CHEMISTRY

NAME: _____ **GRADE:** _____

PERIOD: _____ **TEST REVIEW - ADDED PRACTICE**

1. A substance is 40.2 % K, 26.9 % Cr and 32.9 % O. What is the simplest (empirical) formula?

① ASSUME 100.0g THEN 40.2g K, 26.9g Cr, 32.9 g O

② CALC MOLES USING GFW

$\frac{40.2\text{ g K}}{} \left| \frac{1\text{ mole K}}{39.1\text{ g}} \right. = \frac{1.03\text{ mol K}}{0.52}$ $\quad \frac{32.9\text{ g O}}{} \left| \frac{1\text{ mole O}}{16.00\text{ g}} \right. = \frac{2.06\text{ mole O}}{0.52}$

$\frac{26.9\text{ g Cr}}{} \left| \frac{1\text{ mole Cr}}{52.0\text{ g}} \right. = \frac{0.52\text{ mol Cr}}{0.52}$

③ DIVIDE BY SMALLEST # moles → $K_{1.98}Cr_{1.0}O_{3.96}$ ④ Round K_2CrO_4 $\quad K_2CrO_4$

2. If there are 24 grams of O atoms in a sample of Na_3PO_4, what is the mass of Na in the sample? What is the mass of the total sample?

$\frac{24\text{ g O}}{} \left| \frac{1\text{ mole O}}{16.00\text{ g O}} \right| \frac{3\text{ moles Na}}{4\text{ moles O}} \left| \frac{22.99\text{ g}}{1\text{ mol Na}} \right. = 25.86\text{ g Na}$

$3 \cdot 22.99 = 68.97$
$1 \cdot 30.97 = 30.97$
$4 \cdot 16.00 = 64.00$
163.94 g

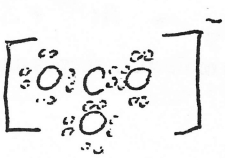
$\frac{24\text{ g O}}{16.00\text{ g}} \left| \frac{1\text{ mole O}}{4\text{ moles O}} \right| \frac{1\text{ mole } Na_3PO_4}{1\text{ mole } Na_3PO_4} \left| \frac{163.94\text{ g}}{} \right.$

25.86 g Na $\quad$ 61.48 g Na_3PO_4

3. How many sigma and pi bonds are present in each of the following?

$CH_3-CH=CH_2$

8 sigma
1 pi



3 sigma
1 pi

4. Using only your periodic table, rank the following from smallest atomic radius to largest.

1 Ne $\quad$ 5 Rb $\quad$ 4 Sr $\quad$ 2 Se $\quad$ 3 Ag

5. Which of the following metric units is used to indicate the size (diameter) of atoms?

a) centimeters b) millimeters c) nanometers (d) Angstrom (Å) 10^{-10} m
older unit

6. Complete the following metric conversions:

$\frac{3970\text{ nm}}{} \left| \frac{1\text{ m}}{10^9\text{ nm}} \right| \frac{1000\text{ mm}}{1\text{ m}}$

a) 1250 mm = 125 cm $\quad$ b) 3970 nm = 0.00397 mm

c) 0.00199 mm = 1990 nm $\quad$ d) 1.3×10^{-7} m = 130 nm

$\frac{0.00199\text{ mm}}{} \left| \frac{1\text{ m}}{1000\text{ mm}} \right| \frac{1 \times 10^9\text{ nm}}{1\text{ m}} =$ $\quad \frac{1.3 \times 10^{-7}\text{ m}}{} \left| \frac{1 \times 10^9\text{ nm}}{1\text{ m}} \right.$

7. 50 mL of an unknown base is neutralized by 25 mL of 0.1 M H_3PO_4. What is the normality of the base?

① NORMALITY H_3PO_4 $\frac{0.1 \text{ mole}}{1.0 \text{ L}} \left| \frac{3 \text{ eq}}{1 \text{ mole } H_3PO_4} \right. = 0.3 N$

② Neutralization EQN

$N_a V_a = N_b V_b$

$25mL \cdot 0.3N = 50mL \cdot x$

$x = 0.15 N$

0.15 N

8. 3 moles of H_2 gas react with 2 moles of O_2 gas to form water. How many moles of water will form?
You must write a balanced equation for this reaction first. ① $2H_2 + O_2 \rightarrow 2H_2O$

$\frac{3 \text{ moles } H_2}{2 \text{ moles } H_2} \left| \frac{2 \text{ moles } H_2O}{} \right. = 3 \text{ moles } H_2O$

$\frac{2 \text{ moles } O_2}{1 \text{ mole } O_2} \left| \frac{2 \text{ mole } H_2O}{} \right. = 4 \text{ moles } H_2O$

Always choose smaller it represents the limiting reagent

3 moles H_2O

9. How many unpaired electrons are in each of the following?

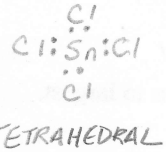
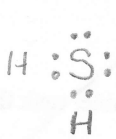
0 Ne 1 Rb 0 Sr ____ Se 1 Ag

10. Which of the following solutions would show the greatest colligative effects (boiling point elevation, freezing point depression, vapor pressure reduction).

0.2 M NaOH 0.2 M $BaCl_2$ **0.2 M $AlCl_3$** 0.2 M Na_2SO_4 0.2 M $NH_4C_2H_3O_2$

$AlCl_3 \rightarrow Al^{3+} + 3Cl^-$ when dissolved 4 particles ∴ biggest effect

11. Predict the molecular shapes and bond angles for the following compounds or ions:

$SnCl_4$	O_3	H_2S	CO_3^{-2}
$4 + 4(7) = 32$	$6 \cdot 3 = 18e$	$2 + 6 = 8e$	
			
TETRAHEDRAL 109°	BENT 120°	BENT ~ 109° MOD. TETRAHEDRAL	

12. Match the compounds on the left with the molecular shapes listed on the right. What bond angle is associated with each molecular shape?

C 1. ClF_3 a. Linear - bond angle = 180°

B 2. SO_3 b. Trigonal Pyramidal - bond angle = 120°

a 3. CO_2 c. Trigonal Planar (T-shaped) - bond angle = 90° & 180°

d 4. CH_4 d. Tetrahedral - bond angle = 109°

$4 \cdot 6 = 24$

13. Match the compounds on the left with the predominant intermolecular force from the column on the right. Each choice may be used more than once.

COMPOUND	INTERMOLECULAR FORCE
C 1. Ar	A) Dipole-dipole attraction
A 2. CO	B) Hydrogen bonding
B 3. H_2O	C) London dispersion forces
C 4. CH_4	
B 5. HF	

14. What are the pH and pOH of a 0.002 M HCl solution?

$\log(0.002) = -2.69$

$pH = 2.69$

$14 - pH = pOH$

$14 - 2.69 = 11.3$

pH 2.69 pOH 11.3

15. Which of the following might represent $H_2PO_4^-$ acting as a weak acid? A

(The Ka equilibrium expression)

WK ACID → ACIDS MAKE HYDRONIUM

a) $H_2PO_4^{-1} + H_2O \longrightarrow HPO_4^{-2} + H_3O^+$ $\quad \frac{[HPO_4^{-2}][H_3O^+]}{[H_2PO_4^{-1}]} = Ka$

BASES MAKE OH^- IN H_2O

b) $H_2PO_4^- + H_2O \longrightarrow H_3PO_4 + OH^-$ $\quad \frac{[H_3PO_4][OH^-]}{[H_2PO_4^-]} = Kb$

c) $H_2PO_4^- + H_3O^+ \longrightarrow H_3PO_4 + H_2O$

d) $H_2PO_4^- + OH^- \longrightarrow HPO_4^{-2} + H_2O$

Which of the above would represent $H_2PO_4^-$ acting as a weak base? B

(The Kb equilibrium expression)

16. Which of the following represent conjugate acid/base pairs? DIFFER BY 1 H^+

____ HCl / KOH ✓ (ACID / CON BASE) HF / F^{-1} ____ H_3PO_4 / HPO_4^{-2} ↑ 2 H^+ SO NO ✓ (ACID / CON BASE) H_3PO_4 / $H_2PO_4^{-1}$

17. Which of the following can act as both a Bronsted-Lowery acid and base?

HF F^{-1} H_3PO_4 $H_2PO_4^{-1}$ HPO_4^{-2} PO_4^{-3}

ACID BASE CON BASE CONJ. ACID

$H_2PO_4^{-1} + H_2O \rightleftharpoons HPO_4^{-2} + H_3O^+$

BASE ACID CON. ACID CON BASE

$HPO_4^{-2} + H_2O \rightleftharpoons H_2PO_4^{-1} + OH^-$

18. WA 10.0 g chemical sample contains only phosphorus and oxygen. If the mass of phosphorus is 5.63 grams, what is the empirical formula for this compound?

$\frac{5.63\text{ g P}}{30.97\text{ g}} \times \frac{1\text{ mole P}}{} = \frac{0.18\text{ mole P}}{0.18}$ $2(P_1O_{1.5})$ P_2O_3

$\frac{4.37\text{ g O}}{16.00\text{ g O}} \times \frac{1\text{ mole O}}{} = \frac{0.273\text{ mole O}}{0.18}$

P_2O_3

19. What are the numerical values (and labels) for STP? 0°C or 273K and 760 Torr or 1 ATM

20. Match the following elements with their correct chemical group.

A	1. lithium	A. Alkali Metals
C	2. fluorine	B. Alkaline Earth Metals
E	3. nickel	C. Halogens
D	4. krypton	D. Noble Gases
B	5. barium	E. Transition Metals

21. What is the molarity of a solution in which 10.21 g of sodium bromide (GFW = 102.89g) are dissolved in enough liquid to make 500 mL of solution?

$\frac{10.21\text{ g NaBr}}{500\text{ mL}} \times \frac{1000\text{mL}}{1\text{L}} \times \frac{1\text{ mole NaBr}}{102.89\text{g}} = 0.198\text{ mol/L}$ 0.2 M

0.2 M

22. Identify the element oxidized, the element reduced, the oxidizing agent and the reducing agent in the following redox reaction.

Lost 2e

$^{+7\ -2}2MnO_4^{-1}{}_{(aq)} + {}^{+1\ +4\ -2}5H_2SO_{3(aq)} + {}^{+1}H^{+1} \dashrightarrow {}^{+2}2Mn^{+2}{}_{(aq)} + {}^{+1\ +6\ -2}5HSO_4^{-1}{}_{(aq)} + {}^{+1\ -2}3H_2O$

Gained 5e-

OXIDIZED SO_3^{-2} REDUCED Mn^{+7} OX. AG Mn^{+7} RED. AGENT SO_3^{-2}

23. Predict the effect of each of the following changes on the Keq (a.k.a., Also Known As K or Kc) of the following equilibrium reaction. (circle one)

$$N_{2(g)} + 3\,H_{2(g)} \text{ <====> } 2\,NH_{3(g)} + \text{heat}$$

Keq IS CONSTANT AT GIVEN T

	CIRCLE ONE		
a) Increase in temperature	increase Keq	decrease Keq	Keq unchanged
b) Decrease pressure	increase Keq	decrease Keq	Keq unchanged
c) Increase H_2 concentration	increase Keq	decrease Keq	Keq unchanged
d) Decrease H_2 concentration	increase Keq	decrease Keq	Keq unchanged

MOLARITIES OF PRODUCT OR REACTANT CHANGE NOT KEQ

24. In which of the following reactions would the entropy (ΔS°) value be positive, negative, zero?

a) $AgCl_{(s)} \longrightarrow Ag^{+1}_{(aq)} + Cl^{-1}_{(aq)}$ — ΔS° (+)

b) $2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(g)}$ — ΔS° (-)

c) $2H_2O_{(l)} \longrightarrow 2H_2O_{(s)}$ — ΔS° (-)

d) $2HI_{(g)} \longleftrightarrow H_{2(g)} + I_{2(g)}$ — ΔS° (+)

ENTROPY DISORDER

DISSOLVING
INCREASE TEMP
INCREASE VOLUME
EVAPORATING
MIXING
MAKING MORE MOLES
INCREASE RANDOMNESS
MELTING

HI

H_2 & I_2

MORE UNEVEN MICRO STATES POSSIBLE