ANSWER KEY

AHAM'S LAW OF EFFUSION

Name _____

ham's Law says that a gas will effuse at a rate that is inversely proportional to the quare root of its molecular mass, MM. Expressed mathematically:

$$\frac{rate_1}{rate_2} = \sqrt{\frac{MM_2}{MM_1}}$$

Solve the following problems.

1. Under the same conditions of temperature and pressure, how many times faster will hydrogen effuse compared to carbon dioxide?
   4.7
2. If the carbon dioxide in Problem 1 takes 32 sec to effuse, how long will the hydrogen take?
   6.8 sec
3. What is the relative rate of diffusion of NH_3 compared to He? Does NH_3 effuse faster or slower than He?
   0.49, slower
4. If the He in Problem 3 takes 20 sec to effuse, how long will NH_3 take?
   41 sec
5. An unknown gas diffuses 0.25 times as fast as He. What is the molecular mass of the unknown gas?
   64 g/mole

le 25

ELEMENT SYMBOLS

Name _____

An element symbol can stand for one atom of the element or one mole of atoms of the element. (One mole = 6.02×10^{23} atoms of an element.)

Write the symbol for the following elements.

1. oxygen — O
2. hydrogen — H
3. chlorine — Cl
4. mercury — Hg
5. fluorine — F
6. barium — Ba
7. helium — He
8. uranium — U
9. radon — Rn
10. sulfur — S
11. plutonium — Pu
12. americium — Am
13. radium — Ra
14. germanium — Ge
15. zinc — Zn
16. arsenic — As
17. lead — Pb
18. iron — Fe
19. calcium — Ca
20. cobalt — Co

Write the name of the element that corresponds to each of the following symbols.

21. Kr — Krypton
22. K — potassium
23. C — carbon
24. Ne — neon
25. Si — silicon
26. Zr — zirconium
27. Sn — tin
28. Pt — platinum
29. Na — sodium
30. Al — aluminum
31. Cu — copper
32. Ag — silver
33. P — phosphorus
34. Mn — manganese
35. I — iodine
36. Au — gold
37. Mg — magnesium
38. Ni — nickel
39. Br — bromine
40. Hg — mercury

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ATOMIC STRUCTURE

Name _____

An atom is made up of protons and neutrons (both found in the nucleus) and electrons (in the surrounding electron cloud). The atomic number is equal to the number of protons. The mass number is equal to the number of protons plus neutrons. In a neutral atom, the number of protons equals the number of electrons. The charge on an ion indicates an imbalance between protons and electrons. Too many electrons produces a negative charge, too few, a positive charge.

This structure can be written as part of a chemical symbol.

Example: $^{15}_{7}N^{+3}$ (mass number 15, atomic number 7, charge +3)

7 protons
8 neutrons (15 – 7)
4 electrons

Complete the following chart.

Element/ Ion	Atomic Number	Atomic Mass	Mass Number	Protons	Neutrons	Electrons
H	1	1.0079	1	1	0	1
H^+	1	1.0079	1	1	0	0
$^{12}_{6}C$	6	12.011	12	6	6	6
$^{7}_{3}Li^+$	3	6.941	7	3	4	2
$^{35}_{17}Cl^-$	17	35.453	35	17	18	18
$^{39}_{19}K$	19	39.0983	39	19	20	19
$^{24}_{12}Mg^{2+}$	12	24.305	24	12	12	10
As^{3-}	33	74.9216	75	33	42	36
Ag	47	107.868	108	47	61	47
Ag^{+1}	47	107.868	108	47	61	46
S^{-2}	16	32.06	32	16	16	18
U	92	238.029	238	92	146	92

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ISOTOPES AND AVERAGE ATOMIC MASS

Name _____

Elements come in a variety of isotopes, meaning they are made up of atoms with the same atomic number but different atomic masses. These atoms differ in the number of neutrons.

The average atomic mass is the weighted average of all the isotopes of an element.

Example: A sample of cesium is 75% ^{133}Cs, 20% ^{132}Cs and 5% ^{134}Cs. What is its average atomic mass?

Answer: .75 x 133 = 99.75
.20 x 132 = 26.4
.05 x 134 = 6.7
Total = 132.85 amu = average atomic mass

Determine the average atomic mass of the following mixtures of isotopes.

1. 80% ^{127}I, 17% ^{126}I, 3% ^{125}I — 126.86 amu
2. 50% ^{197}Au, 50% ^{198}Au — 197.5 amu
3. 15% ^{55}Fe, 85% ^{54}Fe — 55.85 amu
4. 99% ^{1}H, 0.8% ^{2}H, 0.2% ^{3}H — 1.012 amu
5. 98% ^{14}N, 3% ^{15}N, 2% ^{16}N — 14.07 amu
6. 98% ^{12}C, 2% ^{14}C — 12.04 amu

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