Chemistry Review for Final Exam – Answer Key

Bonding and Reactions

1) Describe the differences in bonding between ionic and covalent compounds.

Ionic compounds occur when a metal transfers electrons to a nonmetal.

Covalent compounds occur when two or more non-metals share electrons.

2) Metals __lose___ electrons and become __(+)__ . Nonmetals ___gain___ electrons and become ____(-)_____.

3) What are the oxidation states of the following elements?

a) beryllium +2
b) xenon 0
c) oxygen -2
d) fluorine -1

4) Name 5 signs of a chemical change.

1) Bubbles
2) Color Change
3) Precipitate
4) New Substance/New Properties/Irreversible
5) Heat/Light/Sound

5) Name the following compounds:

a) Na_2SO_4 Sodium Sulfate
b) P_3N_5 Triphosphorus Pentanitride
c) $Mg(OH)_2$ Magnesium Hydroxide
d) Fe_2O_3 Iron III Oxide
e) N_2O_4 Dinitrogen Tetraoxide

6) Write the formulas of the following compounds:

a) lithium sulfate Li_2SO_4
b) potassium oxide K_2O
c) dinitrogen trioxide N_2O_3
d) calcium phosphate $Ca_3(PO_4)_2$
e) sulfur dioxide SO_2
f) ammonium carbonate $(NH_4)_2CO_3$

7) Balance the following equations:

__2__ C_8H_{18} + __25__ O_2 → _16_ CO_2 + __18__ H_2O

__1__ $CaSO_4$ + __2__ LiF → __1__ CaF_2 + __1__ Li_2SO_4

__2__ AlF_3 + __3__ Na_2CO_3 → __6__ NaF + __1__ $Al_2(CO_3)_3$

__1__ S_8 + __12__ O_2 → __8__ SO_3

8) Classify the following reactions as either exothermic or endothermic.

$4Fe + 3O_2 \longrightarrow 2Fe_2O_3 + Heat$ ____exothermic_____

$NH_4NO_3 + Heat \longrightarrow NH_4^+ + NO_3^-$ ___endothermic___

9) Types of Reactions – In the space provide, indicate the type of reaction taking place.

$1\ C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$ ___combustion___

$1\ N_2 + 3\ H_2 \rightarrow 2\ NH_3$ ____synthesis_____

$2\ Ag_2O \rightarrow 4\ Ag + 1\ O_2$ ____decomposition___

$2\ NaCl + 1\ F_2 \rightarrow 2\ NaF + 1\ Cl_2$ ___single replacement___

$HCl + NaOH \rightarrow H_2O + NaCl$ ___neutralization___

Stoichiometry

10) How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and have an excess of sulfuric acid?

$2\ NaOH + H_2SO_4 \rightarrow 2\ H_2O + Na_2SO_4$

$$200g\ NaOH \times \frac{1mol\ NaOH}{39.997gNaOH} \times \frac{1mol\ Na_2SO_4}{2mol\ NaOH} \times \frac{142.044g\ Na_2SO_4}{1mol\ Na_2SO_4} = 355g\ Na_2SO_4$$

11) How many moles CO_2 are produced when 30.0g of C_2H_6 are burned completely?

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

$$30.0g\ of\ C_2H_6 \times \frac{1mol\ C_2H_6}{30.07g\ C_2H_6} \times \frac{4\ mol\ CO_2}{\mathbf{2\ mol\ C_2H_6}} = 2.00\ mol\ CO_2$$

12) What volume of O_2 is required to produce 80.0 L of NO(g)?

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

$$80.0L\ of\ NO \times \frac{1mol\ NO}{22.4L\ NO} \times \frac{5\ mol\ O_2}{\mathbf{4\ mol\ NO}} \times \frac{22.4L\ O_2}{\mathbf{1\ mol}\ O_2} = 100.L\ O_2$$

Scientific Investigation

13) Why can there be only one independent variable in any given experiment?

Because if you change more than one thing, it's impossible to draw a valid conclusion on why the DV changed.

14) Suppose you want to use a flashlight, but when you turn it on, it doesn't work. What would your observation be? What might your hypothesis be? How would you test that hypothesis?

Observation – The flashlight wont work.
Hypothesis – If you change the batteries, then the flashlight will work.
Test – Change the batteries and see if the flashlight works.

15) In an experiment, the control is __the standard that is used for comparison_(D)____.

A a judgment based on the information obtained
B the variable that the experimenter plans to change
C the variable that changes due to changes in the independent variable
D the standard that is used for comparison

16) A student determined that the density of a sample of tin is 8.00 g/mL, when the actual density of tin is 7.28 g/mL. What was the percent error in the student's calculation?

8.00 – 7.28 = 0.72/7.28 x 100 = 9.9%

Periodic Table Stuff

17) A row of elements on the periodic table is called a __Period__. A column of elements on the periodic table is called a __family____.

18) Fill in the table for each element below.

Elements	Atomic #	Atomic mass	# of Protons	# of Neutrons	# of Electrons
Ca	**20**	**40.078**	**20**	**20**	20
Fe	**26**	**55.847**	**26**	**30**	26
Sn	**50**	**118.710**	**50**	**69**	50
Br	**35**	**79.904**	**35**	**45**	35

19) Define the terms Electronegativity and Ionization Energy.

Electronegativity is the ability to attract electrons in a bond.
Ionization Energy is the energy to remove an electron (i.e. to make a positive ion).

Questions 20 - 23 refer to the set of lettered choices below. Select the one lettered choice that best fits each statement. A choice may be used once, more than once, or not at all.

(A) alkali metal
(B) transition metal
(C) alkaline earth metal
(D) noble gas

20) This type of element is associated with the outer electron configuration p^6. Noble Gases (D)

21) This type of element is associated with the outer electron configuration s^1. Alkali Metals (A)

22) This type of element is associated with the outer electron configuration d^7. Transition Metals (B)

23) This type of element is associated with the outer electron configuration s^2. Alkaline earth metal (C)

Equilibrium

24) When a reaction is at equilibrium, the rate of the ___forward____ reaction is equal to the rate of the __reverse___ reaction.

25) Write the equilibrium expression for the following reaction: $N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$

Keq = $\frac{[NH_3]^2}{[N_2][H_2]^3}$

Solutions

Calculate the Molarities of the following solutions:

26) 2.3 moles of sodium chloride in 0.45 liters of solution.
M = 2.3mol / 0.45L = 5.1mol/L

98 grams of sodium hydroxide in 2.2 liters of solution.
98gNaOH x 1mol/39.997g = 2.5mol/2.2L = 1.1mol/L

Molar Dilutions

28) How many milliliters of 2.55 M NaOH is needed to make 125 mL of 0.75 M NaOH solution?

M1V1 = M2V2 ; (2.55M)(V1) = (0.75M)(125mL) ; V1 = 37ml

Gas Laws

29) What is temperature and pressure at STP?
STP = Standard Temperature and Pressure (pressure = 1atm, 760 mmHg or torr, 101.3kPa; Temperature = 0°C, or 273K)

30) If I have 5.6 L of gas in a piston at a pressure of 1.5 atm and compress the gas until its volume is 4.8 L, what will the new pressure inside the piston be?
P1V1 = P2V2 ; 1.5atm(5.6L) = P2(4.8L); P2 = 1.8atm

31) Normal room temperature is 25°C. What is this temperature expressed in Kelvin?
298K

Significant Figures

How many significant figures are in each of the following numbers?

32) 210 _2___ 33) 1011 __4___

34) 0.00120 ___3_

Solve the following mathematical problems such that the answers have the correct number of significant figures:

35) 334.540 grams + 198.9916 grams = _____533.532g_____

36) 34 grams / 10.1 mL = _____3.4g/ml_____

Acids and Bases

37) List two characteristics of an Acid.
pH less than 7
Sour
Turns blue litmus red
H+ donor
e^- pair acceptor

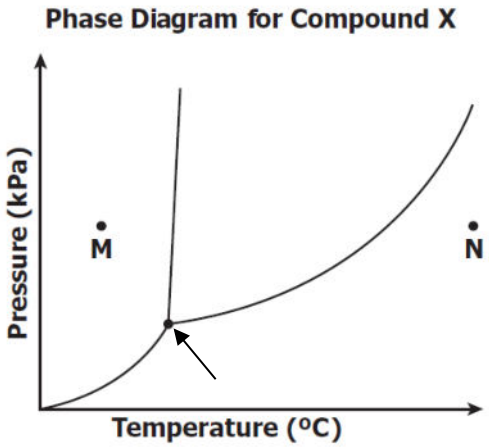
38) List two characteristics of a Base.
pH greater than 7
bitter
Turns red litmus blue
H+ acceptor
e^- pair donor

Find the pH of the following solutions:

39) A 0.001 M solution of HCl (hydrochloric acid).
1×10^{-3} = pH 3

40) A solution whose pOH is 12.

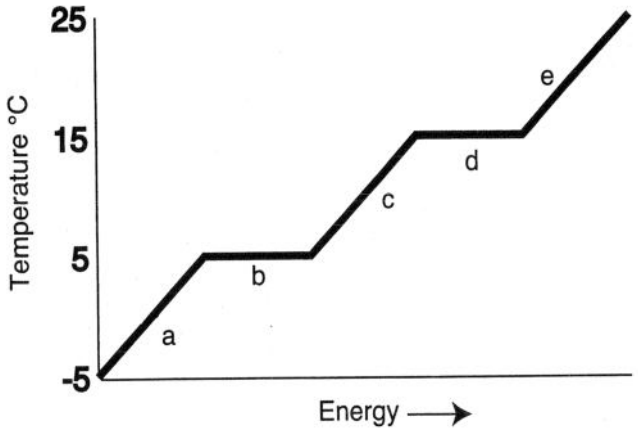
pH = 2



41) What phase is occurring at M in the above diagram? ____Solid_____

42) What phase exists at N in the above diagram? ____Gas_____

43) What is happening at the point indicated by the arrow in the above diagram and what is this point called? It is the triple point where all phases are in equilibrium (i.e. changing at the same rate).



44) Label a-e on the above Heating Curve.

a = solid; b = heat of fussion; c = liquid; d = heat of vaporization; e = gas

45) Why is the temperature not increasing at b and d on the above Heating Curve?

Energy is being used to make or break bonds.

Organic Chemistry

46) Would Margarine contain saturated or unsaturated fatty acids? Explain the difference in saturated and unsaturated fatty acids.

Margarine is saturated which allows the fatty acids to pack closely together and become solid. Saturated is all single bonds. Unsaturated has one or more double or triple bonds.

47) Name two synthetic polymers. What do we mean when we refer to a polymer as synthetic?

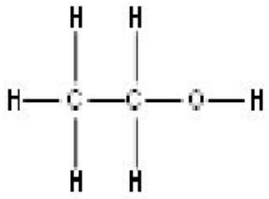
Nylon; Kevlar; or Polyethylene

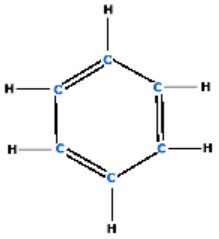
Synthetic means man made or made in a lab.

48) Name three common organic pharmaceuticals.

Aspirin, Insulin, Vitamins

49) Draw the Lewis structures for C_2H_2, CH_3CH_2OH, and C_6H_6.

;


;


50) Why does ice float?

It's less dense than water and has hydrogen bonds between it's molecules.