

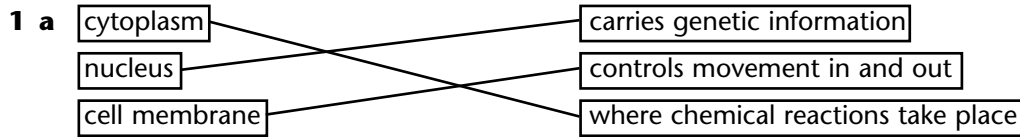
B3 LIVING AND GROWING

B3 answers

Remember:

Check which grade you are working at.

Page 58 Molecules of life



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

b Mitochondria

2 a Nucleus; gene; protein

b James; pattern is identical

3 a Biological catalyst; that speeds up reactions in body

b As temperature increases the rate increases; until 40 °C when it falls

c 40–42 °C

(Any temperature in this range)

Page 59 Diffusion

1 a i Carbon dioxide

ii Move out of small intestine into blood then into body cells (Any 2)

b Movement of a substance from a region of high concentration to low concentration

c Carbon dioxide; waste

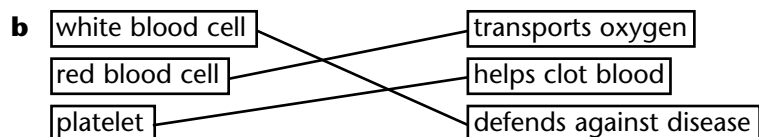
d Alveoli

2 a Evaporation

b Higher concentration outside diffuses through stomata lower concentration inside maintained by photosynthesis

Page 60 Keep it moving

1 a (See picture)



c i Disc-shaped: large surface area takes up oxygen quicker; no nucleus: more space to carry more oxygen

ii Haemoglobin

2 a Pump blood around the body

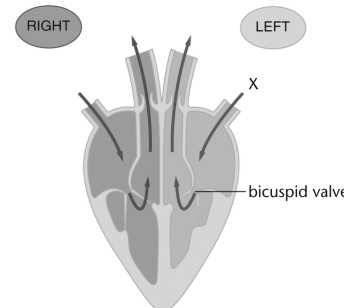
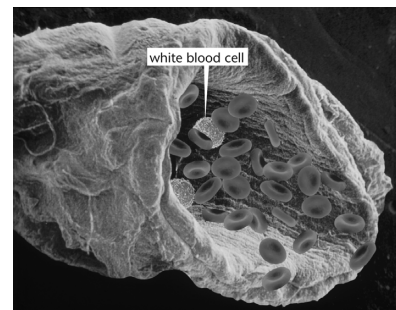
b i (Left side top chamber, atrium = 1 mark)

ii (Left side between ventricle and atrium = 1 mark)

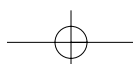
c Needs to pump blood further; at higher pressure

d Rejection; waiting for donor; need for anti-rejection drugs

3 Arteries transport blood away from heart; capillaries allow the exchange of materials with tissue; veins transport blood back to heart



(Any 2 = 1 mark each)



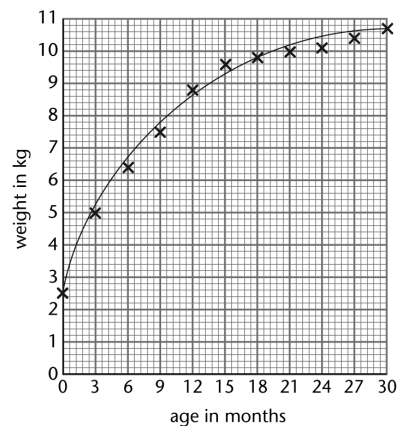
B3 answers

Page 61 Divide and rule

- 1 a** Grow; replace worn out cells; repair damaged tissue (Any 2 = 1 mark each)
- b** Mitosis
- c** Limits size organism can grow to; no cell differentiation; unable to form complex tissue
e.g. nerves (Any 2 = 1 mark each)
- 2 a i** So it can swim
- ii** Larger cytoplasm
- b** Contains enzymes; to break down egg membrane
- c** Meiosis
- d** Only contain one of each pair of chromosomes/contain half the number of chromosomes found in body cells

Page 62 Growing up

- 1 a i** Cell wall; vacuole (Either order = 1 mark each)
- ii** Chloroplast
- b i** Cell differentiation
- ii** Stem cells
- 2 a** B E A D (C) (B before E =1; E before A =1; A before D =1 mark)
- b i** (See diagram)



(9 correct = 3 marks; 5,6 or 7 correct = 2 marks; 3 or 4 correct = 1 mark)

- ii** (See diagram)
- iii** Weight increases; as age increases
- iv** infancy

B3 answers

Page 63 Controlling plant growth

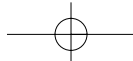
- 1 a** Flowering; growth of shoots; growth of roots *(Any 2 = 1 mark each)*
- b i** Slows down growth
ii Stimulates root growth
iii Speeds up growth too much; so they die
iv Narrow leaves; they do not absorb as much weedkiller
- 2 a i** Up
ii Root grows down
- b i** Geotropism
ii Because it grows in the same direction as gravity

Page 64 New genes for old

- 1 a** A; B
- b** Select characteristics; cross-breed; select the best offspring; breed these offspring over many generations *(Any 3 = 1 mark each)*
- 2** Radiation; chemicals (chemical example such as cigarette tar); occur spontaneously
- 3 a** Find the gene for beta-carotene in carrots; remove gene; put gene into rice
- b** Advantage: produces organisms with new characteristics; disadvantage: may have harmful effects

Page 65 More of the same

- 1 a** Genetically identical copy
- b** Twins
- c** Sperm collected from bull; cows artificially inseminated; embryo collected; embryo cloned; embryo implanted in surrogate cow *(Any 3 = 1 mark each)*
- d i** Pig organs used for transplants instead of humans; reduces need to wait for donors to die
ii Breeding pigs just to kill them; may not want an animal's organ; religious reasons *(Any 1 = 1 mark)*
- 2 a** D B (A) C *(D before B =1; B before C =1 mark)*
- b** Advantage: characteristics all the same/mass produce plants quickly;
 disadvantage: susceptible to new disease/changes in the environment/lack variation
- 3 a** Grow shoots from eyes; on tuber



C3 THE PERIODIC TABLE

C3 answers

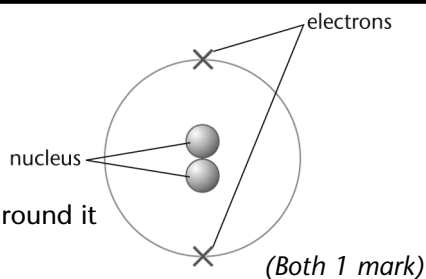
Remember:

Check which grade you are working at.

Page 67 What are atoms like?

1 a i (See diagram)

ii Because it has the same number of positive charges in the nucleus as there are negatively charged electrons around it



(Both 1 mark)

b Protons; neutrons

c

	relative charge	relative mass
electron	-1	0.0005 (zero)
proton	+1	1
neutron	0	1

d The number of protons in an atom

e The total number of protons and neutrons in an atom

2 a Phosphorus

b 20

c A substance that cannot be broken down chemically

d There are just over 100 elements in the periodic table

e A substance that contains at least two elements that are chemically joined together

f Isotopes are elements that have the same atomic number but different mass numbers

Page 68 Ionic bonding

1 a **atom** has more than one atom in its formula and no charge
molecule is a charged atom or group of atoms
ion is the smallest particle that can bond with another particle

b	atom	ion	molecule
	O	Na ⁺	H ₂
	H	Cl ⁻	NaOH
	Mg	SO ₄ ²⁻	MgSO ₄

2 a i An atom has extra electrons in its outer shell and needs to lose them to be stable

b (See diagram)

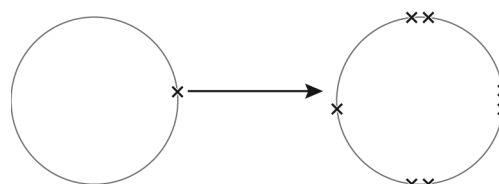
c i Positive

ii Sodium/lithium/potassium

d i Gaining

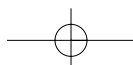
ii Fluorine/chlorine/bromine/iodine

e Positive; negative; lattice



3 a Have a high melting point; dissolve in water; do not conduct electricity when solid

b Sodium chloride solution; molten (melted) magnesium oxide; molten sodium chloride



C3 answers

Page 69 Covalent bonding

- 1 a i** Three
ii Two
- 2 a** Covalent bonding
- b** A molecule of water is made up of three atoms, two hydrogen and one oxygen; oxygen has six electrons in its outer shell; it needs two more electrons to be complete; hydrogen atoms each have one electron in their only shell; the oxygen outer shell is shared with each of the hydrogen electrons; each of the hydrogen atoms has a share of two more electrons making the shell full
- c** Because they are covalently bonded; there are no free electrons
- 3 a i** Group 1
ii Sodium; potassium
- b** Sodium; silicon; sulphur
- c** The group number is the same as the number of electrons in the outer shell; it has 1 electron in the outer shell
- d** 7
- e** 2
- f** It is in the second row down because the first two electrons are in the first shell and the next 7 electrons are in the second shell; fluorine electrons occupy two shells so it is in the second period

Page 70 The group 1 elements

- 1 a** They react with air and water
- b i** Their density is less than the density of water
ii Hydrogen
- c** Sodium + water \longrightarrow sodium hydroxide + hydrogen
- d** Potassium, sodium, lithium
- e**
- | | melting point in °C | boiling point in °C |
|--------------------|---------------------|---------------------|
| ${}_{3}\text{Li}$ | 179 | 1317 |
| ${}_{11}\text{Na}$ | 98 | 892 |
| ${}_{19}\text{K}$ | 64 | 774 |
- f** They each have one electron in their outer shell so they react in a similar way

- 2 a**
- | | |
|--------|-----------|
| red | potassium |
| yellow | lithium |
| lilac | sodium |

- b** They moistened a flame test wire with dilute hydrochloric acid; they dipped the flame test wire into the sample of solid chemical; they held the flame test wire in a blue Bunsen burner flame

C3 answers

Page 71 The group 7 elements

- 1 a i Chlorine is used to sterilise water
ii Iodine is used to sterilise wounds

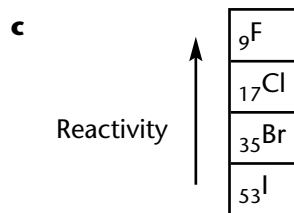
b A preservative; a flavouring; in the manufacture of chlorine

(Any 2)

2 a

chlorine	green gas
iodine	grey solid

b They all have seven electrons in their outer shell



d Potassium + iodine \longrightarrow potassium iodide

- 3 a i Chlorine displaces the bromide ions which become bromine solution which is red-brown; a displacement reaction occurs
ii This is because chlorine is more reactive than bromine; bromine does not displace the chloride ions
- b i Bromine + potassium iodide \longrightarrow potassium bromide + iodine
ii $\text{Br}_2 + 2\text{KI} \longrightarrow 2\text{KBr} + \text{I}_2$

Page 72 Electrolysis

1 Electrolysis; electrolyte; anode; cathode; anode; cathode; negative; positive

2 a The electrolyte is a dilute solution of sulphuric acid; two electrodes are connected to a dc source of electric current, between 6 V and 12 V, and placed into the electrolyte; the electrode connected to the negative terminal is the cathode; the electrode connected to the positive terminal is the anode; when the current is switched on bubbles of gas appear at both electrodes; water splits into two ions: H^+ is the positive ion and OH^- is the negative ion; H^+ is attracted to the negative cathode and discharged as hydrogen gas, H_2 ; OH^- is attracted to the positive anode and discharged as oxygen gas, O_2

b Because the formula of the compound breaking up is H_2O

- 3 a i Lighted splint burns with a 'pop' in hydrogen
ii A glowing splint relights in oxygen

4 a The ore of aluminium oxide is bauxite; aluminium oxide is melted; aluminium is formed at the graphite cathode; oxygen is formed at the graphite anode; the anodes are gradually worn away by oxidation; this forms carbon dioxide; the process requires a high electrical energy input (Any 4)

b Aluminium oxide \longrightarrow aluminium + oxygen

C3 answers

Page 73 Transition elements

- 1 a** Conduct heat; are shiny; conduct electricity; are sonorous (ring when struck); are malleable; are ductile
- b i** Copper compounds are blue
ii Iron(II) compounds are pale green
iii Iron(III) compounds are orange/brown.
- c i** Iron is used in the Haber process to make ammonia
ii Nickel is a transition metal; because it is in the transition metal block
- 2 a** A precipitation reaction
- 3 a** Thermal decomposition
- b** copper carbonate \longrightarrow copper oxide + carbon dioxide

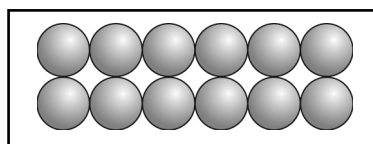
4 a

ion	colour
Cu^{2+}	form a blue gelatinous solid
Fe^{2+}	form a grey/green gelatinous solid
Fe^{3+}	form an orange gelatinous solid

Page 74 Metal structure and properties

- 1 a i** C
ii B
iii C
- b** A
- c** Lustrous; malleable
- d** It has high thermal conductivity and is malleable; it is also resistant to attack by oxygen or acids

2 a



- b** The particles are close together; in a regular arrangement
- 3 a** Very low temperatures
- b** Materials that conduct electricity with little or no resistance
- c** Loss-free power transmission; super-fast electronic circuits; powerful electromagnets

P3 answers

Remember: Check which grade you are working at.

Page 76 Speed

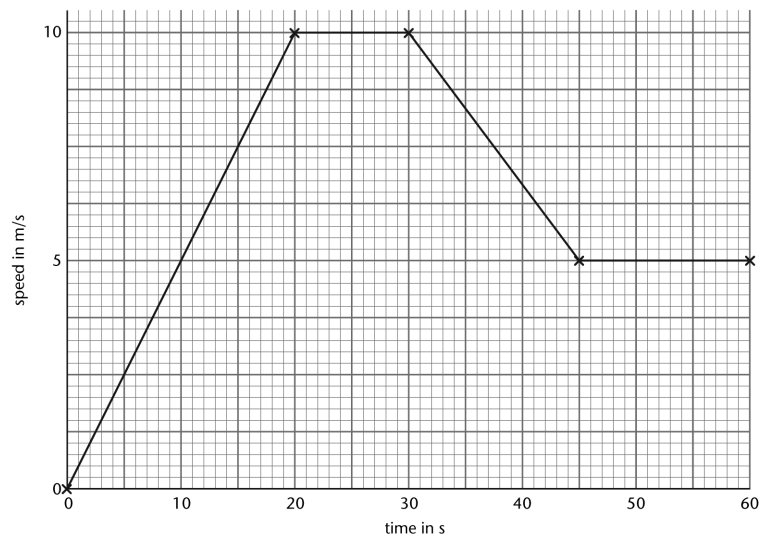
- 1 a i** Eve
ii Eve covered the same distance as Melissa but in a shorter time
- b i** Distance travelled; time taken
ii Distance: meter rule/tape; time: stop clock; light gates with accurate timer; data logger
- c** Distance = 8×1.5
= 12 m
Time = 0.5 s
Speed = distance travelled in 1 s
= 12×2
= 24 m/s
- d i** Average speed = $\frac{\text{distance}}{\text{time}}$
= $\frac{390}{3}$
= 130 km/h
ii Car cannot maintain the same speed throughout
iii Yes; if average speed is 130 km/h the car must have gone faster (and slower) than this at times
- 2 a** A to B; E to F
b 80 s
c 80 m
d D to E

P3 answers

Page 77 Changing speed

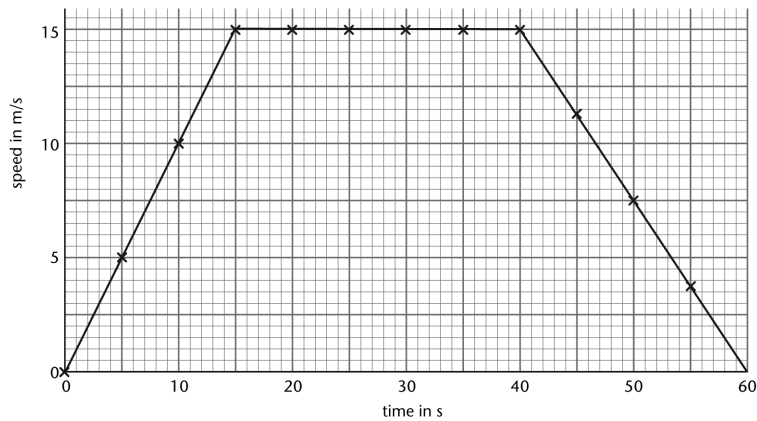
- 1 a** Increases steadily from rest; reaching a speed of 10 m/s after 30 s; then travels at a constant speed of 10 m/s

ii



iii Area under graph

b i



- ii** Yes; 50 km/h = 50 000 m/h

$$= \frac{50\,000}{3600} \text{ m/s}$$

$$= 13.9 \text{ m/s}$$

2 Acceleration = $\frac{\text{change in speed}}{\text{time}}$

$$= \frac{(40 - 10)}{6}$$

$$= 5 \text{ m/s}^2$$

P3 answers

Page 78 Forces and motion

1 Accelerate

- b i** Increase
- ii** Greater acceleration
- c** Smaller acceleration

2 a $a = \frac{(v - u)}{t}$
 $= \frac{(40 - 0)}{20}$
 $= 2 \text{ m/s}^2$

b $F = ma$
 $= 500 \times 2$
 $= 1000 \text{ N}$

c Resistive forces ignored

3 a Distance travelled by car between applying the brakes and the car stopping

b Distance travelled by car between seeing the need to brake and applying the brakes (time for brain to react)

c Stopping distance = thinking distance + braking distance

d Increase; thinking/reaction time unchanged; but she will travel a greater distance in that time at a higher speed

e Tired; under influence of alcohol/other drugs; distracted/lacking concentration

(Any 2)

P3 answers

Page 79 Work and power

1 a More

b Less

c None

d The food that she eats

e $WD = \text{force} \times \text{distance}$
 $= 80 \times 2$
 $= 160 \text{ J}$

2 a Same

b Chris is more powerful than Abi

c $60 \times 10 = 600 \text{ N}$

d $WD = \text{force} \times \text{distance}$
 $= 600 \times 3$
 $= 1800 \text{ J}$

e Chris' power = $\frac{WD}{\text{time taken}}$
 $= \frac{1800}{8}$
 $= 225 \text{ W}$

f Abi's power = $\frac{1800}{12}$
 $= 150 \text{ W}$

3 a A

b C

c Fuel pollutes the environment; car exhaust gases are harmful; carbon dioxide is a major source of greenhouse gases; carbon dioxide contributes to global warming

(Any 3)

P3 answers

Page 80 Energy on the move

- 1 a** Energy of an object that is moving
- b** B; C
- 2 a i** 1.6 litre diesel
- ii** Diesel
- iii** Higher mpg than both petrol cars
- b i** Fewer road junctions; speed changes; gear changes
- ii** $\frac{96}{24} = 4$
- iii** Less
- iv** Land Rover has a bigger engine capacity
- 3 a** Recharging requires electricity from power stations which cause pollution
- b i** Advantage: energy from Sun so causes no pollution; do not have batteries that need recharging; do not use electricity from power stations (Any 1)
- ii** Sun does not always shine; does not have a constant energy source (Any 1)

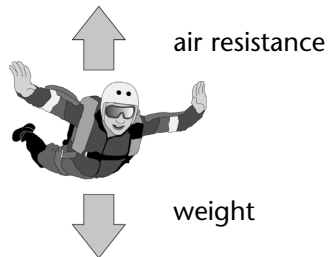
Page 81 Crumple zones

- 1 a i** Crumple zones
- ii** Air bag
- iii** Seat belt
- b**
- | safety feature | how it works |
|----------------|---|
| seatbelt | designed to stretch a little so that some of a person's KE is converted to elastic energy |
| crumple zones | absorb some of the car's KE by changing shape (crumpling) on impact |
| air bag | absorbs some of a person's KE by squashing up around them |
- c i** Directly improve the safety of a car
- ii** Indirectly improve the safety of a car
- d i** ABS brakes; traction control; safety cage (Any 2)
- ii** Electric windows; cruise control; paddle shift controls; adjustable seating (Any 2)
- e i** To be effective they need to be kept in good working order
- ii** Car crash may have damaged some of the safety features
- iii** In case the belt fabric has been overstretched
- f i** Anti-lock braking system
- ii** Driver gets maximum braking force without skidding; can still steer car

P3 answers

Page 82 Falling safely

- 1 a** Gravity pulls them towards the Earth
b Increases
c Golf ball heavier than ping pong ball; so air resistance has a bigger effect on ping pong ball
d Golf ball
e i 10 m/s^2
ii (See diagram)
iii Weight greater than air resistance
iv The faster she falls the more air molecules she displaces each second; so the greater the air resistance force; net/resultant force is less so acceleration is less
v Terminal speed
vi Balanced; equal in size but opposite in direction
- 2 a** To reduce drag; air resistance force acting on them; slowing them down
b Crouch over handlebars; wear tight-fitting clothes; wear shaped helmet with no sharp edges and sleek shape; lubricate bicycle; have bicycle with no sharp edges and sleek shape



(Any 2)

Page 83 The energy of theme rides

- 1** GPE; GPE; KE; GPE
2 a A: GPE; B: GPE + KE, C: EPE (elastic potential energy)
b Some energy is converted into thermal energy and sound
3 a B
b Increases
c C
d GPE to KE
e Energy is transferred to other forms: sound/thermal energy; due to friction
f Make B higher so it gains greater GPE; GPE lost = KE gained + energy transferred due to friction; its maximum KE will be greater; more KE means higher speed

(Any 3)