



## FORMULAE

You may find the following formulae useful.

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

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

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}}$$

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

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

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

Where necessary, assume the acceleration of free fall,  $g = 10 \text{ m/s}^2$ .

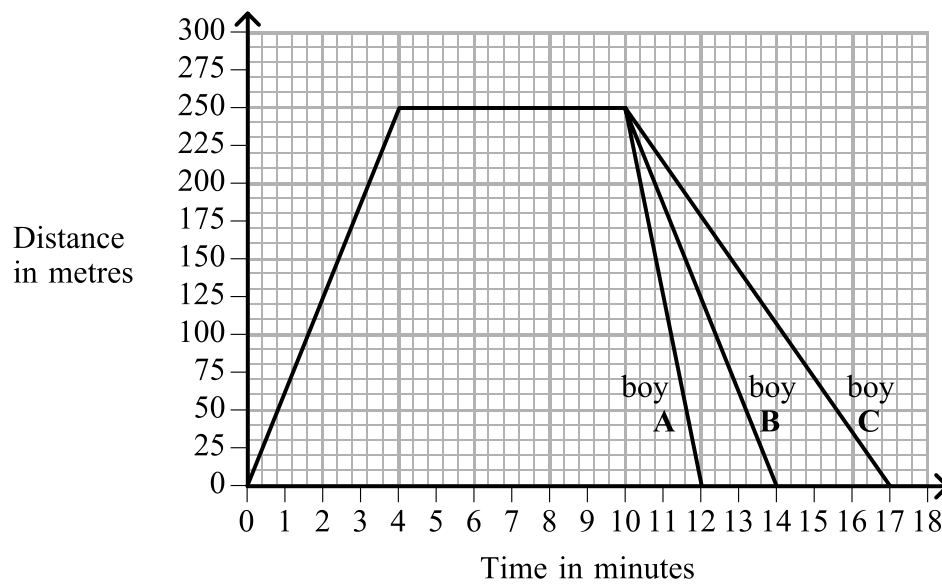


1. Three brothers, **A**, **B** and **C**, all walk together from their home to a shop.

When they leave the shop

- one boy runs home
- one boy walks home
- one boy walks home slowly

The graph shows how their distance from home varies with time.



Complete the spaces in the following sentences.

- (a) The shop is at a distance of ..... metres from the boys' home. (1)
- (b) The boys are in the shop for a time of ..... minutes. (1)
- (c) Boy ..... walks home slowly, boy ..... walks home and boy ..... runs home. (1)
- (d) Boy **C** takes ..... minutes more than boy **A** to get home. (1)
- (e) The slowest boy is away from home for ..... minutes. (1)

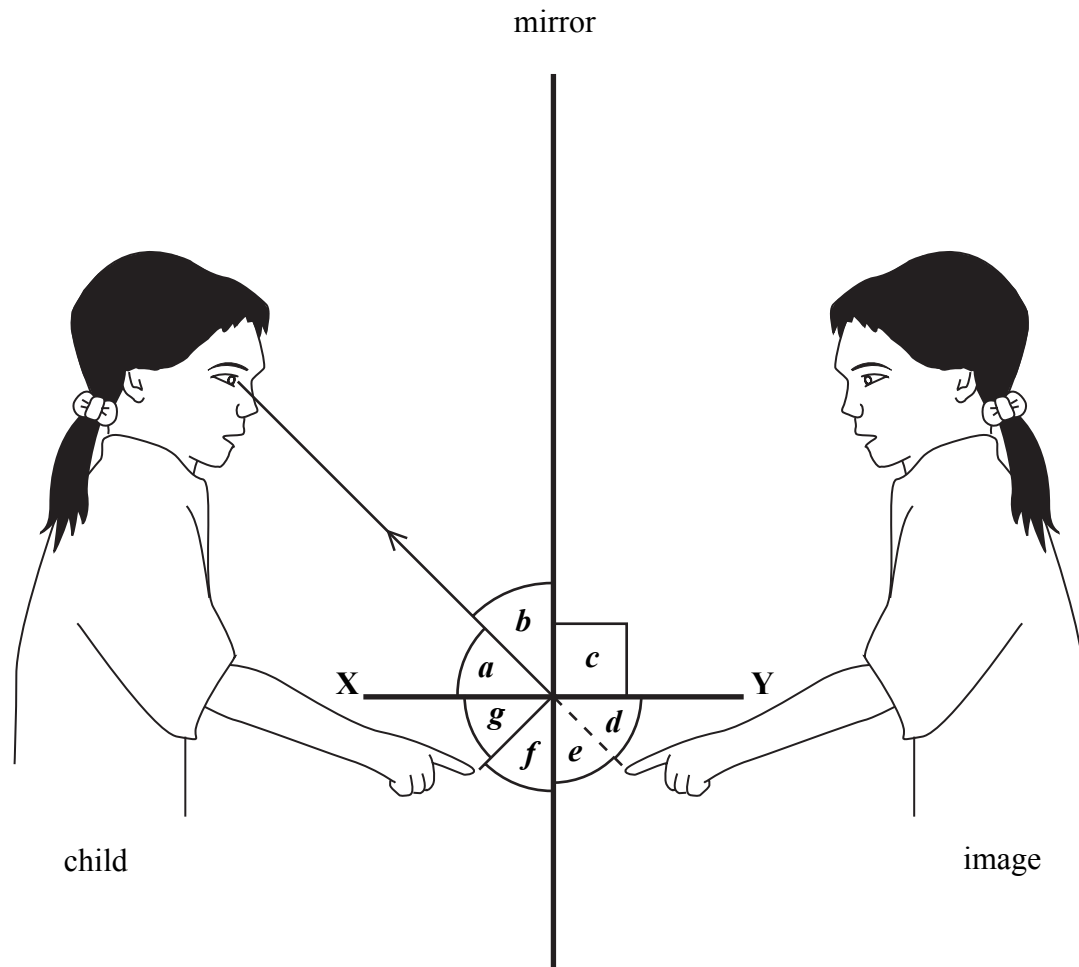
(Total 5 marks)

Q1



Leave blank

2. A child looks at her finger in a plane mirror.



(a) Complete the sentence by putting a cross (☒) in the correct box.

The mirror is described as plane because it is

- flat
- shiny
- vertical

(1)



Leave  
blank

(b) A process takes place at the mirror.

(i) Name this process.

.....  
(1)

(ii) A law applies to this process.

Use **two** of the angles *a*, *b*, *c*, *d*, *e*, *f* and *g*, to write an equation for this law.

.....  
(1)

(iii) Name the line **XY**.

.....  
(1)

(c) The child sees an image in the mirror.

(i) Is this image real or virtual?

.....  
(1)

(ii) How can you tell?

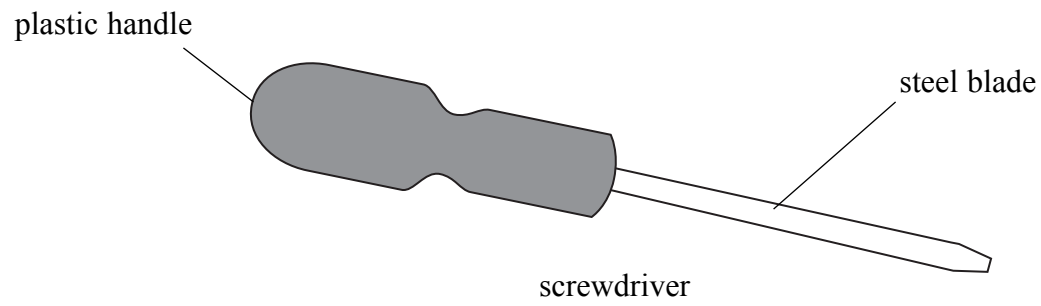
.....  
(1)

(Total 6 marks)

Q2



3. The diagram shows a small screwdriver.



(a) (i) Which part, or parts, can conduct electricity easily? Put a cross (☒) next to the correct answer.

- both parts
- neither parts
- only the blade
- only the handle

(1)

(ii) A child pushes the screwdriver into a mains electricity socket. This is very dangerous. Why?

.....  
.....

(1)

(b) Give an example of **one** device in the home in which electrical heating is used.

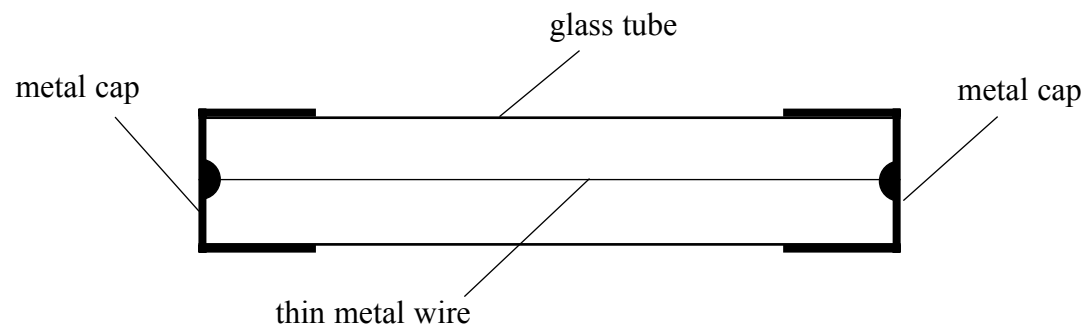
.....

(1)



Leave blank

(c) The diagram shows one kind of fuse.



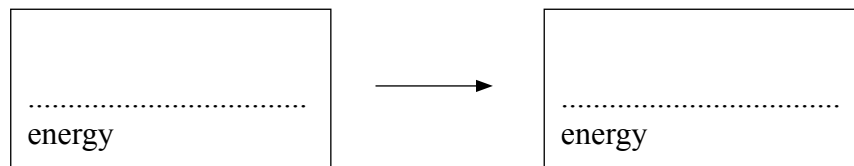
(i) Electricity passes from one end of the fuse to the other. What path does it take?

.....  
.....

(1)

(ii) When there is a current in the fuse a transfer of energy takes place.

Complete the boxes for this transfer.



(2)

(iii) Complete the sentence by putting a cross (☒) in the correct box.

When the current increases, the temperature of the fuse will

- decrease
- increase
- stay the same

(1)

(iv) Explain why fuses are used.

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

(2)

Q3

(Total 9 marks)



Leave blank

4. (a) The box gives the names of several colours in the visible spectrum.

red	orange	yellow	blue	indigo	violet
-----	--------	--------	------	--------	--------

Complete the sentences.

(i) The colours are arranged in order of decreasing ..... (1)

(ii) The colour green is missing from the box.

It should go between ..... and ..... (1)

(b) This box gives the names of several radiations in the electromagnetic spectrum.

radio waves	microwaves	infra-red	ultraviolet	X-rays	gamma rays
-------------	------------	-----------	-------------	--------	------------

Complete the sentences.

(i) The radiations are arranged in order of increasing ..... and decreasing..... (2)

(ii) Visible light is missing from the box.

It should go between ..... and ..... (1)

(iii) All the radiations in the electromagnetic spectrum travel at the same ..... in free space. (1)

(iv) Gamma rays are used to sterilise ..... because gamma rays kill ..... (2)

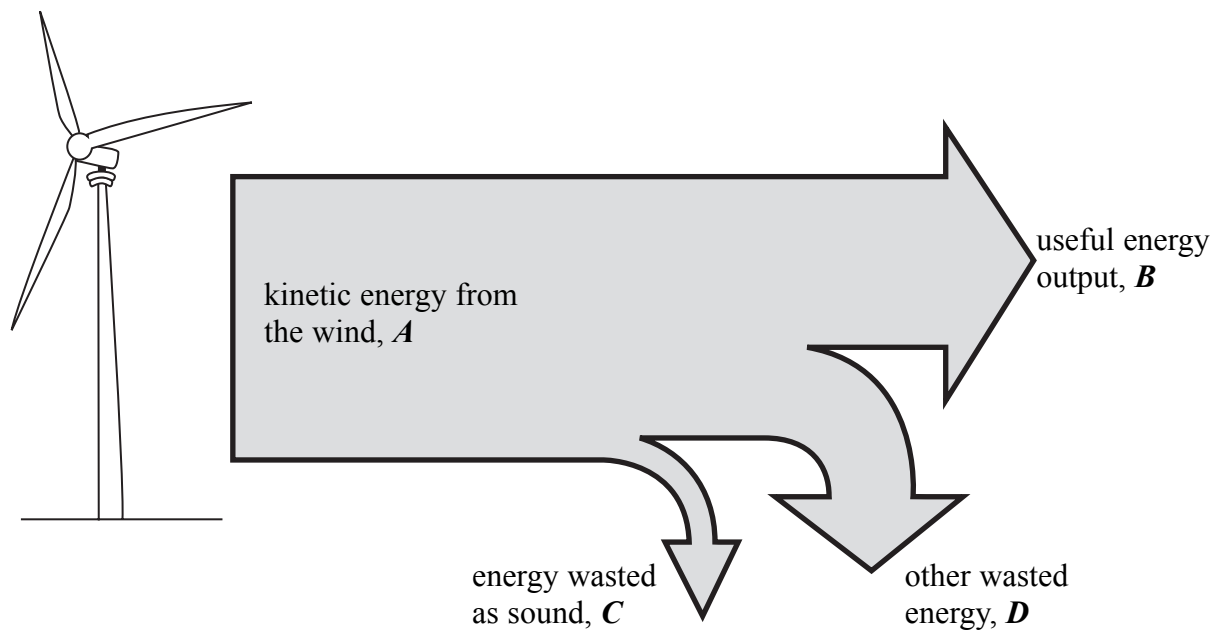
(Total 8 marks)

Q4





5. The diagrams show a wind turbine-generator and the energy flow for the system.

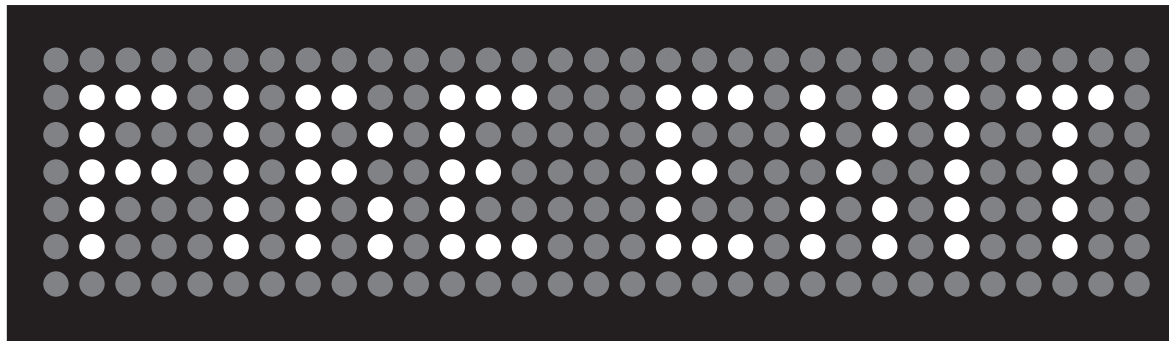


- (a) Complete the equation for the relationship between *A*, *B*, *C* and *D*.  
 $A = \dots\dots\dots$  (1)
- (b) In what form is the useful energy output, *B*?  
 $\dots\dots\dots$  (1)
- (c) In what form is the other wasted energy, *D*?  
 $\dots\dots\dots$  (1)
- (d) Complete the equation for the efficiency of this system.  
 efficiency =  $\dots\dots\dots$  (1)

(Total 4 marks) Q5



6. A student uses a set of LEDs (light emitting diodes) to make a sign. Her sign can be used to show different messages. The diagram shows FIRE EXIT as an example.



(a) (i) Are the LEDs connected in series or in parallel?

..... (1)

(ii) Explain.

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

(b) There is only a very small current in each lit LED. Which unit is used for this current? Put a cross (☒) in the correct box.

- mA
- mC
- mΩ
- mV

(1)



Leave  
blank

(c) Each LED lets charge flow in only one direction. A direct current (d.c.) gives a flow of charge in only one direction.

(i) Which word in the box means the 'rate of flow of charge'?

..... (1)

(ii) Give an example of a d.c. supply.

..... (1)

(d) What does the abbreviation a.c. mean?

..... (1)

(Total 6 marks)

Q6



Leave blank

7. (a) Most atoms contain the following particles

- electrons
- neutrons
- protons

State which of these particles

- (i) is the smallest ..... (1)
- (ii) has no charge ..... (1)
- (iii) has a negative charge ..... (1)
- (iv) are in the nucleus ..... and ..... (1)

(b) Some atoms emit ionising radiations and are described as radioactive.

- (i) Which part of a radioactive atom emits ionising radiations?  
..... (1)

(ii) Which **two** of the following can be used to investigate ionising radiations? Put a cross (☒) next to the **two** correct answers.

- Geiger-Müller detector
- joulemeter
- litmus paper
- newtonmeter
- photographic film
- thermometer

(2)

Q7

(Total 7 marks)



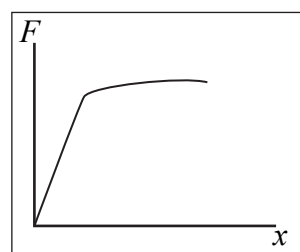
8. (a) Graphs **A**, **B**, **C** and **D** show how the extension  $x$  changes with the applied force  $F$  for different objects.

Draw a line linking each object to its graph.

**Object**

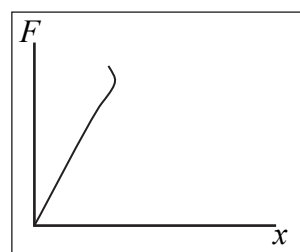
**Graph**

helical spring



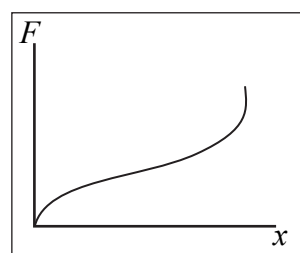
**A**

metal wire

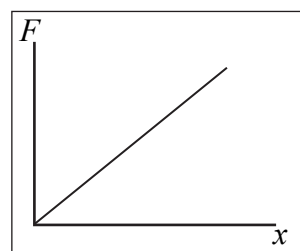


**B**

rubber band



**C**



**D**

(3)

(b) (i) Complete the sentence.

An object obeys Hooke's Law when the ..... and the ..... are ..... proportional to each other.

(2)

(ii) Which of the graphs in (a) is for an object that obeys Hooke's Law throughout?

.....

(1)

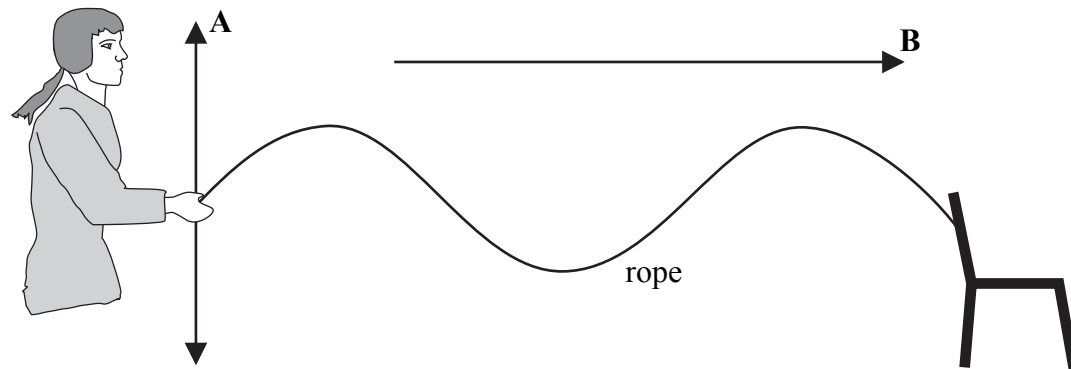
(Total 6 marks)

Q8



9. A student ties one end of a rope to a chair. She uses the rope to demonstrate wave behaviour to her class.

(a) She produces a transverse wave as shown below. **A** is the direction of vibration and **B** is the direction of the wave.

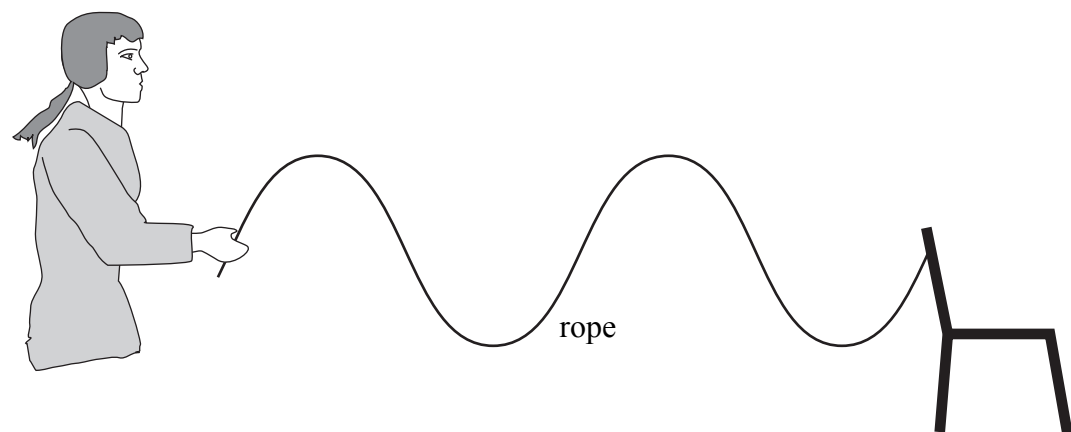


(i) State how the student could increase the amplitude of the wave.

.....  
.....

(1)

(ii) State how the student could decrease the wavelength to produce the wave shown below.



.....  
.....

(2)



Leave  
blank

(b) When the frequency of the wave is 1.5 Hz, the wavelength is 0.80 m. Calculate the speed in m/s of the wave.

.....  
.....

Speed = ..... m/s  
**(3)**

(c) The student then uses a spring to demonstrate the behaviour of a longitudinal wave.



Draw arrows on this diagram to show

- (i) the direction of vibration, and label this **A**.
- (ii) the direction of the wave, and label this **B**.

**(2)**

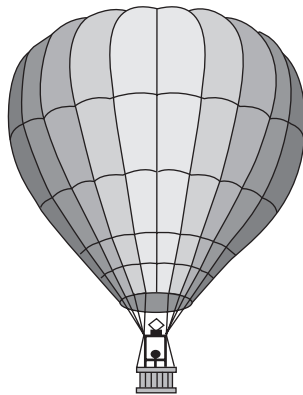
**Q9**

**(Total 8 marks)**



Leave blank

10. The first hot air balloon to cross the Pacific Ocean did so in 1991. It took 46 hours to travel 10 700 km.



- (a) Choose words from the box to complete the sentences.  
Each word may be used once, more than once or not at all.

conduction	contracts	convection	expands	
increases	less	more	radiation	reduces

In a hot air balloon the air inside the balloon is heated.

The heated air ..... and becomes .....  
dense. Some of the air is pushed out of the balloon.

This ..... the mass of air in the balloon and the balloon  
rises. The hot air inside the balloon rises and hence transfers heat energy by a process  
known as ..... Two other processes of transferring heat  
energy are ..... and .....

(6)

- (b) A hot air balloon carries a mass of 3500 kg.

Calculate the weight in N of this mass.

.....

Weight = ..... N  
(2)

Q10

(Total 8 marks)





Leave  
blank

11. (a) Phosphorus-32 (P-32) is a radioactive isotope. It has a half-life of 14 days. It is used to treat some bone diseases. The activity of a sample of P-32 is 10 000 Bq.

(i) What is Bq an abbreviation of?

.....  
(1)

(ii) Calculate the activity, in Bq, of this sample after 28 days.

.....  
.....

Activity = ..... Bq  
(2)

(b) Another radioactive isotope of phosphorus, P-34, has a half-life of 12.4 seconds.

(i) State what is meant by the term **isotope**.

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

(ii) After 28 days, some activity is still detected close to a sample of P-34. What do we call this activity?

.....  
(1)

(c) State two non-medical uses of radioactivity.

1 .....

2 .....

(2) Q11

(Total 8 marks)

**TOTAL FOR PAPER: 75 MARKS**

**END**



**BLANK PAGE**



**BLANK PAGE**



**BLANK PAGE**

