Huge Final Exam Review

Review of Matter

intensive – physical; chemical; intensive – physical; intensive – physical; extensive – physical; intensive – physical; intensive – physical; extensive – physical; chemical; intensive – physical; extensive – physical; intensive – physical; chemical

Classify:

1. homogeneous mixture 2. element 3. homogeneous mixture 4. compound 5. homogeneous mixture 6. heterogeneous mixture 7. homogeneous mixture 8. element 9. heterogeneous mixture

Properties:

1. intensive 2. chemical 3. chemical 4. chemical 5. intensive 6. intensive 7. intensive 8. intensive? chemical? 9. extensive 10. intensive 11. intensive 12. chemical 13. intensive 14. chemical 15. extensive 16. extensive 17. chemical 18. intensive

Changes:

a. physical? chemical? b. chemical? c. physical d. chemical e. chemical? f. physical g. chemical? h. chemical i physical j. physical K. physical l. chemical

Classify:

a. heterogeneous b. ? homogeneous? c. element d. homogeneous e. compound f. compound g. compound h. heterogeneous i. element j. heterogeneous

Heating Curve:

a. B b. E c. D d. A e. B & D f. D g. C & E h. A i. A, C, E j. D K. B & D l. A, C, E m. B & D n. B & D

Heating Curve for Water

a. E b. A c. C d. B e. D

a. B b. E c. D d. A e. B & D f. D g. C & E h. A i. A, C, E j. D K. B & D l. A, C, E m. B & D n. B & D

Review of Atomic Theory

^{23}Na, 11, mass #=23, 11, atom, 0, 11, 12

K, 19, atomic mass = 39.0983, 19, atom, 0, 19, 20

^{90}Sr, 38, mass # = 90, 38, atom, 0, 38, 52

F^-, 9, atomic mass = 18.9984, 9, anion, -1, 10, 10

$^{41}Ca^{2+}$, mass # = 41, 20, cation, 18, 21

^{122}Sn, 50, mass # = 122, 50, atom, 0, 50, 72

^{131}I, 53, mass # = 131, 53, atom, 0, 53, 78

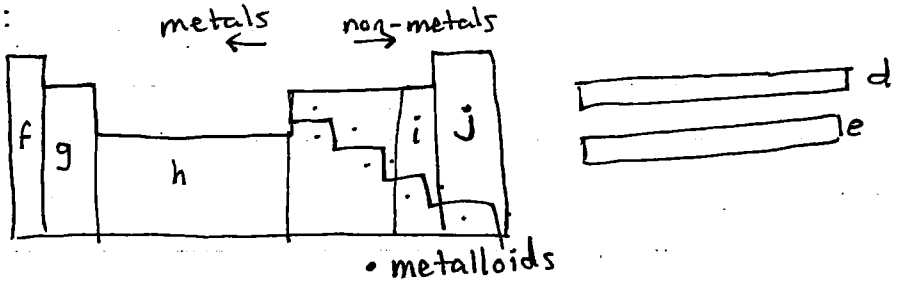
^{26}Mg, 12, mass # = 26, 12, atom, 0, 12, 14

$^{109}Ag^-$, 47 mass # 109, 47, anion, -1, 46, 62

Average Atomic Mass:

$$\text{atomic mass} = \frac{90.48(20)+0.27(21)+9.25(22)}{100 \text{ atoms}} = 20.1877 \text{ a.m.u.}$$

Periodic Table:



Orbital Diagrams:

a).
4s ⇅
3s ⇅
2s ⇅
1s ⇅
4p ⇅ ⇅ ⇅
3p ⇅ ⇅ ⇅
2p ⇅ ⇅ ⇅
3d ⇅ ⇅ ⇅ ⇅ ⇅

b)
4s ⇅
3s ⇅
2s ⇅
1s ⇅
3p ⇅ ⇅ ⇅
2p ⇅ ⇅ ⇅

c)
4s ⇅
3s ⇅
2s ⇅
1s ⇅
3d ↑ ↑ ↑ ↑ ↑
3p ⇅ ⇅ ⇅
2p ⇅ ⇅ ⇅

d)
4s ⇅
3s ⇅
2s ⇅
1s ⇅
4p ↑ ↑ ⇅
3d ⇅ ⇅ ⇅ ⇅ ⇅
3p ⇅ ⇅ ⇅
2p ⇅ ⇅ ⇅

Electron Configuration:

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

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

c) $1s^2 2s^2 2p^6 3s^2 3p^6$ d) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

Abbreviated E.C.

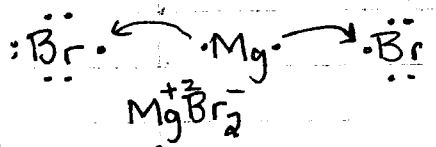
a) $[Xe]6s^2 5d^1 4f^5$ b) $[Xe]6s^2 4f^{14} 5d^7$ c) $[Xe]6s^2 5d^1 4f^{10}$
d) $[Rn]7s^2$ **Lewis Dot Structures:** a) $Li\cdot$ b) $\cdot Mg\cdot$ c) $\cdot Al\cdot$ d) $\cdot Si\cdot$
e) $\cdot\ddot{S}\cdot$ f) $F\cdot$ g) $\cdot He\cdot$ **Octet Rule:** a) loses $3e^-$, B^{3+} b) gain $1e^-$, Cl^- c) gain or lose $4e^-$ $C^{+/-4}$ d) Rb^+, lose $1e^-$

Bond Type:

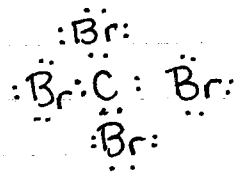
a) ionic b) polar covalent c) polar covalent d) polar covalent e) covalent

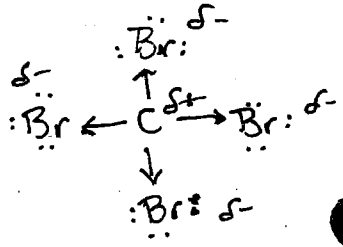
Electron Dot Diagram:

a) $MgBr_2$ (ionic)



b) CBr_4 (covalent)





Formulas from Names:

1) P_2O_5 2) H_2O_2 3) SO_2 4) CCl_4 5) C_5O_{10} 6) $SiCl_6$ 7) P_2Br 8) SeO_3
9) Bi_3F_7 10) C_9H_{10} 11) $Fe(NO_3)_2$ 12) $Fe(OH)_3$ 13) Al_2O_3 14) $(NH_4)_2SO_4$
15) KI 16) $Zn(NO_3)_2$ 17) $NaNO_3$ 18) OsS_4 19) $CuNO_3$ 20) $PbSO_4$ 21) Fe_2O_3
22) $KClO_3$ 23) HCl 24) $HClO_4$ 25) H_2SO_3 26) H_2S 27) $HMnO_4$ 28) HNO_3
29) $FeCl_3$ 30) SnO_2 31) $CuBr$ 32) Sb_2S_5 33) As_2O_3 34) HgS_2
35) $Fe(OCN)_3$ * sorry: cyanate is OCN^- 36) $Ba(OH)_2$ 37) NH_4Cl 38) $CuSO_4$
39) $(NH_4)_2Cr_2O_7$ 40) NH_4BrO_3 41) $Fe(OH)_2$ * sorry, ferrous is an old name for Fe^{2+}; Ferric is Fe^{3+} 42) $Ni(CN)_3$ 43) $AuBr_3$ * sorry: Auric is the old name for Au^{3+}; Au^{2+} is Aurous 45) $Zn(OH)_2$ 46) $Ga_2(Cr_2O_7)_3$
47) K_2CrO_4

Name from Formula:

1) triphosphorus tetrafluoride 2) dichlorine heptoxide 3) sulphur trioxide
4) dinitrogen pentoxide 5) carbon tetrachloride 6) diphosphorus pentoxide
7) sulphur hexafluoride 8) nitrogen monoxide 9) dinitrogen tetrahydride
10) iodine trifluoride 11) phosphoric acid 12) hydroselenic acid.
13) acetic acid OR ethanoic acid 14) chromic acid 15) hydrofluoric acid
16) chlorous acid 17) hydroiodic acid 18) hypochlorous acid

19) calcium chloride octahydrate 20) iron(II) sulphate hexahydrate 21) lithium hydroxide monohydrate 22) lead(II) chloride trihydrate 23) lithium chromate pentahydrate 24) sodium sulphate decahydrate 25) potassium carbonate 26) sodium phosphate 27) iron(II) chlorate 28) aluminum acetate OR aluminum ethanoate. 29) zinc phosphate 30) lead (II) nitride 31) nickel(II) iodide 32) cobalt (III) selenide 33) tin(IV) oxide 34) lithium chloride 35) barium oxide 36) potassium sulphide 37) aluminum oxide

Polarity:

1) Non-polar (BH_3) 2) (H_2O) polar ⇧ 3)(CH_2F_2) polar ⇗

Uncertainty:

1. a) 2 b) 3 c) 3 d) 2 e) 5 f) 3 g) 1 h) 4

2a) = 14.857 24 ⇝ (3 S.F.) 14.9 b) = 180.28 ⇝ (1 decimal place) 180.3

c) ignore d) = 0.71458... ⇝ (3 S.F.) 0.715 e) ignore

f) = −610.78467 ⇝ (1 d.p.) −610.8 g) ignore h) ignore

3a) 8.96×10^{4} b) 2.3×10^{-4} d) 7.5×10^{7} c) 8.6×10^{4}

d) 2.53×10^{-6} 4 a) correct b) 2.53×10^{-4} c) correct.

5. density = $\frac{\text{mass}}{\text{volume}}$ a) = $\frac{30.67\ g}{52.3\ mL}$ = 0.586 g/mL b) d = $\frac{21.4\ g}{2.56\ cm^3}$ = 8.36 g/cm³ ∴ not Fe

c) $d = \frac{\text{mass}}{\text{volume}}$ ⇝ mass = d × volume = 359 g

= (19.3)(18.6)

d) $d = \frac{m}{V}$ ⇝ $V = \frac{m}{d} = \frac{25.3\ g}{0.917} = 27.6\ cm^3$ e) $d = \frac{1.35\ g}{0.500\ cm^3} = 2.7\ g/cm^3$

6. a) 3.28 ± 0.02 cm b) 7.90 ± 0.02 cm c) 5.00 ± 0.02 cm

7. a) 26.5 ± 0.1 mL b) 17.0 ± 0.1 mL c) 24.9 ± 0.1 mL

d) 11.9 ± 0.1 mL

8a) 0.72 ± 0.01 cm b) 1.16 ± 0.01 cm c) 1.27 ± 0.01 cm

d) 1.63 ± 0.01 cm 9a) 3.9 ± 0.1 mm b) 7.0 ± 0.1 mm

10. a) 2.35 ± 0.05 g b) 0.75 ± 0.01 mL c) 156.5 ± 0.1 g

Dimensional Analysis: (refer to measurement notes for metric conversions)

1 a) $6.2\,nm \times \frac{1\times10^{-9}\,m}{1\,nm} = 6.2\times10^{-9}\,m$ b) $26\,400\,mL \times \frac{1\,L}{1000\,mL} = 2.64\,L$

c) $892\,Ks \times \frac{1000\,s}{1\,Ks} \times \frac{1000\,ms}{1\,s} = 8.92\times10^{8}\,ms$ d) $2.67\,\frac{g}{mL} \times \frac{1\,Kg}{1000\,g} \times \frac{1000\,mL}{1\,L} = 2.67\,\frac{Kg}{L}$

e) $5.6\times10^{-4}\,Mm \times \frac{1\times10^{6}\,m}{1\,Mm} \times \frac{1\,dm}{1\times10^{-1}\,m} = 5600\,dm$ f) $567\,900\,mL \times \frac{1\,L}{1000\,mL} = 56.79\,L$

g) $677\,Ks \times \frac{1000\,s}{1\,Ks} \times \frac{1000\,ms}{1\,s} = 6.77\times10^{7}\,ms$ h) $7.95\,\frac{g}{L} \times \frac{1\,Kg}{1000\,g} = 0.00795\,\frac{Kg}{L}$

i) $(1\,L = 1\,dm^3)\ 100L \times \frac{1\,dm^3}{1\,L} = 100\,dm^3$

2. $d = \frac{m}{V} \rightsquigarrow V = \frac{m}{d} = 16.5\,Kg \times \frac{1000\,g}{1\,Kg} = 16500\,g/mL$

$V = \frac{16500\,g}{19.3\,g/mL} = 854.922...\,mL \times \frac{1\,L}{1000\,mL} = 0.855\,L$

3. $3.0\times10^{10}\,\frac{cm}{s} \times \frac{60\,s}{1\,min} \times 8.29\,min = 1.492\times10^{13}\,min$

4. (5 goats = 8 sheep) (5 sheep = 3 hogs) (250 lbs = 1 hog) ($55.00 = 100.0 lbs)

$60\,goats \times \frac{8\,sheep}{5\,goats} \times \frac{3\,hogs}{5\,sheep} \times \frac{250\,lbs}{1\,hogs} \times \frac{55.00\,\$}{100.0\,lbs} = \$2640.$

5. $384\,Mm \times \frac{1\times10^{6}\,m}{1\,Mm} \times \frac{1000\,mm}{1\,m} = 3.84\times10^{11}\,mm$

6. $110\,\frac{km}{h} \times \frac{1000\,m}{1\,km} \times \frac{1\,h}{3600\,s} = 30.6\,m/s$

7. $150\,Gm \times \frac{1\times10^{6}\,m}{1\,Gm} \times \frac{1\,s}{385\,m} \times \frac{1\,min}{60\,s} = 6493.51\,minutes$

8. $1.05\times10^{-12}\,g \times \frac{1\,ng}{1\times10^{-9}\,g} = 0.00105\,ng$ 9. $115\,\mu g \times \frac{1\times10^{-6}\,g}{1\,\mu g} = 1.15\times10^{-4}\,g$

10. $40.5\,\mu m \times \frac{1\times10^{-6}\,m}{1\,\mu m} \times \frac{1\,Km}{1000\,m} = 4.05\times10^{-8}\,Km$

11. $7.50 \frac{Km}{L} \times \frac{1000\ m}{1\ Km} \times \frac{1\ L}{1000\ mL} = 7.50\ m/mL$ 12. (1 L = 1 dm^3)

12. cont' $0.250\ L \times \frac{1\ dm^3}{1\ L} \times \frac{0.001\ m^3}{1\ dm^3} \times \frac{1 \times 10^6\ cm^3}{1\ m^3} \times \frac{1\ in^3}{16.39\ cm^3} = 15.26\ in^3$

(for cubed units, the relationship is also cubed. For example, there are 100 cm in 1 m. Therefore there would be 100^3 cm in 1 m^3)

13. $384\ Mm \times \frac{1 \times 10^6\ m}{1\ Mm} \times \frac{1\ s}{385\ m} \times \frac{1\ min}{60\ s} = 16623.38\ min$

14. (1 cig = 5mg tar) (1 cig = 0.4mg) (1 pack = 2 cigs) (1 oz = 28.35 g)

a) $4\ oz_{tar} \times \frac{28.35\ g}{1\ oz} \times \frac{1000\ mg\ tar}{1\ g\ tar} \times \frac{1\ cig}{5\ mg} \times \frac{1\ pack}{20\ cig} = 1134\ packs$

b) $1\ g\ nic \times \frac{1000\ mg\ nic}{1\ g\ nic} \times \frac{1\ cig}{0.4\ mg\ nic} \times \frac{1\ pack}{20\ cigs} = 125\ packs$

15. $\$7.90 \times \frac{1\ gallon}{\$1.29} \times \frac{4\ qt}{1\ gallon} \times \frac{946.3\ mL}{1\ qt} \times \frac{1\ L}{1000\ mL} \times \frac{14\ Km}{1\ L} \times \frac{0.6214\ mi}{1\ Km} = 201.66\ miles$

16. $3.5\ L \times \frac{1000\ mL}{1\ L} \times \frac{1\ hr}{1.63\ mL} = 2147.24\ hrs.$

17. $\frac{5\ fur}{fort} \times \frac{220\ yards}{1\ fur.} \times \frac{36\ inches}{1\ yard} \times \frac{2.54\ cm}{1\ inches} \times \frac{1\ m}{100\ cm} \times \frac{1\ fort.}{14\ days} \times \frac{1\ days}{24\ hr.} \times \frac{1\ hr}{60\ min} \times \frac{1\ min}{60\ s} = 8.32 \times 10^{-4}\ m/s$

18. a) No. Because it was essential to the plot and to get the action going ☺ I guess No because the sand only has a mass of 3.0g while the same volume of the idol would have a mass of 19.3g

b) I dont Know about the guide, but Harrison Ford (who played Indiana Jones in the) is a superhero, it is feasible.

19. $3\ \frac{g}{cm^3} \times \frac{1\ cm^3}{1\ mL} \times \frac{1000\ mL}{1\ L} = 19300\ grams \times \frac{1\ Kg}{1000\ g} \times \frac{1\ lb}{0.454\ Kg} = 42.5\ lbs$

Moles, Molecules & STP:

1/ $0.89 \text{ mol } CaCl_2 \times \frac{110.9854 \text{ g } CaCl_2}{1 \text{ mol } CaCl_2} = 98.78 \text{ g } CaCl_2$

2/ $158.1 \text{ g } PbSO_4 \times \frac{1 \text{ mol } PbSO_4}{303.2626 \text{ g } PbSO_4} = 0.521 \text{ mol}$

3/ $1.112 \text{ mol} \times \frac{20.0063 \text{ g HF}}{1 \text{ mol HF}} = 22.25 \text{ g HF}$

4/ $362.8 \text{ g } C_5H_{12} \times \frac{1 \text{ mol}}{72.1498 \text{ g}} = 5.03 \text{ mol}$

5/ $0.159 \text{ mol} \times \frac{60.0843 \text{ g } SiO_2}{1 \text{ mol}} = 9.55 \text{ g } SiO_2$

6/ $12.35 \text{ g } C_4H_8O_2 \times \frac{1 \text{ mol}}{88.106 \text{ g } C_4H_8O_2} = \text{ mol}$

7/ $3.66 \text{ mol } N_2 \times \frac{28.0134 \text{ g}}{1 \text{ mol } N_2} = 102.53 \text{ g } N_2$

8/ $66.38 \text{ g } KMnO_4 \times \frac{1 \text{ mol}}{158.0339 \text{ g}} = 0.420 \text{ mol}$

9/ $0.58 \text{ mol Se} \times \frac{6.02 \times 10^{23} \text{ part.}}{1 \text{ mol Se}} \times \frac{1 \text{ atom Se}}{1 \text{ part. Se}} = 3.49 \times 10^{23} \text{ atoms Se}$

10/ $6.80 \times 10^{24} \text{ F.U.} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ F.U. } Ba(NO_3)_2} = 11.296 \text{ mol}$

11/ $1.25 \text{ mol } O_2 \times \frac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mol } O_2} \times \frac{2 \text{ atoms O}}{1 \text{ particle } O_2} = 1.51 \times 10^{24} \text{ atoms O}$

12/ $5.38 \times 10^{24} \text{ FU} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ FU}} = 8.94 \text{ mol}$

13/ $0.688 \text{ mol } AgNO_3 \times \frac{6.02 \times 10^{23} \text{ F.U.}}{1 \text{ mol}} = 4.14 \times 10^{23} \text{ F.U.}$ (* F.U. = formula units = particles)

14/ $8.46 \times 10^{24} \text{ F.U.} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ FU}} = 14.05 \text{ mol } C_2H_6$

15/ $1.48 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ FU}}{1 \text{ mol}} = 8.91 \times 10^{23} \text{ F.U.}$

16/ $3.5 \text{ g NaOH} \times \frac{1 \text{ mol}}{39.9971 \text{ g NaOH}} \times \frac{6.02 \times 10^{23} \text{ FU}}{1 \text{ mol}} = 5.27 \times 10^{22} \text{ F.U. NaOH}$

17/ $6.10 \times 10^{24} \text{ molecules } C_2H_6 \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{30.0694 \text{ g } C_2H_6}{1 \text{ mol } C_2H_6} = 304.69 \text{ g } C_2H_6$

18/ $5.1 \text{ g } TiO_2 \times \frac{1 \text{ mol } TiO_2}{79.8658 \text{ g } TiO_2} \times \frac{6.02 \times 10^{23} \text{ Formula Unit.}}{1 \text{ mol } TiO_2} = 3.84 \times 10^{22} \text{ F.U. } TiO_2$

19/ $3.62 \times 10^{24} \text{ molec.} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec}} \times \frac{32.042 \text{ g } CH_3OH}{1 \text{ mol } CH_3OH} = 192.68 \text{ g } CH_3OH$

Moles cont'

20/ $1.4\text{ g } PbCl_2 \times \frac{1\text{ mol } PbCl_2}{278.1054\text{ g } PbCl_2} \times \frac{6.02\times10^{23}\text{ F.U. } PbCl_2}{1\text{ mol } PbCl_2} = 3.03\times10^{21}$

21/ $2.94\times10^{24}\text{ molec.} \times \frac{1\text{ mol}}{6.02\times10^{23}\text{ molec.}} \times \frac{142.2838\text{ g } C_{10}H_{22}}{1\text{ mol } C_{10}H_{22}} = 694.87\text{ g } C_{10}H_{22}$

22/ $5.6\text{ g} \times \frac{1\text{ mol } H_2S}{34.0808\text{ g } H_2S} \times \frac{6.02\times10^{23}\text{ F.U. } H_2S}{1\text{ mol } H_2S} = 9.89\times10^{22}\ H_2S$

23/ $893\text{ L} \times \frac{1\text{ mol}}{22.4\text{ L}} = 0.0399\text{ mol}$

24/ $0.37\text{ mol } N_2 \times \frac{22.4\text{ L}}{1\text{ mol}} = 8.29\text{ L}$

25/ $694\text{ L} \times \frac{1\text{ mol}}{22.4\text{ L}} = 30.99\text{ mol}$

26/ $13.8\text{ mol} \times \frac{22.4\text{ L}}{1\text{ mol}} = 309.12\text{ L}$

27/ $3.68\text{ L} \times \frac{1\text{ mol}}{22.4\text{ L}} = 0.164\text{ mol}$

28/ $0.884\text{ mol} \times \frac{22.4\text{ L}}{1\text{ mol}} = 19.80\text{ L}$

29/ $101\text{ L} \times \frac{1\text{ mol}}{22.4\text{ L}} = 4.51\text{ mol}$

30/ $138\text{ mol } HBr \times \frac{22.4\text{ L}}{1\text{ mol}} = 3091.2\text{ L}$

Percentage Composition, Empirical Formulae, and Molecular Formulae:

1. a 2. c 3. c. 4. a 5. c 6. b 7. $\%\text{ Fe} = \frac{1.1169\text{ g}}{1.596\text{ g}} \times 100 = 69.92\%\text{ Fe}$

$\%\text{O} = \frac{0.479\text{ g}}{1.596\text{ g}} \times 100 = 30.08\%\text{ O}$

$69.92\text{ g Fe} \times \frac{1\text{ mol}}{55.845\text{ g}} = 1.25204\text{ mol Fe}$

$30.08\text{ g O} \times \frac{1\text{ mol}}{15.9994\text{ g}} = 1.88007\text{ mol O}$

Fe	O
$\frac{1.25\ldots\text{ mol}}{1.25\ldots\text{ mol O}}$	$\frac{1.88\ldots\text{ mol Fe}}{1.25\ldots\text{ mol O}}$
$= 1.000 \times 2 = 1.0$	$= 1.50 \times 2 = 3.0$

Fe_2O_3

Writing and Balancing Reactions

1. $CaCO_3 \rightarrow CaO + CO_2$ 2. $Zn + Cu(NO_3)_2 \rightarrow Zn(NO_3)_2 + Cu$
3. $N_2O_5 + H_2O \rightarrow 2HNO_3$ 4. $C + 2ZnO \rightarrow 2Zn + CO_2$
5. $P_4 + 6Br_2 \rightarrow 4PBr_3$ 6. $CaH_2 + H_2O \rightarrow Ca(OH)_2 + H_{2(g)}$
7. $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$ 8. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
9. $3NH_4Cl + Pb(NO_3)_2 \rightarrow 3NH_4NO_3 + PbCl_3$
10. $2AlCl_3 + 3Na_2CO_3 \rightarrow Al_2(CO_3)_3 + 6NaCl$ 11. $Cr_2(SO_4)_3 + 3K_2CO_3 \rightarrow$ $Cr_2(CO_3)_3 + 3K_2SO_4$ 12. $4Al + 3O_2 \rightarrow 2Al_2O_3$ 13. $H_{2(g)} + 2NF_3 \rightarrow N_{2(g)} + 6HF$
14. $V_2O_5 + 5Ca \rightarrow 5CaO + 2V$ 15. $2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2NH_3 + 2H_2O$

Balancing and Predicting Reactions:

1a combustion b double replacement c decomposition d. double replacement
e. synthesis f. synthesis g. decomposition h. single replacement

2. a $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ b. $H_3PO_4 + 3KOH \rightarrow K_3PO_4 + 3H_2O$
c. $3H_2SO_4 + 2Fe(OH)_3 \rightarrow Fe_2(SO_4)_3 + 6H_2O$ d. $H_4P_2O_7 + 2Ca(OH)_2 \rightarrow$ $Ca_2P_2O_7 + 4H_2O$ 3. a. $2HNO_3 + Sr(OH)_2 \rightarrow Sr(NO_3)_2 + 2H_2O$ double replacement (neutralization) b. $2NO_2 \rightarrow N_2 + 2O_2$ decomposition c. $Cl_2 + CaBr_2 \rightarrow CaCl_2 +$ Br_2 single replacement d. $ZnSO_4 + SrCl_2 \rightarrow ZnCl_2 + SrSO_4$ double replacement
e. Don't worry about this one. Not sure what will happen with Sulphur.
f. $4Zn + S_8 \rightarrow 4ZnS_2$ synthesis g $2ICl \rightarrow I_2 + Cl_2$ decomposition
h. $2NaBr + Ca(OH)_2 \rightarrow 2NaOH + CaBr_2$ double replacement
i. $4C_5H_9O + 27O_2 \rightarrow 20CO_2 + 18H_2O$ j $3Pb + 2H_3PO_4 \rightarrow Pb_3(PO_4)_2 + 3H_2$ single replacement. K. $Li_3N + 3NH_4NO_3 \rightarrow 3LiNO_3 + (NH_4)_3N$ double replacement. l. $3HBr + Al(OH)_3 \rightarrow AlBr_3 + 3H_2O$ double replacement (neutraliza
4. an acid-base reaction/neutralization reaction is a double replacement reaction. What makes it a "special" double replacement reaction is that the reactants are always an acid and a base and the products are always water and a salt (compound)

Energy of Chemical Reactions:

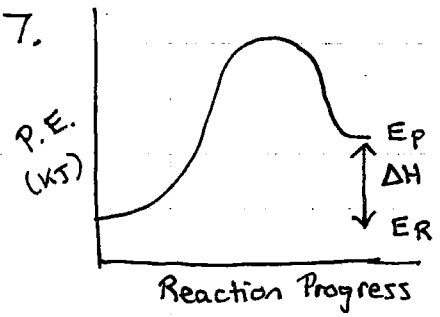
1. The burning of wood is exothermic. As the burning proceeds, energy in the form of heat, light, and flame. 2. Melting sugar would be endothermic. To perform the reaction, energy must be provided to the reaction.

3. When the beaker becomes warm, this indicates that energy is being released as reactants change to products. The energy released is the energy that was originally stored in the reactant bonds. This released energy would not be part of the products. The chemicals are losing energy and the reaction is exothermic.

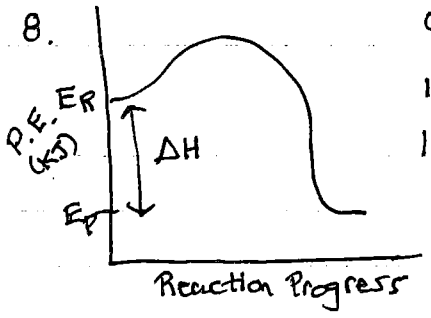
4. In an endothermic reaction, products would have more energy than reactants. R P . 5. In an exothermic reaction, energy must be removed because products have less energy than reactants.

6. ΔH is negative ($\Delta H < 0$) for all exothermic reactions. For all endothermic reactions, ΔH will always be positive ($\Delta H > 0$).

7.



8.



9. $F \rightarrow G + 50kJ$

10. $\Delta H = +30kJ$

11. $\Delta H = -25kJ$. The reactants will have more energy than products.

11-2 Practice Problems (Stoichiometry):

1. $0.38\,g\ Li_3N \times \frac{1\ mol\ Li_3N}{34.8297\ g\ Li_3N} \times \frac{3\ mol\ LiOH}{1\ mol\ Li_3N} \times \frac{23.9483\ g\ LiOH}{1\ mol\ LiOH} = 0.784\,g\ LiOH$

2. $2NaI + Cl_2 \rightarrow 2NaCl + I_2$

$0.29\,g\ NaI \times \frac{1\ mol\ NaI}{149.8938\ g\ NaI} \times \frac{2\ mol\ NaCl}{2\ mol\ NaI} \times \frac{58.442\ g\ NaCl}{1\ mol\ NaCl} = 0.113\,g\ NaCl$

3. $0.85\,g\ C_4H_{10} \times \frac{1\ mol}{58.123\ g\ C_4H_{10}} \times \frac{8\ mol\ CO_2}{2\ mol\ C_4H_{10}} \times \frac{44.0098\ g\ CO_2}{1\ mol\ CO_2} = 2.57\,g\ CO_2$

4. $0.46\,g\ Sb_2O_3 \times \frac{1\ mol\ Sb_2O_3}{291.5182\ g\ Sb_2O_3} \times \frac{2\ mol\ Sb}{1\ mol\ Sb_2O_3} \times \frac{121.760\ g\ Sb}{1\ mol\ Sb} = 0.384\,g$

5. $2H_2O_2 \rightarrow 2H_2O + O_2$ $\quad 0.77\,g\ H_2O \times \frac{1\ mol\ H_2O}{18.0152\ g\ H_2O} \times \frac{2\ mol\ H_2O_2}{2\ mol\ H_2O} \times \frac{34.0146\ g}{1\ mol}$

$= 1.45\,g\ H_2O_2$

6. $2CO + O_2 \longrightarrow 2CO_2$

$$0.69\ g\ CO_2 \times \frac{1\ mol\ CO_2}{44.0098\ g\ CO_2} \times \frac{2\ mol\ CO}{2\ mol\ CO_2} \times \frac{13.0189\ g\ CO}{1\ mol\ CO} = 0.204\ g\ CO$$

7. $$0.73\ g\ Ni(NO_3)_2 \times \frac{1\ mol\ Ni(NO_3)_2}{182.7032\ g\ Ni(NO_3)_2} \times \frac{2\ mol\ NaNO_3}{1\ mol\ Ni(NO_3)_2} \times \frac{84.9947\ g\ NaNO_3}{1\ mol\ NaNO_3}$$

$$= 0.679\ g\ NaNO_3$$

8.

Name:_____ Block:_____ Date:_____

Chemistry 11 **Moles, Molecules and STP Worksheet Key** Assignment

1. 99g $CaCl_2$
2. 0.5213mol $PbSO_4$
3. 22.2g HF
4. 5.04mol C_5H_{12}
5. 9.56g SiO_2
6. 0.140mol $C_4H_8O_2$
7. 102g N_2
8. 0.4201mol $KMnO_4$
9. $3.5x10^{23}$ atoms Se
10. 11.3mol $BaNO_3$
11. $1.51x10^{24}$ atoms O
12. 8.93mol MgBr
13. $4.14x10^{23}$ formula units $AgNO_3$
14. 14.0mol C_2H_6
15. $8.91x10^{23}$ formula units NaF
16. $5.3x10^{22}$ formula units NaOH
17. 304g C_2H_6
18. $3.8x10^{22}$ formula units TiO_2
19. 192g CH_3OH
20. $3.0x10^{21}$ formula units $PbCl_2$
21. 693g $C_{10}H_{22}$
22. $9.9x10^{22}$ formula units H_2S
23. 39.9mol air
24. 8.3L N_2
25. 31.0mol O_2
26. 309L CO
27. 0.164mol Ne
28. 19.8L H_2S
29. 4.51mol Ar
30. 3090L HBr or $3.09x10^3$L HBr

Chemistry 11 **Percentage Composition, Empirical Formulae, And Molecular Formulae Key** Assignment

1. A
2. C
3. C
4. A
5. A
6. B
7. 69.92% Fe ; 3.0×10^{1}% O
8. 86.7% Br ; 13% Mg
9. C_2H_6O
10. $C_6H_{12}O_6$
11. 63.1% Fe ; 36.9% S
12. $C_8H_{11}O_3N$
13. 0.428g F ; 0.419g Fe
14. $Ca_3P_3O_{13}H$
15. GaP
16. BI_3
17. $AlCl_3$
18. Pd_2H_4
19. N_2O_4
20. C_2H_6
21. C_3H_6
22. $C_{10}H_{22}$
23. C_2H_2

Chemistry 11 **Percentage Composition Key** Assignment

1. a. %Fe = 44.0%
   %Cl = 56.0%

   b. %Ca = 40.1%
   %C = 12.0%
   %O = 48.0%

   c. %N = 28.2%
   %H = 8.05%
   %P = 20.8%
   %O = 43.0%

2. a. $\%H_2O = 24.5\%$

   b. $\%H_2O = 22.94\%$

   c. $\%C_2H_3O_2 = 54.76\%$

Chemistry 11 **Empirical Formulae Key** Assignment

1. Cu_2O
2. CH_2O
3. CH
4. Fe_2O_3
5. HO
6. CuO
7. K_2CO_3
8. $CHCl_3$
9. $CrCl_2$
10. CS_2
11. CH_4O
12. $CaSO_4$
13. Al_2O_3
14. Fe_3O_4
15. GaC_3O_6

Name:_____ Block:_____ Date:_____

Chemistry 11 **Molarity Worksheet Key** Assignment

1. a) 0.70M b) 0.00140M c) 1.71M d) 0.0769M
2. a) 161g b) 16.3g c) 5.71g d) 1.32g
3. 0.0875mol
4. 1.14L
5. 7.15×10^{-5} mol
6. 0.13L
7. 55.6M
8. 17.5M
9. 1.77 g/mL
10. 0.875g
11. 277g of acetone; 0.427g of benzoic acid. Since the volume of solvent used was 350.0mL, the very small amount of benzoic acid wouldn't change the overall volume appreciably.
12. 1.0×10^{-4}M
13. 0.0609L or 60.9mL
14. 0.185L
15. 2.07M
16. 1.25M
17. 14.6mL
18. 11.7g
19. 0.204M
20. 0.188L
21. 0.326M
22. 0.318M
23. 1.21M
24. 0.240M
25. a) 0.268M b) 1.901×10^{-3}M c) 0.0649M
26. a) 2.66M b) 0.143M c) 0.16M d) 0.260M
27. a) 1.07M b) 0.0288M c) 0.586M
28. a) 1.5×10^{3}g b) 8.45g c) 5.12g
29. a) 6.162M b) 13.6M c) 10.91M
30. 0.417L
31. 3.25mL
32. 14.0g
33. 4.68mol
34. 2.88g/mL
35. 0.145L
36. 0.552mol
37. 0.158L
38. 0.124M
39. 0.44M
40. 11.3M

Name:_____ Block:_____ Date:_____

Chemistry 11 **Molarity Intro Key** Assignment

1. 0.901M
2. 83.9g
3. 2.27M
4. 228g
5. 0.0111M
6. 974g
7. 8.29M
8. 1950g

Name:_____ Block:_____ Date:_____

Chemistry 11 **Mole Conversions Key** Assignment

1. a) 6.57L H_2S b) 2.69×10^{-3}L c) 0.019L BrF d) 3.2×10^{3} L B_2H_6

2. a) 3.271×10^{-22}g Au b) 3.6×10^{-7}g AgCl c) 0.469g C_3H_6 d) 13.0g SF_6

3. a) 0.0391mol $C_{10}H_8$ b) 2.47×10^{-3} mol K_3PO_4 c) 0.268mol NO_3F d) 4.46×10^{-5}mol O_3
   e) 7.56×10^{-12}mol Pt f) 1.000×10^{-7}mol PCl_5

4. a) 7.53×10^{6}g/mol b) 413g/mol c) 178g/mol d) 248.2g/mol e) 93.0g/mol f) 329.6g/mol

5. a) 1.52×10^{-3}g/mL b) 0.01020L/mol c) 0.0207mol CS_2 d) 0.704g/mL e) 0.899mL Ag
   f) 2.28g/mL g) 129mol C_2H_5OH h) 34.0g/mol i) 0.418mL NaCl j) 62.2g/mol
   k) 0.013L/mol

6. a) 18 atoms b) 5.39×10^{7}L COF_2 c) 4.38×10^{23} molecules d) 1.12×10^{-3}mol HCN
   e) 10.5L ClF_3 f) 0.457mol Fe g) 3.36×10^{21}molecules NOCl h) 9.755g Pt i) 136.5g/mol
   j) 2.32×10^{-3}g/mL k) 0.0935g Kr l) 8.573×10^{-3}L/mol m) 63.9g/mol n) 1.05g/mL
   o) 6.99×10^{-4}mol CuSCN p) 3.73mL q) 5.49×10^{-4}g/mol r) 51.9g/mol s) 1.74mol HgS

Chemistry 11 **Writing and Balancing Reactions Key** Assignment

1. $CaCO_3 \rightarrow CaO + CO_2$
2. $Zn + Cu(NO_3)_2 \rightarrow Zn(NO_3)_2 + Cu$
3. $N_2O_5 + H_2O \rightarrow 2HNO_3$
4. $C + 2ZnO \rightarrow 2Zn + CO_2$
5. $2P + 3Br_2 \rightarrow 2PBr_3$
6. $CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2$
7. $H_2SO_4 + 2\ KOH \rightarrow K_2SO_4 + 2H_2O$
8. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
9. $3NH_4Cl + Pb(NO_3)_3 \rightarrow 3NH_4NO_3 + PbCl_3$
10. $2AlCl_3 + 3Na_2CO_3 \rightarrow Al2(CO_3)_3 + 6NaCl$
11. $Cr_2(SO_4)_3 + 3K_2CO_3 \rightarrow Cr_2(CO_3)_3 + 3K_2SO_4$
12. $4Al + 3O_2 \rightarrow 2Al_2O_3$
13. $3H_2 + 2NF_3 \rightarrow N_2 + 6HF$
14. $V_2O_5 + 5Ca \rightarrow 5CaO + 2V$
15. $2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2NH_3 + 2H_2O$

Name: Key Block: _____ Date: _____

Chemistry 11 **Energy of Chemical Reactions** Assignment
(17 marks)

Answer each of the following questions in full sentences.

1. Is the burning of wood exothermic or endothermic? Explain. (2 marks)

1/2 - exothermic, heat is given off

2. Is the melting of sugar exothermic or endothermic? Explain. (2 marks)

1/2 - endothermic, requires added heat to melt sugar

3. A beaker becomes warm when a reaction occurs in it. Are the chemicals in the beaker gaining or losing energy? Is the reaction endothermic or exothermic? (2 marks)

1/2 - losing energy
- ∴ exothermic

4. Which contain more energy in an endothermic reaction: the reactants or the products? (1 mark)

1/1 - products
(energy was gained from the surroundings during the reaction)

5. In an exothermic reaction, do you have to add or remove energy in order to allow products to form? Explain. (2 marks)

1/2 - Exothermic reactions release energy ✓ so energy would be removed to the surroundings ✓
(some energy may be initially required to break some bonds/get the reaction started)

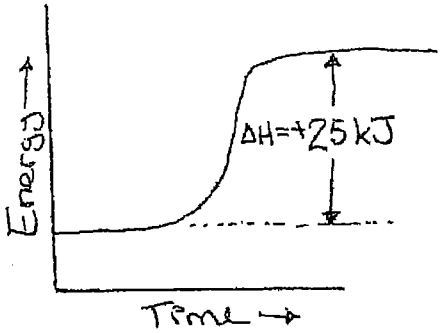
6. Is $\Delta H > 0$ or $\Delta H < 0$ for an endothermic reaction? Is $\Delta H > 0$ or $\Delta H < 0$ for an exothermic reaction? (2 marks)

1/2 $\Delta H > 0$ (positive) for an endothermic reaction

$\Delta H < 0$ (negative) for an exothermic reaction

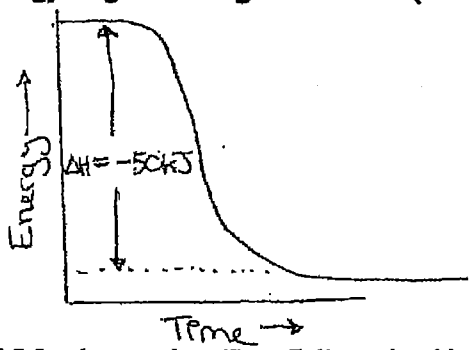
7. Draw an energy diagram having ΔH = +25 kJ. (1 mark)

1



8. Draw an energy diagram having ΔH = -50 kJ. (1 mark)

1



9. ΔH = -50 kJ for the reaction: F → G. Re-write this equation to show the 50 kJ properly on the reactant or product side. (1 mark)

1 $F \rightarrow G + 50kJ$

10. If a reaction absorbs 30 kJ of heat, what is ΔH for the reaction? (1 mark)

1 $\Delta H = +30kJ$

11. If P → Q + 25 kJ, what is ΔH for the reaction? Which have more energy, the reactants or the products? (2 marks)

1/2 - $\Delta H = -25kJ$ ✓

- reactants have more energy ✓

Chemistry 11 **11-2 Practice Problems Key** Assignment

1. 0.79g LiOH
2. 0.11g NaCl
3. 2.6g CO_2
4. 0.38g Sb
5. 1.5g H_2O_2
6. 0.44g CO
7. 0.68g $NaNO_3$
8. 1.3g $Ca(OH)_2$
9. 0.87g O_3
10. 7.31g $C_6H_{12}O_6$
11. 297L O_2
12. 1.54g C_6H_6
13. 11.7g Na
14. 111L O_2
15. 61.8L O_2
16. 3.79g Al
17. 90.3L H_2
18. 3.54g S_8
19. 1.7L CO_2
20. 14.2L H_2S ; 21.3L O_2
21. 5.70L SO_2 ; 11.4L H_2S
22. 3.7L CO_2
23. 2.4L H_2 ; 1.5L N_2
24. 2.2L N_2 ; 0.36L O_2
25. 1.3L CO_2

Chemistry 11 **11-1 Practice Problems Key** Assignment

1. $Pb + HCl \rightarrow PbCl_2 + H_2$; 0.72mol HCl
2. 1.0mol HNO_3
3. $C + 2ZnO \rightarrow 2Zn + CO_2$; 0.19mol CO_2
4. 1.4mol NaBr
5. $2P + 3Br_2 \rightarrow 2PBr_3$; 0.52mol PBr_3
6. 0.88mol H_2
7. 1.9mol O_2
8. $N_2 + 3H_2 \rightarrow 2NH_3$; 0.24mol N_2
9. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$; 0.090mol Fe_2O_3
10. 0.940mol H_2O

Name:_____ Block:_____ Date:_____

Chemistry 11 **Limiting Reagents and Percent Yield Key** Assignment

1. O_2 is limiting.
2. $Mg(OH)_2$ is limiting.
3. H_2SO_4 is limiting.
4. NaCl is in excess.
5. 12g of $CrCl_3$
6. 15.5g SO_3
7. 44.2g Fe
8. 27.3g N_2
9. 22.9g NaCl
10. a) $Pb(NO_3)_2 + 2NaI \rightarrow 2NaNO_3 + PbI_2$
    b) 8.51g $NaNO_3$
    c) NaI
    d) 8.4g $Pb(NO_3)_2$ would be left over.
11. 42% yield
12. 49.1% yield
13. 81.6% yield
14. a) 20.00g $FeCl_2$
    b) 20.0% yield
15. a) 22.2g CS_2
    b) 2.1g SO_2 left over.
16. 0.279g $BaBr_2$
17. a) 21.1g SiF_4
    b) 8.03g left unused.
    c) 34.2% yield