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REVISE EDEXCEL GCSE (9–1)

Physics

REVISION WORKBOOK

Foundation

For the 9–1 exams

Pearson

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Physics

REVISION WORKBOOK

Foundation

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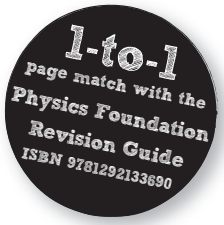

Contents

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Key concepts

Guided

1 Complete the table for units of physical quantities and their abbreviations.

ampere		joule		pascal	Pa		
		watt		newton		ohm	

(2 marks)

2 Explain the difference between a base unit and a derived unit.

Use the words 'independent' and 'made up' in your answer.

.....

..... **(2 marks)**

3 Convert each quantity.

(a) 750 grams to kilograms

1000 g = 1 kg; 1000 W = 1 kW; 60 s = 1 minute; 1000 mm = 1 m; 1 000 000 J = 1 MJ

..... kg **(1 mark)**

(b) 0.75 kilowatts to watts

..... W **(1 mark)**

(c) 25 minutes to seconds

..... s **(1 mark)**

4 A frequency of 2.5 kHz is written in SI units as 2500 Hz and in standard form as 2.5×10^3 Hz.

Write the length 8 nm in SI units and then in standard form.

SI: .....

standard form: ..... **(2 marks)**

Guided

5 Calculate the speed of a car that takes 10.5 s to travel 75 m. Give your answer to 5 significant figures.

Look at the number that follows the significant figure you are asked to consider (in this case the 5th one). If it is greater than 5, round the 5th figure up; if it is less then round down, e.g. 1.23076923 would become 1.2308 to 5 significant figures.

$s = d \div t$ so ..... m ÷ ..... s = ... m/s

so to 5 significant figures

speed = ... m/s **(2 marks)**

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Had a go ☐ Nearly there ☐ Nailed it! ☐

Scalars and vectors

1 (a) Identify the correct category for each quantity listed below. Write your answers in the table.

acceleration displacement speed
temperature mass force velocity
distance

A scalar has only a magnitude (size) but a vector has both a magnitude **and** a direction.

Scalars	Vectors

(2 marks)

Guided

(b) (i) Give **one** example of a scalar from your table and explain why it is a scalar.

..... is a scalar because .....

..... **(2 marks)**

(ii) Give **one** example of a vector from your table and explain why it is a vector.

..... is a vector because .....

and ..... **(2 marks)**

2 At the swimming pool, two swimmers are practising for a swimming gala. They swim from opposite ends of the pool. The first swimmer dives in from the left side and swims the length of the pool at a velocity of 1.3 m/s. The second swimmer then swims from the right at a velocity of −1.4 m/s.

(a) Explain why the velocity is used in this example instead of the speed.

.....

..... **(2 marks)**

(b) Explain why the second swimmer's velocity has a negative value.

..... **(1 mark)**

3 (a) Which of the following is **not** a scalar?

☐ **A** energy ☐ **C** mass

☐ **B** temperature ☐ **D** weight **(1 mark)**

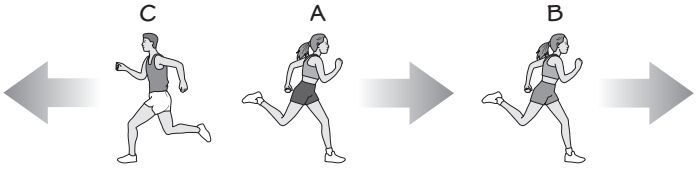
(b) Give a reason for your answer to (a).

.....

..... **(1 mark)**

4 (a) Write the letter of each runner shown in the picture next to a suitable velocity in the table below.

	–3 m/s
	5 m/s
	4.5 m/s



(b) Give a reason for your choice.

..... **(1 mark)**

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Paper 1

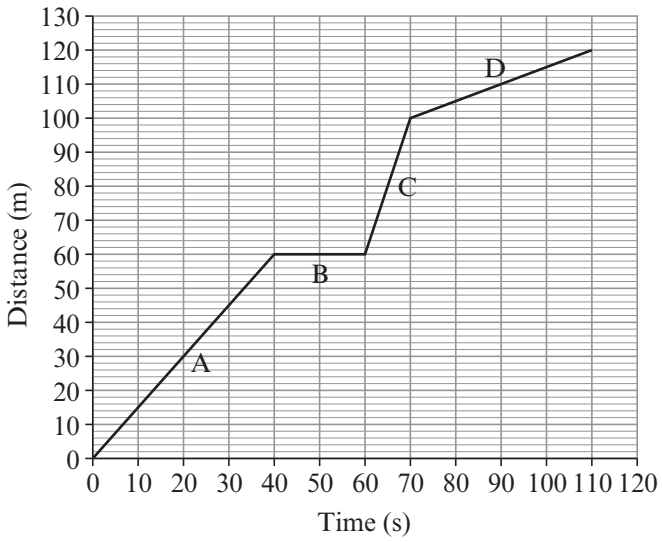
Speed, distance and time

1 The distance/time graph shows a runner's journey from his home to the park.

(a) State the letter that corresponds to the part of the runner's journey where he:

(i) stops ..... **(1 mark)**

(ii) runs fastest. ..... **(1 mark)**



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(b) Calculate the runner's speed in part A of his journey.

In part A, he travels ..... m in ..... s.

speed = distance ÷ .....

speed = ... m/s **(3 marks)**

(c) Explain how the graph shows a faster speed compared to a slower speed in different parts of the runner's journey.

.....

..... **(2 marks)**

2 The lift in a wind turbine tower takes 24 s to go from the ground to the generator 84 m above.

Speed = distance ÷ time only. Velocity is speed in a given direction.

(a) Calculate the speed of the lift. State the unit.

speed = ... unit ..... **(3 marks)**

(b) State the velocity of the lift.

..... **(1 mark)**

3 A jogger runs through a park at a constant speed of 5 m/s covering a distance of 400 m.

Calculate the time it takes for the jogger to run the 400 m.

time = ... s **(2 marks)**

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Equations of motion

1 Identify the unit for acceleration.

☐ **A** ms^2

☐ **B** m^2

☐ **C** m/s^2

☐ **D** m/s

2 Draw a line from each symbol to its correct description. One has been done for you.

Initial velocity means the velocity when time = 0.

Symbol	Description
v	acceleration
u	time
a	distance
x	final velocity
t	initial velocity

(2 marks)

3 (a) A racing car takes 8 seconds to speed up from 15 m/s to 25 m/s. Calculate its acceleration.

You may find the equation $a = v - u \div t$ useful. Remember that initial velocity = *u* and final velocity = *v*.

acceleration = ... m/s^2 **(3 marks)**

Guided

(b) The racing car now accelerates at the same rate for 12 seconds, from 25 m/s to a higher velocity. It travels 300 m during this time. Calculate its final velocity.

$v^2 = u^2 + 2 \times a \times x$

$= .....^2 + 2..... \times .....$

$v^2 =$

so $v =$

velocity = ... m/s **(3 marks)**

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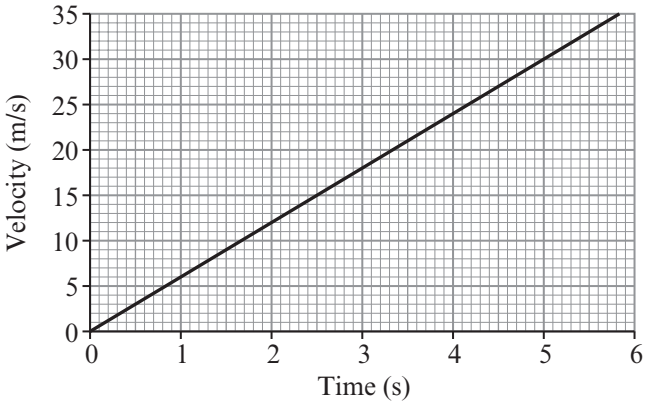
Paper 1

Velocity/time graphs

1 The velocity/time graph shows how the velocity of a car changes with time.



(a) This graph can be used to analyse the car's journey. Choose **one** correct statement that describes what else the graph shows as well as acceleration.

☐ **A** the distance the car travelled

☐ **B** how long the car was stopped

☐ **C** where the car travelled

☐ **D** the constant velocity of the car

(1 mark)

(b) Draw a triangle on the graph to show the acceleration and the time taken. **(1 mark)**

(c) Calculate the acceleration of the car as shown in the graph.

Guided

change in velocity = ... m/s, time taken for the change = ... s

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}} =$$

acceleration = ... m/s^2 **(2 marks)**

(d) Use the graph to calculate the distance travelled by the car in the first 5 s.

Work out the area under the graph.

distance = ... m **(2 marks)**

2 A cyclist takes 5 seconds to reach maximum velocity of 4 m/s, from an initial velocity of 0 m/s, moving in a straight line.

(a) Calculate the cyclist's acceleration.

Guided

change in velocity =

so

acceleration = ...unit ..... **(3 marks)**

(b) The cyclist travels at constant velocity for 15 seconds and then takes another 15 seconds to slow down to a stop. Sketch a graph of the journey and use this to explain how the total distance travelled could be calculated.

.....

.....

.....

..... **(3 marks)**

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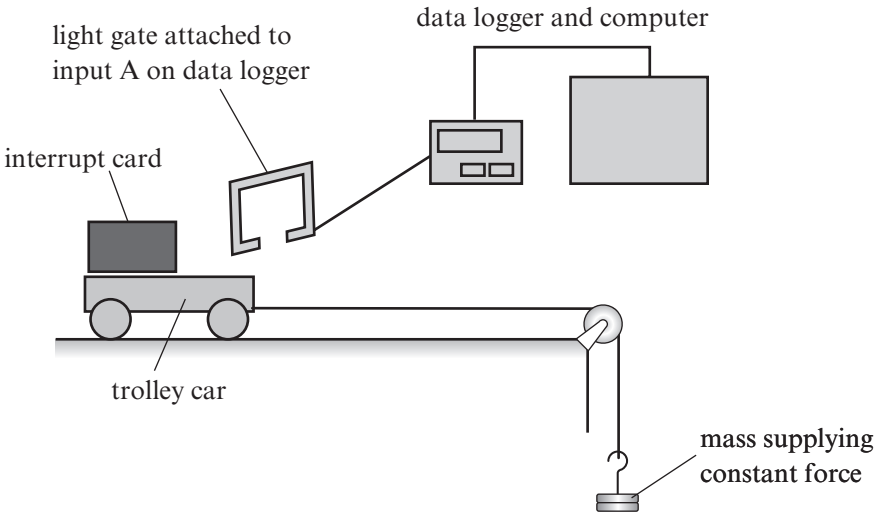
Determining speed

1 Draw a line from each activity to its correct speed. One has been done for you.

Activity	Speed
commuter train	330 m/s
running	1.5 m/s
speed of sound in air	3.0 m/s
walking	55 m/s

(1 mark)

2 The diagram shows a light gate being used to measure the speed of a model vehicle.



(a) Describe how the interrupt card can be used to measure the speed of the trolley car.

Guided

The light beam is .....
as it enters the light gate and this starts the timer. When the card has passed through .....
and ..... **(3 marks)**

(b) State how the speed is found using this method.

.....
..... **(1 mark)**

3 Suggest why it is better to use light gates and a computer than to use a stopwatch and a ruler to measure the speed of a toy car.

Light gates can measure instantly so computers can calculate speeds over very short distances. Consider this advantage over measurement by a person.

.....
.....
.....
..... **(3 marks)**

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Newton's first law

1 Explain what is meant by a resultant force.

.....

..... **(2 marks)**

Guided

2 A speed skater is standing on the ice waiting for the start of a race.

(a) Describe the action and reaction forces acting on the skater and her skates.

The action is the .....and the

reaction is ..... **(2 marks)**

(b) The race begins and the skater pushes against the ice producing a forward thrust on the skates of 30 N. There is resistance from the air of 10 N and friction on the blades of 1 N. Calculate the resultant force.

resultant force = positive direction – negative direction so

force = ... N **(2 marks)**

(c) During the race the resistive forces become equal to the forward thrust. Describe what happens to the velocity of the skater.

.....

..... **(2 marks)**

(d) At the end of the race the skater stops skating. Describe what happens next before the skater comes to a halt.

.....

..... **(2 marks)**

3 A space probe falls towards the Moon. In the Moon's gravitational field the probe has a weight of 1700 N. The probe fires rockets giving an upward thrust of 1900 N.

(a) Calculate the resultant force on the space probe.

resultant force = ... N **(2 marks)**

(b) Explain the changes in the probe's velocity.

.....

..... **(2 marks)**

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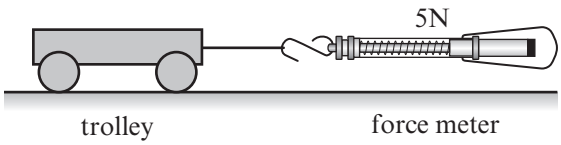
Newton's second law

1 In an experiment a student pulls a force meter attached to a trolley along a bench. The trolley has frictionless wheels. The force meter gives a reading of 5 N.



(a) Describe what happens to the trolley.

Guided

The trolley will .....

in the direction..... **(2 marks)**

(b) The student stacks some masses on the trolley and again pulls it with a force of 5 N. Explain why the trolley takes longer to travel the length of the bench.

The acceleration is ..... because .....

..... **(2 marks)**

2 When the Soyuz spacecraft travels to the International Space Station, it is accelerated by rockets. The spacecraft has a mass of 3000 kg and the peak acceleration of the spacecraft is 39 m/s^2.

(a) Calculate the peak resultant force acting on the spacecraft. State the unit.

$F = m \times a$

force = ... unit ..... **(3 marks)**

(b) State the direction in which the force acts.

..... **(1 mark)**

3 A Formula One racing car has a mass of 640 kg. A resultant force of 10 500 N acts on the car.

(a) Calculate the acceleration on the racing car. State the unit.

acceleration = ... unit ..... **(3 marks)**

(b) Explain what will happen to the acceleration of the car as its fuel tank empties, assuming the resultant force in forward direction remains constant.

.....

..... **(2 marks)**

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Weight and mass

1 Which of the following is a description of weight?

☐ **A** Weight is a type of force.

☐ **B** Weight is measured in kilograms (kg).

☐ **C** Weight is a measure of mass.

☐ **D** Weight is calculated by mass ÷ gravitational field strength. **(1 mark)**

Guided

2 The lunar roving vehicle (LRV), driven by astronauts on the Moon, has a mass of 210 kg on Earth. State the mass of the unchanged LRV on the Moon. Give a reason for your answer.

The mass of the LRV on the Moon is ..... kg

because .....

.....

..... **(2 marks)**

3 (a) Calculate the total weight of a backpack of mass 1 kg, containing books with a mass of 2 kg and trainers with a mass of 1.5 kg. Take gravitational field strength (g) to be 10 N/kg.

Use the equation relating weight to mass and gravitational field strength.

weight = ... N **(3 marks)**

(b) The book and trainers are removed from the bag and replaced with a sports kit. The weight of the bag is now 30 N. Calculate the mass of the sports kit.

You will need to rearrange the equation used in part (a).

mass = ... kg **(2 marks)**

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Force and acceleration

A ramp, a trolley, masses and electronic light gates can be used to investigate the relationship between force, mass and acceleration.

1 State **one** advantage of using electronic measuring equipment to determine acceleration compared to using a ruler and stopwatch.

.....

.....

..... **(2 marks)**

2 Describe how acceleration changes with mass, for the same force.

..... **(1 mark)**

Guided

3 Explain why it is necessary to use two light gates when measuring acceleration in this experiment.

Acceleration is calculated by the change in speed ÷ time taken, so .....

.....

..... **(2 marks)**

Guided

4 Describe the conclusion that can be drawn from this experiment.

For a constant slope, ...

.....

..... **(2 marks)**

5 Suggest **one** hazard associated with this experiment and **two** safety precautions that could be taken to minimise the risk of harm to the scientist.

Consider the potential dangers of using accelerated masses or electrical equipment.

.....

.....

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.....

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..... **(3 marks)**

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Newton's third law

1 Select the statement that summarises Newton's third law.

☐ **A** For every action there is a constant reaction.

☐ **B** The action and reaction forces are different due to friction.

☐ **C** Reaction forces may be stationary or at constant speed.

☐ **D** For every action there is an equal and opposite reaction. **(1 mark)**

2 Rockets are used to carry people into space to the International Space Station. Explain how Newton's third law can be used to describe the motion of the rocket.

The rocket pushes out hot gases that exert a force.

.....

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.....

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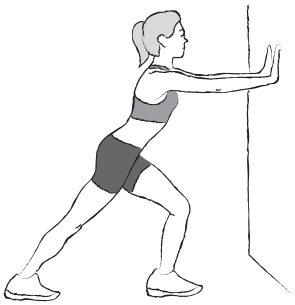
..... **(3 marks)**

3 (a) A runner stretches her calf muscle, as shown in the diagram against a brick wall. Explain this using Newton's third law.



.....

.....

.....

..... **(2 marks)**

Guided

(b) If the brick wall is replaced with a fabric curtain explain, using Newton's third law, why the athlete would fall forwards if she pushed with the same force as she used on the brick wall.

The curtain is not rigid and so would not .....

.....

.....

..... **(2 marks)**

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Human reaction time

1 (a) Reaction time is an important consideration in driving a vehicle safely. Which is the distance travelled due to the reaction time of a driver?

- ☐ **A** overall stopping distance
- ☐ **B** thinking distance
- ☐ **C** braking distance
- ☐ **D** reaction distance **(1 mark)**

(b) Suggest a factor that may influence the reaction time of a driver.

..... **(1 mark)**

2 Explain how human reaction time is related to the brain.

Guided

Human reaction time is the .....

.....

It is related to how quickly .....

..... **(2 marks)**

3 Explain how to measure human reaction time using a ruler.

Outline the main points in the 'drop and grab' test.

.....

.....

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..... **(3 marks)**

4 Name a profession which relies on fast reaction times and give a reason why this is important.

.....

.....

.....

..... **(2 marks)**

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Stopping distance

Guided

1 Complete the table below to summarise the factors that affect overall stopping distance.

Thinking distance is affected by the driver; braking distance is affected by the car or conditions.

Separate the factors that may affect the reaction time of a driver from those that affect the vehicle.

Factors increasing overall stopping distance	
Thinking distance will increase if	**Braking distance will increase if**
the car's speed increases	the car's speed increases
the driver is distracted	
	the road is icy or wet

(2 marks)

2 Explain why the overall stopping distance of a car with worn tyres is different from a car with new tyres.

.....

.....

.....

..... **(2 marks)**

3 (a) Write the word equation used to calculate overall stopping distance.

..... **(1 mark)**

Guided

(b) Calculate the overall stopping distance when a car increases its speed from 20 mph to 60 mph. Take thinking distance to be 6 m and braking distance to be 6 m when travelling at 20 mph.

Speed increases by 3 times so thinking distance also increases by .....

so thinking distance =

Speed increases by 3 times so braking distance increases by .....

so braking distance =

therefore, total stopping distance =

= ..... m **(3 marks)**

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Extended response – Motion and forces

A skydiver leaves the training aeroplane and accelerates before opening the parachute. After opening the parachute the speed of the skydiver reduces significantly so that he lands safely. Explain the forces acting on the skydiver before and after opening the parachute and suggest a reason for the skydiver being in the position shown in the photograph.

You should try to use the information given in the question.

You will be more successful in extended writing questions if you plan your answer before you start writing. The question asks you to give a detailed explanation of the forces acting on the drone as it is flown to the position for filming. Think about:

- the forces acting on the skydiver causing him to accelerate
- how the forces change during the descent
- the effect of air resistance
- the effect of change in surface area
- the effect of balanced forces
- how the skydiver is able to land at a safe velocity.

You should try to use the information given in the question.

.....

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..... **(6 marks)**

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Paper 1

Energy stores and transfers

1 Which of the following is an energy store?

- ☐ **A** electrical
- ☐ **B** light
- ☐ **C** radiation
- ☐ **D** thermal

(1 mark)

Guided

2 Explain how energy transfers can be represented using a diagram.

An energy transfer diagram shows both the .....

.....

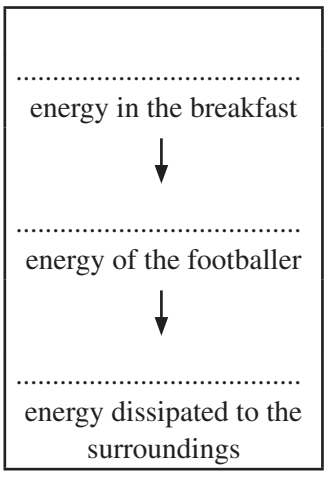
.....

.....

..... **(3 marks)**

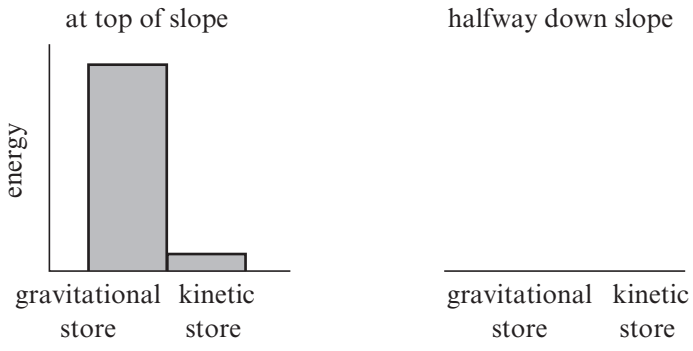
3 A footballer has a breakfast of cereal and toast before setting off for a training session at the club. Complete the flow chart to show how energy is transferred to other stores.

Write the correct store(s) of energy in each space.



(3 marks)

4 The bar graphs below illustrate energy stores before each energy transfer occurs. Add bars to the second graph to show changes in the energy stores after the energy transfer has occurred. The graphs represent the energy of a bobsleigh at the top of a slope and halfway down the slope.



(3 marks)

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Efficient heat transfer

1 Identify the most suitable material, from the table below, for building an energy-efficient garage. Give a reason for your answer.

The larger the relative thermal conductivity, the more heat will be conducted through the material.

Material	Relative thermal conductivity
brick	1.06
concrete	1.00
sandstone	2.20
granite	2.75

.....

.....

..... **(2 marks)**

2 Some houses are built with very thick walls. Explain how these walls help to keep the houses warm in the winter.

.....

.....

.....

..... **(2 marks)**

Guided

3 A crane lifts a box to the top of a building. 1 000 000 joules is transferred to the gravitational store when the box is moved from the bottom to the top of the building. The crane uses fuel with 4 000 000 joules in a chemical store. Calculate the efficiency of the crane.

$$\text{efficiency} = \frac{\text{useful energy transferred by the crane}}{\text{total energy supplied to the crane}}$$

useful energy transferred =

total energy used by the crane =

Efficiency = ... **(2 marks)**

4 (a) The motor in a food blender has an efficiency of 20%. The motor transfers 40 joules per second into the kinetic store. Calculate the energy that is transferred to the motor each second.

energy transferred each second = ... J **(3 marks)**

(b) State the power of the motor. Give the unit.

power = ... unit ..... **(1 mark)**

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Energy resources

1 Name **three non-renewable** energy resources.

..... **(1 mark)**

2 Identify the **renewable** energy resources from their descriptions given below.

(a) generates electricity from water trapped by a dam and then flowing down a pipe.

..... **(1 mark)**

(b) uses the rise and fall of the tide to generate electricity.

..... **(1 mark)**

(c) uses kinetic energy from the wind to generate electricity.

..... **(1 mark)**

3 Some of the sources of renewable energy listed below are only available at certain times, while other sources can be used at any time.

hydroelectric	tidal	solar	wind	geothermal

(a) State the sources of renewable energy in the list that are always available.

Guided

hydroelectric and ..... **(1 mark)**

(b) Explain why it is an advantage to have energy sources available at any time.

Think about how the weather affects some renewable energy sources.

Demand is greatest .....

Demand may be high when .....

..... **(2 marks)**

4 Compare the way geothermal and oil-fired power stations are used to generate electricity.

.....

.....

..... **(3 marks)**

5 A hydroelectric power station is used to produce electricity when demand is high.

(a) Explain why the hydroelectric power station is a reliable producer of electricity.

.....

..... **(2 marks)**

(b) Give **one** reason why we cannot use hydroelectric power stations in more places in the UK.

.....

..... **(1 mark)**

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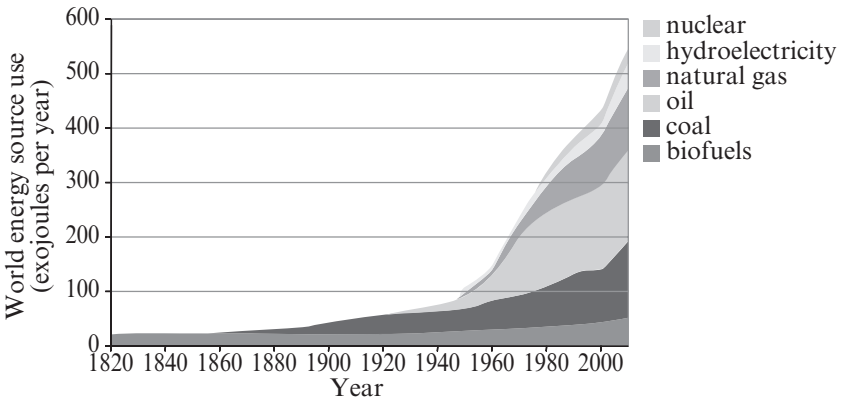
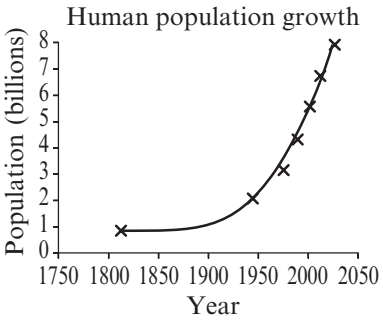
Patterns of energy use

1 The graphs show patterns of energy use and human population growth.





(a) Give **three** reasons why energy consumption rose significantly after the year 1900.

Guided

After 1900 the world's .....

There was development in .....

and ..... **(3 marks)**

(b) (i) Identify which category of energy resources has been the main contributor to world energy consumption since the year 1900.

..... **(1 mark)**

(ii) Suggest **two** reasons why the consumption of energy resources has increased in the developed world.

.....

..... **(2 marks)**

(iii) Suggest a reason why nuclear energy resources only appear after 1950.

..... **(1 mark)**

(iv) Identify a renewable resource from the graph that makes use of a change in gravitational potential energy.

..... **(1 mark)**

2 If the patterns in energy consumption are similar to the patterns in the world's population growth, discuss the issues resulting from the continuing use of energy in the way shown in the graph in Q1.

Consider finite non-renewable resources and increasing demand due to population, transport and industrial growth.

.....

.....

.....

.....

..... **(4 marks)**

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Potential and kinetic energy

1 (a) State how an object gains gravitational potential energy.

..... **(1 mark)**

(b) State the **two** variables that can cause a change in the amount of gravitational potential energy of an object.

..... **(2 marks)**

2 Identify the correct equation for calculating gravitational potential energy change.

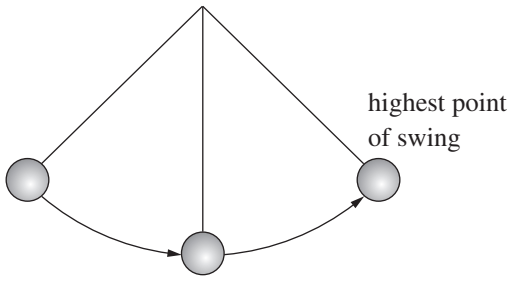
☐ **A** GPE = $m \times v \times h$ ☐ **C** GPE = $m \times F \times a$

☐ **B** GPE = ½ $m \times v^2$ ☐ **D** ΔGPE = $m \times g \times \Delta h$ **(1 mark)**

3 Calculate the change in gravitational potential energy of a drone that has a mass of 2 kg and is raised by 25 m. State the unit.

gravitational potential energy = ... unit ..... **(3 marks)**

4 Add the correct labels, A, B and C, to the diagram to show where the maximum and minimum gravitational potential energy (GPE) and kinetic energy (KE) occur in a swinging pendulum.



A	maximum KE	minimum GPE
B	no KE	maximum GPE
C	maximum GPE	no KE

(2 marks)

5 Calculate the kinetic energy of a cyclist and her bicycle, with combined mass of 70 kg, travelling at 6 m/s.

Guided

You may find this equation useful:

KE = ½ mv^2

kinetic energy = ... J **(2 marks)**