
GCSE Physics

Test 1

Time Allowed: 1 Hour

Total Marks: 60

29 September 2023

Calculator Allowed

Full Name of Student:

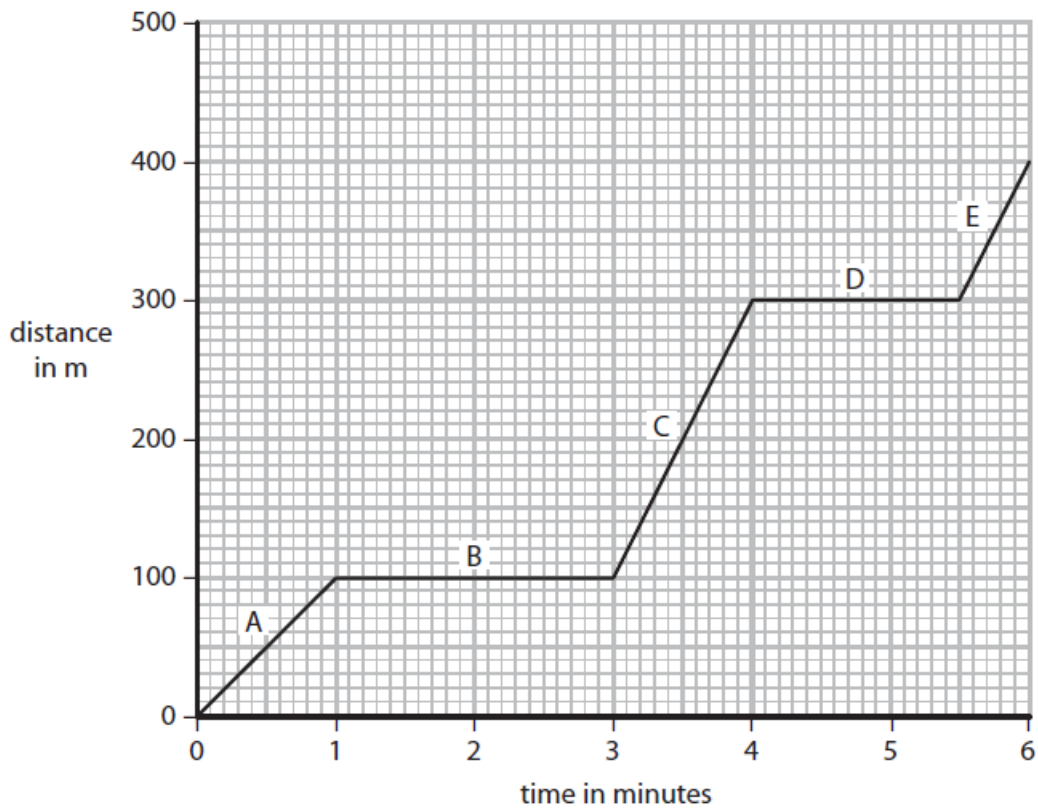
1.

A car travels along a very busy road.



© AnRo0002 (Wikipedia)

The graph shows how the distance travelled by the car changes during a six-minute period.



(a) Calculate the total amount of time the car is stationary during this period.

(2)

time = minutes

(b) Explain which stage of the graph, A, B, C, D or E, shows the car moving at the slowest speed.

(2)

(c) (i) State the equation linking average speed, distance moved and time taken.

(1)

(ii) Calculate the speed of the car at stage C.

Give a suitable unit for your answer.

(3)

speed = unit

(d) State two factors that could affect the braking distance of the car.

(2)

[Total for Question 1 = 10 marks]

2.

This question is about parts of the electromagnetic spectrum.

gamma rays	x-rays		visible light	infrared waves	microwaves	radio waves
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(a) Name the missing part of this spectrum.

(1)

(b) Which part of this spectrum has the shortest wavelength?

(1)

(c) Explain how the frequency of electromagnetic waves in free space differs with increasing wavelength.

(2)

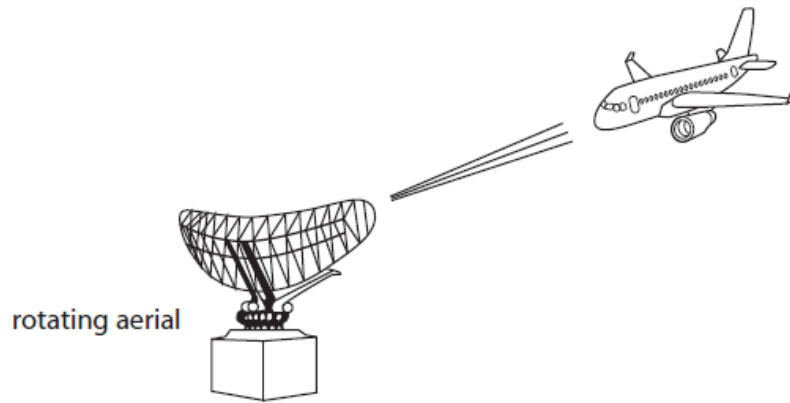
(d) Microwaves are used to heat food.

State another part of the spectrum that is used to heat food.

(1)

(e) Microwaves are used at airports to detect aeroplanes.

A microwave beam is emitted from a large rotating aerial and reflected back off the metal surface of the aeroplane.



(i) Explain how microwaves are used to find the distance to an aeroplane.

(3)

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(ii) Suggest why it is important for the aerial to rotate through a full circle every two seconds.

(1)

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[Total for Question 2 = 9 marks]

3.

(a) Which of these is a scalar quantity?

(1)

- A weight
- B mass
- C momentum
- D velocity

(b) Which of these is a vector quantity?

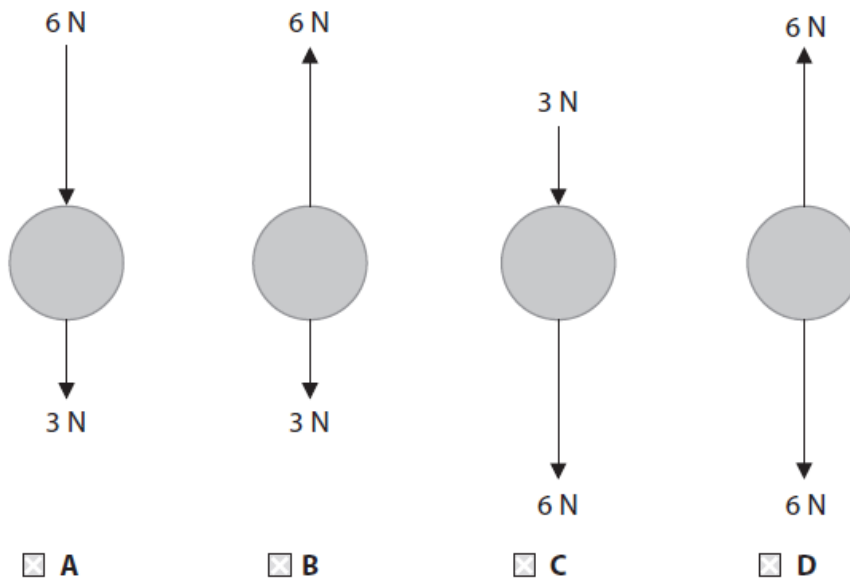
(1)

- A acceleration
- B temperature
- C charge
- D density

(c) The diagrams show the forces acting on four balls falling in air.

Which diagram shows a ball decelerating as it falls?

(1)



[Total for Question 3 = 3 marks]

4.

The table gives some measurements about a raindrop.

mass of raindrop	0.000 035 kg
distance raindrop falls	1200 m
speed of raindrop as it hits the ground	8.8 m/s

(a) (i) State the relationship between momentum, mass and velocity. (1)

(ii) Calculate the momentum of the raindrop as it hits the ground.
Give the unit. (3)

momentum = unit

(b) (i) State the equation linking gravitational potential energy, mass, g and height. (1)

(ii) Calculate the change in gravitational potential energy (GPE), when the raindrop falls 1200 m above the ground. (2)

GPE = J

(iii) State the kinetic energy (KE) of the raindrop as it hits the ground.
[assume no energy losses] (1)

KE = J

(c) (i) State the equation linking kinetic energy, mass and speed.

(1)

(ii) Show that the speed of the raindrop as it hits the ground would be about 150 m/s.
[assume no energy losses]

(3)

(iii) Explain why the actual speed of the raindrop as it hits the ground is much less than 150 m/s.

(2)

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[Total for Question 4 = 14 marks]

5.

Tritium is an isotope of hydrogen that decays by emitting beta particles.

It is used in some luminous signs.

(a) (i) The symbol for tritium is ${}^3_1\text{H}$.

Determine the number of protons and the number of neutrons in a single atom of tritium.

(2)

number of protons

number of neutrons

(ii) Describe three differences between an alpha particle and a beta particle.

(3)

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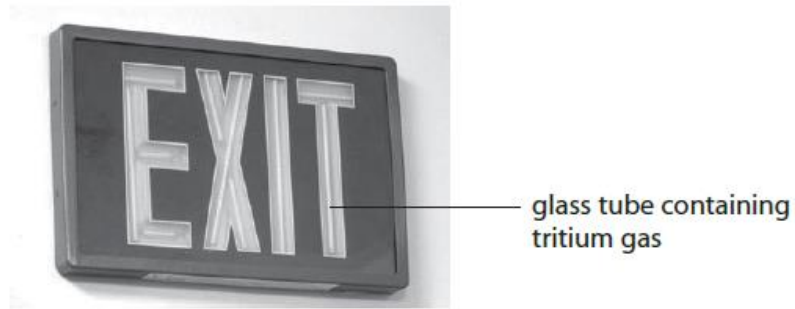
(iii) Suggest why tritium cannot emit alpha particles.

(1)

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(b) Tritium is used in this luminous sign.



In this sign

- the letters are made up of glass tubes containing tritium gas
- the inside of each tube is coated with a phosphor
- the phosphor emits light when beta particles hit it

Suggest why this sign is safe to use even though beta particles are ionising and can be dangerous.

(2)

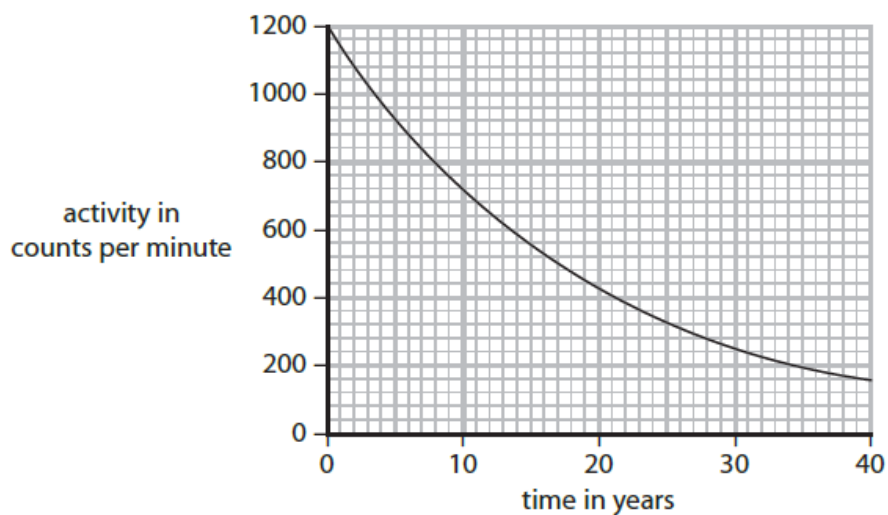
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(c) The graph shows how the activity of tritium in this luminous sign varies with time.



(i) Explain what is meant by the term **half-life**.

(2)

(ii) Use the graph to estimate the half-life of tritium.

Show your working.

(2)

half-life = years

(d) The manufacturer of this luminous sign claims that the sign will work for more than 20 years.

The minimum activity required for the tubes to emit sufficient light is 400 counts per minute.

Evaluate the manufacturer's claim.

(2)

[Total for Question 5 = 14 marks]

6.

(a) A student measures the weight of a cannonball as 50 N.

(i) Name a piece of equipment he could use to measure the weight.

(1)

(ii) State the equation relating weight, mass and g .

(1)

(iii) Calculate the mass of the cannonball.

(2)

mass = kg

(b) Describe how the student could find the density of the cannonball.

You should include details of any further measurements he would need to make.

(3)

(c) A cannonball is fired from a cannon.

When the cannonball is fired, the cannon moves in the opposite direction, as shown in the diagram.



Using ideas about momentum, explain why the cannon moves in the opposite direction to the cannonball.

(3)

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[Total for Question 6 = 10 marks]

- End of Test -