temperature that is equivalent to 20°C is
a. 253 K. **c.** −293 K.
b. 293 K. **d.** 13.7 K.

____ **9.** The reason for organizing, analyzing, and classifying data is
a. so that computers can be used.
b. to prove a law.
c. to find relationships among the data.
d. to separate qualitative and quantitative data.

_____ **10.** A theory is an accepted explanation of an observed phenomenon until
- **a.** one study conflicts with the theory.
- **b.** repeated data and observation conflict with the theory.
- **c.** scientists disagree about the research method used to gather data.
- **d.** an eminent scientist feels that it is inadequate.

_____ **11.** What is the density of 37.72 g of matter whose volume is 6.80 cm^3?
- **a.** 0.18 g/cm^3
- **b.** 5.55 g/cm^3
- **c.** 30.92 g/cm^3
- **d.** 256.4 g/cm^3

_____ **12.** The relationship between the mass m of a material, its volume *V,* and its density *D* is
- **a.** $V = mD$.
- **b.** $Vm = D$.
- **c.** $DV = m$.
- **d.** $D + V = m$.

_____ **13.** The gold foil experiment led to the discovery of the
- **a.** electron.
- **b.** cathode ray.
- **c.** nucleus.
- **d.** neutron.

_____ **14.** The nucleus of most atoms is composed of
- **a.** tightly packed protons.
- **b.** tightly packed neutrons.
- **c.** tightly packed protons and neutrons.
- **d.** loosely connected protons and electrons.

_____ **15.** Protons and neutrons strongly attract when they
- **a.** are moving fast.
- **b.** are very close together.
- **c.** are at high energies.
- **d.** have opposite charges.

_____ **16.** Isotopes are atoms of the same element that have different
- **a.** principal chemical properties.
- **b.** masses.
- **c.** numbers of protons.
- **d.** numbers of electrons.

_____ **17.** “Orbitals of equal energy are each occupied by one electron before any is occupied by a second electron, and all electrons in singly occupied orbitals must have the same spin” is a statement of
- **a.** the Pauli exclusion principle.
- **b.** the aufbau principle.
- **c.** the quantum effect.
- **d.** Hund’s rule.

_____ **18.** The abbreviation for atomic mass unit is
- **a.** amu.
- **b.** mu.
- **c.** a.
- **d.** μ.

_____ **19.** The atomic number of sodium, the first element in Period 3, is 11. The atomic number of the second element in this period is
- **a.** 3.
- **b.** 10.
- **c.** 12.
- **d.** 18.

_____ **20.** An element that has an electron configuration of [He]$2s^2 2p^3$ is in Period _____ of the periodic table.

a. 1 **c.** 3
b. 2 **d.** 4

_____ **21.** To which group of the periodic table do lithium and potassium belong?

a. alkali metals **c.** halogens
b. transition metals **d.** noble gases

_____ **22.** To which group of the periodic table do fluorine and chlorine belong?

a. alkaline-earth metals **c.** halogens
b. transition elements **d.** actinides

_____ **23.** The outer electron configuration of an alkali metal has

a. 1 electron in the *s* orbital. **c.** 1 electron in the *p* orbital.
b. 2 electrons in the *s* orbital. **d.** 2 electrons in the *p* orbital.

_____ **24.** A solution of two or more metals is

a. an insulator. **c.** brittle.
b. a jelly. **d.** an alloy.

_____ **25.** An anion

a. is an ion with a negative charge.
b. attracts ions with negative charges.
c. results when an alkaline-earth metal loses one of its two outermost electrons.
d. has more protons than electrons.

_____ **26.** In a crystal of an ionic compound, each cation is surrounded by

a. molecules. **c.** dipoles.
b. positive ions. **d.** anions.

_____ **27.** The indium(II) ion and indium(III) ion

a. have the same charge.
b. are polyatomic ions.
c. have charges of 1+ and 2+, respectively.
d. have charges of 2+ and 3+, respectively.

_____ **28.** A comparison of calcium sulfate and calcium sulfite shows that

a. both have a monatomic cation and a polyatomic anion.
b. calcium sulfite has more oxygen atoms than calcium sulfate.
c. only calcium sulfite contains a polyatomic anion.
d. only calcium sulfate is arranged in a crystal lattice pattern.

____ **29.** What is the formula for the compound formed by the barium ion, Ba^{2+}, and the hydroxide ion, OH^-?

a. BaOH **c.** $Ba(OH)_2$

b. $BaOH_2$ **d.** Ba(OH)

____ **30.** The name of a polyatomic ion that contains hydrogen begins with the term

a. *hypo-*. **c.** hydrogen.

b. *thio-*. **d.** *per-*.

____ **31.** The chemical bond formed when two atoms share one or more pairs of electrons is a(n)

a. ionic bond. **c.** polar bond.

b. orbital bond. **d.** covalent bond.

____ **32.** A covalent bond forms when the attraction between two atoms is balanced by repulsion and the potential energy is

a. at a maximum. **c.** at a minimum.

b. zero. **d.** equal to the kinetic energy.

____ **33.** A polar covalent bond is most likely to form between two elements that have a difference in electronegativity values of

a. 0.1. **c.** 3.0.

b. 1.5. **d.** Both (a) and (b)

____ **34.** Which of the following molecular formulas show the polar nature of the HBr molecule?

a. $H^{\delta+}Br^{\delta+}$ **c.** $H^{\delta-}Br^{\delta+}$

b. $H^{\delta+}Br^{\delta-}$ **d.** $H^{\delta-}Br^{\delta-}$

____ **35.** The correct Lewis structure for a Group 18 atom has

a. One pair of valence electrons and one single valence electron

b. Two pairs of valence electrons and one single valence electron

c. Three pairs of valence electrons and one single valence electron

d. Four pairs of valence electrons

____ **36.** Iodine monochloride, ICl, has a higher boiling point than bromine, Br_2, partly because ICl is a(n)

a. nonpolar molecular substance. **c.** metallic substance.

b. ionic substance. **d.** polar molecular substance.

____ **37.** If 0.500 mol of Na^+ combines with 0.500 mol of Cl^- to form NaCl, how many formula units of NaCl are present?

a. 3.01×10^{23} **c.** 6.02×10^{24}

b. 6.02×10^{23} **d.** 1.00

____ **38.** Changing a subscript in a correctly written chemical formula

a. changes the number of moles represented by the formula.

b. changes the charges on the other ions in the compound.

c. changes the formula so that it no longer represents that compound.

d. has no effect on the formula.

_____ **39.** To determine the molar mass of an element, one must know the element's
a. Avogadro number. **c.** number of isotopes.
b. atomic number. **d.** average atomic mass.

_____ **40.** A compound contains 27.3 g of C and 72.7 g of O. What is the empirical formula for this compound?
a. CO **c.** C_2O
b. CO_2 **d.** C_2O_4

_____ **41.** The molecular formula for vitamin C is $C_6H_8O_6$. What is the empirical formula?
a. CHO **c.** $C_3H_4O_3$
b. CH_2O **d.** $C_2H_4O_2$

_____ **42.** The percentage of sulfur in SO_2 is about 50%. What is the percentage of oxygen in this compound?
a. 25% **c.** 75%
b. 50% **d.** 90%

_____ **43.** The reaction, $C_2H_5OH + 3O_2 \xrightarrow{\text{heat}} 2CO_2 + 3H_2O$, will occur most rapidly if
a. C_2H_5OH is a liquid and O_2 is a liquid. **c.** CO_2 is a gas and H_2O is a liquid.
b. C_2H_5OH and O_2 are in close contact. **d.** CO_2 is a gas and H_2O is a gas.

_____ **44.** How would oxygen be represented in the formula equation for the reaction of methane and oxygen to yield carbon dioxide and water?
a. oxygen **c.** O_2
b. O **d.** O_3

_____ **45.** The reaction $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$ is a(n)
a. synthesis reaction. **c.** combustion reaction.
b. decomposition reaction. **d.** ionic reaction.

_____ **46.** The reaction $Cl_2(g) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(l)$ is a(n)
a. synthesis reaction. **c.** displacement reaction.
b. ionic reaction. **d.** combustion reaction.

_____ **47.** What is the name of a list of elements arranged according to the ease with which they undergo certain chemical reactions?
a. reactivity list **c.** activity series
b. reaction sequence **d.** periodic list

_____ **48.** A precipitate forms in a double-displacement reaction when
- **a.** hydrogen gas reacts with a metal.
- **b.** positive ions combine with negative ions.
- **c.** water boils out of the solution.
- **d.** a gas escapes.

_____ **49.** In the reaction $2H_2 + O_2 \rightarrow 2H_2O$, what is the mole ratio of oxygen to water?
- **a.** 1:2 **c.** 8:1
- **b.** 2:1 **d.** 1:4

_____ **50.** What is needed to calculate the mass of ammonia gas produced from 2.0 L of nitrogen gas in excess hydrogen gas in the reaction below?
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
- **a.** one molar mass and one mole ratio
- **b.** one molar masses and two mole ratios
- **c.** two molar masses, one density, and one mole ratio
- **d.** two densities, two molar masses, and two mole ratios

_____ **51.** What is the ratio of the actual yield to the theoretical yield, multiplied by 100%?
- **a.** mole ratio **c.** molar yield
- **b.** percentage yield **d.** excess yield

_____ **52.** The actual yield of a chemical reaction is
- **a.** less than the theoretical yield. **c.** equal to the percentage yield.
- **b.** greater than the theoretical yield. **d.** greater than the percentage yield.

_____ **53.** For the reaction $SO_3 + H_2O \rightarrow H_2SO_4$, calculate the percentage yield if 500. g of sulfur trioxide react with excess water to produce 575 g of sulfuric acid.
- **a.** 82.7% **c.** 91.2%
- **b.** 88.3% **d.** 93.9%

_____ **54.** To determine the limiting reactant in a chemical reaction involving known masses of the two reactants, A and B, which of the following calculations would be the most useful?
- **a.** determining the masses of 100 mol A and 100 mol B
- **b.** finding the masses of the products
- **c.** calculating bond energies
- **d.** calculating the mass of a single product formed from each reactant