1.7

Year 9 · Unit 1 · 1.7 Chemical change · Worksheet E

Answers

Level 1 · One or two numbers (three are already balanced)

1. 1 Mg + 1 Cl_2 ⟶ 1 $MgCl_2$ — magnesium + chlorine → magnesium chloride
2. 2 Na + 1 Cl_2 ⟶ 2 $NaCl$ — sodium + chlorine → sodium chloride
3. 1 HCl + 1 $NaOH$ ⟶ 1 $NaCl$ + 1 H_2O — hydrochloric acid + sodium hydroxide → sodium chloride + water
4. 1 N_2 + 3 H_2 ⟶ 2 NH_3 — nitrogen + hydrogen → ammonia
5. 2 Rb + 1 S ⟶ 1 Rb_2S — rubidium + sulphur → rubidium sulphide
6. 1 C + 2 S ⟶ 1 CS_2 — carbon + sulphur → carbon disulphide
7. 1 NH_3 + 1 HCl ⟶ 1 NH_4Cl — ammonia + hydrochloric acid → ammonium chloride
8. 4 Na + 1 O_2 ⟶ 2 Na_2O — sodium + oxygen → sodium oxide
9. 2 Li + 2 H_2O ⟶ 2 $LiOH$ + 1 H_2 — lithium + water → lithium hydroxide + hydrogen

Level 2 · Bigger numbers (up to 6)

10. 3 Rb + 1 P ⟶ 1 Rb_3P — rubidium + phosphorus → rubidium phosphide
11. 2 Al + 3 S ⟶ 1 Al_2S_3 — aluminium + sulphur → aluminium sulphide
12. 6 Cs + 1 N_2 ⟶ 2 Cs_3N — caesium + nitrogen → caesium nitride
13. 3 Li + 1 $AlCl_3$ ⟶ 3 $LiCl$ + 1 Al — lithium + aluminium chloride → lithium chloride + aluminium
14. 2 N_2 + 5 O_2 ⟶ 2 N_2O_5 — nitrogen + oxygen → dinitrogen pentoxide
15. 6 K + 1 B_2O_3 ⟶ 3 K_2O + 2 B — potassium + boron oxide → potassium oxide + boron
16. 5 C + 2 SO_2 ⟶ 1 CS_2 + 4 CO — carbon + sulphur dioxide → carbon disulphide + carbon monoxide
17. 4 NH_3 + 3 O_2 ⟶ 2 N_2 + 6 H_2O — ammonia + oxygen → nitrogen + water

Level 3 · Brackets

A number after a bracket multiplies everything inside it: $Mg(OH)_2$ is 1 Mg, 2 O, 2 H. Treat PO_4 or SO_4 as one block.

18. 1 H_3PO_4 + 3 KOH ⟶ 1 K_3PO_4 + 3 H_2O
    phosphoric acid + potassium hydroxide → potassium phosphate + water
19. 1 $Al(OH)_3$ + 3 HBr ⟶ 1 $AlBr_3$ + 3 H_2O
    aluminium hydroxide + hydrogen bromide → aluminium bromide + water

Page done? Tick it off

20 $\boxed{2}\,NaOH + \boxed{1}\,H_2CO_3 \longrightarrow \boxed{1}\,Na_2CO_3 + \boxed{2}\,H_2O$

sodium hydroxide + carbonic acid → sodium carbonate + **water**

21 $\boxed{3}\,NH_4OH + \boxed{1}\,H_3PO_4 \longrightarrow \boxed{1}\,(NH_4)_3PO_4 + \boxed{3}\,H_2O$

ammonium hydroxide + phosphoric acid → ammonium phosphate + **water**

22 $\boxed{2}\,H_3PO_4 + \boxed{3}\,Mg(OH)_2 \longrightarrow \boxed{1}\,Mg_3(PO_4)_2 + \boxed{6}\,H_2O$

phosphoric acid + magnesium hydroxide → magnesium phosphate + **water**

23 $\boxed{2}\,Al(OH)_3 + \boxed{3}\,H_2SO_4 \longrightarrow \boxed{1}\,Al_2(SO_4)_3 + \boxed{6}\,H_2O$

aluminium hydroxide + sulphuric acid → aluminium sulphate + **water**

Level 4 · Burning fuels

C first, then H, then O last. Need an odd number of O atoms? Double every number. Word equation for all six: fuel + **oxygen** → **carbon dioxide** + **water**

24 $\boxed{1}\,CH_4 + \boxed{2}\,O_2 \longrightarrow \boxed{1}\,CO_2 + \boxed{2}\,H_2O$

25 $\boxed{1}\,C_3H_8 + \boxed{5}\,O_2 \longrightarrow \boxed{3}\,CO_2 + \boxed{4}\,H_2O$

26 $\boxed{2}\,C_2H_6 + \boxed{7}\,O_2 \longrightarrow \boxed{4}\,CO_2 + \boxed{6}\,H_2O$

27 $\boxed{2}\,C_4H_{10} + \boxed{13}\,O_2 \longrightarrow \boxed{8}\,CO_2 + \boxed{10}\,H_2O$

28 $\boxed{2}\,C_6H_6 + \boxed{15}\,O_2 \longrightarrow \boxed{12}\,CO_2 + \boxed{6}\,H_2O$

29 $\boxed{2}\,C_{10}H_{22} + \boxed{31}\,O_2 \longrightarrow \boxed{20}\,CO_2 + \boxed{22}\,H_2O$

Level 5 · Challenge

30 $\boxed{4}\,FeS_2 + \boxed{11}\,O_2 \longrightarrow \boxed{2}\,Fe_2O_3 + \boxed{8}\,SO_2$

iron pyrite + **oxygen** → **iron oxide** + **sulphur dioxide**

31 $\boxed{10}\,Na + \boxed{2}\,NaNO_3 \longrightarrow \boxed{6}\,Na_2O + \boxed{1}\,N_2$

sodium + sodium nitrate → **sodium oxide** + **nitrogen**

32 $\boxed{1}\,Ca_3(PO_4)_2 + \boxed{3}\,SiO_2 + \boxed{5}\,C \longrightarrow \boxed{3}\,CaSiO_3 + \boxed{5}\,CO + \boxed{2}\,P$

calcium phosphate + silicon dioxide + **carbon** → calcium silicate + carbon monoxide + **phosphorus**

Notes for marking

1 mark per correctly balanced equation: 32 in total. Names are not marked; check spelling. Accept carbon sulphide for carbon disulphide and hydrogen chloride for HCl. Phosphorus and sulphur are written as P and S here (really P_4 and S_8).