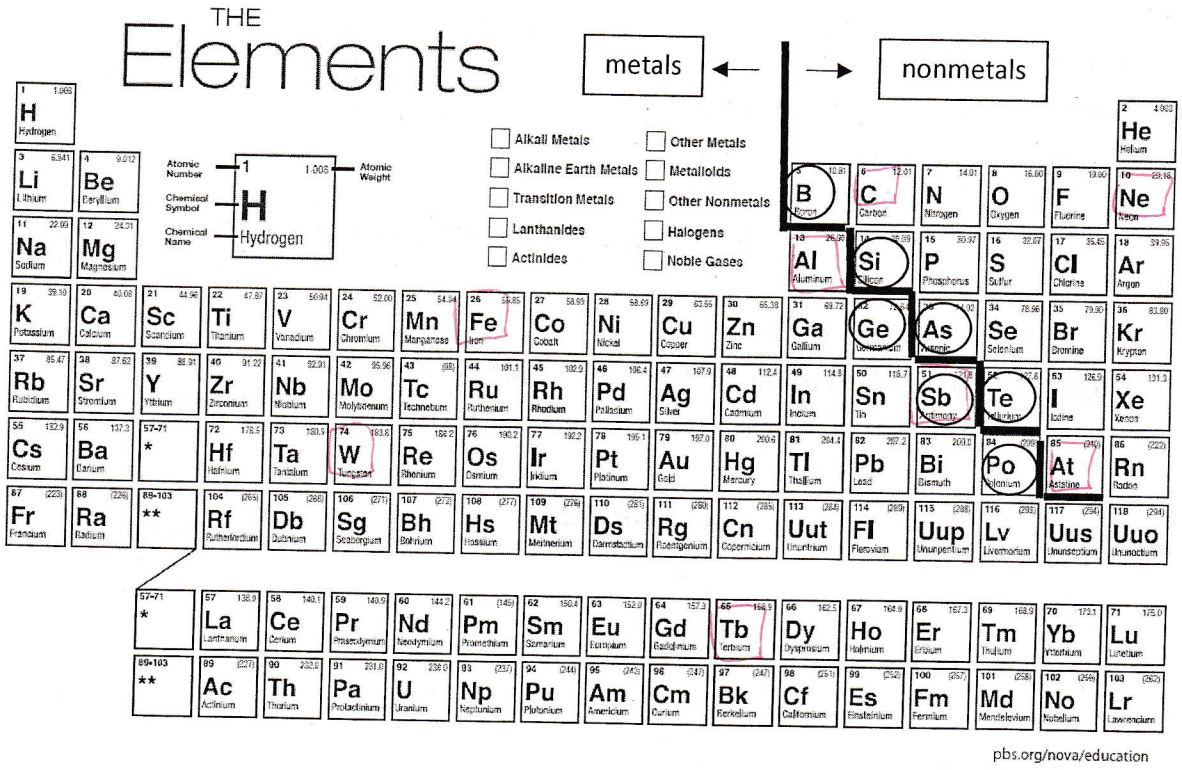
Key

Science 10

Review for Chemistry Test

Metalloids, Metals and Nonmetals



Identify each of the following elements as a metalloid, metal or nonmetal.

a) iron metal

b) carbon nonmetal

c) neon nonmetal

d) tungsten metal

e) astatine nonmetal

f) antimony metalloid

g) aluminum metal

h) terbium metal

Types of Ions

1. monatomic ions (MI)
   -> 1 type of atom involved: Na^{1+} (sodium ion)
   Cl^{1-} (chloride ion)

2. polyatomic ions (PI)
   -> more than 1 type of atom involved: NO_3^{1-}, BO_3^{3-}, NH_4^{1+}
   -> end in: "ate" ie/ sulfate ion, SO_4^{2-}
   "ite" ie/ chlorite ion, ClO_2^{1-}
   "ide" cyanide ion (CN^{1-}), hydroxide ion (OH^{1-}), peroxide ion (O_2^{2-})

3. ions of multivalent metals (IMM)
   -> 1 type of atom involved but more than one possible ion: Cu^{1+}, Cu^{2+}
   -> names include roman numerals: copper (I) ion, copper (II) ion

Identify each of the following ions as MI, PI or IMM.

a) ClO^{1-} PI

b) Zn^{2+} MI

c) aluminum ion Al^{3+} MI

d) V^{5+} V^{3+}/V^{5+} IMM

e) sulfite ion SO_3^{2-} PI

f) lead (IV) ion IMM

g) ammonium ion NH_4^{+} PI

h) thiocyanate ion SCN^{-} PI

i) Lu^{3+} MI

j) $P_2O_7^{4-}$ PI

k) oxide ion MI

Ionic Compounds

Start with a metal or NH_4^+.

1. simple binary compounds:
   Li_3N –> lithium nitride

2. ionic compounds involving a polyatomic ion:
   $Mg(OH)_2$ –> magnesium hydroxide
   $(NH_4)_3P$ –> ammonium phosphide

3. ionic compounds involving multivalent metals:
   Cr_2O_3 –> chromium (III) oxide

4. ionic compounds involving multivalent metals and polyatomic ions:
   $CuNO_3$ –> copper (I) nitrate

Complete the table below.

Name of Ionic Compound	Formula of Ionic Compound
Silver phosphide	Ag_3P
barium borate Ba^{2+} $(BO_3)^{-3}$	$Ba_3(BO_3)_2$
bismuth (V) sulfate	$Bi_2(SO_4)_5$
ammonium selenide $(NH_4)^{+1}$ Se^{2-}	$(NH_4)_2Se$
manganese (IV) carbonate	$Mn(CO_3)_2$ (+4, −4)
zinc chloride Zn^{2+} Cl^{-1}	$ZnCl_2$
iron (III) arsenide Fe^{3+} As^{3-}	$FeAs$

Molecular Compounds

Involve nonmetals and metalloids.

Prefixes: mono – 1	tri – 3	penta – 5	hepta – 7	nona – 9
di – 2	tetra – 4	hexa – 6	octa – 8	deca – 10

1. simple binary compounds:
   SO_3 – sulfur trioxide
   C_2H_4 – dicarbon tetrahydride

2. diatomic molecules:

hydrogen – H_2	fluorine – F_2	chlorine – Cl_2
oxygen – O_2	bromine – Br_2	
nitrogen – N_2	iodine – I_2	

3. common names:
   water – H_2O
   ammonia – NH_3
   hydrogen peroxide – H_2O_2

Complete the table below.

Name of Molecular Compound	Formula of Molecular Compound
tetraphosphorous decahydride	P_4H_{10}
oxygen dichloride	OCl_2
tricarbon hexahydride	C_3H_6
iodine monochloride	ICl
dinitrogen trioxide	N_2O_3
diphosphorous pentaoxide	P_2O_5

Types of Compounds

Identify each compound as ionic or molecular.

1. PCl_3 (nm) — molecular
2. $Al(OH)_3$ (m) — ionic
3. SCl_6 (nm) — molecular
4. $Zn_3(PO_4)_2$ (m) — ionic
5. N_2O_4 (nm) — molecular
6. CS_2 (nm) — molecular
7. silicon dioxide (metalloid) — molecular
8. ammonium nitride (NH_4^+) — ionic
9. nitrogen trihydride (nm) — molecular
10. iron (II) sulfate (m) — ionic
11. oxygen difluoride (nm) — molecular
12. potassium iodide (m) — ionic
13. $PbSO_3$ (m) — ionic
14. carbon tetrachloride (nm) — molecular

Types of Reactions

1. Formation: $A + B \rightarrow AB$ (1 product)
2. Decomposition: $AB \rightarrow A + B$ (1 reactant)
3. Single Replacement Reaction: $\underset{\text{element}}{A} + \underset{\text{compound}}{BC} \rightarrow \underset{\text{element}}{B} + \underset{\text{compound}}{AC}$
4. Double Replacement Reaction: $\underset{\text{compound}}{AB} + \underset{\text{compound}}{CD} \rightarrow \underset{\text{compound}}{AD} + \underset{\text{compound}}{BC}$
5. Combustion Reaction: $\text{hydrocarbon} + O_2 \rightarrow CO_2 + H_2O$

Balancing Chemical Reactions

Use numerical coefficients to balance the atoms in a chemical reactions.

$$CaCl_2 + K_2S \rightarrow CaS + 2KCl$$

(2 is the numerical coefficient)

Identify each reaction as a formation reaction, decomposition reaction , single replacement reaction , double replacement reaction or combustion reaction.

Type

F 1. $4\,Al + 3\,O_2 \rightarrow 2\,Al_2O_3$

$Al = 1 \times 4 = 4$ | $Al = 2 \times 2 = 4$

$O = 2 \times 3 = 6$ | $O = 3 \times 2 = 6$

Type

6+4=10

C 2. ___ C_3H_8 + 5 O_2 -> 3 CO_2 + 4 H_2O

C = 3
H = 8
O = 2 x [5] = 10

C = 1 x [3] = 3
H = 2 x [4] = 8
O = ~~5~~ 10

DR 3. ___ $Al(NO_3)_3$ + 3 NaOH -> ___ $Al(OH)_3$ + 3 $NaNO_3$

Al = 1
NO_3 = 3
Na = 1 x [3] = 3
OH = 1 x 3 = 3

Al = 1
NO_3 = 1 x [3] = 3
Na = 1 x 3 = 3
OH = 3

D 4. 2 KNO_3 -> 2 KNO_2 + ___ O_2

K = 1
N = 1
O = 3

K = 1
N = 1
O = 4

use trial + error

SR 5. 3 O_2 + ___ CS_2 -> ___ CO_2 + 2 SO_2

2 + 4

O = 2 x [3] = 6
C = 1
S = 2

O = ~~4~~ 6
C = 1
S = 1 x [2] = 2

D 6. 2 $KClO_3$ -> 2 KCl + 3 O_2

K = 1 x 2 = 2
Cl = 1
O = 3 x [2] = 6

K = 1 x [2] = 2
Cl = 1
O = 2 x [3] = 6

Type

DR 7. 3 $BaF_2 + K_3PO_4 \rightarrow Ba_3(PO_4)_2 + KF$

Ba = 1 x 3 = 3	Ba = 3
F = 2 x 3 = 6	F = 1 x 6 = 6
K = 3 x 2 = 6	K = 1 x 6 = 6
PO4 = 1 x 2 = 2	PO4 = 2

DR 8. ___ H_2SO_4 + ___ $Mg(NO_3)_2$ -> ___ $MgSO_4$ + 2 HNO_3

H = 2	H = 1 x 2 = 2
SO4 = 1	SO4 = 1
Mg = 1	Mg = 1
NO3 = 2	NO3 = 1 x 2 = 2

SR 9. 2 Al + 3 H_2SO_4 -> ___ $Al_2(SO_4)_3$ + 3 H_2

Al = 1 x 2 = 2	Al = 2
H = 2 x 3 = 6	H = 2 x 3 = 6
SO4 = 1 x 3 = 3	SO4 = 3

SR 10. ___ WO_3 + 3 H_2 -> ___ W + 3 H_2O

W = 1	W = 1
O = 3	O = 1 x 3 = 3
H = 2 x 3 = 6	H = 2 x 3 = 6