Answers to worksheet questions

Chapter 1

Worksheet 1.1

Assess by inspection of collages/posters produced.

Worksheet 1.2

1 The air is roughly four-fifths ***nitrogen*** and one-fifth ***oxygen***. When things burn, they ***react*** with the oxygen present in the air. New chemical compounds called ***oxides*** are formed, and energy is given out. The scientific word for burning is ***combustion***.

2 **a** carbon + ***oxygen*** → ***carbon dioxide***

b **i** water

ii hydrogen + ***oxygen*** → ***water***

c A = candle; B = waste gases; C = carbon dioxide and water vapour; D = water; E = carbon dioxide; F = limewater

3 Work done will be demonstrated by the leaflets/posters produced.

Worksheet 1.3

Assess by inspection of notes and contribution to discussion.

Worksheet 1.4

Assess by inspection of notes and contribution to discussion.

Worksheet 1.5

The lithosphere

1 **a** iron(III) oxide

b aluminium oxide

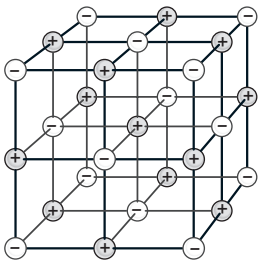
c calcium carbonate

d sodium chloride

2

Mineral	Chemical name	Ions present	Chemical formula
malachite	copper(II) carbonate	Cu^{2+} and CO_3^{2-}	$CuCO_3$
galena	lead(II) sulfide	Pb^{2+} and S^{2-}	PbS
quartz	calcium silicate	Ca^{2+} and SiO_3^{2-}	$CaSiO_3$
bauxite	aluminium oxide	Al^{3+} and O^{2-}	Al_2O_3
cryolite	sodium aluminium fluoride	Na^+ and AlF_6^{3-}	Na_3AlF_6

3



The hydrosphere

1 from Groups I and II

These are the most reactive metals and they form soluble salts.

2 boron and oxygen

The first part of the name tells us that boron is present. The ending '-ate' tells us that oxygen is present.

3 chloride ions (Cl^-) ions are present in excess; 0.54 mol/dm^3 to 0.46 mol/dm^3

The effective concentration of sodium chloride (NaCl) is therefore determined by the level of sodium ions present, so a concentration of 0.46 mol/dm^3.

4 concentration of NaCl is 0.46 mol/dm^3

1 mole of NaCl = 23 + 35.5 = 58.5 g

mass of NaCl in 1 dm^3 = 0.46 × 58.5 = 26.9 g

5 magnesium chloride ($MgCl_2$) as Mg^{2+} ions are the next most concentrated metal ion in seawater

Variations in the saltiness of different seas

1 very hot climates and enclosed geographical situations with few outlets

2 Because of their climate and geography there is limited flow of water from these seas (no flow out of the Dead Sea) and therefore the water evaporates easily and the salts are concentrated in each body of water.

Worksheet 1.6

1 acid rain

2 methane

3 carbon dioxide

4 climate change

5 sulfur dioxide

6 global warming

7 ozone depletion

8 greenhouse gas

9 photochemical smog

Worksheet 1.7

1 **a**

Element	Percentage / %	Boiling point / °C
argon	***0.9***	−186
nitrogen	78	−196
oxygen	***21***	−183

b oxygen (−183 °C)

2 **a** fractional distillation
b argon
c oxygen

3 carbon dioxide and water vapour

4 **a** in electric light bulbs / inert atmosphere in welding
b refrigerant/cryostatics – for biological samples / fast freezing food / making ammonia / packaging of food to prevent it being oxidised (going rancid)

5 Oxygen is used in the conversion of iron to steel. Oxygen is blasted into the molten mixture through an 'oxygen lance' to remove impurities.

Worksheet 1.8

1 **a** because the electrolyte contains potassium hydroxide solution, which is an alkali
b to allow gases to pass through
c because it conducts electricity

2 They produce electricity directly from fuel.

3 $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$

4 They do not run out of charge. They produce only water as a product – which means that they can be used effectively in spacecraft (and submarines).

5 solar cells

Worksheet 1.9

1 **a** CO is carbon monoxide.
b NO_x are oxides of nitrogen.
c Unburnt HCs are unburnt hydrocarbons from petrol (gasoline).

2 **a** C
b carbon monoxide
c oxides of nitrogen
d transition metals

3 **a** It creates a large surface area of catalyst.
b Raising the temperature increases the rate of reaction.

4 **a** Reactants attach to the surface of the catalyst / products detach from the surface when formed / heavy metals attach to the surface and block sites for the reactants to attach / they 'poison' the catalyst.
b Lead is a heavy metal. It poisons the catalyst.

Worksheet 1.10

1 carbonic acid, H_2CO_3

2 hydrogencarbonate ion

3 A weak acid is an acid that is only partly split into ions when dissolved in water.

4 **a** It means that the reaction is reversible.
b It means that the substance is in solution in water.

5 a hydrogen ion, H^+
b hydroxide ion, OH^-
c 100 times