B2 answers

Remember: Check which grade you are working at.

Page 31 Ecology in our school grounds

1 a i Too cold; no food
ii Difficult to reach so difficult to explore *(Any 1)*

b i The range of living things in an ecosystem
ii Using pesticides kills the invertebrates; less food for the vertebrates; so their number also falls *(Any 2 = 1 mark each)*

2 a $\frac{20 \times 10}{5} = 40$

b i Set more traps; over larger area
ii Larger sample size; be more representative of the whole wood not just a small area

Page 32 Grouping organisms

1 a i Birds
ii Beak; feathers

b No backbone

c

	food	shape	movement
animals	eat food	compact	move around

2 a Hybrid

b It is not a species

3 a Organisms that interbreed; produce fertile offspring

b i Bobcat; ocelot
ii First part of Latin name the same

Page 33 The food factory

1 a $6CO_2 + 6H_2O = C_6H_{12}O_6 + 6O_2$

b

product of photosynthesis	use in the plant
cellulose	cell wall
protein	growth/repair
oil	storage

2 a Carbon dioxide; temperature

b i As light intensity increases the rate increases; until point B when it levels off

3 a Respiration

b Need the energy it provides to live

B2 answers

Page 34 Compete or die

1 a The place an organism occupies within its ecosystem

b i Grey squirrels out-compete red
ii Increase in numbers

2 a i Decrease
ii More caterpillars; so more get eaten

b i Organism that feeds off another living organism
ii Mutualism

3 Population starts to rise because plenty of food; population starts to fall; because of increase in predator number; predator number falls so lemming population can rise again

(Any 3 = 1 mark each)

Page 35 Adapt to fit

1 a

adaptation	why it helps the camel survive
no fat on body, except in hump	whole body not insulated
hair-lined nostrils	stop sand getting into nose
higher body temperatures do not harm camel	higher body temperature reduces need to sweat

b i Layer of fat; for insulation; small ears; reduce heat loss; fur on soles; insulate feet
(Any 3 = 1 mark each)

ii Adapted to different habitats; cannot compete with brown bear in warmer habitat

2 a Reduces surface area; so reduced water loss

b Colourful petals; nectar; sticky pollen

(Any 1 = for 1 mark each)

c Pollen is smaller; feathery stigma; no nectar; no colour to flowers

(Any 1 = for 1 mark each)

Page 36 Survival of the fittest

1 a (B) C D A *(C before D = 1; D before A = 1; A at end = 1 mark)*

b Some body parts decay and do not survive; some fossils have not been discovered yet; fossilisation is rare

c For: complex organisms appear then disappear/there are gaps in fossil record;
against: there are examples of gradual change seen in the fossil record e.g. horse

2 a Organisms better adapted are more likely to survive

b More resistant bacteria survive; pass on resistance

B2 answers

Page 37 Population out of control?

1 a Global warming/greenhouse effect; climate change; melting ice caps; rise in sea level

(Any 2 = 1 mark each)

b **i** CFC
ii More ultra violet rays get through

2 a Exponential growth

b Developed countries use more fuel per person; developed countries have more cars; developed countries have more factories; developed countries have more fossil-fuelled power stations

(Any 2 = 1 mark each)

3 a Indicator species

b Mussels, damselfly lava and bloodworms survive in polluted water; if it was clean you would find alderfly and stonefly

Page 38 Sustainability

1 a Loss of habitat; hunted; other animals out-competed it; disease; habitat polluted

(Any 2 = 1 mark each)

2 a Captive breeding programs/prevent hunting to extinction

b Tourism; improved transport; improved water supply/other resources

(Any 2 = 1 mark each)

3 a For: provide food/jobs; against: whales could become extinct

b Area too large to police

4 a Leaves enough fish behind to breed; maintain population

b Alternative to fossil fuels; can easily be replaced; because they grow fast

(Any 2 = 1 mark each)

C2 answers

Remember: Check which grade you are working at.

Page 40 Paints and pigments

1 a Made of tiny droplets of one liquid in water which is called an emulsion; when emulsion paint has been painted onto a surface as a thin layer; the water evaporates leaving the binding medium and pigment behind; as it dries it joins together to make a continuous film

b Oil paint and emulsion paints are colloids because they are a mixture of solid particles in a liquid; the particles/droplets are very small and stay scattered in the liquid; they do not settle out in the bottom; particles in paint are small enough to stay dispersed through the liquid while it is in use

c The solvent evaporates the oil slowly; reacts with oxygen in the air; the oil binding medium is oxidised by the air to form a tough, flexible film over the wood

2 a Used to paint cups; used to paint kettles; act as a warning *(Any 2)*

b The thermochromic paints are mixed with different colours of normal acrylic paints in the same way that any coloured paints are mixed

c The mixture contains a blue thermochromic pigment and yellow acrylic paint; when the mixture gets hot the thermochromic pigment goes colourless; the green loses the blue colour so only the yellow of the acrylic paint is seen

d Phosphorescence

e Light

3 a In luminous clock dials

b Radioactive paints because the phosphorescent pigments are much safer

Page 41 Construction materials

1 a Limestone; marble; granite

b

building material	**brick**	**cement**	**glass**	**iron**	**aluminium**
raw material	clay	limestone and clay	sand	iron ore	aluminium

c Sedimentary

d Granite is an igneous rock made from molten rock which solidifies slowly forming interlocking crystals; marble is a metamorphic rock made by putting chalk/limestone under heat and pressure

e Limestone is made from the shells of dead sea-creatures that were compressed together

2 a Calcium carbonate $\longrightarrow$ calcium oxide + carbon dioxide *(Each compound = 1 mark)*

b Limestone is heated; clay is added

c $CaCO_3 \longrightarrow CaO + CO$

d If a heavy load is put on a concrete beam it will bend very slightly; when a beam bends its underside starts to stretch; which puts it under tension and cracks start to form; steel is strong under tension; steel rods reinforce concrete to stop it stretching

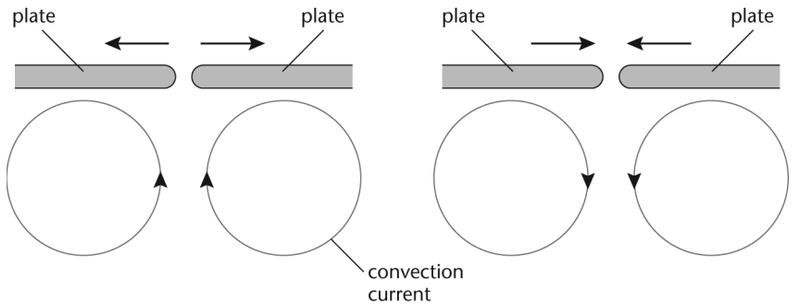
C2 answers

Page 42 Does the Earth move?

1 a Less dense

b Continental plates; oceanic plates

c In plate tectonics, energy from the hot core is transferred to the surface by slow convection currents in the mantle; if two adjacent convection currents move clockwise/anticlockwise the plates will be pulled together; if anticlockwise/clockwise the plates will move apart; or they can scrape sideways past each other



d Two convection currents moving up and away from each other cause the plates to move apart; two convection currents moving down and towards each other cause the plates to collide; they can scrape sideways past each other.

e The coastlines of Africa and South America 'fit' suggesting that they have split and the continents have drifted apart; the sea floor shows ridges in the middle of the ocean suggesting plate movement

2 a Because it is less dense than the crust

b

small crystals
cools rapidly
basalt

large crystals
cools slowly
granite

c i Silica-rich magma

ii It shoots out as clouds of searingly hot ash and pumice; the falling ash often includes large lumps of rock called volcanic bombs; geologists investigate past eruptions by looking at the ash layers; in each eruption coarse ash falls first, followed by fine ash, producing graded bedding

C2 answers

Page 43 Metals and alloys

1 a It must first be analysed to find out how much of each element is present

b It has to be electrolysed again before it can be used

2 a Impure copper

b It is 'plated' with new copper

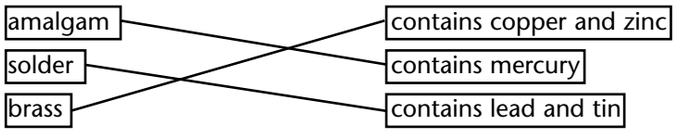
c It dissolves

d The cathode is plated in pure copper and gets thicker

e Blister copper/boulder copper

f They sink to the bottom of the cell

3 a



b Pure copper conducts electricity so well

c They can be bent more than steel so they are much harder to damage; they change shape at different temperatures, this is 'shape memory'

d In the frames of glasses to stop them breaking; in shower heads to reduce the water supply if the temperature gets so hot it scalds; a small piece of metal can be put into a person's blocked artery and then warmed slightly, as it warms up it changes shape into a much larger tube that holds the artery open and reduces the risk of a heart attack

(Any 2)

e Nickel and titanium

C2 answers

Page 44 Cars for scrap

1 a Salt accelerates rusting which means that car bodies rust quicker

b It has a protective layer of aluminium oxide which does not flake off the surface

c It flakes off

d iron + water + oxygen ⟶ hydrated iron(III) oxide

2 a Iron; carbon

b Stronger, harder; does not rust as easily as pure iron *(Any 2)*

c Advantages: the mass of a car body made of aluminium will be less than the same car body made from steel; the car body made of aluminium will corrode less; disadvantage: the car body of the same car will be more expensive if made from aluminium

d

material and its use	reasons material is used
aluminium in car bodies and wheel hubs	less dense so greater fuel economy, corrodes less
copper in electrical wires	good electrical conductivity
plastic in dashboards, dials, bumpers	easily cleaned, lightweight, not easily damaged
pvc in metal wire coverings	flexible, easy to colour
plastic/glass composite in windscreens	transparent, less easy to break
fibre in seats	soft, comfortable, flexible

3 a More recycling of metals means that less metal ore needs to be mined; recycling of iron and aluminium saves money and energy compared to making iron from their ores; less crude oil is used to make plastics; less non-biodegradable waste from plastics is dumped; recycling batteries reduces the dumping of toxic materials into the environment

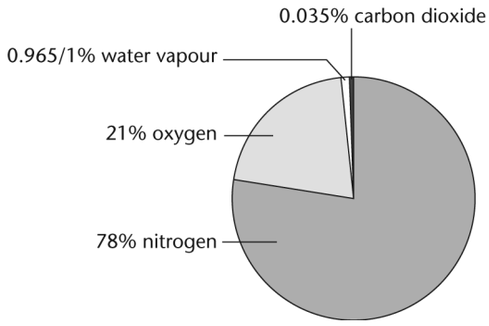
(Any 3)

C2 answers

Page 45 Clean air

1 a i *(See diagram)*

ii *(See diagram)*



iii Combustion and respiration increase the level of carbon dioxide and decrease the level of oxygen; photosynthesis decreases the level of carbon dioxide and increases the level of oxygen

2 a

increased energy usage	more fossil fuels are being burnt in power stations
increased population	the world's energy requirements increase
deforestation	as more rainforests are cut down less photosynthesis takes place

b i The original atmosphere contained ammonia and later carbon dioxide

ii A chemical reaction between ammonia and rocks produced nitrogen and water; the percentage of nitrogen slowly increased; nitrogen is very unreactive so very little nitrogen was removed

iii Much later organisms that could photosynthesise evolved; these organisms converted carbon dioxide and water into oxygen; as the percentage of oxygen in the atmosphere increased, the percentage of carbon dioxide decreased, until today's levels were reached

3 a

pollutant	**carbon monoxide**	**oxides of nitrogen**	**sulphur dioxide**
origin of pollutant	incomplete combustion of petrol/diesel in car engine	formed in the internal combustion engine	formed when sulphur impurities in fossil fuels burn

b A rhodium catalyst

c i The two gases formed are natural components of air/no longer pollutants

ii Carbon monoxide + nitric oxide ⟶ nitrogen dioxide + carbon dioxide

(Reactants = 1 mark, product = 1 mark)

iii $2CO + 2NO \longrightarrow N_2 + 2CO_2$

(Reactants = 1 mark, products = 1 mark, balance = 1 mark)

C2 answers

Page 46 Faster or slower (1)

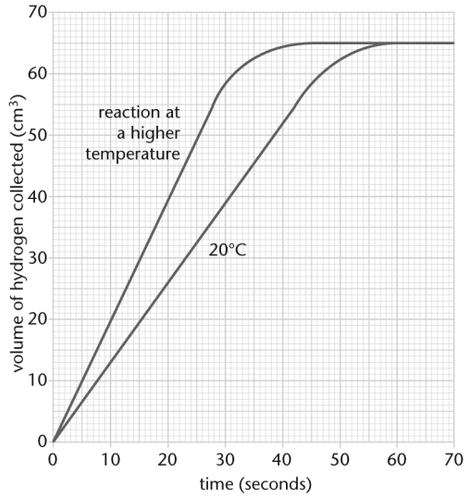
1 a **i** *(See graph)*

ii The higher temperature

iii As the temperature increases the particles move faster; the reacting particles have more kinetic energy and so the number of collisions increases and the number of successful collisions increases

b The frequency of successful collisions

c It increases by the number of successful collisions between reactant particles that happen each second



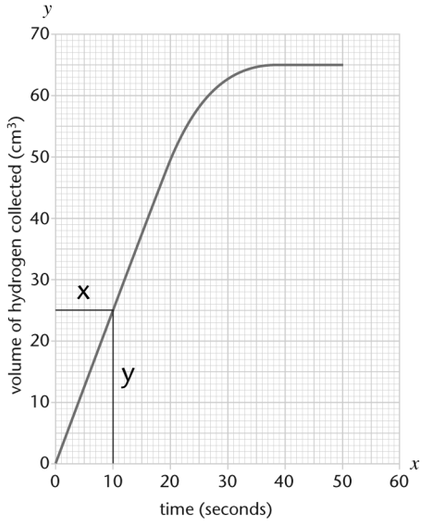
2 a **i** The higher concentration of acid results in a quicker reaction rate

ii The same amount of hydrogen collected in both cases

b **i** X = 10 secs; y = 25 cm^3

Gradient = $\frac{y}{x}$ = 2.5 cm^3/sec

ii Reading within the graph between closer points



Page 47 Faster or slower (2)

1 a Carbon dioxide and water vapour; a large volume of gaseous products are released, moving outwards from the reaction at great speed, causing the explosive effect

2 a A gas is given off: carbon dioxide

b **i** 27–29 seconds

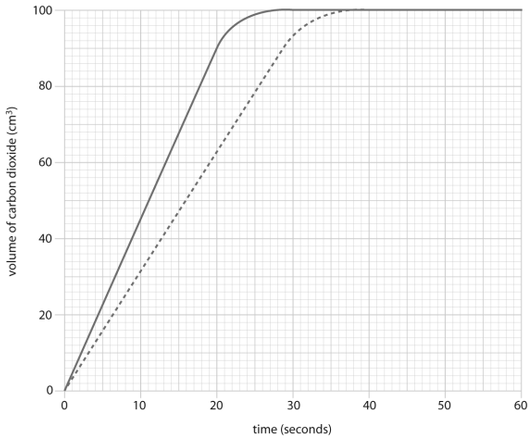
ii *(See graph)*

iii As the reactants are used up there are less frequent collisions

c There are more frequent collisions as there are more exposed particles

3 a It makes the reaction go faster

b It often provides a specific surface on which the appropriate chemicals can react



P2 answers

Remember: Check which grade you are working at.

Page 49 Collecting energy from the Sun

1 a Robust/not much maintenance; no fuel/no power cables; no pollution/no contribution to global warming; renewable energy source

b N-type has excess free electrons; p-type has absence of free electrons; impurity added

2 a Walls and floors radiate energy back into room

b i
ii

X-rays	ultraviolet	visible light	infrared **S**	radio **P**

3 a Moving air

b Advantages: no atmospheric pollution; do not contribute to global warming; disadvantage: noisy; environmental impact; do not work if no wind; do not work if too windy

(Any 2)

Page 50 Generating electricity

1 a Stronger magnet; more turns on coil; turn coil faster *(Any 2)*

b Magnetic field turns inside coil of wire

2 a Turbine turns generator

b Current in wire warms wire; loses energy to surroundings; higher voltage means less current; less energy loss

(Any 3)

c Boilers; generators; cooling towers

Page 51 Fuels for power

1 a i Substance that burns
ii Releases energy as heat atoms of uranium split

b i Global warming
ii Renewable energy source

2 a Power = voltage x current
= 12 x 2
= 24 W

b Cost = power x time x cost per kWh
= 2.5 x 0.5 x 12
= 15p

c Not much is needed but it still has to be produced

3 a Nuclear; DNA; mutate; cancer

b Advantages: fossil fuels not being used up; no atmospheric pollution; no CO_2 leading to global warming; disadvantages: high maintenance costs; radioactive nuclear waste produced; risk of accident

(Any 4)

P2 answers

Page 52 Nuclear radiations

1 a Radon gas; rocks and soil; cosmic rays; food and drink *(Any 2)*

b False; true; true; false

c Negative ions: atom gains electrons; positive ions: atom loses electrons

2 a Tracer

b Penetrating

3 a Remains radioactive/harmful for that long

b Not suitable for making bombs; can be used to contaminate water supplies; can be used to contaminate areas of land

Page 53 Our magnetic field

1 a Magnetic field is similar to a bar magnet

b Solid inner core; moves within liquid outer core; comparison with dynamo effect

2 a The presence of the Moon

b Another planet in same orbit as old Earth; planets collided; iron core formed centre of new Earth; less dense rocks started to orbit; clumped together to form Moon

(Any 3)

3 Spiral around magnetic field lines; cause auroras/lights in sky

4 Charged particles; radio signals

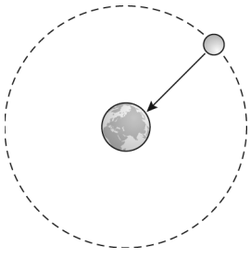
Page 54 Exploring our Solar System

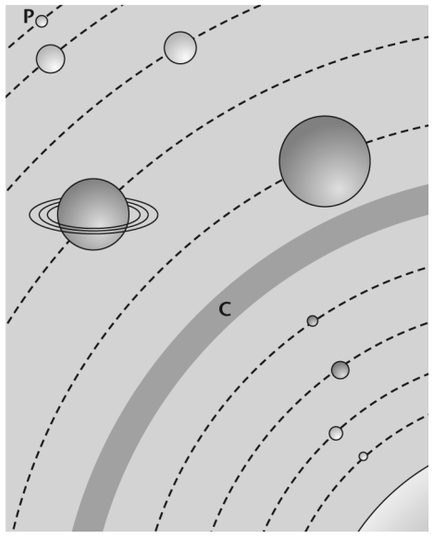
1 a i *(See diagram)*

ii *(See diagram)*

b i Centripetal

ii





2 a Always gravitational forces acting however small

b Avoid being blinded by Sun

c Mars; nearest planet/atmosphere most similar to Earth

3 Distance travelled by light in one year

P2 answers

Page 55 Threats to Earth

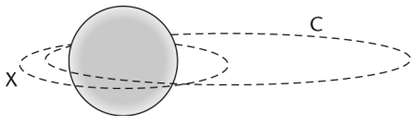
1 a Mars; Jupiter

b Rocks left over when the Solar System formed

c Asteroids have low mass compared to Jupiter; gravitational force from Jupiter prevents asteroids joining together

2 a *(C on elliptical orbit)*

b *(X on elliptical orbit at far left)*



c Solar winds blow dust

3 a Increased accuracy of predicting if a collision may occur

b Send a rocket packed with explosives; explode rocket close to asteroid

Page 56 The Big Bang

1 a Those furthest away

b Wavelength of light increases when light source moving away from observer; spectral lines on star's spectrum; move to red end of spectrum

c Faster moving galaxies show more red shift

2 a Cloud pulled together by gravity; starts to get hot and glow; hot enough to produce nuclear fusion; joining of hydrogen atoms to form helium and release energy

b i Red giant; core contracts; outer changes colour from yellow to red and expands; planetary nebula thrown out; core becomes white dwarf; cools to become black dwarf

(Any 4)

ii Red supergiant; core contracts; outer expands; core becomes neutron star; explosion/supernova; neutron star becomes black hole; supernova remnants become new stars

(Any 4)