Chemistry A: 1st Semester Review (ANSWERS)

Find the molar mass for each of the following

1. $FeCrO_4$ — 1. 171.85
2. $BaCl_2$ — 2. 208.23
3. $NaC_2H_3O_2$ — 3. 82.04
4. ammonium sulfide $(NH_4)_2S$ — 4. 68.17
5. dinitrogen monoxide N_2O — 5. 18.02

6. How many protons does the isotope I-129 have? — 6. 53
7. How many neutrons does the isotope ^{129}I have? — 7. 76
8. How many electrons does a Ba^{+2} ion have? — 8. 54

9. What is the mass of a diamond that has a volume of 1.7 ml and a density of 1.06 g/cm^3?

mass = density x volume $\quad 1.06 g/cm^3 \times 1.7 cm^3 = 1.8 g$ — 9. 1.8g

IN THE SPACE AT THE RIGHT, WRITE THE FOLLOWING IN NORMAL NUMBER NOTATION

10) 2.3×10^3 — 10. 2300
11) 4.7×10^{-7} — 11. 0.00000047
12) 5.3×10^{-4} — 12. 0.0053

IN THE SPACE AT THE RIGHT, WRITE THE FOLLOWING IN STANDARD SCIENTIFIC NOTATON

13) 0.016 30 — 13. 1.6×10^{-2}
14) 2 020 500 — 14. 2.0205×10^6
15) 0.002020 — 15. 2.02×10^{-4}

SOLVE THE FOLLOWING SHOWING ALL WORK, INCLUDE UNITS (Remember sig figs)

16) 6.7 m / 100 cm / 1 m / = 670 cm — 16. 670cm

17) 17.7 g / 1000 mg / 1 g / = 17,700 mg — 17. 17,700 mg

18) 8 MOLES OF O / 16.00 g / 1 mol O / = 128 g OF O (16 g OF O = 1 MOLE OF O) — 18. 128 g

REMEBER SIG FIGS

19) 4.1 + 6.29 — 19. 10.4
20) 0.1 x 7.01 — 20. 0.7
21) 7.6 x 2.94 — 21. 22
22) 7.8×10^4 / 1.9×10^2 — 22. 410

23) 42.640 — 23. 5
24) 0.000 120 — 24. 3
25) 4920 — 25. 3

Convert these temperatures

26. 234 °C to _____ K — 26. 507
27. 654K to _____ °C — 27. 381
28. 25 °C to _____ K — 28. 298

Name these compounds

29. SODIUM BROMIDE — 29. NaBr
30. IRON (III) CHLORIDE — 30. $FeCl_3$
31. CARBON MONOXIDE — 31. CO
32. CALCIUM SULFIDE — 32. CaS
33. CARBON TETRAHYDRIDE — 33. CH_4
34. AMMONIUM SULFITE — 34. $(NH_4)_2SO_3$
35. MAGNESIUM BICARBONATE — 35. $Mg(HCO_3)_2$
36. COPPER (III) OXIDE — 36. Cu_2O_3
37. SULFER TRIOXIDE — 37. SO_3
38. SODIUM CHROMATE — 38. Na_2CrO_4

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NAME THE FOLLOWING COMPOUNDS AND MOLECULES

39. MgS — 39 Magnesium Sulfide
40. FeS — 40 Iron (II) Sulfide
41. Al_2O_3 — 41 Aluminum Oxide
42. $(NH_4)_3 PO_4$ — 42 Ammonium Phosphate
43. N_2O_4 — 43 Dinitrogen tetroxide
44. N_2O — 44 Dinitrogen monoxide
45. CO_2 — 45 Carbon dioxide
46. CuCl — 46 Copper (I) Chloride
47. Na_2SO_3 — 47 Sodium Sulfite
48. $MgSO_4$ — 48 Magnesium Sulfate
49. H_2SO_3 — 49 Sulfurous acid
50. H_2S — 50 Hydrogen Sulfide

PUT THE FOLLOWING IN THEIR EMPIRICAL FORMULA

51. $C_2H_6O_3$ — 51 $C_2H_6O_3$
52. $CaCl_2$ — 52 $CaCl_2$
53. H_2O_2 — 53 HO
54. $C_{12}H_6$ — 54 C_6H

55. What is the percentage by mass of oxygen in $CaCO_3$?
a. 48% b. 64.0% c. 60.0% d. 92.3% — 55 a (48%)

56. The normal melting point of ice on the Kelvin scale is
a. 0.0 K b. 32 K c. 80 K d. 273 K — 56 d (273)

57. The empirical formula of a compound is CH. If the molecular mass of the compound is 78 g/mol, then the molecular formula is:
a. CH b. C_3H_6 c. C_5H_{18} d. C_6H_6 — 57 d (C_6H_6)

58. Which expression gives the number of atoms in 44 g of CO_2?
a. 6.02×10^{23} b. 1.81×10^{24} c. 22.4 d. 2 moles — 58 a (6.02×10^{23})

59. What is the molar mass of ammonium sulfide? $(NH_4)_2S$
a. 38 g/mol b. 44 g/mol c. 50 g g/mol d. 68 g/mol — 59 d (68.)

60. A compound consists of 72.2% magnesium and 27.8% nitrogen by mass. What is the empirical formula? — 60 Mg_3N_2

$72.2\,g \left| \frac{1\,mol}{24.31\,g} \right| = 2.97$ $\qquad \frac{2.97}{1.98} = 1.5 \cdot 2 = 3$

$27.8\,g \left| \frac{1\,mol}{14.01\,g} \right| = 1.98$ $\qquad \frac{1.98}{1.98} = 1 \cdot 2 = 2$

Mg_3N_2

Chemistry A: 1st Semester Review (ANSWERS)

Balance the following equations:

61. $4C_2H_3 + 11O_2 \text{ -------> } 8CO_2 + 6H_2O$

62. $2Na + 2H_2O \text{ ---> } 2NaOH + H_2$

63. $2H_3PO_4 \text{ ---> } H_4P_2O_7 + H_2O$

64. $C_{10}H_{16} + 8Cl_2 \text{ ---> } 10C + 16HCl$

65. $CO_2 + 2NH_3 \text{ ---> } OC(NH_2)_2 + H_2O$

Identify whether the following are metals, nonmetals or metalloids.

66. Zn a
67. He c
68. H c
69. Re a
70. B b
71. Ba a

a. metal
b. metalloid
c. nonmetal
d. heavy metal, dooood!
e. bogus

Nuclear Chemistry

Write the balanced nuclear equation for the decay of each of the following nuclides

72. beta decay of I-136
73. alpha decay of Pu-234
74. positron production by C-11

73. $^{136}_{53}I \rightarrow {}^{0}_{-1}\beta + {}^{136}_{54}Xe$

74. $^{234}_{94}Pu \rightarrow {}^{4}_{2}He + {}^{230}_{92}U$

75. $^{11}_{6}C \rightarrow {}^{0}_{1}\beta + {}^{11}_{5}B$

75. Write a balanced nuclear equation for the bombardment of Al-27 with alpha particles to produce P-30 and a neutron.

76. What is the difference between nuclear fission and nuclear fusion?

76. $^{27}_{13}Al + {}^{4}_{2}He \rightarrow {}^{30}_{15}P + {}^{1}_{0}n$

77. $^{210}_{84}Po \rightarrow {}^{4}_{2}He + ?$ What is the second product (also known as the daughter)?

$^{206}_{82}Pb$

78. What type of decay is demonstrated in the following reaction? $^{60}_{27}Co \rightarrow {}^{0}_{-1}\beta + {}^{60}_{28}Ni$ BETA DECAY

List what type the following reactions are:

double displacement	single displacement	oxidation/reduction (redox)
combustion	acid-base	decomposition
precipitation	synthesis	

79. $NaOH + KNO_3 \rightarrow NaNO_3 + KOH$
Double Displacement

80. $CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$
Combustion, Redox

82. $2\ Fe + 6\ NaBr \rightarrow 2\ FeBr_3 + 6\ Na$
Single Displacement, Redox

83. $CaSO_4 + Mg(OH)_2 \rightarrow Ca(OH)_2 + MgSO_4$
Double Displacement, Precipitation

84. $NH_4OH + HBr \rightarrow H_2O + NH_4Br$
Acid-Base

85. $Pb + O_2 \rightarrow PbO_2$
Synthesis, Redox

86. $Na_2CO_3 \rightarrow Na_2O + CO_2$
Decomposition, Redox

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87. Which is a precipitate in this equation?
$AgNO_3(aq) + NaCl(aq) \text{-------} > AgCl(s) + NaNO_3(aq)$
AgCl is the precipitate
88. Write the net ionic equation for the following equation
$AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$
$Ag^+(aq) + Cl^-(aq) \longrightarrow AgCl(s)$
89. Write the net ionic equation for the following equation
$Fe(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Fe(NO_3)_2(aq)$
$Fe(s) + Ag^+(aq) \longrightarrow Ag(s) + Fe^{2+}(aq)$
90. According to the following unbalanced equation:
$\_2\_CH_3OH + \_3\_O_2 \rightarrow \_4\_H_2O + \_2\_CO_2$
how many grams of oxygen would be required to react completely with 198 g of CH_3OH?

$$\frac{198g\ CH_3OH}{} \left| \frac{1\ mole\ CH_3OH}{32.05g\ CH_3OH} \right| \frac{3\ mole\ O_2}{2\ mole\ CH_3OH} \left| \frac{32.00g\ O_2}{1\ mole\ O_2} \right. = \mathbf{297\ g\ O_2}$$

91. What is the % yield of water in a reaction in which the theoretical yield is 45.52 g of H_2O and actual yield is 36.25 g of H_2O?

$$\frac{36.25g\ H_2O}{45.52g\ H_2O} \times 100 = \mathbf{79.6\%}$$

Limiting Reactant Problem
$2C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$
If we begin with 2.36 moles of C_2H_6 and 7.31 moles of O_2, and the reaction goes to completion,
92. How many moles of CO_2 will be produced?
93. How many grams of H_2O will be produced?
94. How many moles of C_2H_6 will be left un-reacted?
Information we need to know before we can answer the questions, "Which is the limiting reactanct?"

$$\frac{2.36\ moles\ C_2H_6}{} \left| \frac{7\ moles\ O_2}{2\ moles\ C_2H_6} \right.$$ = 8.26 moles O_2 needed to complete reaction. We only have 7.31, therefore O_2 is the limiting reactant.

92.

$$\frac{7.31\ moles\ O_2}{} \left| \frac{4\ moles\ CO_2}{7\ moles\ O_2} \right. = \mathbf{4.18\ moles\ CO_2}$$

93.

$$\frac{7.31\ moles\ O_2}{} \left| \frac{6\ moles\ H_2O}{7\ moles\ O_2} \right| \frac{18.02\ g\ H_2O}{1\ mole\ H_2O} = \mathbf{112\ g\ H_2O}$$

94.

$$\frac{7.31\ moles\ O_2}{} \left| \frac{2\ moles\ C_2H_6}{7\ moles\ O_2} \right.$$ = 2.09 moles C_2H_6 are needed for the reaction. We have 2.36, therefore C_2H_6 is in XS.

2.36 moles C_2H_6 - 2.09 moles C_2H_6 = **0.27 moles C_2H_6 unreacted**