CHEMISTRY

NAME: _____ MIDTERM REVIEW:

1. Write chemical **names and formulas** for each of the following chemical combinations:

a. calcium and phosphate

$Ca_3(PO_4)_2$

calcium phosphate

b. lead (II) and nitrate

$Pb(NO_3)_2$

lead (II) nitrate

c. 1 sulfur and 3 oxygen

sulfur trioxide

sulfur SO_3

d. silver and nitrogen

Ag_3N

silver nitride

e. cobalt (III) and bromine

$CoBr_3$

cobalt (III) bromide

f. 1 nitrogen and 1 oxygen

nitrogen monoxide

NO

2. Write balanced chemical equations for the following reactions:

a. Copper (II) reacts with oxygen to form cupric oxide.

$2Cu + O_2 \rightarrow 2CuO$

b. Potassium chlorate decomposes to form potassium chloride and oxygen.

$2KClO_3 \rightarrow 2KCl + 3O_2$

c. Magnesium reacts with silver nitrate to form magnesium nitrate and silver.

$Mg + 2AgNO_3 \rightarrow Mg(NO_3)_2 + 2Ag$

d. Cobalt (II) chloride reacts with sodium hydroxide to form NaCl and $Co(OH)_2$.

$CoCl_2 + 2NaOH \rightarrow 2NaCl + Co(OH)_2$

3. If 745 grams of a solid occupies 317 mL what will its density be?

$D = m/V \quad 745/317 = 2.35\ g/mL$

4. If 12 grams of zinc reacts with excess hydrochloric acid, how many grams of hydrogen will be formed? $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

$$\frac{12\ g\ Zn}{65.39\ g\ Zn} \times \frac{1\ mole\ Zn}{1\ mol\ Zn} \times \frac{1\ mol\ H_2}{1\ mole\ H_2} \times \frac{2.02\ g}{} = 0.37\ g\ H_2$$

5. How many liters of oxygen will it take to just burn with 35 grams of benzene (C_6H_6) in forming carbon monoxide and water?

$C_6H_6 + 4.5O_2 \rightarrow 6CO + 3H_2O$

$2C_6H_6 + 9O_2 \rightarrow 12CO + 6H_2O$

$$\frac{35\ g\ Benz}{78.12\ g\ Benz} \times \frac{1\ mole\ Benz}{2\ Mole\ Benz} \times \frac{9\ mole\ O_2}{1\ mole\ O_2} \times \frac{22.4\ L}{} = 45.16\ L\ O_2$$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

6. If problem #5 is carried out at 725 mm and 18°C, what will the volume be?

$\frac{45.0 \cdot 760}{273} = \frac{V_2 \cdot 725}{291}$ 45.0 50.46 L 273+18 291

7. 128 L of Ne gas at 529 mm is compressed to 984 mm, what is the new volume?

$P_1V_1 = P_2V_2$ $128 \cdot 529 = 984\ V_2$ 68.8 L

8. 258 mL of gas at 33°C is heated to 67°C what will the new volume be?

2 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\frac{258}{306} = \frac{V_2}{340}$ 287 mL

9. 0.23 moles of helium has a pressure of 2.3 atmospheres and a temperature of 25°C. What size balloon could it fill? (R = 0.0821) $PV = nRT$

$V = \frac{nRT}{P}$ $2.3\ V = 0.23 \cdot 0.0821 \cdot 298$ $= 2.45$ L

10. Give the four quantum numbers for the last electron in the element sodium.

n = 3 l = 0 m = 0 s = $+\frac{1}{2}$

11. Draw the Lewis dot diagram the compound calcium phosphide. Ca_3P_2 16e⁻

Ca : P : Ca : P : Ca

12. What is the molarity of a solution that has 3.6 moles of tin (IV) sulfate in 6.8 liters of solution? molarity = moles / Liter

$\frac{3.6 \text{ moles}}{6.8 \text{ L}} = 0.53$ M

13. How many grams of cobalt chloride will it take to make a 0.34 N solution in 540 mL of water? $CoCl_2$

$\frac{540 \text{mL}}{1000 \text{mL}} \left| \frac{1 \text{L}}{1 \text{L}} \right| \frac{0.34 \text{ equiv}}{2 \text{equiv}} \left| \frac{1 \text{mole}}{1 \text{mole}} \right| \frac{129.83 \text{g}}{1 \text{mole}} = 11.92 \text{g}$

14. How many molecules of barium oxide are in 18 grams of this substance? BaO

$\frac{18 \text{g}}{153.32 \text{g}} \left| \frac{1 \text{mole}}{1 \text{mol}} \right| \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{mol}} = 7.07 \times 10^{22}$ molecules

15. How many moles are in 12.6 liters of neon gas at STP?

$\frac{12.6 \text{L}}{22.4 \text{L}} \left| \frac{1 \text{mole}}{1 \text{mole}} \right. = 0.56$ moles N_2

SOLVE THE FOLLOWING USING CORRECT SIGNIFICANT DIGITS:

16. 567.08 + 120.6 + 35 = 723 1's place

17. 0.025 X 1.8 = 4.5×10^{-2} 0.045 2 SF

18. 23.67 - 12.4 = 11.27

11.3 1/10's place

19. 98.77 / 23.6 = 4.19 3 SF

20. $\frac{12.345 \times 1.66 \times 0.00042}{6.54 \times 0.0331}$ = 0.040 (2 SF)

21. The prefix micro means 10^{-6}

22. The prefix nano means 10^{-9}

23. The prefix kilo means 10^{3}

24. The prefix milli means 10^{-3}

25. The evaporation of liquid chlorine is an example of (physical) (chemical) change.

26. How many calories does it take to melt 1 gram of ice at 0°C and raise the temperature to 50°C? $\Delta H = M \cdot Hf$ + $\Delta H = M \cdot \Delta T \cdot C_P$

80 + 50 130 cal

27. How many calories does it take to heat 25 grams of water from 10°C to 85°C 1875 cals

$\Delta H = M \Delta T \cdot CP$

$\Delta H = 25 \cdot 75 \cdot 1 = 1875$

28. How many calories does it take to change 50 grams of water at 25°C into steam at 150°C?

50 · 75 · 1 3750

50 · 540 27000

50 · 75 · 0.5 1250

32,000 cals

29. Calculate the enthalpy change (H) for the following reaction, using your heat of formation chart (Hf). Is this reaction exothermic or endothermic?

$2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$

2 (7.9) − (2 · 21.6) = −27.4 Kcal (EXO)

30. Determine thenumber of protons, electrons and neutrons in the nuclides

	$^{236}_{90}Th$	$^{33}_{15}P$	$^{89}_{38}Sr^{+2}$
protons	90	15	38
electrons	90	15	36
neutrons	146	18	51

31. Write the complete electron configuration for platinum (Pt). (1s2, 2s2, etc.)

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}, 4p^6, 5s^2 4d^{10}, 5p^6 6s^2 4f^{14} 5d^8$

32. Circle the bond that you think will be most polar or ionic in nature:

P-I P-At P-Br P-Cl (P-F)

greatest difference in Electronegativity