

FORMULAE

You may find the following formulae useful.

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

$$\text{frequency} = \frac{1}{\text{time period}}$$

$$f = \frac{1}{T}$$



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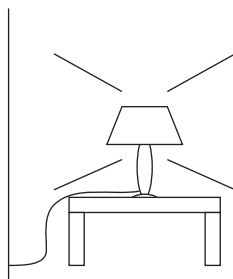
TURN OVER FOR QUESTION 1



1. The box contains the names of different forms of energy.

chemical	elastic potential	electrical	gravitational potential
kinetic	light	sound	thermal

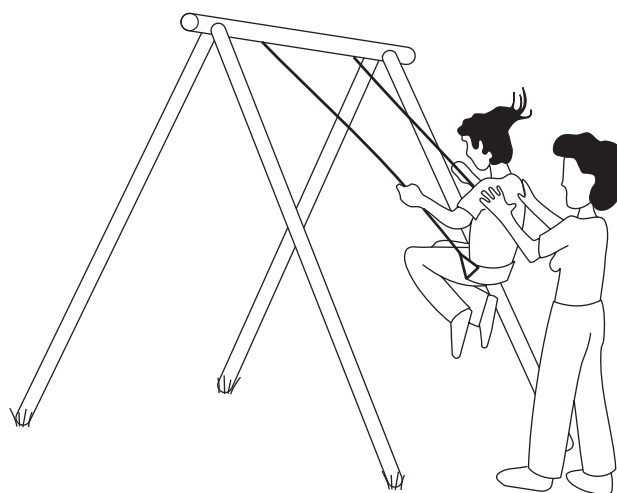
(a) The diagram shows a table lamp, lighting up a room.



Use words from the box to describe the energy transfer taking place.

..... energy to energy
(2)

(b) The diagram shows a child on a swing.



Leave
blank

Use words from the box to complete the following sentences.

When the child swings downwards, his
energy increases and his energy
decreases.

The swing gradually loses energy in the form of
..... energy.

This lost energy is replaced when an adult pushes the swing. The adult gets energy
from the energy in food.

(4)

Q1

(Total 6 marks)

TURN OVER FOR QUESTION 2



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2. (a) Tick the boxes next to **four** objects which are in our solar system.

black hole	<input type="checkbox"/>
comet	<input type="checkbox"/>
Earth	<input type="checkbox"/>
galaxy	<input type="checkbox"/>
nebula	<input type="checkbox"/>
Sun	<input type="checkbox"/>
Venus	<input type="checkbox"/>
white dwarf	<input type="checkbox"/>

(4)

(b) Name the force which keeps satellites in orbit around the Earth.

.....

(1)

(Total 5 marks)

Q2

TURN OVER FOR QUESTION 3



3. The table shows some information about two electrical appliances.

appliance	voltage (V)	current (A)	power (W)
food processor	230	2.0	
dishwasher	230	12.2	2800

(a) Use the equation

$$\text{power} = \text{voltage} \times \text{current}$$

to calculate the power of the food processor.

.....

 W
(2)

(b) What is the power of the dishwasher measured in kilowatts?

..... kW
(1)

(c) The dishwasher is switched on for 30 minutes.

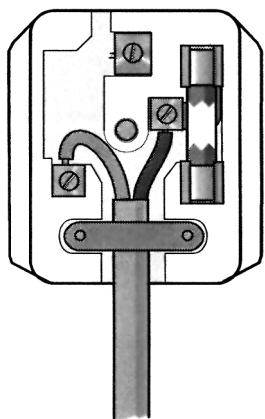
Calculate the electrical energy used in kW h.

.....

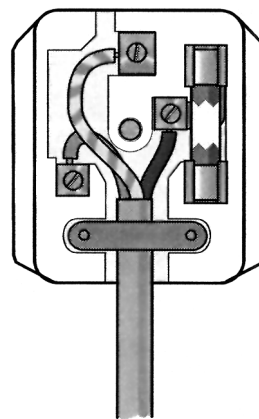
 kWh
(2)



(d) The diagrams show the wiring in the plugs attached to the food processor and the dishwasher.



plug attached to the food processor



plug attached to the dishwasher

(i) What is the correct colour of the insulation on the neutral wire?

..... (1)

(ii) What is the correct colour of the insulation on the live wire?

..... (1)

(iii) Explain why the dishwasher has an earth wire and the food processor does not.



.....
.....
.....
.....
.....
..... (3)

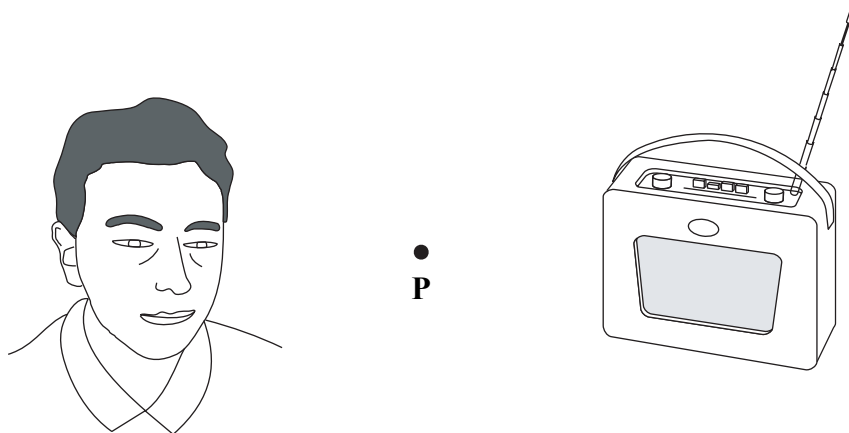
(Total 10 marks)

Q3

TURN OVER FOR QUESTION 4



4. (a) The diagram shows someone listening to the sound waves produced by a radio.



Sound is a longitudinal wave.

Draw **two** arrows on the diagram at point **P** to show how the air is vibrating.

(2)

(b) (i) What is meant by the frequency of a sound wave?

.....
.....

(1)

(ii) Give the unit of frequency.....

(1)

(c) We can hear ordinary sound waves.

Why are we not able to hear ultrasound waves?

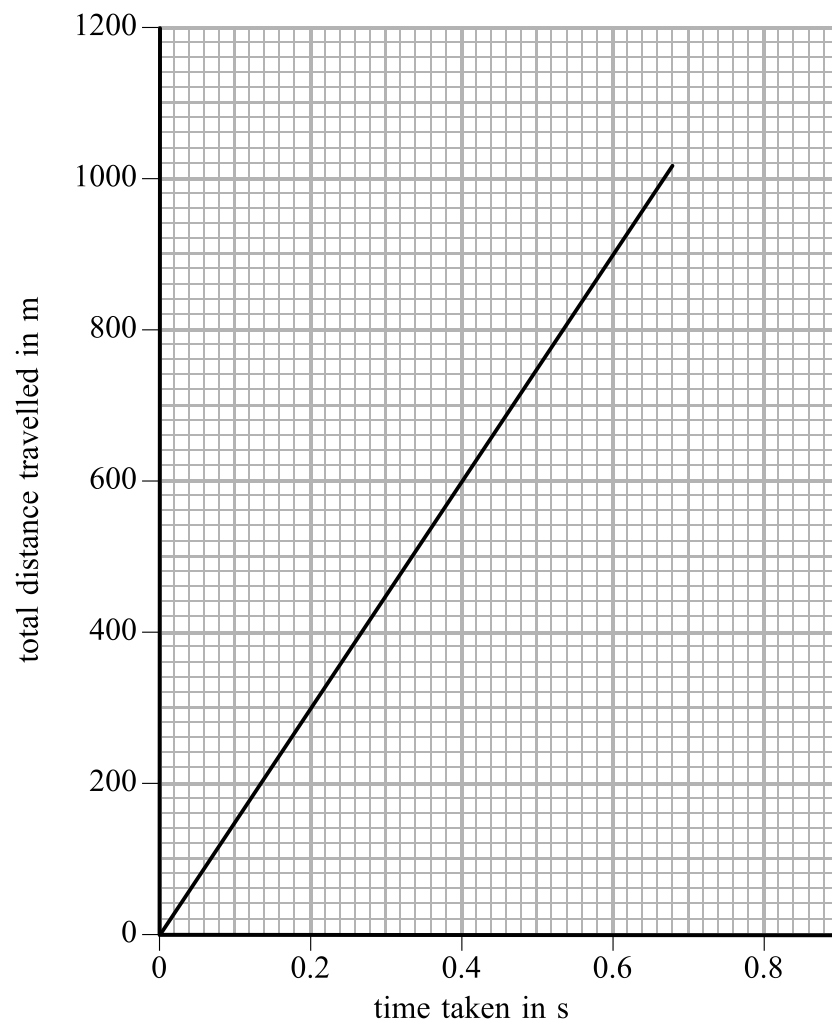
.....
.....
.....
.....

(2)



- (d) Ultrasound is used to measure the depth of the sea. A pulse of ultrasound from a ship is reflected off the seabed. The time between the pulse leaving and arriving back at the ship is measured.

The graph shows the relationship between the time taken and the total distance travelled by ultrasound in water.



- (i) Use the graph to determine the depth of the sea where the time taken is 0.4 s.

.....
.....
(2)

- (ii) State one other use for ultrasound.

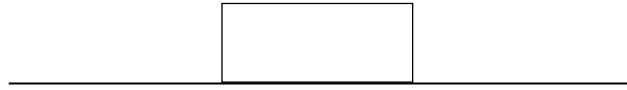
.....
.....
(1)

(Total 9 marks)

Q4

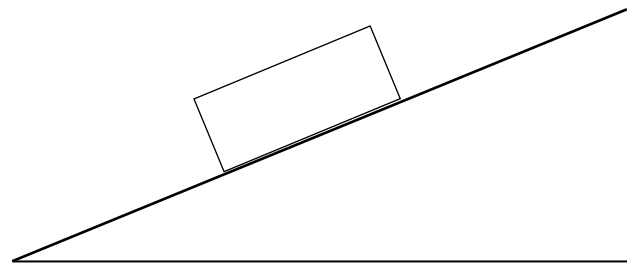


5. The diagram shows a block of wood resting on a horizontal surface.



(a) Add to the diagram two labelled arrows to show and name the forces acting on the block of wood. **(2)**

(b) The surface is now tilted at an angle. The block of wood does not move.



Add to the diagram labelled arrows to show and name the forces acting on the block of wood. **(3)**



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(c) As the surface is tilted further, the block of wood begins to move and slide down the slope.

(i) Explain why the block begins to slide down the slope.

.....
.....
.....

(2)

(ii) Describe the energy changes taking place as the block slides down the slope.

.....
.....
.....
.....

(3)

Q5

(Total 10 marks)

TURN OVER FOR QUESTION 6



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6. The boxes show the names of five physical quantities and six units used to measure physical quantities.

Draw **one** straight line from each physical quantity to its unit.

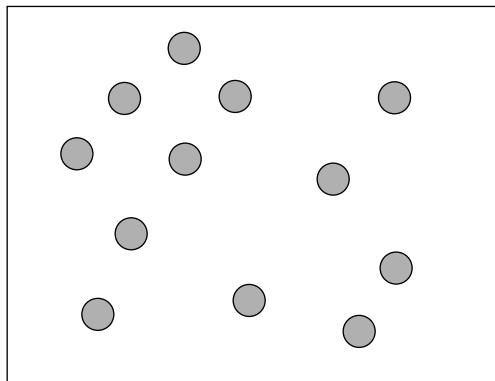
physical quantity	unit
force	joules
energy	kilogrammes
pressure	newtons
speed	pascals
mass	metres/sec
	watts

(Total 5 marks)

Q6



7. The diagram shows gas particles in a container at room temperature.



(a) Describe the motion of the gas particles.

.....
.....
(2)

(b) How would the motion change if the gas particles had less energy?

.....
(1)

(c) What would you need to do to the gas to reduce the energy of the gas particles?

.....
.....
(1)

(d) What is exerted on the wall of the container when a gas particle collides with it?

.....
(1)

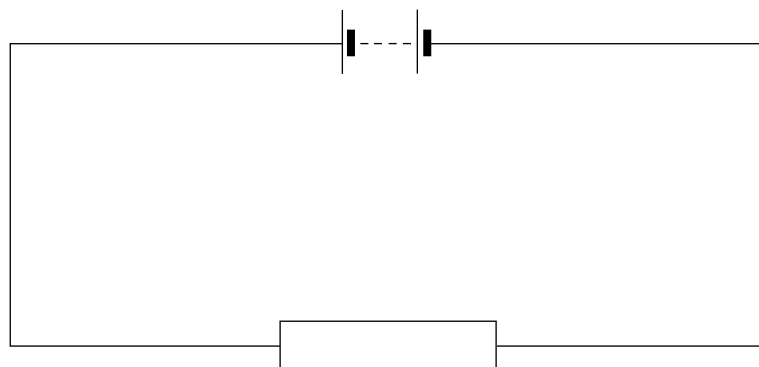
(Total 5 marks)

Q7

TURN OVER FOR QUESTION 8



8. The diagram shows a circuit used by a student to investigate the relationship between the resistance of a circuit and the current in the circuit.



(a) Using the correct symbol, add to the circuit a meter which would measure the current in the resistor. (2)

(b) The current in the resistor is 0.4 A and the resistance is 20 Ω .

(i) Write down an equation which could be used to calculate the voltage across the resistor.

..... (1)

(ii) Calculate the voltage across the resistor.

.....
.....
.....
..... (2)



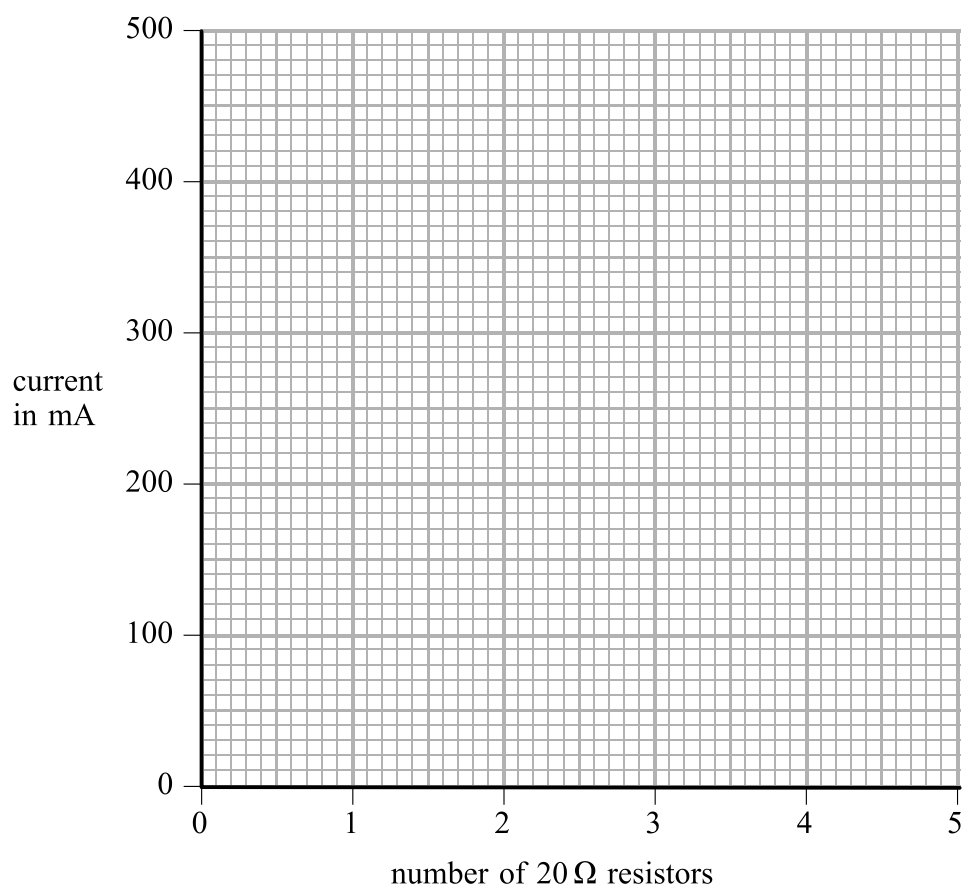
- (c) The student has four more $20\ \Omega$ resistors. She adds these to the circuit one at a time in series with the first resistor. After she adds each resistor, she records the current.

Her results are shown in the table.

number of $20\ \Omega$ resistors	current (mA)
1	400
2	200
3	130
4	100
5	80

- (i) Use the grid to draw the graph of current against number of resistors.

(3)



- (ii) The student repeats the experiment but this time she uses five $40\ \Omega$ resistors.

Use the grid to sketch the curve you would expect her results to produce this time.

(1)

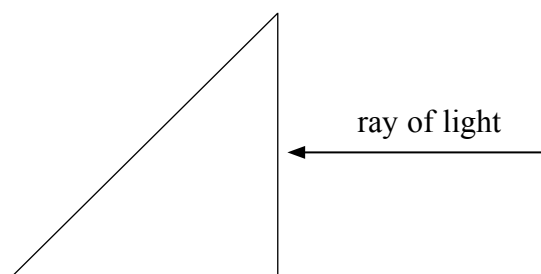
Q8

(Total 9 marks)



9. (a) The diagram shows a ray of light approaching a glass prism.

Complete the diagram to show the path of the ray as it travels inside the prism and out again.



(2)

(b) Light is an electromagnetic wave.

Which colour has the longest wavelength?

..... (1)

(c) The diagram shows the electromagnetic spectrum. Two of the electromagnetic waves are not named.

B	microwaves	A	light	ultraviolet	X-rays	gamma
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(i) Name the wave in box **A**.

..... (1)

(ii) Name the wave in box **B**.

..... (1)



Leave blank

(d) The table shows some statements about electromagnetic waves.

Tick the boxes next to the **three** correct statements.

they are all transverse	<input type="checkbox"/>
they are all longitudinal	<input type="checkbox"/>
they all have the same frequency	<input type="checkbox"/>
they all travel at the same speed in a vacuum	<input type="checkbox"/>
they can all travel through concrete	<input type="checkbox"/>
they can all transmit energy	<input type="checkbox"/>

(3)

(e) All electromagnetic waves can be diffracted.

The diffraction of microwaves can be observed using a 3 cm gap.
Suggest why the same size gap could not be used to show the diffraction of X-rays.



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(3)

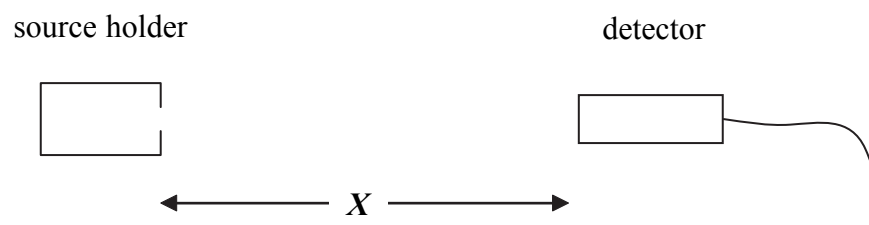
Q9

(Total 11 marks)

TURN OVER FOR QUESTION 10



10. The diagram shows the apparatus used to measure the activity of different radioactive sources. A radioactive source is placed in the holder and its activity is measured using the detector. The distance X can be changed.



- (a) Name a suitable detector.

.....
(1)

- (b) The activity of three sources is measured at three distances X . Each source emits only one type of ionising radiation.

The results are shown in the table.

	activity (Bq)		
	$X = 1 \text{ cm}$	$X = 7 \text{ cm}$	$X = 100 \text{ cm}$
no source	3	2	4
source 1	230	4	3
source 2	230	200	5
source 3	230	233	228

- (i) Why does the detector still record some activity when there is no source in the source holder?

.....
.....
(1)



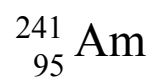
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(ii) Use the results to help you to complete the following table about the three sources.

	type of ionising radiation	charge
source 1		
source 2		negative
source 3	gamma	

(4)

(c) Source 1 is americium-241. The symbol for a nucleus of americium-241 is



(i) How many protons are there in a nucleus of americium-241?

..... (1)

(ii) How many neutrons are there in a nucleus of americium-241?

..... (1)

(iii) Americium-241 is used in home smoke detectors. Suggest why it is used instead of source 2 or source 3.

.....
.....
.....
.....
..... (2)



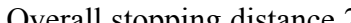


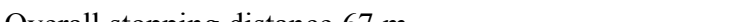



(Total 10 marks)

Q10

TURN OVER FOR QUESTION 11



11. The chart shows the shortest stopping distances for a car travelling at different speeds.

15 m/s	Thinking distance 9 m 	Braking distance 19 m 	Overall stopping distance 28 m 
25 m/s	Thinking distance 15 m 	Braking distance 52 m 	Overall stopping distance 67 m 
35 m/s	Thinking distance 21 m 	Braking distance 102 m 	Overall stopping distance 123 m 

(a) (i) What is meant by the thinking distance?

.....

 (2)

(ii) Use the figures in the chart to show that the thinking time is 0.6 s for each of the speeds shown.

.....

 (3)

(iii) State **two** factors that could affect the thinking time.

1
 2 (2)



Leave
blank

(b) (i) What is meant by the braking distance?

.....

.....

(1)

(ii) Explain why the braking distance increases as the speed of the car increases.

.....

.....

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(2)

Q11

(Total 10 marks)

TOTAL FOR PAPER: 90 MARKS

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