

FORMULAE

You may find the following formulae useful.

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

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

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

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

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

$$F = m \times a$$

$$\text{change in potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height} \quad PE = m \times g \times h$$

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

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

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

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

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

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

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

$$W = F \times s$$



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1. Anya is a technician in a hospital.

In her job she uses both X-rays and gamma rays.



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

	killing cancer cells	<input checked="" type="checkbox"/>
Gamma rays are used for	looking for broken bones	<input checked="" type="checkbox"/>
	taking pictures of unborn babies	<input checked="" type="checkbox"/>

(1)

(b) Suggest one precaution that Anya needs to take when she uses X-rays.

.....
.....

(1)

Q1

(Total 2 marks)

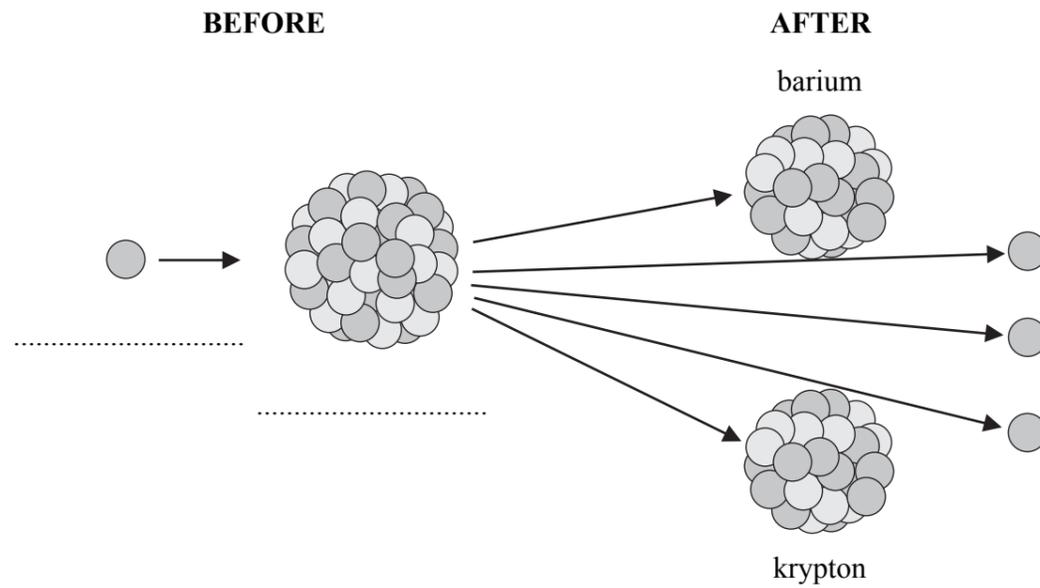
3

Turn over



Leave blank

2. The diagram shows the fission of uranium-235.



(a) Use words from the box to label the diagram.

electron	neutron	uranium
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(2)

(b) The fission of uranium-235 can produce a nuclear chain reaction.

(i) State one peaceful use of a nuclear chain reaction.

.....
.....

(1)

(ii) State one destructive use of a nuclear chain reaction.

.....
.....

(1)

(Total 4 marks)

Q2



Leave blank

3. Five quantities are shown in the boxes on the left.
Draw one straight line from each quantity to its correct description.
One has been done for you.

quantity

description

energy	●	●	ability to do work
weight	●	●	amount of matter in an object
mass	●	●	rate of change of velocity
acceleration	●	●	downward pull of gravity
velocity	●	●	distance in a given direction
		●	rate of doing work
		●	speed in a given direction

(Total 4 marks)

Q3

5

Turn over



N 3 6 4 7 2 A 0 5 1 2

Leave blank

4. The diagram shows the structure of an alpha particle.
Alpha particles are positively charged.

alpha
particle



key

- proton
● neutron

- (a) Add electrons to the diagram **below** to show the structure of a helium atom.

helium
atom



key

- proton
● neutron
× electron

(2)

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

A helium atom is

negatively charged	<input type="checkbox"/>
not charged	<input type="checkbox"/>
positively charged	<input type="checkbox"/>

(1)

Q4

(Total 3 marks)



Leave blank

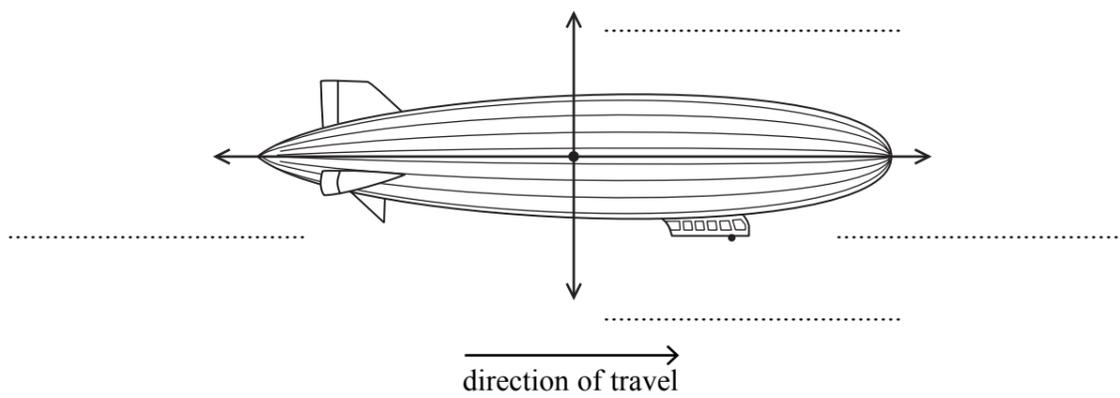
5. In October 2008, a tour company started using a Zeppelin for flights around San Francisco.

A Zeppelin is a type of balloon (airship) that carries passengers.

(a) The Zeppelin shown below is travelling at constant speed and at constant height.

Complete the diagram by adding the following labels to the force arrows.

air resistance	lift	thrust	weight
----------------	------	--------	--------



(2)

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

When the Zeppelin moves at constant speed and constant height,

	is bigger than	<input checked="" type="checkbox"/>	
the thrust	is equal to	<input checked="" type="checkbox"/>	the air resistance.
	is smaller than	<input checked="" type="checkbox"/>	

(1)

(c) The upward force is now decreased.

Describe what happens to the movement of the Zeppelin.

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

(1)

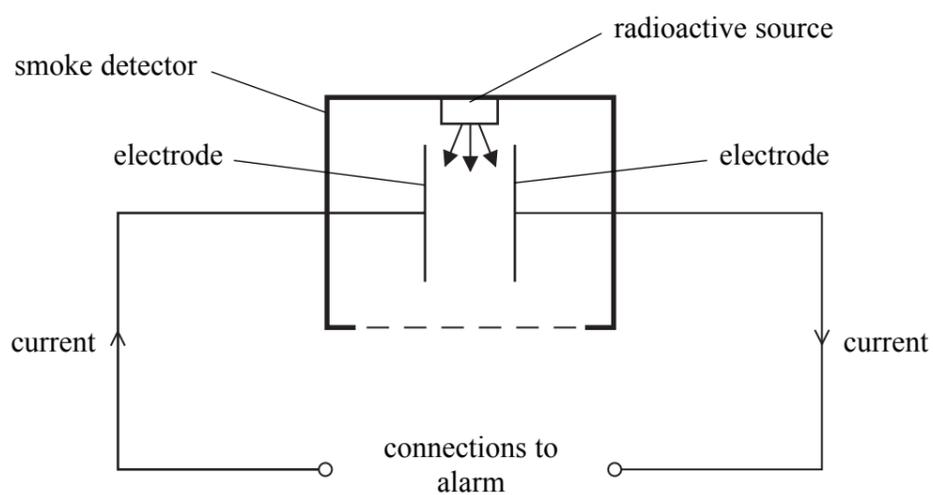
Q5

(Total 4 marks)



Leave blank

6. This smoke detector is an example of how radioactivity is used to good effect.



It uses americium-241.
Americium-241 emits alpha particles.

(a) The following sentences describe how a smoke alarm works.
The sentences are not in the correct order.
Put them into the correct order by numbering the boxes.
One has been done for you.

action	order
The alpha particles ionise the air.	
The circuit is broken and the alarm sounds.	
The ions complete a circuit.	
While this circuit is complete the alarm does not sound.	3
When smoke particles enter the cell, the ionisation is reduced.	

(3)





<p>(b) Alpha, beta and gamma radiations are emitted by radioactive sources.</p> <p>(i) What is beta radiation?</p> <p>.....</p> <p style="text-align: right;">(1)</p> <p>(ii) Describe what gamma rays are.</p> <p>.....</p> <p>.....</p> <p>.....</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;">(Total 6 marks)</p>	Leave blank
	Q6

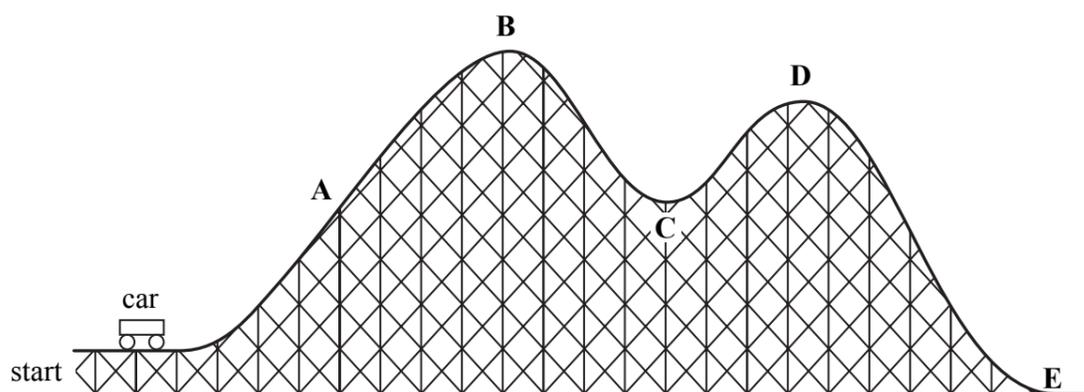


N 3 6 4 7 2 A 0 9 1 2



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7. The diagram shows a roller-coaster ride.
The car is pulled from the start to point **B** and is then released.



- (a) Choose a letter from the diagram to complete each sentence below.
- (i) The car has the most gravitational potential energy at point (1)
- (ii) The car is going fastest at point (1)
- (b) An electric motor is used to pull the car from the start to point **B**.
It takes 25 s for the car to reach point **B**.
The motor works at a voltage of 1400 V and a current of 4.5 A.
- Calculate the electrical energy supplied to the motor.

electrical energy = J
(2)



Leave
blank

- (c) The mass of the car is 900 kg.
The maximum speed of the car is 15 m/s.

Calculate the maximum kinetic energy of the car.

maximum kinetic energy = J
(2)

- (d) Explain why the maximum kinetic energy is much less than the electrical energy transferred by the motor.

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

(Total 7 marks)

Q7

TOTAL FOR PAPER: 30 MARKS

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