

**KWANTLEN UNIVERSITY COLLEGE**  
**CHEMISTRY 0094 S-11**  
**EXAM No. 2**  
**February 28, 2002**

**ANSWER KEY**

**Question One:**

- a) C<sub>2</sub>H<sub>5</sub>OH - molecular      b) Na<sub>2</sub>CO<sub>3</sub> - ionic  
c) CaO - ionic      d) LiI - ionic  
e) BCl<sub>3</sub> - molecular      f) SF<sub>6</sub> - ionic

**Question Two:**

Ionic Compounds: b) Na<sub>2</sub>CO<sub>3</sub>, c) CaO, and d) LiI would be expected to have relatively high melting points. This is due to the very strong electrostatic forces of attraction between the oppositely charged ions. It would take a lot of energy to separate the cations from the anions.

Molecular Compounds: a) C<sub>2</sub>H<sub>5</sub>OH, e) BCl<sub>3</sub>, and f) SF<sub>6</sub> have relatively weak attractive forces between molecules resulting in low melting points.

**Question Three:**

| Nuclear Symbol             | Number of Protons | Number of Electrons | Number of Neutrons | Atomic Number | Mass Number |
|----------------------------|-------------------|---------------------|--------------------|---------------|-------------|
| $^{59}_{27}\text{Co}^{2+}$ | 27                | 25                  | 32                 | 27            | 59          |
| $^{30}_{16}\text{S}^{2-}$  | 16                | 18                  | 14                 | 16            | 30          |
| $^{18}_{35}\text{Br}$      | 35                | 35                  | 46                 | 35            | 81          |

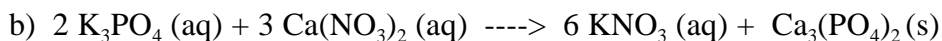
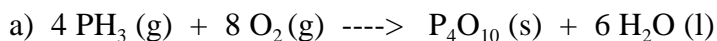
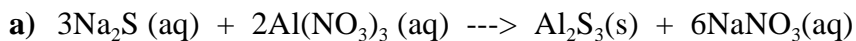
**Question Four:**

a)

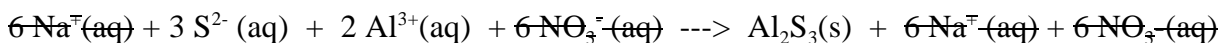
$$\begin{array}{rclcl}
 23.9850 \text{ amu} & \times & 0.7899 & = & 18.946 \text{ amu} \\
 24.9858 \text{ amu} & \times & 0.1000 & = & 2.499 \text{ amu} \\
 25.9826 \text{ amu} & \times & 0.1101 & = & 2.861 \text{ amu} \\
 & & & & \text{-----} \\
 & & & & 24.31 \text{ amu}
 \end{array}$$

b) Mg - magnesium

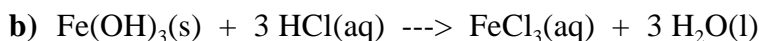
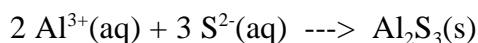
**Question Five:**a) chromium(III) sulfide -  $\text{Cr}_2\text{S}_3$ b) zinc chlorate -  $\text{Zn}(\text{ClO}_3)_2$ c) potassium acetate -  $\text{KC}_2\text{H}_3\text{O}_2$ d) diphosphorus pentoxide -  $\text{P}_2\text{O}_5$ e) tin(IV) oxide -  $\text{SnO}_2$ f) calcium nitride -  $\text{Ca}_3\text{N}_2$ g) ammonium nitrate -  $\text{NH}_4\text{NO}_3$ h) magnesium cyanide -  $\text{Mg}(\text{CN})_2$ **Question Six:**a)  $\text{CaI}_2$  - Calcium Iodideb)  $\text{Fe}_2(\text{CrO}_4)_3$  - iron(III) chromatec)  $\text{PCl}_5$  - phosphorus pentachlorided)  $\text{Be}(\text{OH})_2$  - beryllium hydroxidee)  $\text{NaHCO}_3$  - sodium hydrogen carbonate or sodium bicarbonatef)  $\text{Li}_3\text{P}$  - lithium phosphideg)  $\text{NiSO}_4$  - nickel(II) sulfateh)  $\text{K}_2\text{Cr}_2\text{O}_7$  - potassium dichromate**Question Seven:**a)  $\text{H}_2\text{S}$  - hydrosulfuric acidb)  $\text{HClO}_4$  - perchloric acidc)  $\text{HNO}_3$  - nitric acidd)  $\text{H}_3\text{PO}_4$  - phosphoric acid**Question Eight:**a) bromous acid -  $\text{HBrO}_2$ b) hydrocyanic acid -  $\text{HCN}$ c) acetic acid -  $\text{HC}_2\text{H}_3\text{O}_2$ d) carbonic acid -  $\text{H}_2\text{CO}_3$

**Question Nine:****Question Ten:**

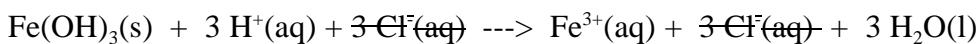
Complete Ionic Equation:



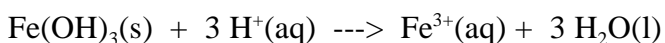
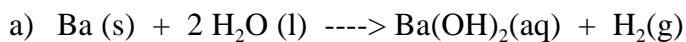
Net Ionic Equation:



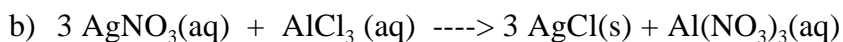
Complete Ionic Equation:



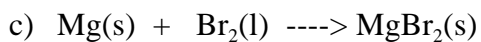
Net Ionic Equation:

**Question Eleven:**

Single (or active metal) Replacement Reaction

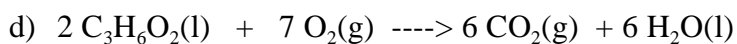


Double Replacement (Precipitation) Reaction

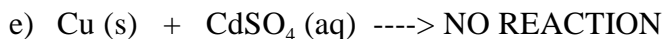


Combination Reaction

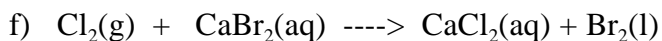
**Question Eleven: (Continued)**



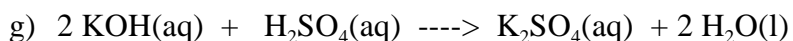
Combustion Reaction



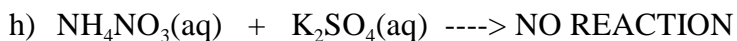
Copper is less reactive metal than cadmium according to the metal activity series.



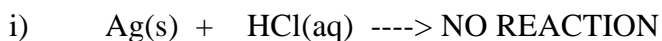
Single (or halogen) Replacement Reaction



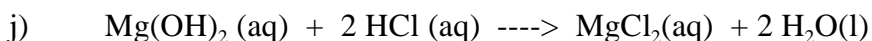
Double Replacement (Acid - Base) Reaction



Both anticipated products of this double replacement reaction:  $\text{KNO}_3$  and  $(\text{NH}_4)_2\text{SO}_4$  are soluble.



Silver is less reactive than hydrogen according to the metal activity series, therefore, Ag will not replace H in HCl in a single replacement reaction.



Double Replacement (Acid - Base) Reaction