P2a answers

Remember: Check which grade you are working at.

Page 111 See how it moves!

1 a i Travelling forward *(1)*; at a steady speed *(1)*

ii Stopped *(1)*

b Section C *(1)*

2 a Average speed $= \frac{\text{total distance}}{\text{time}}$ *(1)*

$= \frac{90}{2}$ *(1)*

$= 45$ km/h *(1)*

b He will slow down at junctions / traffic lights *(1)*; and speed up on clear roads / his speed is constantly changing *(1)*

Page 111 Speed isn't everything

3 a Speed *(1)*; in a certain direction *(1)*

b i Velocity increases as he starts to run faster *(1)*

ii Changes because he changes direction *(1)*

iii Decreases as he slows down at the end *(1)*

4 a 0 m/s *(1)*

b Acceleration $= \frac{\text{change in speed}}{\text{time taken}}$ *(1)*

$= \frac{150}{0.5}$ *(1)*

$= 300$ m/s^2 *(1)*

P2a answers

Page 112 Velocity-time graphs

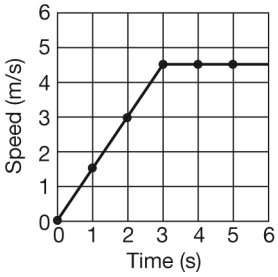
1 a i Steady speed *(1)*

ii Accelerating *(1)*

b Section D *(1)*

c The line would reach the x-axis *(1)*

2 a



Both axes labelled correctly = (2) points correctly plotted = (1) line drawn = (1)

b i Area under graph *(1)*

ii Gradient of graph at that point *(1)*

iii Read value off the y-axis *(1)*

Page 112 Let's force it!

3 a i 400 N *(1)*

ii Accelerating *(1)*; forwards *(1)*

b i Balanced *(1)*

ii Steady speed *(1)*; forwards *(1)*

Page 113 Force and acceleration

1 a i Positive *(1)*; acting in forwards direction *(1)*

ii It is zero *(1)*

b i It increases *(1)*

ii Force = mass x acceleration *(1)*
= 20 x 4 *(1)*
= 80 N *(1)*

2 a Newtonmeter / force meter *(1)*

b Yes, it does prove this *(1)*; as force doubles, acceleration doubles *(1)*

c 4N reading *(1)*; doesn't follow the pattern *(1)*

Page 113 Balanced forces

3 a Points of forces that are equal in size *(1)*; opposite in direction *(1)*

b i Balanced *(1)*

ii They are the same *(1)*

c Bigger *(1)*

P2a answers

Page 114 Terminal velocity

1 a Air resistance *(1)*

b It increases *(1)*

c Top speed reached when forces balance *(1)*

d *(Any 3:)* Forward force gets greater causing acceleration *(1)*; air resistance increases*(1)*; because his speed increases *(1)*; at his top speed, forces are balanced *(1)*

2 a Air resistance *(1)*

b Air resistance acts in the opposite direction to forces causing motion *(1)*; and makes him decelerate *(1)*

Page 114 Stop!

3 a Distance travelled while the car is stopping / between the driver seeing a hazard and the car stopping *(1)*

b Braking distance *(1)*; thinking distance *(1)*

c Slower reaction time / less experience / concentrating on car control not road conditions *(1)*

d Longer distance *(1)*; slower reaction time *(1)*

e More friction *(1)*; so shorter braking distance *(1)*

Page 115 Moving through fluids

1 a Drag / friction / allow upthrust *(1)*

b As it falls it accelerates and the drag increases with speed *(1)*; until drag equals weight *(1)*

c Thicker fluid causes more drag (at lower speeds) *(1)*; so the terminal velocity is slower *(1)*

d Increase the terminal velocity *(1)*

Page 115 Energy to move

2 a Heat *(1)*; kinetic *(1)*

b Chemical *(1)*

c Electrical energy *(1)*; light energy *(1)*

3 a Batteries *(1)*

b The energy spreads to surroundings and moving parts of car *(1)*; which become hotter *(1)*

c More work done *(1)*; against friction *(1)*

P2a answers

Page 116 Working hard

1 a 12 J *(1)*

b Weight (allow gravity) *(1)*

c Work done = force x distance *(1)*
= 25 x 2 *(1)*
= 50 J *(1)*

d Changed into heat and sound energy *(1)*; as work was done against friction *(1)*

Page 116 How much energy?

2 a Energy something has because it is moving *(1)*

b Slow down / stop *(1)*

c PE = weight x height *(1)*

= 3 x 10 *(1)*

= 30 J *(1)*

3 Andrea has a large elastic harness attached to her when she does a bungee jump from the top of a bridge. As she jumps, the **gravitational potential** energy she has on the bridge changes into **kinetic** energy as she falls. At the bottom of the jump, the rope is fully extended and it gains **elastic potential** energy. Eventually she stops moving because all the energy has spread as **thermal/heat** energy to the surroundings. *(4)*

Page 117 Momentum

1 a i Speed / mass *(1)*

ii Velocity / force *(1)*

b Momentum = mass x velocity *(1)*
= 0.5 kg x 8 m/s *(1)*
= 4 kg m/s *(1)*

2 a Inelastic *(1)*

b Momentum = mass x velocity *(1)*
= 2 x 3 *(1)*
= 6 kgm/s *(1)*

c 6 kgm/s *(1)*

d Velocity = $\frac{\text{momentum}}{\text{mass}}$ *(1)*

$= \frac{6}{4}$ *(1)*

= 1.5 m/s *(1)*

Page 117 Off with a bang!

3 a Backwards *(1)*

b Momentum of balloon equals momentum of air *(1)*; the air and balloon move in opposite directions so total momentum remains zero *(1)*

c Swimmer pushes water backwards *(1)*; so she must move forwards *(1)*; to conserve momentum *(1)*

P2a answers

Page 118 Keep it safe

1 a A force or similar answer *(1)*

b i The van *(1)*

ii The car *(1)*

c i Same change in momentum *(1)*; but less force is felt *(1)*; because the momentum takes longer

ii Zero

2 a Zero *(1)*

b Smaller force *(1)*; due to longer time of impact *(1)*; carpet absorbs some KE *(1)*

Page 118 Static electricity

3 a Electrons

b Electrons *(1)*; are rubbed off the cloth *(1)*; and move onto the balloon *(1)*

c The two balloons move apart *(1)*; because like charges repel *(1)*

Page 119 Charge

1 a A flow *(1)*; of electrons *(1)*

b i Insulator *(1)*

ii Electrons rubbed off materials *(1)*; cannot flow away / through an insulator *(1)*; so they build up *(1)*

2 a They are the same *(1)*

b Gold leaf electroscope *(1)*

Page 119 Van der Graaff generator

3 a Insulators *(1)*

b As the belt moves, it rubs against the roller *(1)*; transferring electrons *(1)*

c To stop the charge flowing away through the bench / prevent discharge *(1)*

4 *(Any 3:)* The sharp point of lightning conductor is higher than surrounding buildings *(1)*; lightning is attracted to conductor instead of to the building *(1)*; the lightning conductor is made from metal *(1)*; so it is easy for lightning charge to flow down it *(1)*

P2a answers

Page 120 Sparks will fly!

1 a Insulators *(1)*

b You see a spark *(1)*

c Flammable gases *(1)*; can explode *(1)*; if there is a spark from a discharge *(1)*

2 a Opposite charges attract / the toner and drum are oppositely charged *(1)*

b Positive *(1)*

3 a Shoes rub *(1)*; electrons off *(1)*; the carpet *(1)*

b i Discharge *(1)*

ii *(Any 2:)* Metal is a conductor *(1)*; connected to Earth *(1)*; so electrons can flow off Monique *(1)*

4 a Electrons are rubbed off the paint particles *(1)*; as they rub on the sides of the spray gun *(1)*

b Particles have the same charge *(1)*; so repel each other *(1)*

P2b answers

Remember: Check which grade you are working at.

Page 122 Circuit diagrams

1 a Shine a light on it / cover it up *(1)*

b 2 *(1)*

c Fuse *(1)*

2 a Variable resistor *(1)*

b Adjusting the variable resistor's setting reduces its resistance *(1)*; which increases the current *(1)*; which increases the brightness *(1)*

c Can't control bulbs separately *(1)*; bulbs are dimmer *(1)*

Page 122 Resistance 1

3 a Flow *(1)*; of electrons *(1)*

b The resistance of a conductor is low *(1)*; the resistance of an insulator is high *(1)*

c Electrons free to move around *(1)*

Page 123 Resistance 2

1 a i It increased *(1)*

ii It decreased *(1)*

b i Resistance increases if electrons *(1)*; have more collisions *(1)*; with nuclei *(1)*

ii Different materials have an atomic structure / arrangement so there is a different chance of collisions *(1)*

Page 123 Ohm's Law

2 a As voltage increases *(1)*; current increases / they are proportional to each other *(1)*

b 1.5 A *(1)*

c Resistance $= \frac{\text{voltage}}{\text{current}}$ *(1)*

$= \frac{6}{1.5}$ *(1)*

$= 4$ ohms *(1)*

d Type of material *(1)*; temperature *(1)*

e Temperature of wire increases / is not constant *(1)*; or the resistance of the wire is not constant *(1)*

P2b answers

Page 124 More components

1 a Heat it up / cool it down *(1)*

b More electrons are released *(1)*; so more electrons can flow in the circuit *(1)*

c Electronic thermometer *(1)*; smoke alarm *(1)*

d It decreases *(1)*

e The current falls *(1)*

f Semiconductor *(1)*

Page 124 Components in series

2 a They are the same *(1)*

b 3V *(1)*

c 1 IV 2 IV 3 IV *(1)*

d 0V *(1)*

Page 125 Components in parallel

1 a 3V *(1)*

b 3V *(1)*

c The other bulbs stay on *(1)*

d Can control bulbs separately / brighter than in a series circuit *(1)*

Page 125 The three-pin plug

2 a Blue *(1)*

b Plastic is an insulator (allow for safety) *(1)*

c *(Any 2:)* If the fuse blows; the current will stop; it isolates the live wire

d Three metal wires *(1)*; each enclosed in plastic *(1)*; all covered in one plastic / insulating layer *(1)*

e It prevents wires being pulled out by accident *(2)*

P2b answers

Page 126 Domestic electricity

1 a Direct current *(1)*

b Y *(1)*

c A higher voltage can be supplied / the cost is less per unit supplied / a continuous supply of energy *(1)*

d (Cathode ray) Oscilloscope (or CRO) *(1)*

Page 126 Safety at home

2 a When the current was too big *(1)*; the fuse blew / melted / broke *(1)*; and broke the circuit *(1)*

b Different equipment uses different sizes of current *(1)*

c Radio double insulated / covered in plastic / no metal parts accessible (or vice versa for heater) *(1)*

d If the metal part becomes live *(1)*; earth wire provides safe / low resistance route for charge to flow away *(1)*; which blows the fuse *(1)*

e Responds more quickly if there is a fault *(1)*; responds to much lower current differences *(1)*

Page 127 Which fuse?

1 a i 3 A fuse *(1)*

ii It will blow / the fuse wire will melt *(1)*; if the current is higher than *(1)*; 13 A *(1)*

iii 200 J *(1)*

b i $\text{Current} = \frac{\text{power}}{230\text{V}}$ *(1)*

$= \frac{2000}{230}$ *(1)*

$= 8.7$ A *(1)*

ii Fuse would keep blowing (1); so the equipment would stop working *(1)*

Page 127 Radioactivity

2 a i Neutron

ii Neutron *(1)*; proton *(1)*

b Charged particle / atom which has lost / gained an electron *(1)*

c i 9 *(1)*

ii 5 *(1)*

iii 2 *(1)*

d i The number of neutrons in the nucleus *(1)*

ii The number of protons in the nucleus *(1)*

P2b answers

Page 128 Alpha, beta and gamma rays 2

1 a Gamma penetrates cardboard / is only stopped by thick lead *(1)*

b Geiger Muller tube / Geiger counter *(1)*

2 a

Type	Mass	Charge
Alpha	**+4**	+2
Beta	Negligible	**–1**
Gamma	**0**	0

(3)

b Ionising radiation knocks electrons off *(1)*; nearby atoms leaving them as charged ions *(1)*

Page 128 Background radiation

3 a Radiation that surrounds us *(1)*; all the time *(1)*

b Cosmic rays *(1)*

c Medical e.g. X-rays / fall-out from nuclear weapon testing / discharge from nuclear power / air travel *(1)*

d Natural sources *(1)*

4 a Granite is more radioactive than other rocks *(1)*; granite is only found in certain places *(1)*

b Yes *(1)*; levels of radioactivity are low / have been naturally present for many years *(1)*; and can be reduced with vents in homes / do not pose a great health risk *(1)*

Page 129 Inside the atom

1 a Plum pudding model *(1)*

b Positively charged *(1)*; central nucleus *(1)*; surrounded by negatively charged electrons *(1)*

c i Some positive charged alpha particles are deflected during Rutherford's experiment *(1)*

ii Many alpha particles passed straight through *(1)*

iii Ions can be produced from neutral atoms *(1)*

Page 129 Nuclear fission

2 a When one large nucleus splits *(1)*; into two or more smaller parts releasing energy *(1)*

b Nuclear power stations / nuclear bombs *(1)*

c i 3 *(1)*

ii At each stage a bigger number of nuclei get involved *(1)*; each neutron produces more than one more neutron from the reaction *(1)*

d The nucleus must be large *(1)*; and unstable for fission to take place *(1)*

P2b answers

Page 130 Nuclear power station

1 a Nuclear fission *(1)*

b The moderator absorbs neutrons *(1)*

c Boron rods *(1)*

d Kinetic energy → electrical energy *(1)*

e i Heat is given out by nuclear fission *(1)*; which changes water into steam *(1)*

ii Steam spins the turbine *(1)*; which spins the generator *(1)*

Page 130 Nuclear fusion

2 a Nuclear fission is when two small nuclei (1); join up releasing heat (1)

b In a star *(1)*

c i Helium *(1)*; energy *(1)*

ii The heat and pressure is needed to overcome strong forces inside the atom *(1)*; which repel the positively charged nuclei *(1)*

iii Only small nuclei undergo fusion *(1)*; because the temperature / pressures needed are too high for larger nuclei *(1)*