

FORMULAE

You may find the following formulae useful.

$$\text{average velocity} = \frac{\text{displacement}}{\text{time}}$$

$$v = \frac{s}{t}$$

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

$$a = \frac{(v-u)}{t}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$F = m \times a$$

$$\text{gravitational potential energy transferred} = \text{mass} \times \text{acceleration of free-fall} \times \text{change in height} \quad PE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{velocity})^2$$

$$KE = \frac{1}{2} \times m \times v^2$$

$$\text{electrical energy} = \text{voltage} \times \text{current} \times \text{time}$$

$$E = V \times I \times t$$

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

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

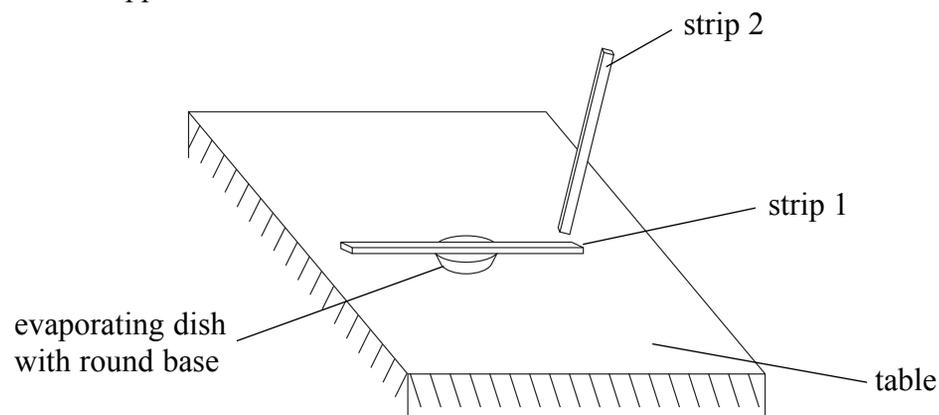
$$\text{work done} = \text{force} \times \text{distance moved in the direction of the force}$$

$$W = F \times s$$



1. Fiona is investigating what happens when two charged, plastic strips are brought close to each other.

She uses this apparatus.



Strip 1 can rotate freely.

- (a) Complete the table to show Fiona's results.

	strip 1 positively charged	strip 1 negatively charged
strip 2 positively charged		attracts
strip 2 negatively charged		
strip 2 no charge		attracts

(4)

- (b) Put a cross (☒) in the correct box to complete each sentence and explain what happens.

Fiona made strip 1 positively charged by rubbing it with a duster.

electrons

- (i) This caused neutrons to move from the strip onto the duster.

protons

negative

- (ii) This gave the duster a positive charge.

zero

(2)

Q1

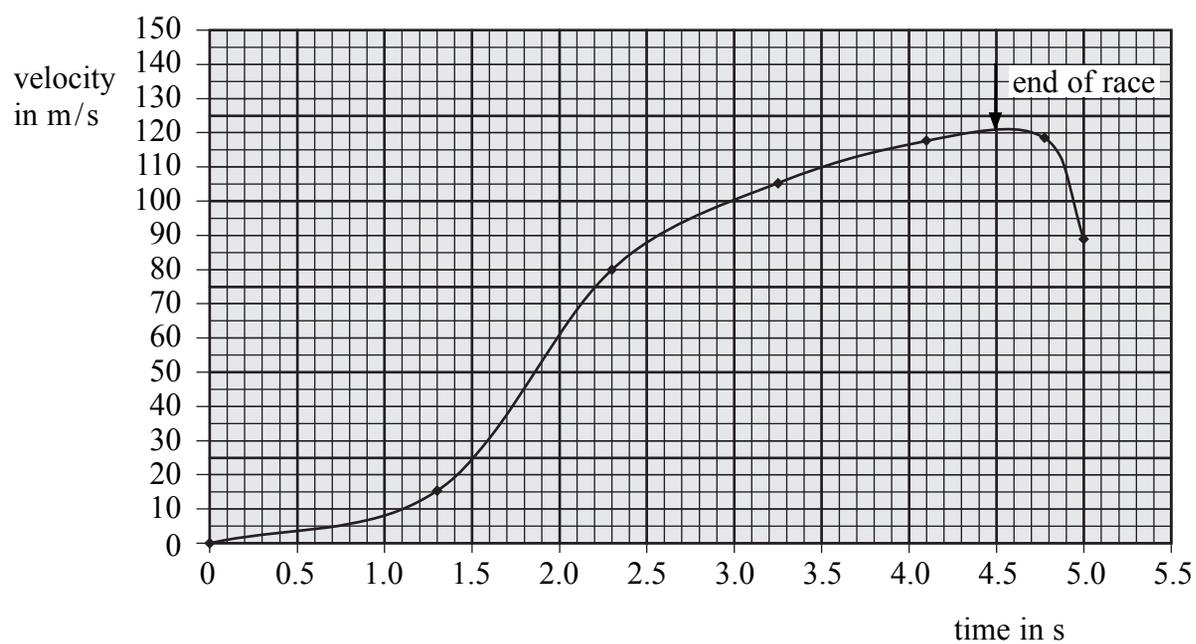
(Total 6 marks)



2. Jason and Chris are watching a drag race.



They write down the velocity of the winning car at different times during the race. Afterwards, they make a graph from the velocities and the times. This is their graph.



(a) Mark on the graph

(i) with an A, where the acceleration is largest

(1)

(ii) with an S, where the car is slowing down.

(1)



(b) What is the velocity of the car when the time is 3.5 s?

velocity = m/s
(1)

(c) At the end of the race (as shown on the graph) the cars have travelled 270 m.

Calculate the average velocity of the car during the race.

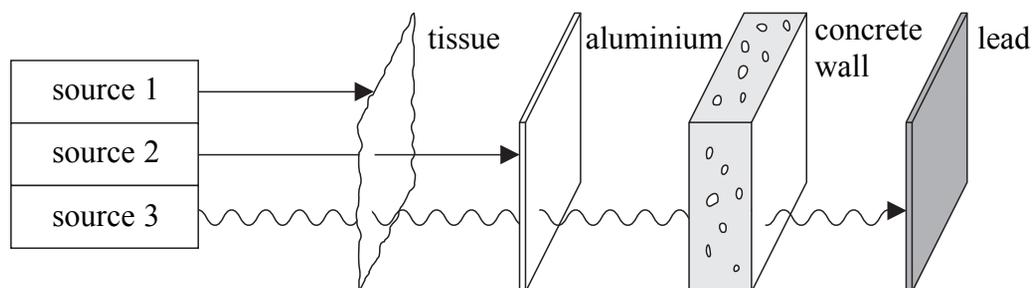
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average velocity = m/s
(2)

Q2

(Total 5 marks)

3. (a) Sohan is revising for a test.
This is part of his notes on radioactivity.



His diagram shows three radioactive sources and the radiations they emit.
Use the information in the diagram to help you identify the radiations.
Draw one straight line from each source to the radiation it emits.

source 1 •	• gamma rays
source 2 •	• alpha particles
source 3 •	• beta particles

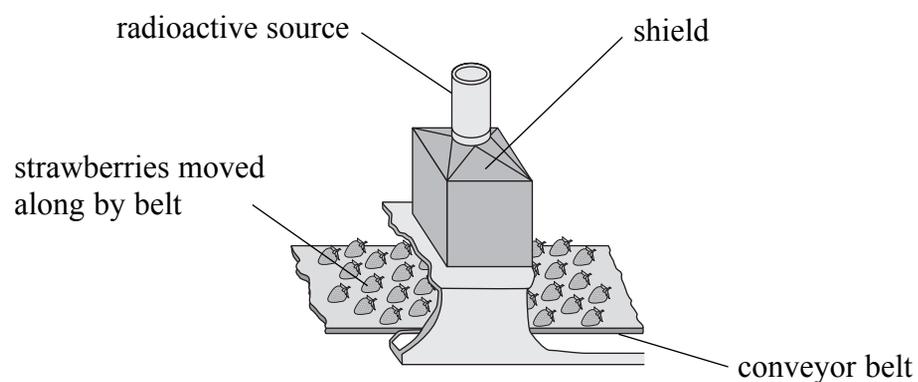
(2)



- (b) Sohan's father, Carl, is a market gardener who grows strawberries. Carl wants his strawberries to stay fresh for longer.



The diagram shows how this could be done using a radioactive source.



Put a cross (☒) in the correct box to complete each sentence.

- (i) Carl uses **alpha particles** **beta particles** **gamma rays** because they are best at penetrating through the strawberries. (1)

- (ii) This process is called **evaporation** **ionisation** **radiation** treatment and it works by killing bacteria. (1)



Leave
blank

(iii) Some people are worried by this treatment.
Suggest why.

.....

.....

(1)

(c) The radiation from Carl's radioactive source can be dangerous.

(i) Describe one way in which the radiation can be harmful to him.

.....

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(1)

(ii) Suggest one precaution that Carl should take when using the radioactive source.

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(1)

(Total 7 marks)

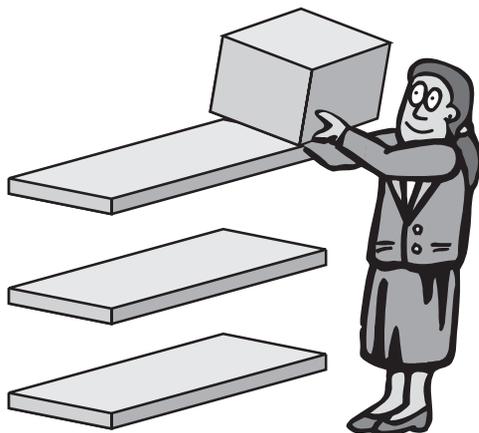
Q3



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4. Jasmine is stacking shelves at her local supermarket.



She lifts 4 boxes from the floor to the top shelf.
The top shelf is 1.5 m from the floor.
Each box has a mass of 5.0 kg.

(a) Calculate the total gravitational potential energy she transfers to the 4 boxes.

acceleration of free-fall = 10 m/s^2

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.....

gravitational potential energy = J
(2)

(b) How much work is done on the boxes?

work done = J
(1)

(c) Sometime later, Jasmine does 2400 J of work in 48 s.
Calculate her power output.

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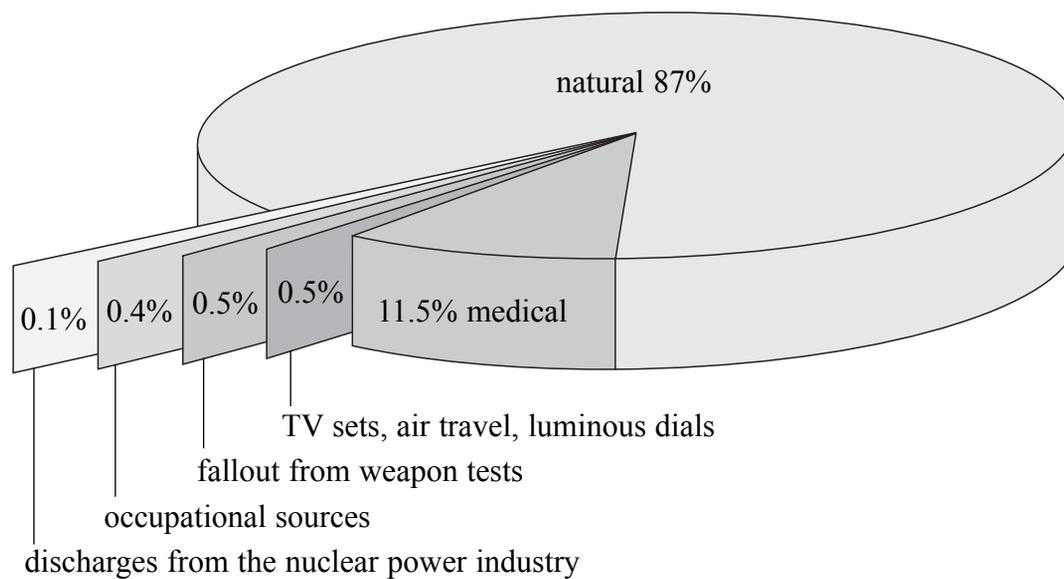
power = W
(2)

(Total 5 marks)

Q4



5. (a) The diagram shows the sources of the radiation that people are exposed to in the UK



(i) Use the data to find the percentage produced by non-natural sources.

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.....
.....

(2)

(ii) State one medical use of radioactive isotopes for diagnosis.

.....

(1)

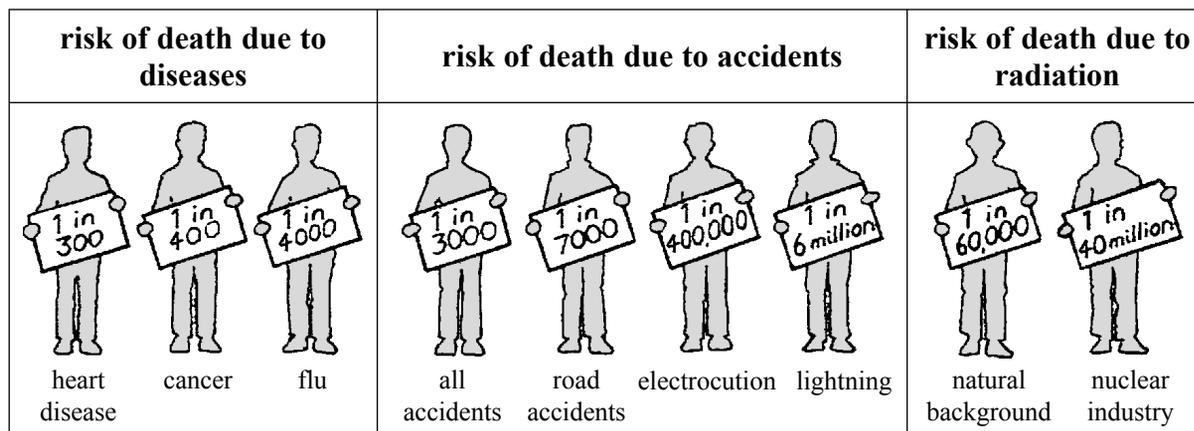
(iii) State one medical use of radioactive isotopes for treatment.

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(1)



(b) The diagram shows the risk of being killed by different causes.



Some people argue that the nuclear industry increases the risk of death due to radiation.

Do the numbers shown support this argument? Explain your answer.

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(3)

Q5

(Total 7 marks)

TOTAL FOR PAPER: 30 MARKS

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