

NA = not attempted NW = no work

Name Key (please read the questions) Name _____
print _____ sign _____

answer every question (mc) even if no clue

For long answer type questions, you must show all work for partial credit. Please write legibly. (I cannot grade what I cannot read.) Please print your name on the top back of the exam so that I can return the quiz in a self serve fashion. (1 pts. for writing name on the back, and for printing and signing your name on the front of the exam) You may remove the periodic table to use it during the exam but please return it with the exam within the pages of the exam.

show all attempted work in space for question

MULTIPLE CHOICE: Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

NW & incorrect - lost all points

- 1) The mass % of F in the binary compound KrF_2 is _____ (molecular weight of $KrF_2 = 121.8$ g/mol) 1) E
- A) 68.80 B) 45.38 C) 18.48 D) 81.52 E) 31.20

- 2) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of $SO_2 = 64.1$ g/mol) 2) E
- A) 1.80×10^{23}
 B) 6.02×10^{24}
 C) 6.02×10^{23}
 D) 1.08×10^{24}
E) 1.08×10^{23}
- $(0.180 \text{ mol } SO_2) \times \left(\frac{6.02 \times 10^{23} \text{ molecules}}{\text{mol}} \right) = 1.08 \times 10^{23}$
- $\frac{2(19)}{121.8} \times 100 = 31.2\%$

- 3) Which of the following are weak electrolytes? 3) A
- HCl strong acid
 CH_3COOH weak acid
 NH_3 weak base
 KCl ionic
- A) CH_3COOH, NH_3
 B) HCl, KCl
 C) CH_3COOH, KCl
 D) HCl, CH_3COOH, NH_3, KCl
 E) HCl, CH_3COOH, KCl
- covalent compounds + weak acid + weak base

- 4) Which ion(s) is/are spectator ions in the formation of a precipitate of $AgCl$ via combining aqueous solutions of $CoCl_2$ and $AgNO_3$? 4) D
- A) NO_3^- and Cl^-
 B) NO_3^-
 C) Cl^-
D) Co^{2+} and NO_3^-
 E) Co^{2+} and Ag^+
- $CoCl_2(aq) + AgNO_3 \rightarrow AgCl + Co(NO_3)_2$
 $Co^{2+} + 2Cl^- + Ag^+ + NO_3^- \rightarrow AgCl + Co^{2+} + 2NO_3^-$
- spectators

- 5) What volume (mL) of a concentrated solution of magnesium chloride (9.00 M) must be diluted to 350. mL to make a 2.75 M solution of magnesium chloride? 5) C
- A) 50.0 B) 2.75 C) 107 D) 350 E) 45.0

$M_{dil} V_{dil} = M_{con} V_{con}$

$(2.75M)(350ml) = (9.00M)(V_{con})$

$V_{con} = \frac{(2.75M)(350)}{(9.00M)} = 107 \text{ ml}$

6) Oxidation is the _____ and reduction is the _____.

- A) loss of oxygen, gain of electrons
- B) loss of electrons, gain of electrons**
- C) gain of electrons, loss of electrons
- D) gain of oxygen, loss of mass
- E) gain of oxygen, loss of electrons

reduction - lower ox #
because e are negative

6) B

7) What are the respective concentrations (M) of Na⁺ and SO₄²⁻ afforded by dissolving 0.500 mol Na₂SO₄ in water to make a 1.33 L solution?

- A) 0.665 and 0.665
- B) 1.33 and 0.665
- C) 0.752 and 0.376**
- D) 0.376 and 0.752
- E) 0.665 and 1.33

$$M(\text{Na}_2\text{SO}_4) = \frac{0.500 \text{ mol}}{1.33 \text{ L}} = 0.376 \text{ M}$$

$$M(\text{Na}^+) = 2(M_{\text{Na}_2\text{SO}_4}) = 2(0.376) = 0.752$$

7) C

8) What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass?

- A) KSO₃
- B) KSO₂
- C) K₂SO₃**
- D) KSO₄
- E) K₂SO₄

assume 100g → 49.4/39.1 = 1.26K 20.3/32.1 = 0.63S → 1
1.26/0.63 = 2K 0.63/0.63 = 1S

9) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is

- A) 2HNO₃ (aq) + Sr(OH)₂ (aq) → Sr(NO₃)₂ (aq) + 2H₂ (g)
- B) HNO₃ (aq) + SrOH (aq) → H₂O (l) + SrNO₃ (aq)
- C) HNO₃ (aq) + Sr(OH)₂ (aq) → Sr(NO₃)₂ (aq) + H₂ (g)
- D) HNO₃ (aq) + Sr(OH)₂ (aq) → H₂O (l) + Sr(NO₃)₂ (aq)
- E) 2HNO₃ (aq) + Sr(OH)₂ (aq) → 2H₂O (l) + Sr(NO₃)₂ (aq)**

acid base water salt

30.3/16 = 1.89 → 1.89
0.63

10) Which of the following is soluble in water at 25 °C?

- A) FeCO₃
- B) Fe₃(PO₄)₂
- C) Fe(OH)₂
- D) FeS

all nitrates soluble
E) Fe(NO₃)₂

Fe not exception to insolubles

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts total)

11) Avogadro's number is (give the number).

did not mention moles - 1/2

11) 6.02 x 10²³

12) Molarity is defined as

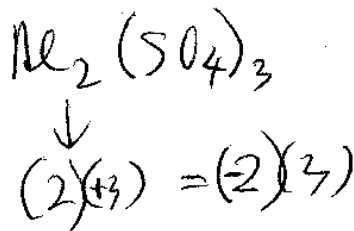
moles of solute
→ liter of solution

12) _____

13) If you produce a product of a reaction with the ion Al³⁺ (you figure out charge on Al) and SO₄²⁻, write the formula for the neutral molecule produced.

13) Al₂(SO₄)₃

math - 1
sign - 1



Al in group 3A +3

wrong charge but correct formula - 1/2

0 here -1

14) Show how you figure out the oxidation state of N in the polyatomic ion NO_3^- . The oxidation state of N is _____

$(-1) = N + 3(-2)$
 $N = -1 + 6 = +5$

14) +5
Sign -1

15) One of the two types of redox reactions are where an elemental metal reacts with a _____

acid or salt (blank can be filled in by a class or kind of compound) electrolyte
ionic water
base

16) A molecule of H_2S has 1 atoms of S and 2 atoms of H and _____

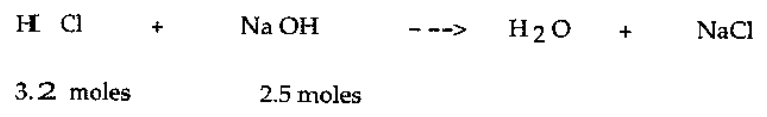
weighs 34.12 amu.
math -1/2

$2(1.01) + 32.1$

polyatomic ion
nonmetal -1/2

17) A molecular formula is always a whole number multiple of an empirical formula. _____

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between: _____



(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

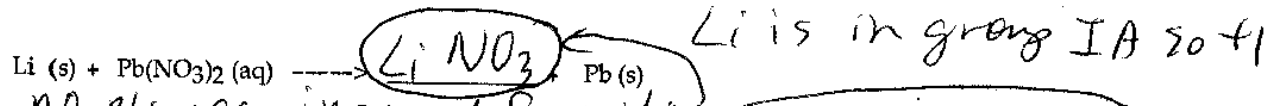
19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts. _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter) _____

21) The oxidation number for N_2 is 0 _____

22) The oxidation number of Na in NaCl is +1 _____

23) A displacement reaction product for the following reactants is (fill in the blank). _____



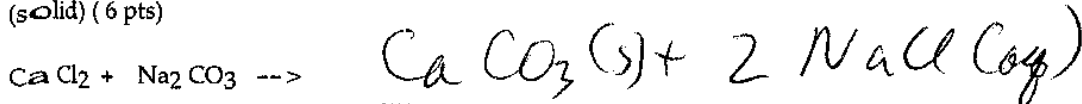
24) If you do a dilution of a solution, complete the equation: _____

$M_{\text{concentrated}} V_{\text{concentrated}} = M_{\text{dilute}} V_{\text{dilute}}$
Moles con OK.
re write $M_{\text{con}} V_{\text{con}} = M_{\text{dil}} V_{\text{dil}}$
solution, 2 - $M_2 V_2$
-1/2

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)

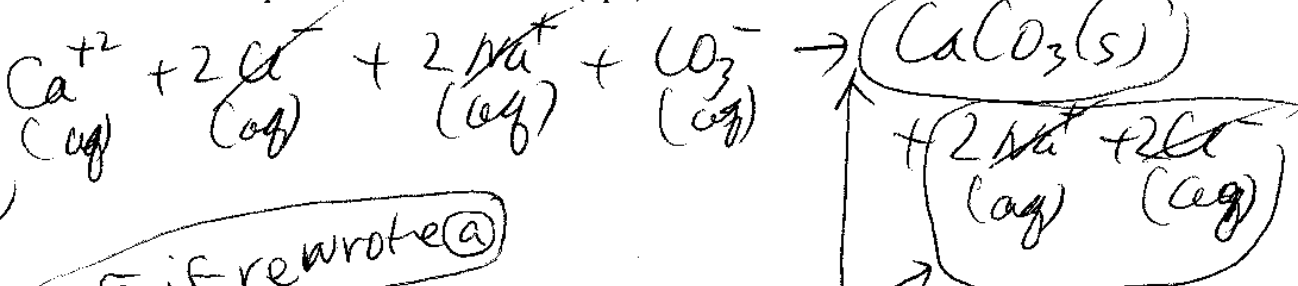


wrong insoluble -1

not balanced -2

wrote subscript as coefficient or vice versa -1/2

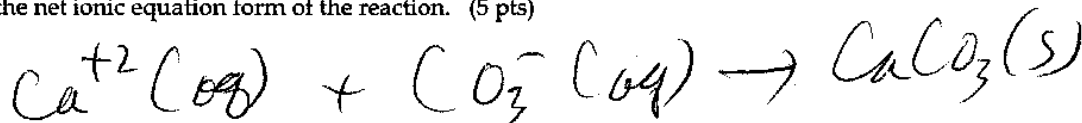
b. Write the ionic equation form of the reaction. (5 pts)



-5 if rewrote (a)

ion as molecule -1
+ backwards

c. Write the net ionic equation form of the reaction. (5 pts)



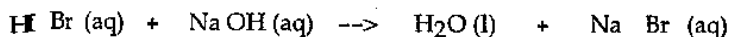
-5 if rewrote (a) or (b)

spectator only -2

some spectator -1

26) a. Given the following reaction, if you start out with 14.5 g HBr (MW = 80.91 g/mol), how many grams of H₂O would you produce. (6 pts)

$$MW_{H_2O} = 2(1.01) + 16.0 = 18.02$$



$$14.5 \text{ g HBr} \times \frac{1 \text{ mol HBr}}{80.91 \text{ g HBr}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HBr}} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 3.23 \text{ g H}_2\text{O}$$

math -1

sig fig - 1/2

b. Given the reaction above, if you are given 23.5 mL of a 7.23 M solution of reactant HBr, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

$$23.5 \text{ mL HBr solution} \times \frac{7.23 \text{ mol HBr}}{1000 \text{ mL HBr solution}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HBr}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ atoms H}}{1 \text{ mol H}} = 2.04 \times 10^{23} \text{ atoms H}$$

1 pt

math -1

sig fig - 1/2

please use dimensional analysis - easy problem if you do

Name Key (Please read the questions) Name _____

print answer every mc question even if no clue sign _____

For long answer type questions, you must show all work for partial credit. Please write legibly. (I cannot grade what I cannot read.) Please print your name on the **top back** of the exam so that I can return the quiz in a self serve fashion. (1 pts. for writing name on the back, & for printing and signing your name on the front of the exam) You may remove the periodic table and solubility rules to use it during the exam but please return it with the exam within the pages of the exam.

SHOW all attempted work in space for questions

MULTIPLE CHOICE Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

1) Which of the following is soluble in water at 25 °C? soluble E

A) FeCO₃ B) Fe(OH)₂ C) FeS D) Fe₃(PO₄)₂ E) Fe(NO₃)₂

2) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of SO₂ = 64.1 g/mol) B

insoluble anion, Fe²⁺ not exception

$$0.180 \text{ mol } \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.08 \times 10^{23} \text{ SO}_2 \text{ molecule}$$

3) What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass? E

A) KSO₂ B) KSO₃ C) K₂SO₄ D) KSO₄ E) K₂SO₃

$$49.4/39.1 = 1.26K \quad 20.3/32.1 = 0.63S \quad 30.3/16 = 1.89O$$

$$\frac{1.26}{0.63} = 2K \quad \frac{0.63}{0.63} = 1S \quad \frac{1.89}{0.63} = 3O$$

4) The mass % of F in the binary compound KrF₂ is _____ (molecular weight of KrF₂ = 121.8) A

A) 31.20 B) 68.80 C) 18.48 D) 81.52 E) 45.38

$$\frac{2(19.0)}{121.8} \times 100 = 31.20$$

5) What volume (mL) of a concentrated solution of magnesium chloride (9.00 M) must be diluted to 350. mL to make a 2.75 M solution of magnesium chloride? B

A) 50.0 B) 107 C) 350 D) 45.0 E) 2.75

6) Oxidation is the _____ and reduction is the _____

A) loss of oxygen, gain of electrons
 B) gain of oxygen, loss of electrons
 C) loss of electrons, gain of electrons
 D) gain of electrons, loss of electrons
 E) gain of oxygen, loss of mass

$M_{con} V_{con} = M_{dil} V_{dil}$
 $(9.00M) V_{con} = (2.75M)(350mL)$
 $V_{con} = \frac{(2.75)(350)}{9.00} = 107$ C

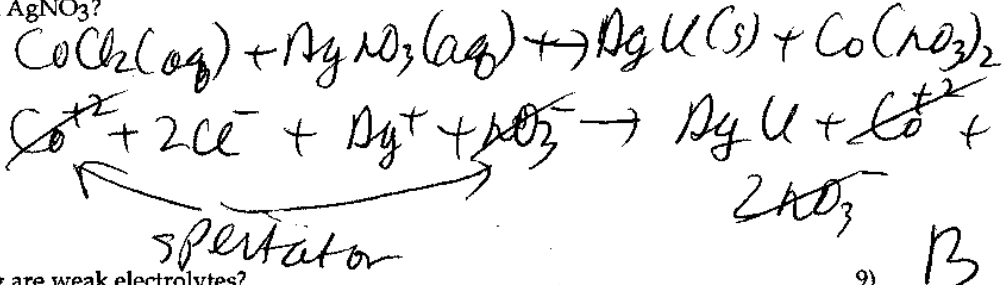
7) What are the respective concentrations (M) of Na⁺ and SO₄²⁻ afforded by dissolving 0.500 mol Na₂SO₄ in water to make a 1.33 L solution? B

A) 0.376 and 0.752
 B) 0.752 and 0.376
 C) 1.33 and 0.665
 D) 0.665 and 0.665
 E) 0.665 and 1.33

$M(Na_2SO_4) = 0.500 / 1.33L = 0.376M$
 $Na^+ \rightarrow 2[Na_2SO_4] = 2(0.376M) = 0.752$

8) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl₂ and AgNO₃? 8) B

- A) NO₃⁻
- B) Co²⁺ and NO₃⁻**
- C) NO₃⁻ and Cl⁻
- D) Cl⁻
- E) Co²⁺ and Ag⁺



9) Which of the following are weak electrolytes?

- HCl strong acid
- CH₃COOH weak acid
- NH₃ weak base
- KCl ionic
- A) HCl, CH₃COOH, NH₃, KCl
- B) CH₃COOH, NH₃**
- C) HCl, CH₃COOH, KCl
- D) CH₃COOH, KCl
- E) HCl, KCl

weak electrolytes
covalent molecule + weak acid + weak base

9) B

10) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is

- A) 2HNO₃ (aq) + Sr(OH)₂ (aq) → 2H₂O (l) + Sr(NO₃)₂ (aq)**
- B) HNO₃ (aq) + SrOH (aq) → H₂O (l) + SrNO₃ (aq)
- C) HNO₃ (aq) + Sr(OH)₂ (aq) → H₂O (l) + Sr(NO₃)₂ (aq)
- D) HNO₃ (aq) + Sr(OH)₂ (aq) → Sr(NO₃)₂ (aq) + H₂ (g)
- E) 2HNO₃ (aq) + Sr(OH)₂ (aq) → Sr(NO₃)₂ (aq) + 2H₂ (g)

acid + base → water + salt

10) A

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts total)

11) A vogadro's number is (give the number).

did not mention moles - 1/2

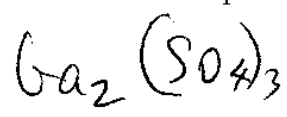
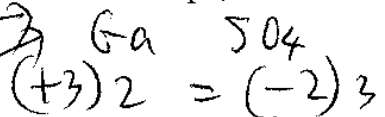
6.02 x 10²³
11) _____

12) Molarity is defined as

moles of solute / liter of solution
said volume → liter of solution
or ml - 1

12) _____

13) If you produce a product of a reaction with the ion Ga (you figure out charge on Ga) and SO₄⁻², write the formula for the neutral molecule produced.



Gr. III A (+3)

13) Ga₂(SO₄)₃

14) Show how you figure out the oxidation state of N in the polyatomic ion NO₃⁻. The oxidation state of N is _____

Math - 1
sign - 1
0 here - 1
-1 here

-1 = N + 3(-2)
-1 = N - 6

N = -1 + 6 = +5
wrong charge but correct formula - 1/2
sign - 1/2

15) One of the two types of redox reactions are where an elemental metal reacts with a

acid or salt (blank can be filled in by a class or kind of compound)

15)

16) A molecule of H₂S has 1 atoms of S and 2 atoms of H and

weighs 34.12 amu.
math - $\frac{1}{2}$

$$2(1.01) + 32.1 = 34.12$$

electrolyte
ionic water (OK)
base

16)

17) A molecular formula is always a whole number multiple of an empirical formula.

17)

polyatomic ion - $\frac{1}{2}$
or non metal

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between:

18)



3.2 moles 2.5 moles

(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts.

19)

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter)

20)

21) The oxidation number for N₂ is 0

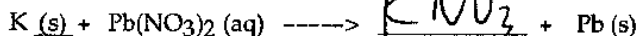
21)

22) The oxidation number of Na in NaCl is +1

22)

23) A displacement reaction product for the following reactants is (fill in the blank)

23)



K in gp. IA so +1

NO pts off incorrect formula

24) If you do a dilution of a solution, complete the equation:

24)

$$M_{\text{concentrated}} V_{\text{concentrated}} = M_{\text{dilute}} V_{\text{dilute}}$$

moles (con) - OK

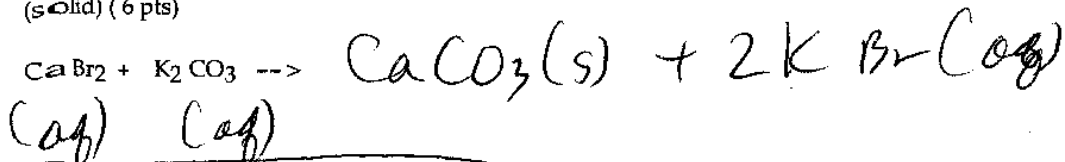
Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

we wrote mconVcon
→

solution or M₂V₂
- 1/2

25) For the following reactants, write the expected product based on the solubility table provided.

a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)

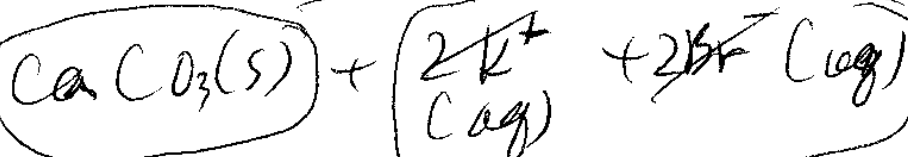
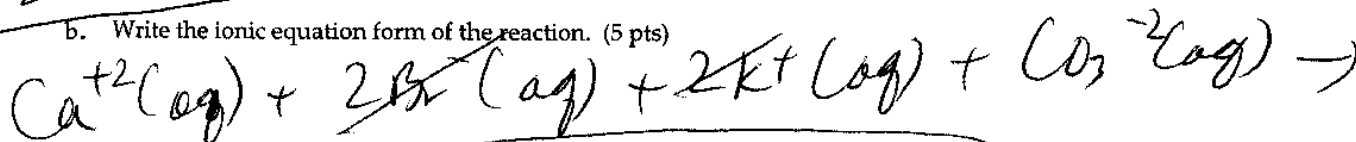


Wrong insoluble -1

not balanced -2

-1/2 wrote subscript as coefficient or visa versa

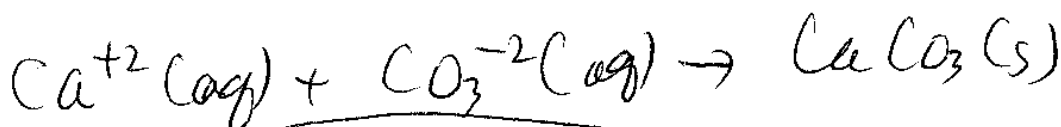
b. Write the ionic equation form of the reaction. (5 pts)



-5 if rewritten

ion as molecule + backwards -1

c. Write the net ionic equation form of the reaction. (5 pts)

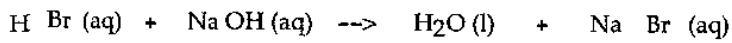


-5 if rewrite @ a/b

spectator only -2

same spectator -1

26) a. Given the following reaction, if you start out with 35.2 g HBr (MW = 80.91 g/mol), how many grams of H₂O would you produce. (6 pts) $MW_{H_2O} = 2(1.01) + 16.0 = 18.02 \text{ g H}_2\text{O}$



$$35.2 \text{ g HBr} \times \frac{1 \text{ mol HBr}}{80.91 \text{ g HBr}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HBr}} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 7.84 \text{ g H}_2\text{O}$$

math - 1 sig fig - 1/2

b. Given the reaction above, if you are given 41.2 mL of a 0.723 M solution of reactant HBr, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

$$41.2 \text{ mL of HBr solution} \times \frac{0.723 \text{ mol HBr}}{1000 \text{ mL HBr solution}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HBr}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} = 6.02 \times 10^{23} \text{ atoms H} = 3.59 \times 10^{22} \text{ atoms of H}$$

math - 1 sig fig - 1/2

please use dimensional analysis - easy problem if you do

Name Please read the question Name sign

print answer every (mc) even if no clue
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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total) NW + incorrect - lost all pts.

- 1) Combining aqueous solutions of BaI_2 and Na_2SO_4 affords a precipitate of $BaSO_4$. Which ion(s) is/are spectator ions in the reaction? 1) B
- A) SO_4^{2-} and I^- $BaI_2 + Na_2SO_4 \rightarrow BaSO_4 + NaI$
 B) Na^+ and I^-
 C) Ba^{2+} and SO_4^{2-} $Ba^{2+} + 2I^- + 2Na^+ + SO_4^{2-} \rightarrow BaSO_4 +$
 D) Ba^{2+} only
 E) Na^+ only
 $Na^+ + I^-$ spectators

- 2) Oxidation is the _____ and reduction is the _____ 2) E
- A) gain of oxygen, loss of mass
 B) gain of oxygen, loss of electrons
 C) loss of oxygen, gain of electrons
 D) gain of electrons, loss of electrons
 E) loss of electrons, gain of electrons
reduction - lower ox #
 because e are negative
 gain e

- 3) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 3) B
- A) $Na_2S_2O_6$ B) $Na_2S_2O_3$ C) $NaSO_3$ D) $NaSO_2$ E) $NaSO$

- 4) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is 4) A
- A) $2HNO_3(aq) + Sr(OH)_2(aq) \rightarrow 2H_2O(l) + Sr(NO_3)_2(aq)$
 B) $2HNO_3(aq) + Sr(OH)_2(aq) \rightarrow Sr(NO_3)_2(aq) + 2H_2(g)$
 C) $HNO_3(aq) + SrOH(aq) \rightarrow H_2O(l) + SrNO_3(aq)$
 D) $HNO_3(aq) + Sr(OH)_2(aq) \rightarrow Sr(NO_3)_2(aq) + H_2(g)$
 E) $HNO_3(aq) + Sr(OH)_2(aq) \rightarrow H_2O(l) + Sr(NO_3)_2(aq)$
acid + base \rightarrow water + salt
- Na 9/23 = 1.26/1.26 = 1x2
 S 41/32 = 1.28/1.26 = 1x2
 O 30/16 = 1.87/1.26 = 1.5

- 5) Which of the following is insoluble in water at 25 °C? 5) A
- A) $Mg_3(PO_4)_2$ insoluble - not exception
 B) $(NH_4)_2CO_3$ - carbonate insoluble but NH_4 exception
 C) Na_2S \rightarrow insoluble but op I A exception
 D) $Ca(OH)_2$ \rightarrow insoluble but Ca^{+2} exception
 E) $Ba(C_2H_3O_2)_2$ \rightarrow all acetates are soluble
- 30

- 6) The mass % of C in methane (CH_4) is _____. (molecular weight of $CH_4 = 16.05$ g/mol) 6) D
- A) 133.6 B) 92.26 C) 25.13 D) 74.87 E) 7.743
- $12/16.05 \times 100 = 74.78\%$

7) What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 200.0 mL to make a 0.880 M solution of sodium hydroxide?

7) E

- A) 26.4 B) 176 C) 50.0 D) 2.64 **E) 29.3**

8) Which of the following are strong electrolytes?

- HCl *strong acid*
 CH₃COOH *weak acid*
 NH₃ *weak base*
 KCl *ionic*

- A) HCl, NH₃, KCl
 B) CH₃COOH, KCl
C) HCl, KCl
 D) HCl, CH₃COOH, KCl
 E) HCl, CH₃COOH, NH₃, KCl

$M_{dil} V_{dil} = M_{con} V_{con}$
 $(0.880)(200.0) = (6.00M) V_{con}$
 $V_{con} = \frac{(0.880)(200.0)}{(6.00)} = 29.3$

strong electrolyte
ionic, strong acid, strong base

9) E

9) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of SO₂ = 64.1 g/mol)

- A) 1.80 × 10²³
 B) 6.02 × 10²⁴
 C) 6.02 × 10²³
 D) 1.08 × 10²⁴
E) 1.08 × 10²³

$0.180 \text{ mol } SO_2 \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol } SO_2} =$

10) What are the respective concentrations (M) of K⁺ and PO₄³⁻ afforded by dissolving 0.800 mol K₃PO₄ in water to make a 1.63 L solution?

10) D

- A) 0.800 and 0.800
 B) 0.489 and 0.163
 C) 0.800 and 0.491
D) 1.44 and 0.491
 E) 0.491 and 0.491

$K_3PO_4 = \frac{0.800 \text{ mol}}{1.63 \text{ L}} = 0.491$
 $K^+ = 3[M(K_3PO_4)] = 3(0.491) = 1.47$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts)

11) A vogadro's number is (give the number).

6.02×10^{23}

11) _____

12) Molarity is defined as

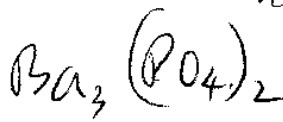
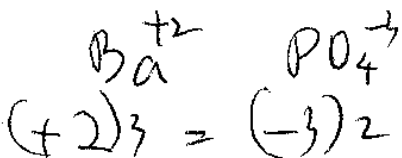
moles solute / *liter solution*
said volume or me - 1

did not mention moles - 1/2

12) _____

13) If you produce a product of a reaction with the ion Ba (you figure out charge on Ba) and PO₄³⁻, write the formula for the neutral molecule produced.

13) _____



Ba₃(PO₄)₂ + 2

wrong charge but incorrect formula - 1/2

math - 1
sign - 1

14) Show how you figure out the oxidation state of S in the polyatomic ion SO_4^{-2} . The oxidation state of S is _____

(0) here -1
 $-2 = S + 4(-2)$
 $-2 = S - 8$
 $-2 + 8 = S$
 $+6 = S$

14) +6
 sign -1/2

15) One of the two types of redox reactions are where an elemental metal reacts with a _____

acid or salt (blank can be filled in by a class or kind of compound)

electrolyte
 ionic water base
 polyatomic ion
 non metal

16) A mole of the element Ba weighs 137.33 grams and has 6.02×10^{23} atoms of Ba

17) A mole of NH_3 has 1 mole of N and 3 mole of H and weighs 17.04 grams.
 $14.01 + 3(1.01) =$
 Math -1/2

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between:



(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts.

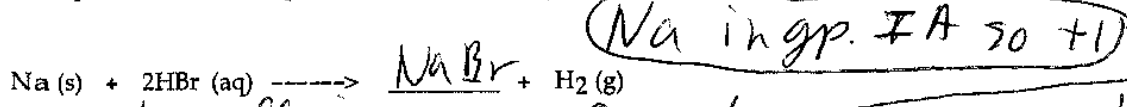
20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter)

21) The oxidation number for H_2 is 0

22) The oxidation number of S in H_2S is -2
 gp # = 6 $\rightarrow 6 - 8 = -2$

$2(+1) + S = 0$
 $S = -2$

23) A displacement reaction product for the following reactants is (fill in the blank).



24) If you do a dilution of a solution, complete the equation:

$M_{\text{concentrated}} V_{\text{concentrated}} = M_{\text{dilute}} V_{\text{dilute}}$

moles can OK

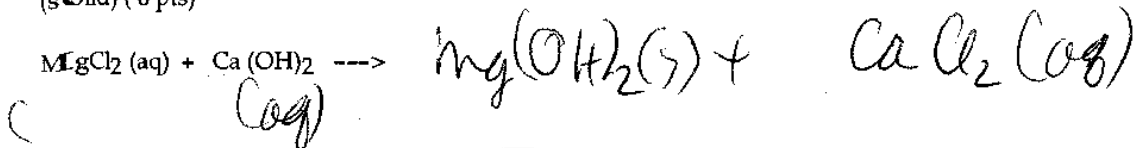
rewrote M con V con
 -3

solution or M_2V_2
 -1/2

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)

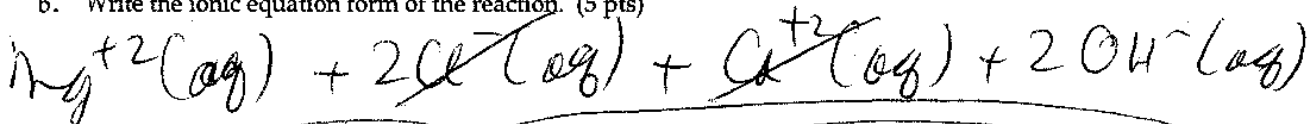


wrong insoluble -1

not balanced -2

wrote subscript as coefficient or
visa versa -1

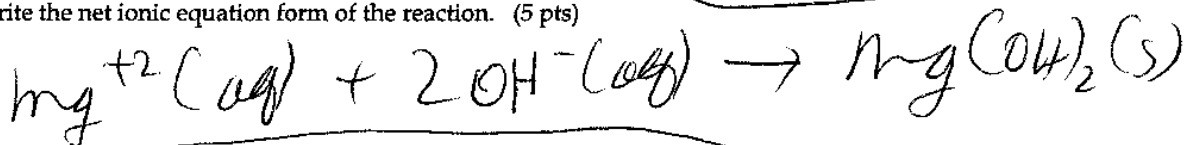
b. Write the ionic equation form of the reaction. (5 pts)



-5 if rewrite (a)

ion as molecule
backward -1

c. Write the net ionic equation form of the reaction. (5 pts)

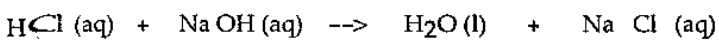


-5 if rewrite @ a or b

spectator only -2

some spectator -1

26) a. Given the following reaction, if you start out with 23.5 g of the HCl (MW = 36.51 g/mol), how many grams of H₂O would you produce. (6 pts) $MW(H_2O) = 2.02 + 16.0 = 18.02 \text{ g/mol}$



mol H₂O

$$23.5 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.51 \text{ g HCl}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HCl}} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} =$$

11.599 g HCl → 11.6 g HCl

math - 1 sig fig - 1/2

b. Given the reaction above, if you are given 23.5 mL of a 1.52 M solution of reactant HCl, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

$$23.5 \text{ mL HCl solution} \times \frac{1.52 \text{ mol HCl}}{1000 \text{ mL HCl soln.}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HCl}} \times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}}$$

$$\times \frac{6.02 \times 10^{23} \text{ atoms H}}{1 \text{ mol H}} = 4.30 \times 10^{22} \text{ atoms H}$$

1 pt math - 1 sig fig - 1/2

please use dimensional analysis
easy problem if you do

Name Lucy (please read the question) Name _____
 print _____ sign _____

For long answer type questions, you must show all work for partial credit. Please write legibly. (I cannot grade what I cannot read.) Please print your name on the top back of the exam so that I can return the quiz in a self serve fashion. (1 pts. for writing name on the back, and for printing and signing your name on the front of the exam) You may remove the periodic table and solubility table to use it during the exam but please return it with the exam by putting it into the pages of the exam.

MULTIPLE CHOICE Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

1) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of $\text{SO}_2 = 64.1 \text{ g/mol}$) 1) D

A) 6.02×10^{23}
 B) 1.08×10^{24}
 C) 1.80×10^{23}
 D) 1.08×10^{23}
 E) 6.02×10^{24}

$0.180 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 1.08 \times 10^{23} \text{ molecules}$

2) The mass % of C in methane (CH_4) is _____ (molecular weight of $\text{CH}_4 = 16.05 \text{ g/mol}$) 2) C

A) 25.13 B) 7.743 C) 74.87 D) 133.6 E) 92.26

$\left(\frac{12}{16.05}\right) \times 100 = 74.77$

3) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 3) E

A) NaSO_3 B) NaSO C) $\text{Na}_2\text{S}_2\text{O}_6$ D) NaSO_2 E) $\text{Na}_2\text{S}_2\text{O}_3$

4) Which of the following is insoluble in water at 25°C ? 4) D

A) Na_2S insoluble, alkali metal except in
 B) $\text{Ca}(\text{OH})_2$ insoluble, Ca except in
 C) $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$ all soluble
 D) $\text{Mg}_3(\text{PO}_4)_2$
 E) $(\text{NH}_4)_2\text{CO}_3$

$29/23 = 1.26/1.26 \rightarrow 1 \times 2 = 2$
 $41/32 = 1.28/1.26 \rightarrow 1 \times 2 = 2$
 $30/16 = 1.88/1.26 \rightarrow 1.5 \times 2 = 3$

5) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is 5) E

A) $\text{HNO}_3(\text{aq}) + \text{SrOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{SrNO}_3(\text{aq})$
 B) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2(\text{g})$
 C) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
 D) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
 E) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$

6) Oxidation is the _____ and reduction is the _____ 6) B

A) loss of oxygen, gain of electrons
 B) loss of electrons, gain of electrons
 C) gain of electrons, loss of electrons
 D) gain of oxygen, loss of mass
 E) gain of oxygen, loss of electrons

reduction - lower #, \bar{e} negative
 gain \bar{e}

$$M_{con} V_{con} = M_{dil} V_{dil}$$

7) What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 200.0 mL to make a 0.880 M solution of sodium hydroxide?

- A) 50.0 B) 176 C) 26.4 D) 2.64 **E) 29.3**

8) Which of the following are strong electrolytes?

HCl *strong acid*

CH₃COOH *weak acid*

NH₃ *weak base*

KCl *ionic*

A) HCl, CH₃COOH, NH₃, KCl

B) HCl, KCl

C) HCl, CH₃COOH, KCl

D) CH₃COOH, KCl

E) HCl, NH₃, KCl

$$(6.00M) V_{con} = (0.880)(200.0 \text{ mL})$$

$$V_{con} = \frac{(0.880)(200.0)}{6.00} = 29.3$$

Strong electrolytes: strong acid, weak base, ionic

9) Combining aqueous solutions of BaI₂ and Na₂SO₄ affords a precipitate of BaSO₄. Which ion(s) is/are spectator ions in the reaction?

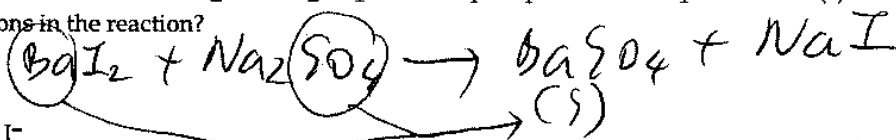
A) Ba²⁺ only

B) Na⁺ and I⁻

C) SO₄²⁻ and I⁻

D) Ba²⁺ and SO₄²⁻

E) Na⁺ only



everything other than part of precipitate are spectators

10) What are the respective concentrations (M) of K⁺ and PO₄³⁻ afforded by dissolving 0.800 mol K₃PO₄ in water to make a 1.63 L solution?

A) 0.491 and 0.491

B) 0.489 and 0.163

C) 0.800 and 0.800

D) 0.800 and 0.491

E) 1.44 and 0.491

$$M(\text{K}_3\text{PO}_4) = \frac{0.800 \text{ mol}}{1.63 \text{ L}} = 0.491 \text{ M}$$

$$\text{K}^+ \rightarrow (3 \text{ mol K}^+ / \text{mol K}_3\text{PO}_4) = 1.47 \text{ M}$$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts)

11) Avogadro's number is (give the number).

did not mention moles - 1/2

11) 6.02×10^{23}

12) Molarity is defined as

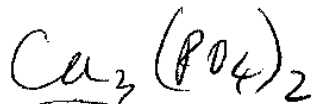
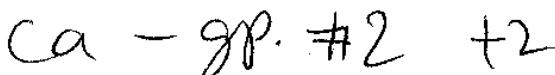
moles solute

12) _____

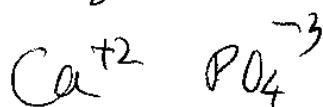
said volume or ml - 1 → *liter solution*

13) If you produce a product of a reaction with the ion Ca (you figure out charge on Ca) and PO₄³⁻, write the formula for the neutral molecule produced.

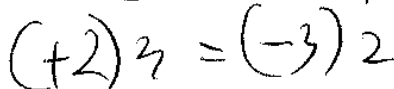
13) _____



math - 1



sign - 1



wrong charge but correct formula - 1/2

14) Show how you figure out the oxidation state of S in the polyatomic ion SO_4^{-2} . The oxidation state of S is _____

14) +6

ohere
-1

$-2 = S + 4(-2)$
 $-2 = S - 8$
 $-2 + 8 = S$
 $+6 = S$

sign -1

15) One of the two types of redox reactions are where an elemental metal reacts with a _____

15) _____

acid or salt (blank can be filled in by a class or kind of compound)

electrolyte
ionic OK
water
base

16) A mole of the element Ba weighs 137.33 grams and has

6.02×10^{23} atoms of Ba

16) _____

17) A mole of NH_3 has 1 mole of N and 3 mole of H and

weighs 17.04 grams.
math -1

$14.01 + 3(1.01) = 17.04$

polyatomic ion
nonmetal
-1/2

18) A limiting reagent is defined as the reactant which you have (a) in excess (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between:

18) _____



1.6 mole 2.5 moles

(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts.

19) _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter)

20) _____

21) The oxidation number for H_2 is 0

21) _____

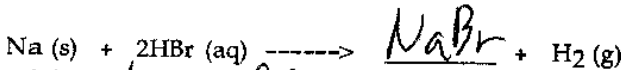
22) The oxidation number of S in H_2S is -2

single gray 6
 $6 - 8 = -2$

22) _____

23) A displacement reaction product for the following reactants is (fill in the blank).

23) _____



Na in gp. IA so (+1)

24) If you do a dilution of a solution, complete the equation:

24) _____

$M_{\text{concentrated}} V_{\text{concentrated}} = M_{\text{dilute}} V_{\text{dilute}}$

moles can OK.

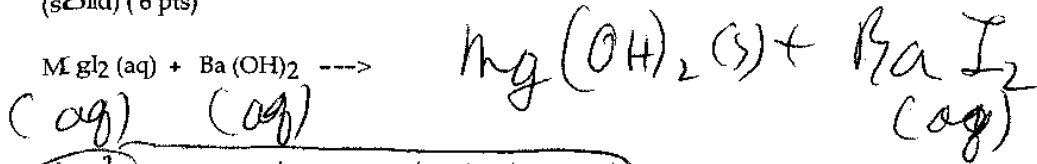
rewrote mean Va

solution, $M_2 V_2$
-1/2

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)

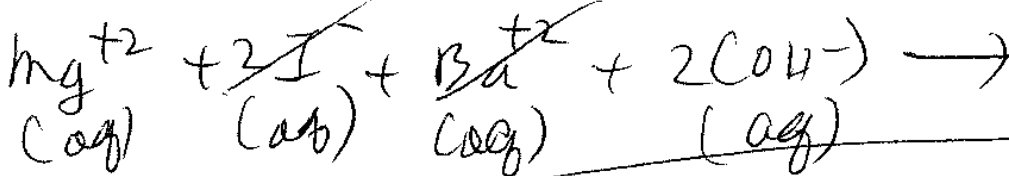


Wrong insoluble -1

not balanced -2

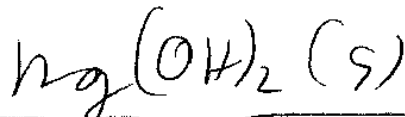
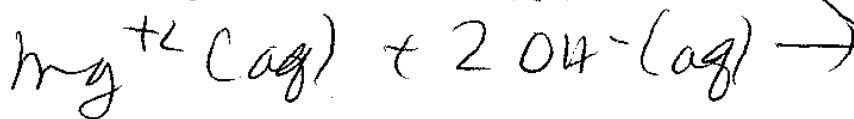
Write subscript as coefficient or vice versa -1

b. Write the ionic equation form of the reaction. (5 pts)



-5 if rewrite @

c. Write the net ionic equation form of the reaction. (5 pts)



-5 if rewrite @ or @

Spectator only -2

Some spectator -1

ion as molecule + backwards -1

26) a. Given the following reaction, if you start out with 45.2 g of the HCl (MW = 36.51 g/mol), how many grams of H₂O would you produce. (6 pts)



$(MW(H_2O) = 2(1.01) + 16.0 =$

$$45.2 \text{ g HCl} \times \frac{1 \text{ mol HCl}}{36.51 \text{ g HCl}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HCl}} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 22.31 \text{ g H}_2\text{O}$$

$\frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}}$

math - 1 sig fig - 2

b. Given the reaction above, if you are given 23.5 mL of a 0.127 M solution of reactant HCl, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

$$23.5 \text{ mL HCl solution} \times \frac{0.127 \text{ moles HCl}}{1000 \text{ mL HCl solution}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol HCl}}$$

$$\times \frac{2 \text{ mol H}}{1 \text{ mol H}_2\text{O}} \times \frac{6.02 \times 10^{23} \text{ atoms H}}{1 \text{ mol H}} = 3.59 \times 10^{21} \text{ atoms H}$$

please use dimensional analysis easy problem if you do

Name _____
printName _____
sign

For long answer type questions, you must show all work for partial credit. Please write legibly. (I cannot grade what I cannot read.) Please print your name on the top back of the exam so that I can return the quiz in a self serve fashion. (1 pts. for writing name on the back, and for printing and signing your name on the front of the exam) You may remove the periodic table to use it during the exam but please return it with the exam within the pages of the exam.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

- 1) The mass % of F in the binary compound KrF_2 is _____. (molecular weight of $\text{KrF}_2 = 121.8$ g/mol) 1) _____
A) 68.80 B) 45.38 C) 18.48 D) 81.52 E) 31.20
- 2) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of $\text{SO}_2 = 64.1$ g/mol) 2) _____
A) 1.80×10^{23}
B) 6.02×10^{24}
C) 6.02×10^{23}
D) 1.08×10^{24}
E) 1.08×10^{23}
- 3) Which of the following are weak electrolytes? 3) _____
HCl
 CH_3COOH
 NH_3
KCl
A) $\text{CH}_3\text{COOH}, \text{NH}_3$
B) HCl, KCl
C) $\text{CH}_3\text{COOH}, \text{KCl}$
D) HCl, $\text{CH}_3\text{COOH}, \text{NH}_3, \text{KCl}$
E) HCl, $\text{CH}_3\text{COOH}, \text{KCl}$
- 4) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl_2 and AgNO_3 ? 4) _____
A) NO_3^- and Cl^-
B) NO_3^-
C) Cl^-
D) Co^{2+} and NO_3^-
E) Co^{2+} and Ag^+
- 5) What volume (mL) of a concentrated solution of magnesium chloride (9.00 M) must be diluted to 350. mL to make a 2.75 M solution of magnesium chloride? 5) _____
A) 50.0 B) 2.75 C) 107 D) 350 E) 45.0

- 6) Oxidation is the _____ and reduction is the _____ 6) _____
 A) loss of oxygen, gain of electrons
 B) loss of electrons, gain of electrons
 C) gain of electrons, loss of electrons
 D) gain of oxygen, loss of mass
 E) gain of oxygen, loss of electrons
- 7) What are the respective concentrations (M) of Na^+ and SO_4^{2-} afforded by dissolving 0.500 mol Na_2SO_4 in water to make a 1.33 L solution? 7) _____
 A) 0.665 and 0.665
 B) 1.33 and 0.665
 C) 0.752 and 0.376
 D) 0.376 and 0.752
 E) 0.665 and 1.33
- 8) What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass? 8) _____
 A) KSO_3 B) KSO_2 C) K_2SO_3 D) KSO_4 E) K_2SO_4
- 9) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is 9) _____
 A) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2(\text{g})$
 B) $\text{HNO}_3(\text{aq}) + \text{SrOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{SrNO}_3(\text{aq})$
 C) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
 D) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
 E) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
- 10) Which of the following is soluble in water at 25 °C? 10) _____
 A) FeCO_3 B) $\text{Fe}_3(\text{PO}_4)_2$ C) $\text{Fe}(\text{OH})_2$ D) FeS E) $\text{Fe}(\text{NO}_3)_2$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts total)

- 11) Avogadro's number is (give the number). 11) _____
- 12) Molarity is defined as _____ 12) _____
- 13) If you produce a product of a reaction with the ion Al^{3+} (you figure out charge on Al) and SO_4^{2-} , write the formula for the neutral molecule produced. 13) _____

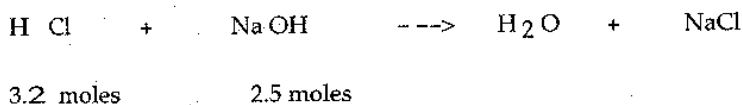
14) Show how you figure out the oxidation state of N in the polyatomic ion NO_3^- . The oxidation state of N is _____ 14) _____

15) One of the two types of redox reactions are where an elemental metal reacts with a _____ (blank can be filled in by a class or kind of compound) 15) _____

16) A molecule of H_2S has _____ atoms of S and _____ atoms of H and weighs _____ amu. 16) _____

17) A molecular formula is always a whole number multiple of an _____ formula. 17) _____

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between: 18) _____



(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

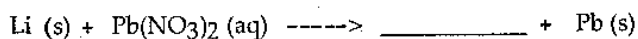
19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts. 19) _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter) 20) _____

21) The oxidation number for N_2 is _____ 21) _____

22) The oxidation number of Na in NaCl is _____ 22) _____

23) A displacement reaction product for the following reactants is (fill in the blank). 23) _____



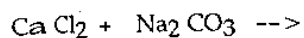
24) If you do a dilution of a solution, complete the equation: 24) _____

$$M \text{ concentrated} V \text{ concentrated} = \text{_____}$$

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

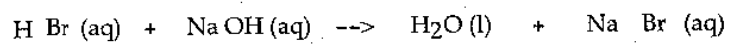
a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)



b. Write the ionic equation form of the reaction. (5 pts)

c. Write the net ionic equation form of the reaction. (5 pts)

- 26) a. Given the following reaction, if you start out with 14.5 g HBr (MW = 80.91 g / mol), how many grams of H₂O would you produce. (6 pts)



- b. Given the reaction above, if you are given 23.5 mL of a 7.23 M solution of reactant HBr, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

Name _____
printName _____
sign

For long answer type questions, you must show all work for partial credit. Please write legibly. (I cannot grade what I cannot read.) Please print your name on the **top back** of the exam so that I can return the quiz in a self serve fashion. (1 pts. for writing name on the back, & for printing and signing your name on the front of the exam) You may remove the periodic table and solubility rules to use it during the exam but please return it with the exam within the pages of the exam.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

- 1) Which of the following is soluble in water at 25 °C? _____
A) FeCO_3 B) $\text{Fe}(\text{OH})_2$ C) FeS D) $\text{Fe}_3(\text{PO}_4)_2$ E) $\text{Fe}(\text{NO}_3)_2$
- 2) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of $\text{SO}_2 = 64.1 \text{ g/mol}$) _____
A) 6.02×10^{23}
B) 1.08×10^{23}
C) 1.08×10^{24}
D) 1.80×10^{23}
E) 6.02×10^{24}
- 3) What is the empirical formula of a compound that contains 49.4% K, 20.3% S, and 30.3% O by mass? _____
A) KSO_2 B) KSO_3 C) K_2SO_4 D) KSO_4 E) K_2SO_3
- 4) The mass % of F in the binary compound KrF_2 is _____. (molecular weight of $\text{KrF}_2 = 121.8 \text{ g/mol}$) _____
A) 31.20 B) 68.80 C) 18.48 D) 81.52 E) 45.38
- 5) What volume (mL) of a concentrated solution of magnesium chloride (9.00 M) must be diluted to 350. mL to make a 2.75 M solution of magnesium chloride? _____
A) 50.0 B) 107 C) 350 D) 45.0 E) 2.75
- 6) Oxidation is the _____ and reduction is the _____. _____
A) loss of oxygen, gain of electrons
B) gain of oxygen, loss of electrons
C) loss of electrons, gain of electrons
D) gain of electrons, loss of electrons
E) gain of oxygen, loss of mass
- 7) What are the respective concentrations (M) of Na^+ and SO_4^{2-} afforded by dissolving 0.500 mol Na_2SO_4 in water to make a 1.33 L solution? _____
A) 0.376 and 0.752
B) 0.752 and 0.376
C) 1.33 and 0.665
D) 0.665 and 0.665
E) 0.665 and 1.33

8) Which ion(s) is/are spectator ions in the formation of a precipitate of AgCl via combining aqueous solutions of CoCl_2 and AgNO_3 ? 8) _____

- A) NO_3^-
- B) Co^{2+} and NO_3^-
- C) NO_3^- and Cl^-
- D) Cl^-
- E) Co^{2+} and Ag^+

9) Which of the following are weak electrolytes? 9) _____

- HCl
- CH_3COOH
- NH_3
- KCl
- A) HCl, CH_3COOH , NH_3 , KCl
- B) CH_3COOH , NH_3
- C) HCl, CH_3COOH , KCl
- D) CH_3COOH , KCl
- E) HCl, KCl

10) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is 10) _____

- A) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
- B) $\text{HNO}_3(\text{aq}) + \text{SrOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{SrNO}_3(\text{aq})$
- C) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
- D) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
- E) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2(\text{g})$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts total)

11) Avogadro's number is (give the number). 11) _____

12) Molarity is defined as _____ 12) _____

13) If you produce a product of a reaction with the ion Ga (you figure out charge on Ga and SO_4^{2-} , write the formula for the neutral molecule produced. 13) _____

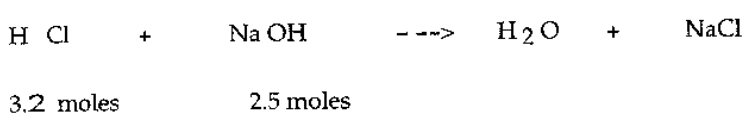
14) Show how you figure out the oxidation state of N in the polyatomic ion NO_3^- . The oxidation state of N is _____ 14) _____

15) One of the two types of redox reactions are where an elemental metal reacts with a _____ (blank can be filled in by a class or kind of compound) 15) _____

16) A molecule of H₂S has _____ atoms of S and _____ atoms of H and weighs _____ amu. 16) _____

17) A molecular formula is always a whole number multiple of an _____ formula. 17) _____

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between: 18) _____



(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

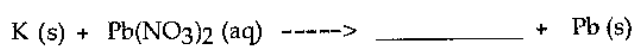
19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts. 19) _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter) 20) _____

21) The oxidation number for N₂ is _____ 21) _____

22) The oxidation number of Na in NaCl is _____ 22) _____

23) A displacement reaction product for the following reactants is (fill in the blank). 23) _____



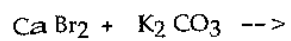
24) If you do a dilution of a solution, complete the equation: 24) _____

$$M \text{ concentrated } V \text{ concentrated} = \text{_____}$$

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

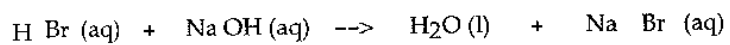
- a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)



- b. Write the ionic equation form of the reaction. (5 pts)

- c. Write the net ionic equation form of the reaction. (5 pts)

- 26) a. Given the following reaction, if you start out with 35.2 g HBr (MW = 80.91 g / mol) , how many grams of H₂O would you produce. (6 pts)



- b. Given the reaction above, if you are given 41.2 mL of a 0.723 M solution of reactant HBr , how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

Name _____
printName _____
sign

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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

- 1) Combining aqueous solutions of BaI_2 and Na_2SO_4 affords a precipitate of BaSO_4 . Which ion(s) _____ 1) _____
is/are spectator ions in the reaction?
A) SO_4^{2-} and I^-
B) Na^+ and I^-
C) Ba^{2+} and SO_4^{2-}
D) Ba^{2+} only
E) Na^+ only
- 2) Oxidation is the _____ and reduction is the _____ 2) _____
A) gain of oxygen, loss of mass
B) gain of oxygen, loss of electrons
C) loss of oxygen, gain of electrons
D) gain of electrons, loss of electrons
E) loss of electrons, gain of electrons
- 3) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 3) _____
A) $\text{Na}_2\text{S}_2\text{O}_6$ B) $\text{Na}_2\text{S}_2\text{O}_3$ C) NaSO_3 D) NaSO_2 E) NaSO
- 4) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is _____ 4) _____
A) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
B) $2\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + 2\text{H}_2(\text{g})$
C) $\text{HNO}_3(\text{aq}) + \text{SrOH}(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{SrNO}_3(\text{aq})$
D) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2(\text{aq}) + \text{H}_2(\text{g})$
E) $\text{HNO}_3(\text{aq}) + \text{Sr}(\text{OH})_2(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{Sr}(\text{NO}_3)_2(\text{aq})$
- 5) Which of the following is insoluble in water at 25 °C? 5) _____
A) $\text{Mg}_3(\text{PO}_4)_2$
B) $(\text{NH}_4)_2\text{CO}_3$
C) Na_2S
D) $\text{Ca}(\text{OH})_2$
E) $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$
- 6) The mass % of C in methane (CH_4) is _____. (molecular weight of $\text{CH}_4 = 16.05 \text{ g/mol}$) 6) _____
A) 133.6 B) 92.26 C) 25.13 D) 74.87 E) 7.743

- 7) What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 200.0 mL to make a 0.880 M solution of sodium hydroxide? 7) _____
 A) 26.4 B) 176 C) 50.0 D) 2.64 E) 29.3
- 8) Which of the following are strong electrolytes? 8) _____
 HCl
 CH₃COOH
 NH₃
 KCl
 A) HCl, NH₃, KCl
 B) CH₃COOH, KCl
 C) HCl, KCl
 D) HCl, CH₃COOH, KCl
 E) HCl, CH₃COOH, NH₃, KCl
- 9) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of SO₂ = 64.1 g/mol) 9) _____
 A) 1.80×10^{23}
 B) 6.02×10^{24}
 C) 6.02×10^{23}
 D) 1.08×10^{24}
 E) 1.08×10^{23}
- 10) What are the respective concentrations (M) of K⁺ and PO₄³⁻ afforded by dissolving 0.800 mol K₃PO₄ in water to make a 1.63 L solution? 10) _____
 A) 0.800 and 0.800
 B) 0.489 and 0.163
 C) 0.800 and 0.491
 D) 1.44 and 0.491
 E) 0.491 and 0.491

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts)

- 11) Avogadro's number is (give the number). 11) _____
- 12) Molarity is defined as _____ 12) _____
- 13) If you produce a product of a reaction with the ion Ba (you figure out charge on Ba) and PO₄³⁻, write the formula for the neutral molecule produced. 13) _____

14) Show how you figure out the oxidation state of S in the polyatomic ion SO_4^{-2} . The oxidation state of S is _____ 14) _____

15) One of the two types of redox reactions are where an elemental metal reacts with a _____ (blank can be filled in by a class or kind of compound) 15) _____

16) A mole of the element Ba weighs _____ grams and has _____ atoms of Ba 16) _____

17) A mole of NH_3 has _____ mole of N and _____ mole of H and weighs _____ grams. 17) _____

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between: 18) _____



1.6 mole 2.5 moles

(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

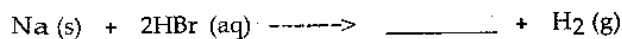
19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts. 19) _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter) 20) _____

21) The oxidation number for H_2 is _____ 21) _____

22) The oxidation number of S in H_2S is _____ 22) _____

23) A displacement reaction product for the following reactants is (fill in the blank). 23) _____



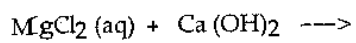
24) If you do a dilution of a solution, complete the equation: 24) _____

$$M_{\text{concentrated}} V_{\text{concentrated}} = \text{_____}$$

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

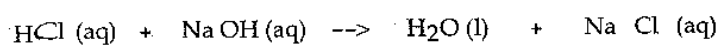
- a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)



- b. Write the ionic equation form of the reaction. (5 pts)

- c. Write the net ionic equation form of the reaction. (5 pts)

26) a. Given the following reaction, if you start out with 23.5 g of the HCl (MW = 36.51 g/mol), how many grams of H₂O would you produce. (6 pts)



b. Given the reaction above, if you are given 23.5 mL of a 1.52 M solution of reactant HCl, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)

Name _____
printName _____
sign

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MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (3 pts each, 30 pts total)

- 1) How many sulfur dioxide molecules are there in 0.180 mol of sulfur dioxide? (molecular weight of $\text{SO}_2 = 64.1 \text{ g/mol}$) 1) _____
- A) 6.02×10^{23}
B) 1.08×10^{24}
C) 1.80×10^{23}
D) 1.08×10^{23}
E) 6.02×10^{24}
- 2) The mass % of C in methane (CH_4) is _____. (molecular weight of $\text{CH}_4 = 16.05 \text{ g/mol}$) 2) _____
- A) 25.13 B) 7.743 C) 74.87 D) 133.6 E) 92.26
- 3) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass? 3) _____
- A) NaSO_3 B) NaSO C) $\text{Na}_2\text{S}_2\text{O}_6$ D) NaSO_2 E) $\text{Na}_2\text{S}_2\text{O}_3$
- 4) Which of the following is insoluble in water at 25 °C? 4) _____
- A) Na_2S
B) $\text{Ca}(\text{OH})_2$
C) $\text{Ba}(\text{C}_2\text{H}_3\text{O}_2)_2$
D) $\text{Mg}_3(\text{PO}_4)_2$
E) $(\text{NH}_4)_2\text{CO}_3$
- 5) The balanced reaction between aqueous nitric acid and aqueous strontium hydroxide is 5) _____
- A) $\text{HNO}_3 (\text{aq}) + \text{SrOH} (\text{aq}) \rightarrow \text{H}_2\text{O} (\text{l}) + \text{SrNO}_3 (\text{aq})$
B) $2\text{HNO}_3 (\text{aq}) + \text{Sr}(\text{OH})_2 (\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2 (\text{aq}) + 2\text{H}_2 (\text{g})$
C) $\text{HNO}_3 (\text{aq}) + \text{Sr}(\text{OH})_2 (\text{aq}) \rightarrow \text{H}_2\text{O} (\text{l}) + \text{Sr}(\text{NO}_3)_2 (\text{aq})$
D) $\text{HNO}_3 (\text{aq}) + \text{Sr}(\text{OH})_2 (\text{aq}) \rightarrow \text{Sr}(\text{NO}_3)_2 (\text{aq}) + \text{H}_2 (\text{g})$
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- 6) Oxidation is the _____ and reduction is the _____. 6) _____
- A) loss of oxygen, gain of electrons
B) loss of electrons, gain of electrons
C) gain of electrons, loss of electrons
D) gain of oxygen, loss of mass
E) gain of oxygen, loss of electrons

- 7) What volume (mL) of a concentrated solution of sodium hydroxide (6.00 M) must be diluted to 200.0 mL to make a 0.880 M solution of sodium hydroxide? 7) _____
 A) 50.0 B) 176 C) 26.4 D) 2.64 E) 29.3
- 8) Which of the following are strong electrolytes? 8) _____
 HCl
 CH₃COOH
 NH₃
 KCl
 A) HCl, CH₃COOH, NH₃, KCl
 B) HCl, KCl
 C) HCl, CH₃COOH, KCl
 D) CH₃COOH, KCl
 E) HCl, NH₃, KCl
- 9) Combining aqueous solutions of BaI₂ and Na₂SO₄ affords a precipitate of BaSO₄. Which ion(s) 9) _____
 is/are spectator ions in the reaction?
 A) Ba²⁺ only
 B) Na⁺ and I⁻
 C) SO₄²⁻ and I⁻
 D) Ba²⁺ and SO₄²⁻
 E) Na⁺ only
- 10) What are the respective concentrations (M) of K⁺ and PO₄³⁻ afforded by dissolving 0.800 mol 10) _____
 K₃PO₄ in water to make a 1.63 L solution?
 A) 0.491 and 0.491
 B) 0.489 and 0.163
 C) 0.800 and 0.800
 D) 0.800 and 0.491
 E) 1.44 and 0.491

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question. If the questions ask you to do so, circle the best choice. If you show work, you may receive partial credit. (3 pts / question, 42 pts)

- 11) Avogadro's number is (give the number). 11) _____
- 12) Molarity is defined as _____ 12) _____
- 13) If you produce a product of a reaction with the ion Ca (you figure out charge on Ca) 13) _____
 and PO₄³⁻, write the formula for the neutral molecule produced.

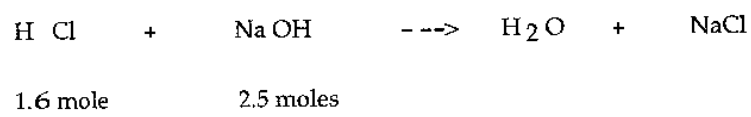
14) Show how you figure out the oxidation state of S in the polyatomic ion SO_4^{-2} . The oxidation state of S is _____ 14) _____

15) One of the two types of redox reactions are where an elemental metal reacts with a _____ (blank can be filled in by a class or kind of compound) 15) _____

16) A mole of the element Ba weighs _____ grams and has _____ atoms of Ba 16) _____

17) A mole of NH_3 has _____ mole of N and _____ mole of H and weighs _____ grams. 17) _____

18) A limiting reagent is defined as the reactant which you have (a) in excess, (b) the lesser amount (choose one letter) among the reactants. An example is in a reaction between: 18) _____



(a) HCl or (b) NaOH (circle one letter) is the limiting reactant.

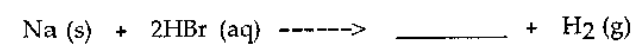
19) In a solution, the solute is the substance which you have in (a) smaller (b) larger (circle one letter) amounts. 19) _____

20) A metathesis reaction is a reaction in which you (a) exchange ionic formula partners (b) gain and lose electrons (circle one letter) 20) _____

21) The oxidation number for H_2 is _____ 21) _____

22) The oxidation number of S in H_2S is _____ 22) _____

23) A displacement reaction product for the following reactants is (fill in the blank). 23) _____



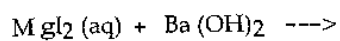
24) If you do a dilution of a solution, complete the equation: 24) _____

$$M_{\text{concentrated}} V_{\text{concentrated}} = \text{_____}$$

Long Answer. Write your answer in the space provided. Please show work for full credit and to receive partial credit for incorrect final answers. (Write legibly please.) (28 pts)

25) For the following reactants, write the expected product based on the solubility table provided.

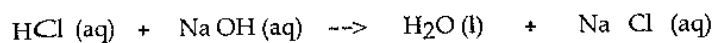
a. Write the balanced molecular equation for the reaction. Please label the precipitate in the reaction as (solid) (6 pts)



b. Write the ionic equation form of the reaction. (5 pts)

c. Write the net ionic equation form of the reaction. (5 pts)

- 26) a. Given the following reaction, if you start out with 45.2 g of the HCl (MW = 36.51 g/mol), how many grams of H₂O would you produce. (6 pts)



- b. Given the reaction above, if you are given 23.5 mL of a 0.127 M solution of reactant HCl, how many atoms of H (in the molecule water) would you produce (assuming complete reaction). (6 pts)