EXERCISES AND PROBLEMS

I. Develop balanced chemical equations using the descriptions of reactions below.

1. Hydrogen gas burns in oxygen gas to produce water vapour.

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2. Silver is attacked by sulfur in the air to form silver sulfide.

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3. In industry diboron trioxide is reacted with magnesium metal to produce boron and magnesium oxide.

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4. Silicon which is used to produce silicon chips for computers can be prepared by heating quartz (silicon dioxide) with carbon at very high temperatures. This produces carbon monoxide as an additional product.

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5. The rotten egg smell from a rotting egg is typically hydrogen sulfide. When this gas burns in air, it produces water vapour and sulfur dioxide gas which has a pungent, choking odour.

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6. Oxy-acetylene torches used for welding rely on the combustion of acetylene (C_2H_2) with oxygen to produce water and carbon dioxide and a very high temperature.

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7. Ozone gas, which forms a protective layer and filters out most of the ultraviolet rays from the Sun, is produced by the reaction of oxygen with oxygen during high energy production of lightning.

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8. Inert gases also form compounds under special conditions. Xenon gas combines directly with fluorine gas in the presence of a catalyst to form xenon hexafluoride.

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9. A chemical that is used in explosives is ammonium nitrate. During explosion, this chemical breaks down into water vapour, nitrogen gas and oxygen gas. The sudden formation and expansion of these gases result in an explosive force.

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10. H_2O_2 is a bleaching agent that is used to remove organic colouration such as bleaching of the hair. Barium peroxide reacts with sulfuric acid to produce hydrogen peroxide and a precipitate of barium sulfate.

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3. *a) tin (II) oxide* *b) tin (IV) oxide*
c) copper (II) sulfide *d) copper (I) sulfide*
e) iron (III) chloride *f) iron (II) iodide*

4. *a) stannous sulfide* *b) stannic sulfide*
c) chromic bromide *d) cobaltic chloride*
e) stannic oxide *f) ferric oxide*
g) mercurous bromide *h) mercuric bromide*

5. *a) xenon hexafluoride*
b) silicon tetrachloride
c) phosphorus pentoxide
d) hydrogen hydroxide or water
e) arsenic tribromide
f) hypochlorous acid
g) ammonium chloride
h) tetraphosphorous decaoxide
i) oxygen dichloride
j) calcium hydride
k) hydrogen chloride
l) nitric oxide or nitrogen monoxide

6. *a) chlorine monofluoride – non-ionic*
b) carbon tetrabromide – non-ionic
c) magnesium sulfide – ionic
d) aluminium chloride – ionic
e) phosphrous trihydride – non-ionic
f) rubidium oxide – ionic
g) lithium oxide – ionic
h) chlorine bromide – non-ionic
i) calcium nitride – ionic
j) arsenic pentoxide – ionic

7. *a)* P^{3-} *b)* PO_4^{3-}
c) PO_3^{3-} *d)* HPO_4^{2-}
e) NO_3^- *f)* NH_4^+
g) NO_2^- *h)* N^{3-}
i) Cl^- *j)* ClO_3^-
k) ClO_4^- *l)* S^{2-}
m) CO_3^{2-} *n)* HCO_3^-
o) CH_3COO^- *p)* CN^-

8. *a) sulfite* *b) nitrate*
c) dichromate *d) chromate*
e) peroxide *f) permanganate*
g) ammonium *h) iodate*
i) dihydrogen phosphate
j) hydrogen sulfite

9. *a) potassium carbonate*
b) ammonium nitrite
c) calcium hydroxide
d) aluminium hydrogensulfate
e) ammonium sulfate
f) silver cyanide
g) calcium phosphate
h) potassium perchlorate
i) iron (III) sulfate
j) potassium peroxide

10. *a) hydrochloric acid* *b) nitric acid*
c) chloric acid *d) nitrous acid*
e) hydrofluoric acid *f) hydrobromic acid*
g) sulfuric acid *h) phosphoric acid*
i) perbromic acid *j) hydrogen sulfide*
k) bromic acid *l) perchloric acid*
m) sulfurous acid

11. *a)* Ba_3N_2 *b)* $CsBr$
c) Ag_2S *d)* RaO
e) RbI *f)* Ag_3N
g) AgI *h)* Mg_3P_2
i) CaH_2 *j)* CuS

12. *a)* NH_4NO_3 *b)* $(NH_4)_3PO_4$
c) $FeSO_4$ *d)* $Mg(CH_3COO)_2$
e) CaO_2 *f)* $CoSO_4$
g) BaO_2 *h)* PBr_3
i) CI_4 *j)* NCl_3
k) $KH(CH_3COO)_2$ *l)* $Ca(ClO_4)_2$

14. *a) xenon hexafluoride*
b) dinitrogen tetroxide
c) oxygen difluoride
d) silicon tetrabromide
e) calcium chromate
f) oxygen dichloride

16. *a)* NO_2 *b)* SO_2
c) N_2O *d)* PCl_5
e) BaO_2 *f)* SF_6
g) MgI_2 *h)* XeF_4
i) NH_4NO_2 *j)* KCH_3COO
k) Al_2S_3 *l)* $BeBr_2$
m) Cs_2SO_3 *n)* $K_2Cr_2O_7$

Multiple Choice Questions

1. a, 2. d, 3. c, 4. a, 5. b, 6. b, 7. a, 8. a, 9. c, 10. b, 11. d, 12. a, 13. b, 14. c, 15. a

Chapter 5. Chemical Reactions and Equations

I.

1. $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$
2. $2Ag(s) + S(s) \rightarrow Ag_2S(s)$
3. $B_2O_3(s) + 3Mg(s) \rightarrow 2B(s) + 3MgO(s)$
4. $SiO_2(s) + 2C(s) \rightarrow 2CO(g) + Si(s)$
5. $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(g) + 2SO_2(g)$
6. $2C_2H_2(g) + 5O_2(g) \rightarrow 2H_2O(g) + 4CO_2(g)$
7. $2O_2(g) + O_2(g) \rightarrow 2O_3(g)$
8. $Xe(g) + 3F_2(g) \rightarrow XeF_6(g)$
9. $2NH_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(l) + O_2(g)$
10. $BaO_2(s) + H_2SO_4(aq) \rightarrow BaSO_4(s) + H_2O_2(g)$