B1 answers

Remember: Check which grade you are working at.

Page 4 Fit for life

1 a i Lactic acid

ii Body needs more energy; not enough oxygen in muscles; anaerobic respiration takes place

b Takes in extra oxygen to break down the lactic acid; repay oxygen debt

2 Bacteria/viruses can still enter body

3 a Take more exercise; eat a balanced diet; lose weight; drink less alcohol; relax more

(Any 2 = 1 mark each)

b Small blood vessels may burst in brain; causing a stroke; blood vessels in kidney may burst

(Any 2 = 1 mark each)

Page 5 What's for lunch?

1 a Kwashiorkor

b RDA = 40 x 0.75
= 30 g

2 a More exercise

b Meat is a good source of essential amino acids or vitamin B1; he will need to eat alternatives

3 a

food type	enzyme	product
protein	protease	amino acids
fat	lipase	fatty acids and glycerol

(1 mark for each correct box)

b Bile emulsifies the fat; breaking it up into smaller droplets; lipase enzyme then breaks up the fat molecules; into fatty acids and glycerol

(Any 3)

Page 6 Keeping healthy

1 a i Vector

ii Feeds off living host

b Drain stagnate water; to kill larva or put oil on water; to prevent lava from breeding or spay insecticide; to kill adult take larium; to kill protozoan

(Any 1)

2 a Active: given pathogen; body makes antibodies; long lasting; given antibodies; passive: body does not learn how to make antibodies; short lived

b Harmless pathogen contains antigen; body learns how to make correct antibody

c i Do not kill virus; only treat bacterial or fungal infections

ii Bacteria are becoming resistant

iii Some patients take the new drug; others take the placebo; without knowing

B1 answers

Page 7 Keeping in touch

1 a

part of the eye	job
retina	contains light receptors
optic nerve	carries impulses to brain
cornea	refracts light

b Allows it to judge distance

c Ciliary muscle relaxes; suspensory muscle pulls; lens thin

d Concave lens; glasses; contact lenses; cornea surgery *(Any 1)*

2 a 3: sensory neurone; 4: relay neurone; 5: motor neurone

b Impulse triggers release transmitter substance; transmitter substance (acetylrcholine) diffuses across synapse; binds with receptors; triggers impulse in second neurone

(Any 2 = 1 mark)

Page 8 Drugs and you

1 a

type of drug	example
hallucinogen	cannabis
depressant	alcohol

(2 correct = 2; 1 correct = 1 mark)

b For: used as a pain killer; may prevent drug crimes; against: may lead to use of more dangerous drugs

2 a Stops cilia moving; dust collects; leads to smokers' cough

b Stimulates the receptors; allows more impulses to pass

3 a Matthew; because he drinks 5 units and Jo drinks only 4 units

b More people drink at weekend; excessive drinking leads to more accidents

B1 answers

Page 9 Staying in balance

1 a Get too hot; start to sweat; lose too much water

b Hypothermia

c Blood capillaries in skin dilate; increasing blood flow

d Body gets too hot mechanisms (e.g. sweating) cool body; body cools switching off mechanisms (stop sweating)

2 a Diabetes

b Diet/insulin injections

3 a Increases thickness

b Maintains levels

c Given sex hormones

Page 10 Gene control

1 a Nucleus; genes; DNA

2 a 10

b 20

c Have 23 chromosomes not 10

d Gene is switched off in nucleus of ear cells

3 a 4

b 30; because A always links to a T

c Base sequence would be different; different amino acid coded for; amino acids will form different protein (enzyme); incorrect enzyme so pigment cannot be made

(Any 3 = 1 mark each)

B1 answers

Page 11 Who am I?

1 a

egg	sperm	fertilised egg	gender of child
X	X	XX	girl
X	Y	XY	boy

(1 mark each)

b Only males have Y chromosome; only sperm can carry X or Y; eggs can only carry X chromosome

(Any 2 = 1 mark each)

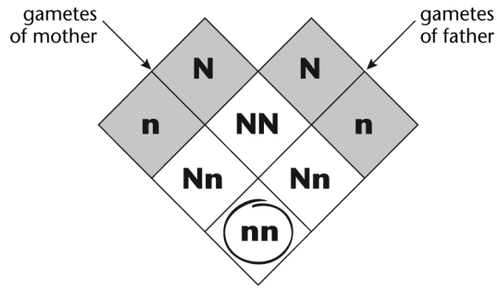
2 a Radiation; chemicals (e.g. tobacco smoke) *(Any 1)*

b Base sequence would be different; different amino acid coded for; amino acids will form different protein; incorrect protein so blood cannot clot

(Any 2 = 1 mark each)

3 a Purple because F1 are all purple

b i



ii *(Ring round nn)*

C1 answers

Remember: Check which grade you are working at.

Page 13 Cooking

1 a The texture of food is improved; the taste of food is improved; the flavour of food is enhanced; food is easier to digest§ *(Any 3 = 1 mark each)*

2 a Potatoes; flour

b Meat; eggs

c The protein molecules change shape; the shape change is irreversible; the protein molecule is said to be denatured; this changes the appearance/texture of the protein

3 a **i** Sodium hydrogencarbonate $\xrightarrow{\text{(heat)}}$ sodium carbonate + carbon dioxide + water

ii Sodium hydrogencarbonate

iii Sodium carbonate; carbon dioxide; water

b $2NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$

4 Colourless; milky (cloudy)

Page 14 Food additives

1 a Stop food from reacting with oxygen and turning bad

b Tinned fruit; wine

c 56 J

2 a To stop food spoiling

b Packaging that changes the condition of the food to extend its shelf life

c It prevents the need for additives such as antioxidants to be added to foods

d A catalyst

e An indicator shows how fresh a food is on the outside of a package; a central circle darkens as the product loses its freshness

3 a The tail is a 'fat-loving' part and the head is a 'water-loving' part; the fat-loving part of the molecule goes into the oil and attracts it towards this end; the water-loving part will not go in; the water-loving part stays out of the oil but is attracted to the water molecules; the oil is, therefore, 'hooked up' to the water

b The mayonnaise does not separate as the egg yolk has a molecule that has two parts; one part is a water-loving part that attracts vinegar to it, called the hydrophilic head; the other part is a water-hating part that attracts oil to it, called the hydrophobic tail; the hydrophobic tail is attracted into the lump of oil but the head is not; the hydrophilic head is attracted to water and 'pulls' the oil on the tail into the water

C1 answers

Page 15 Smells

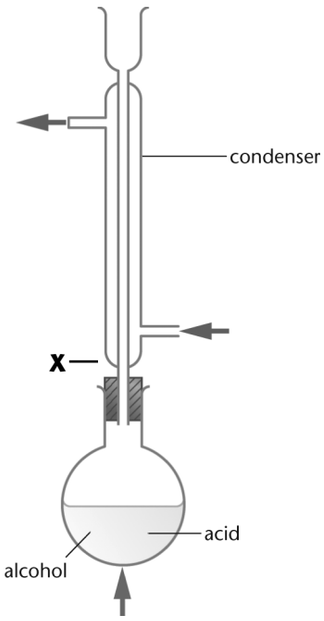
1 a i Acid + alcohol ⟶ ester + water

ii *(Label to mixture in flask)*

iii *(Label to upward condenser tube)*

iv At **X** the vapour is cooling down again and condensing back to a liquid

v So that the mixture can be boiled/react for longer (without drying out)



2

evaporate easily	it can be put directly on the skin
non-toxic	its particles can reach the nose
insoluble in water	it does not poison people
does not irritate the skin	it cannot be washed off easily

3 a Solution

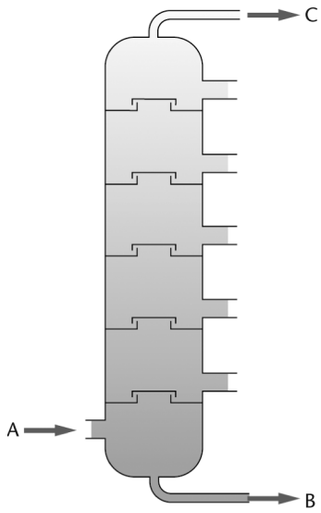
b Solvents

4 a Particles of a liquid are weakly attracted to each other; when some particles of a liquid increase their kinetic energy the force of attraction between the particles is overcome and the particles escape through the surface of the liquid into the surroundings; this is evaporation; if this happens easily the liquid is said to be volatile

b This is because the force of attraction between two water molecules is stronger than that between a water molecule and a molecule of nail varnish; also the force of attraction between two varnish molecules is stronger than between varnish molecule and water molecule

C1 answers

Page 16 Making crude oil useful



1 a A molecule containing carbon and hydrogen only

b **i** *(A: at the bottom, left-hand side, of the tower = 1 mark)*
ii *(B: it 'exits' through the bottom of the tower = 1 mark)*
iii *(C: at the top of the tower = 1 mark)*
iv Fractions with lower boiling points such as petrol/LPG

c The forces between molecules are called intermolecular forces; these forces are broken during boiling/the molecules of a liquid separate from each other as molecules of gas; then either:
the molecules in different fractions have different length chains; this means that the forces between the molecules are different; heavy molecules such as those that make up bitumen and heavy oil have very long chains; so they have strong forces of attraction between the molecules; this means that they are difficult to separate; a lot of energy is needed to pull each molecule away from another; they have high boiling points
or: lighter molecules such as petrol have short chains; each molecule does not have very strong attractive forces and is easily separated; this means that less energy is needed to pull the molecules apart; they have very low boiling points

(Any 5 from either option)

2 a Oil slicks can harm animals, pollute beaches and destroy unique habitats for long periods of time; clean-up operations are extremely expensive and the detergents and barrages used cause problems

3 a C_7H_{16}

b Alkenes have a double bond; alkanes have single bonds

c Polymers

d Cracking the fraction of heavy oil which is in excess supply to produce the smaller molecules needed for petrol which is in high demand but short supply

C1 answers

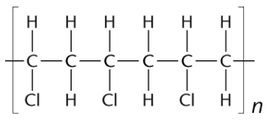
Page 17 Making polymers

1 a C

b High pressure; catalyst

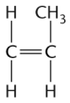
c A double bond

d



(4 or 6 carbon atoms = 1 mark;
alternate H and Cl atoms on bottom = 1 mark;
brackets and bonds through either end = 1 mark;
n at end = 1 mark)

e



(Two carbon atoms joined by a double bond = 1 mark;
CH_3 on top right hand side = 1 mark;
only 4 other atoms/groups joined to two carbon atoms = 1 mark)

f The reaction needs high pressure and catalyst; this causes the double bond in the monomer to break and each of the two carbon atoms forms a new bond; the reaction continues until it is stopped, making a long chain

2 a **i** It has an oxygen atom in its structure
ii It contains a double bond
iii A polymer made from the monomer butene

b **i** This is because the bromine solution has reacted with the alkene and has formed a new compound
ii Remains orange

Page 18 Designer polymers

1 a White dental filling is better than a mercury amalgam; waterproof plastics are better than fabric plasters

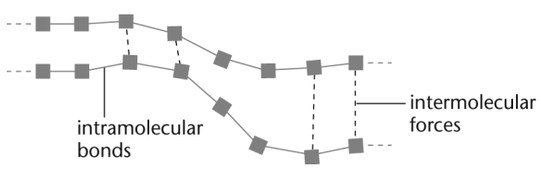
b **i** Hydrophobic means water-hating; the material repels water
ii Water vapour from sweat can pass through the membrane but rainwater cannot so it keeps people dry when sweating; the membrane has pores which are 700 times larger than a water vapour molecule and therefore moisture from sweat passes through

2 a So that they do not have to be disposed of in landfill sites or burned but can decay by bacterial action

b To make laundry bags for hospital so that they degrade when washed leaving the laundry in the machine *(Or any other suitable use)*

c Landfill sites; waste valuable land; burning waste plastic: toxic gases; recycling: difficulty in sorting different polymers

3 a **i** *(See diagram)*
ii *(See diagram)*



b Some plastics have weak intermolecular forces of attraction between the polymer molecules so the polymer molecules can slide over one another/separate easily; some other plastics form intermolecular chemical bonds or cross-linking bridges between polymer molecules; these are strong so the polymer molecules cannot slide over one another; they are rigid/the chains cannot easily separate

C1 answers

Page 19 Using carbon fuels

1 a i Coal

ii High energy value; good availability

b Petrol and diesel are liquids so they can circulate easily in the engine; they are also stored easily in petrol stations along road networks; as these fuels are so easy to use and the population is increasing; more fossil fuels are being consumed, resulting in more carbon dioxide; this is a greenhouse gas; contributes to global warming which is a global problem

(Any 4)

2 a Hydrocarbon fuel + oxygen $\longrightarrow$ carbon dioxide + water

b i Carbon dioxide

ii Water (steam) is tested by turning white copper sulphate to blue

c Less soot is made; more heat is released; toxic carbon monoxide gas is not produced

d People who live in the house are in danger of being made ill or even dying from carbon monoxide poisoning if the room is not well ventilated/heater faulty

e $C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

(Correct product formulae = 1 mark, correct balancing = 1 mark)

Page 20 Energy

1 a Exothermic; endothermic; exothermic; exothermic

b Endothermic

c Bonds are broken which is an endothermic reaction; new bonds are made which is an exothermic reaction; as less energy is needed to break bonds than make new bonds then a reaction is exothermic overall

2 a Blue; complete; yellow; incomplete

3 a Measure the same mass of water in two beakers; put the burners under the beakers for the same time with the same rate of gas; measure the gas volume with a meter; measure the temperature of the water before and after the experiment/temperature increase; same mass water; same volume gas

b i Same distance of the calorimeter from the flame; repeating the experiment 3 times and excluding draughts

ii The energy transferred is calculated using the formula:

energy transferred = mass of water x 4.2 x temperature change

energy = 100 x 4.2 x 50

= 420 x 50

= 21000 J

$$\text{energy per gram} = \frac{\text{energy supplied}}{\text{mass of fuel burnt}}$$

$$= \frac{21000}{4.00}$$

= 5250 J/g

P1 answers

Remember: Check which grade you are working at.

Page 22 Heating houses

1 a Energy flows from warm to cooler body; temperature of warmer body falls

2 Thermogram uses colours to represent different temperatures; car engine/tyres/exhaust will be hot; thermogram will show colours representing high temperature against cold field

3 a Specific heat capacity

b Energy needed = mass x specific heat capacity x temperature change

= 0.5 x 3900 x 70

= 136 500 J

4 a Specific latent heat

b Energy needed to break bonds; holding molecules together

Page 23 Keeping homes warm

1 a 120 ÷ 40 = 3 years

b Shorter payback time

c Only 32% of energy input is useful; as energy output

d 0.32 x 6.5 = £2.08

e Energy is lost up the chimney

f **i** Solids
ii Liquids and gases
iii Radiation does not need a material

Page 24 How insulation works

1 a Particles in solid close together; gap between glass filled with gas or vacuum; particles in gas far apart/no particles in vacuum; more difficult to transfer energy than in solid

(Any 3)

b **i** Air in foam is good insulator; reduces energy transfer by conduction; air is trapped; unable to move; reduces energy transfer by convection

(Any 4)

ii Energy from room reflected back into room in winter; energy from Sun reflected back outside in summer

2 a Particles are in constant motion; particles vibrate and transfer kinetic energy – conduction; particles in solid close together so transfer energy easily; air is a gas so particles are far apart more difficult to transfer energy

(Any 3)

b Air expands when heated; density = $\frac{\text{mass}}{\text{volume}}$; increased volume means less dense

P1 answers

Page 25 Cooking with waves

1 a Microwave radiation is more penetrating than infrared; microwave ovens cook by conduction and convection *(Any 1)*

b Microwaves need line of sight; no obstructions in space

c Amplified; retransmitted back to Earth

2 a Gamma rays

b Wavelength of radiation from iron longer than wavelength of radiation from element

3 Radio waves diffracted around hill; short wavelength/microwaves do not show much diffraction

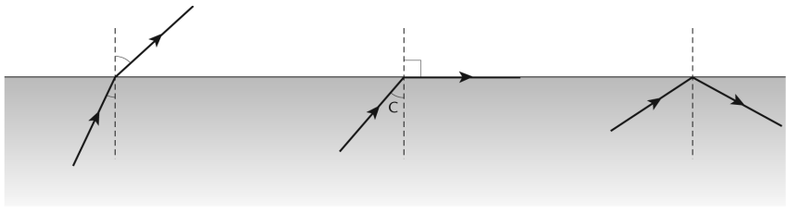
Page 26 Infrared signals

1 a Digital

b

c Digital signals have only two states; interference not noticed; can multiplex digital signals

2 a i



ii *(See diagram)*

b i No need for surgery; can see in real time

ii Light down one set of optical fibres; reflected from internal organs; up a second set of fibres; viewed by eyepiece/camera *(Any 3)*

Page 27 Wireless signals

1 Less refraction at higher frequencies

2 Radio waves diffracted around mountain; shorter wavelengths do not show much diffraction; FM is shorter wavelength than LW

3 a Same as rotation time of Earth so appears to stay in same place

b 0.24 s

4 a The radio station is broadcasting on the same frequency; the radio waves travel further because of weather conditions

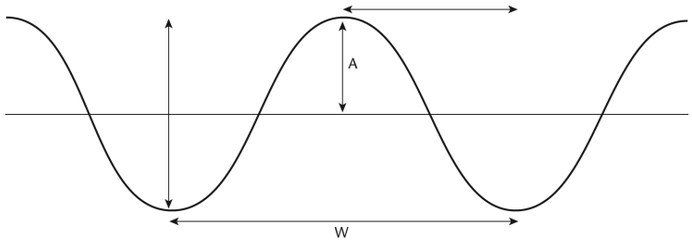
b Aimed at a very small object

P1 answers

Page 28 Light

1 a *(See diagram)*

b *(See diagram)*

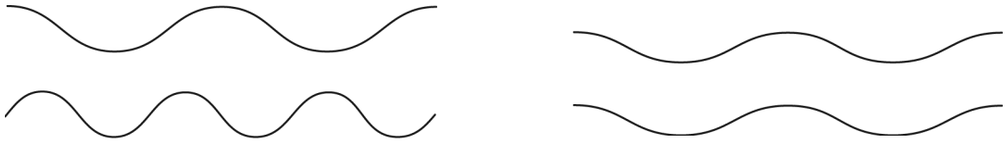


c Number of complete waves passing a point each second

2 a Need to represent letters as electric signal

b Advantage: signal received almost instantaneously; disadvantage: need line of sight; others can see signal *(Any 1)*

c White light: many colours; out of phase; laser light: one colour; in phase



Page 29 Stable Earth

1 a

description	P wave	S wave
pressure wave	✓	
transverse wave		✓
longitudinal wave	✓	
travels through solid	✓	✓
travels through liquid	✓	

b Waves refracted by core; cause shadow on opposite side of Earth

c S-waves do not pass through liquid; not detected on opposite side of Earth

2 a Reflects radiation back down to Earth

b Destroy ozone; reduce thickness of layer

c Ozone filters out ultraviolet radiation

d **i** Ultraviolet radiation; cells in skin produce melanin
ii Can stay in sun 30 times longer; without burning