Assessment

Names and formulas of compounds

Page 73

1. F **2.** C **3.** I **4.** B **5.** C **6.** D **7.** A **8.** C **9.** D **10.** D **11.** C **12.** B

Section 4.3 Chemical Equations

Comprehension

Balancing equations

Page 77

1. $H_2 + F_2 \rightarrow 2\ HF$

2. $2\ Sn + O_2 \rightarrow 2\ SnO$

3. $MgCl_2 \rightarrow Mg + Cl_2$

4. $2\ KNO_3 \rightarrow 2\ KNO_2 + O_2$

5. $2\ BN + 3\ F_2 \rightarrow 2\ BF_3 + N_2$

6. $CuI_2 + Fe \rightarrow FeI_2 + Cu$

7. $2\ Li + 2\ H_2O \rightarrow 2\ LiOH + H_2$

8. $4\ NH_3 + 3\ O_2 \rightarrow 2\ N_2 + 6\ H_2O$

9. $V_2O5 + 5\ Ca \rightarrow 5\ CaO + 2\ V$

10. $2\ C_9H_6O_4 + 17\ O_2 \rightarrow 18\ CO_2 + 6\ H_2O$

11. $H_2S + PbCl_2 \rightarrow PbS + 2\ HCl$

12. $2\ C_3H_7OH + 9\ O_2 \rightarrow 6\ CO_2 + 8\ H_2O$

13. $Zn + CuSO_4 \rightarrow Cu + ZnSO_4$

14. $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$

15. $C_2H_5OH + 3\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O$

16. $2\ Al + 3\ H_2SO4 \rightarrow 3\ H_2 + Al_2(SO_4)_3$

17. $2\ FeCl_3 + 3\ Ca(OH)_2 \rightarrow 2\ Fe(OH)_3 + 3\ CaCl_2$

18. $Pb(NO_3)_2 + K_2CrO_4 \rightarrow PbCrO_4 + 2\ KNO_3$

19. $Cd(NO_3)_2 + (NH_4)_2S \rightarrow CdS + 2\ NH_4NO_3$

20. $Ca(OH)_2 + 2\ NH_4Cl \rightarrow 2\ NH_3 + CaCl_2 + 2\ H_2O$

Applying Knowledge

Word equations

Page 78

1. $2\ H_2 + O_2 \rightarrow 2\ H_2O$

2. $Fe_2O_3 + 3\ H_2 \rightarrow 3\ H_2O + 2\ Fe$

3. $2\ Na + 2\ H_2O \rightarrow 2\ NaOH + H_2$

4. $Ca_2C + O_2 \rightarrow 2\ Ca + CO_2$

5. $2\ KI + Cl_2 \rightarrow 2KCl + I_2$

6. $4\ Cr + 3\ SnCl_4 \rightarrow 4\ CrCl_3 + 3\ Sn$

7. $Mg + CuSO_4 \rightarrow MgSO_4 + Cu$

8. $ZnSO_4 + SrCl_2 \rightarrow ZnCl_2 + SrSO_4$

9. $3\ NH_4Cl + Pb(NO_3)_3 \rightarrow 3\ NH_4NO_3 + PbCl_3$

10. $2\ Fe(NO_3)_3 + 3\ MgS \rightarrow Fe_2S_3 + 3\ Mg(NO_3)_2$

11. $2\ AlCl_3 + 3\ Na_2CO_3 \rightarrow Al_2(CO_3)_3 + 6\ NaCl$

12. $2\ Na_3PO_4 + 3\ Ca(OH)_2 \rightarrow 6\ NaOH + Ca_3(PO_4)_2$

Extension

Chemical reactions and chemical equations

Page 79

1. iron + oxygen → iron(II) oxide

$2Fe + O_2 \rightarrow 2\ FeO$

2. hydrogen chloride + sodium carbonate → carbon dioxide + sodium chloride + water

$2\ HCl + Na_2CO_3 \rightarrow CO_2 + 2\ NaCl + H_2O$

3. aluminum + oxygen → aluminum oxide

$4\ Al + 3\ O_2 \rightarrow 2\ Al_2O_3$

4. water + sodium oxide → sodium hydroxide

$H_2O + Na_2O \rightarrow 2\ NaOH$

5. hydrogen + nitrogen trifluoride → nitrogen + hydrogen fluoride

$3\ H_2 + 2\ NF_3 \rightarrow N_2 + 6\ HF$

6. chromium(III) sulphate + potassium carbonate → chromium(III) carbonate + potassium sulphate

$Cr_2(SO4)_3 + 3\ K_2CO_3 \rightarrow Cr_2(CO_3)_3 + 3\ K_2SO_4$

7. potassium chlorate → oxygen + potassium chloride

$2\ KClO_3 \rightarrow 3\ O_2 + 2\ KCl$

8. zinc + copper(II) sulphate → copper + zinc sulphate

$Zn + CuSO_4 \rightarrow Cu + ZnSO_4$

Assessment

Chemical equations

Page 80

1. B **2.** A **3.** E **4.** D **5.** F **6.** C **7.** G **8.** D **9.** D **10.** D **11.** A **12.** C **13.** B

Chapter 5 Compounds are classified in different ways.

Section 5.1 Acids and Bases

Applying Knowledge

pH scale and pH indicators

Page 84

1. (a) chemical that changes colour depending on the pH of the solution it is placed in

(b) number scale for measuring how acidic or basic a solution is

2. (a)

Substance	pH Value	Acid or Base	Methyl Orange	Bromothymol Blue	Litmus
lemon	2	acid	red	yellow	red
ammonia	11	base	yellow	blue	blue
milk	6	acid	yellow	yellow	red

(b)

Substance	pH Value	Acid or Base	Methyl Red	Phenolphthalein	Indigo Carmine
tomato	4	acid	red	colourless	blue
oven cleaner	13	base	yellow	pink	yellow
egg	8	base	yellow	colourless	blue

3.

Substance	pH Value	Acid or Base	pH Indicator	Colour of pH Indicator
black coffee	5	acid	litmus	red
milk of magnesia	10	base	phenolphthalein	pink
battery acid	0	acid	bromothymol blue	yellow
sea water	8	base	indigo carmine	blue
orange juice	3	acid	methyl orange	red
liquid drain cleaner	14	base	methyl red	yellow

Comprehension

Names of acids

Page 86

1. ate

2. ite

3. (a) carbonic acid

(b) acetic acid

(c) phosphoric acid

(d) chlorous acid

(e) sulphurous acid

(f) nitric acid

(g) hydrofluoric acid

(h) hydrochloric acid

4. (a) HI

(b) H_2SO_4

(c) $HClO_4$

(d) HNO_2

(e) $HClO_3$

(f) HBr

(g) H_3PO_3

(h) HClO

Applying Knowledge

Acids versus bases

Page 87

	ACIDS	BASES
definition	compounds containing hydrogen that produce a solution with a pH of less than 7 when they dissolve in water and that produce a salt and water when they react with ionic compounds containing hydroxide ions	chemical compounds containing hydroxide that produce a solution with a pH of more than 7 when they dissolve in water and produce a salt and water when they react with ionic compounds containing positive hydrogen ions
pH	< 7	> 7
what to look for in chemical formula	H	OH
production of ions	H^+	OH^-
electrical conductivity	conductive	conductive
taste	taste sour	taste bitter
touch	burn skin	feel slippery; burn skin
examples	HCl, H_2SO_4, lemons, stomach acid	NaOH, KOH, drain cleaner, soap

2. (a) acid

(b) base

(c) base

(d) acid

(e) base

(f) acid

(g) acid

(h) base

(i) acid

(j) base

(k) base

(l) acid

Assessment

Acids and bases

Page 88

1. D **2.** F **3.** A **4.** E **5.** B **6.** G **7.** C **8.** A **9.** A **10.** C **11.** A **12.** C **13.** B **14.** B

Section 5.2 Salts

Comprehension

Recognizing acids, bases, and salts

Page 91

1. (a) acid
(b) acid
(c) base
(d) acid
(e) base
(f) acid
(g) acid
(h) acid
(i) salt
(j) base
(k) base
(l) salt
(m) acid
(n) salt
(o) salt
(p) salt
(q) acid
(r) acid
(s) base
(t) acid
(u) acid
(v) salt

2. acetic acid, CH_3COOH

3. sodium chloride, NaCl

4. sulphuric acid, H_2SO_4

5. sodium hydroxide, NaOH

6. magnesium hydroxide, $Mg(OH)_2$

7. hydrochloric acid, HCl

Applying Knowledge

Acid-base neutralization reactions

Page 92

1. (a) $H_2SO_4 + 2\ NaOH \rightarrow 2\ H_2O + Na_2SO_4$
(b) $HNO_3 + KOH \rightarrow H_2O + KNO_3$
(c) $2\ HCl + Ca(OH)_2 \rightarrow 2\ H_2O + CaCl_2$
(d) $2\ H_3PO_4 + 3\ Ba(OH)_2 \rightarrow 6\ H_2O + Ba_3(PO_4)_2$
(e) $CH_3COOH + NaOH \rightarrow H_2O + NaCH_3COO$
(f) $2\ HNO_3 + Sr(OH)_2 \rightarrow 2\ H_2O + Sr(NO_3)_2$
(g) $3\ HF + Fe(OH)_3 \rightarrow 3\ H_2O + FeF_3$
(h) $4\ HBr + Sn(OH)_4 \rightarrow 4\ H_2O + SnBr_4$

2. (a) sulphuric acid + potassium hydroxide → water + potassium sulphate

$H_2SO_4 + 2\ KOH \rightarrow 2\ H_2O + K_2SO_4$

(b) acetic acid + barium hydroxide → water + barium acetate

$2\ CH_3COOH + Ba(OH)_2 \rightarrow 2\ H_2O + Ba(CH_3COO)_2$

(c) phosphoric acid + aluminum hydroxide → water + aluminum phosphate

$H_3PO_4 + Al(OH)_3 \rightarrow 3\ H_2O + AlPO_4$

(d) nitric acid + lithium hydroxide → water + lithium nitrate

$HNO_3 + LiOH \rightarrow H_2O + LiNO_3$

(e) sulphuric acid + calcium hydroxide → water + calcium sulphate

$H_2SO_4 + Ca(OH)_2 \rightarrow 2\ H_2O + CaSO_4$

(f) hydrochloric acid + magnesium hydroxide → water + magnesium chloride

$2\ HCl + Mg(OH)_2 \rightarrow 2\ H_2O + MgCl_2$

Applying Knowledge

Metal oxides and non-metal oxides

Page 93

1. oxygen

2. metal oxide

3. non-metal oxide

4. it becomes basic

5. it becomes acidic

6. a base

7. an acid

8. (a) metal oxide
(b) non-metal oxide
(c) non-metal oxide
(d) metal oxide
(e) non-metal oxide
(f) metal oxide
(g) non-metal oxide
(h) metal oxide

9. (a) a base
(b) an acid
(c) a base
(d) an acid

Assessment

Salts

Page 94

1. A **2.** C **3.** F **4.** E **5.** D **6.** B **7.** C **8.** B **9.** D **10.** B **11.** B **12.** D **13.** B