



Centre Number

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Candidate Number

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General Certificate of Secondary Education
2017–2018

Double Award Science: Physics

Unit P1
Higher Tier

ML

[GDW32]

FRIDAY 23 FEBRUARY 2018, MORNING

TIME

1 hour, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **3(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

Total Marks	
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1 A monkey climbs a tree.



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- (a) The monkey has a mass of 2.5 kg. Calculate the potential energy of the monkey when it is at a height of 12 m.

You are advised to show your working out.

Potential energy = _____ J [3]

- (b) Another monkey does 8000 J of work climbing a tree. Calculate the power developed by the monkey if it takes 40 s to climb the tree.

You are advised to show your working out.

Power = _____ W [3]

Examiner Only	
Marks	Remark
○	○

2 Matter is made up of protons, neutrons and electrons.

(a) Complete the table below to show the location of each particle.

Particle	Location
Proton	
Neutron	
Electron	

[3]

Some nuclei are said to be radioactive and emit radiation.

(b) (i) Why are the nuclei radioactive?

_____ [1]

Two types of radiation emitted are alpha and beta.

(ii) Write the name of the particles that make up an alpha particle.

_____ [1]

(iii) What is a beta particle?

_____ [1]

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Marks	Remark
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(Questions continue overleaf)

- 3 (a) This is a question about a Hooke's Law investigation.
You are given a spring and a number of masses in kg.

State:

- how you would calculate the applied force;
- what measuring instrument you would need to find the extension;
- the measurements you would take and how you would use them to find the extension;
- the graph you would expect to see if you plotted applied force against extension.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

Calculate the applied force.

Measuring instrument to find extension.

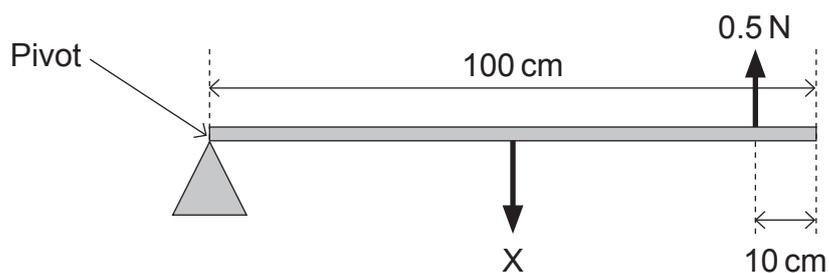
Finding the extension.

The graph you would expect to see.

[6]

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Marks	Remark
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- 4 A uniform metre rule is held in a horizontal position by exerting a vertical force of 0.5 N as shown.



- (i) A force X acts downwards at the mid-point of the ruler. Write down the name of this force.

_____ [1]

- (ii) What is the name of the mid-point of the metre rule?

_____ [1]

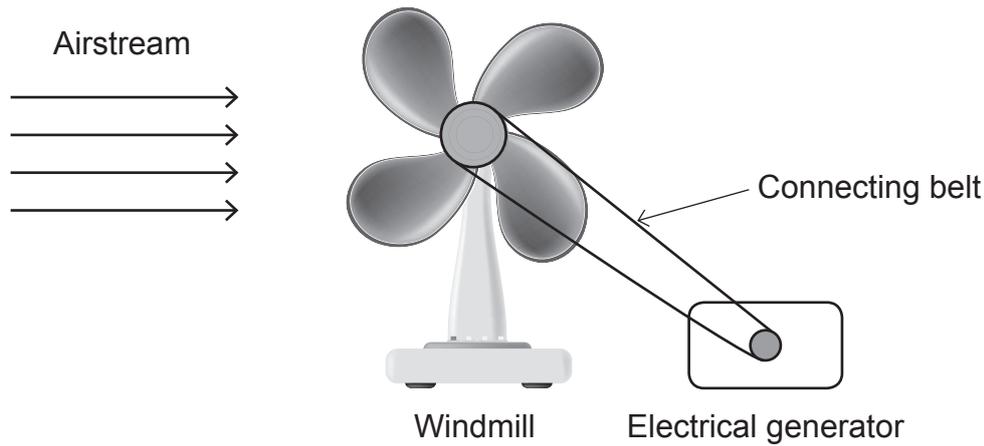
- (iii) Use the Principle of Moments to calculate the force X.

You are advised to show your working out.

Force X = _____ N [4]

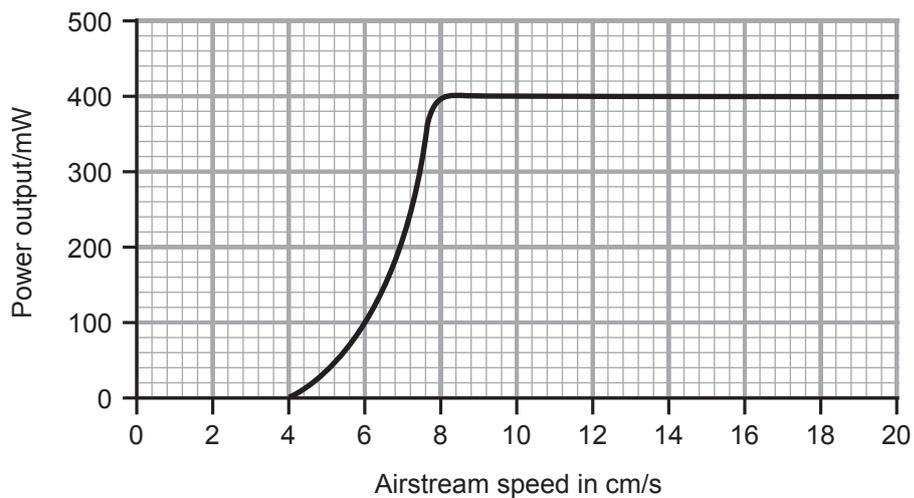
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Marks	Remark
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- 6 An airstream turns the blades of a windmill. The windmill then powers an electrical generator.



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Look at the graph below. It shows how the power output, in **milliwatts**, of the generator depends on the speed of the airstream that hits the windmill blades.



- (a) At what airstream speed do the blades of the windmill begin to turn?

Airstream speed = _____ cm/s [1]

Examiner Only	
Marks	Remark
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- (b) How many joules of electrical energy are produced in **one minute** by the generator when the power output is a maximum?

You are advised to show your working out.

Energy = _____ J [3]

The generator has an efficiency of 0.25. During a certain time interval it produces 150 J of electrical energy.

- (c) Calculate the amount of energy **wasted** by the generator during this time interval.

You are advised to show your working out.

Energy wasted = _____ J [4]

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Marks	Remark

7 (a) Radioactive emissions can cause dangerous ionisations.

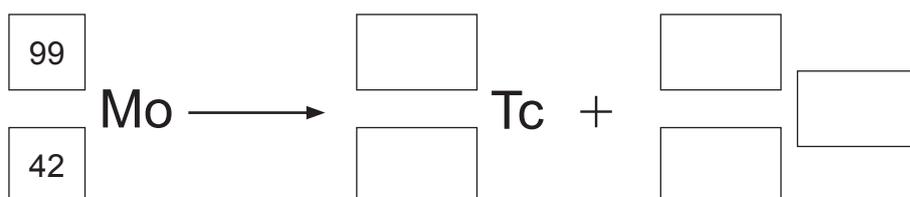
Explain what is meant by ionisation.

State two different ways workers can protect themselves from danger when using radioactive substances.

[4]

An isotope called technetium (Tc) is often used in medicine. It is made when molybdenum (Mo) emits a beta particle.

(b) Write the symbol in the correct box below for the beta particle and then complete the decay equation.

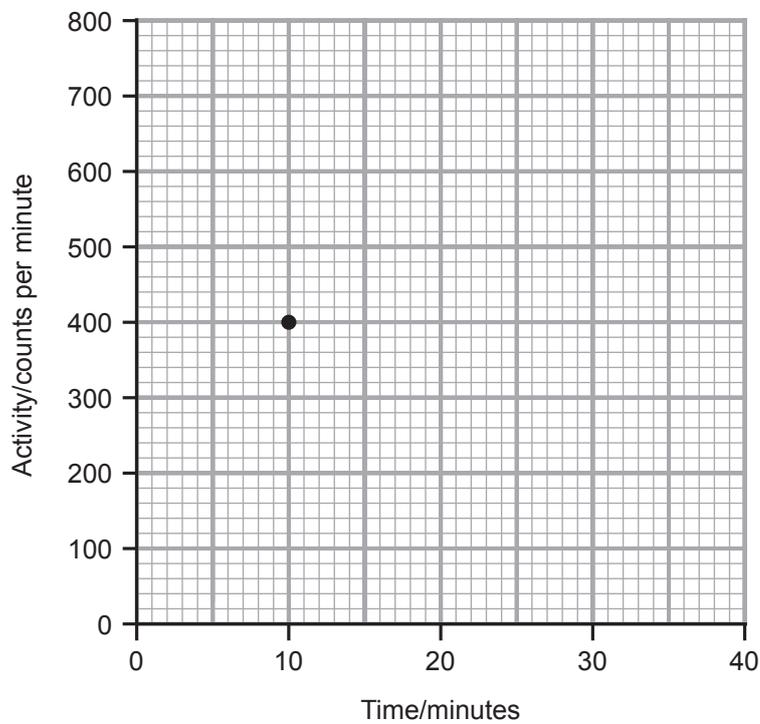


[5]

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The rate at which an isotope decays depends on its half-life. The half-life of a radioactive substance is 10 minutes. One point of its decay curve is shown on the grid below.

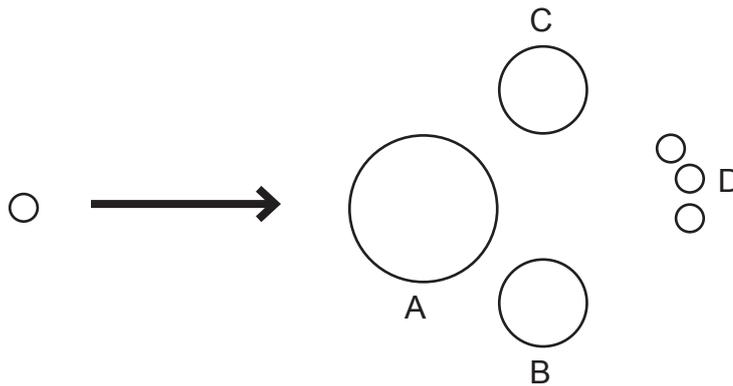
- (c) On the grid, plot points to show the activity for the following times: 0, 20 and 30 minutes.



[3]

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8 Look at the diagram below. It represents nuclear fission.



The various particles involved are labelled A, B, C and D.

(a) (i) What particle, A, B, C or D, represents the fuel?

Particle _____ [1]

(ii) Name a suitable fuel.

_____ [1]

(iii) What particle, A, B, C or D, is responsible for sustaining the chain reaction?

Particle _____ [1]

(iv) Write the name of the particle that initiates the fission reaction.

_____ [1]

(b) An advantage of using nuclear fission is that the process does not involve emission of greenhouse gases. However, the emission of greenhouse gases remains a criticism of the nuclear industry. State one reason why.

_____ [1]

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- 9 A sprinting athlete reaches a maximum velocity of 9 m/s.
The average velocity of the athlete is 6 m/s during this sprint.



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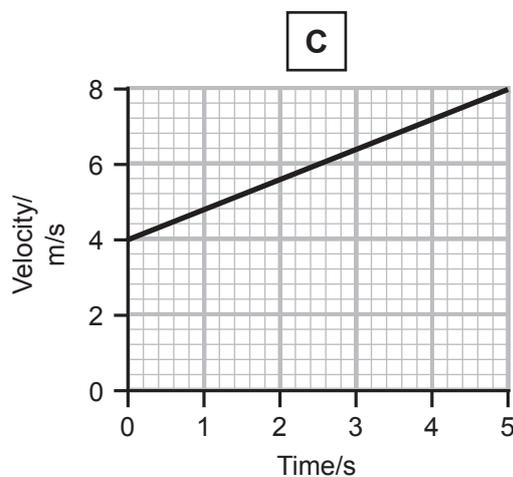
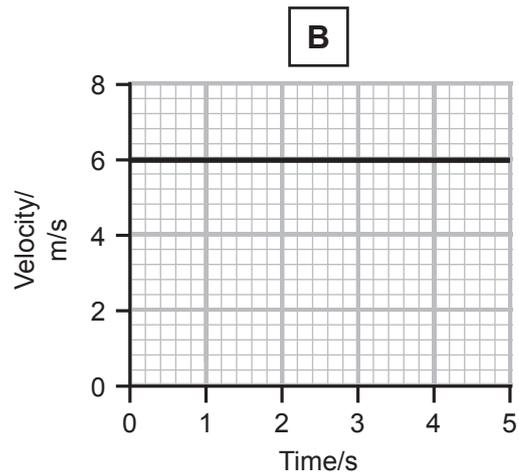
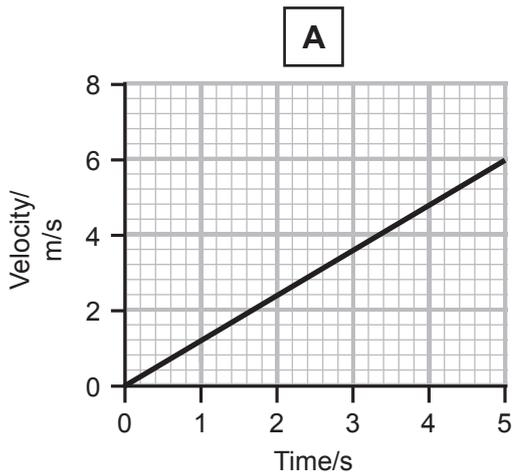
- (a) Calculate his initial velocity.

You are advised to show your working out.

Initial velocity = _____ m/s [3]

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Below are velocity-time graphs for three objects.



Choose from letters A, B, or C to answer the following.

(b) (i) What graph(s) shows constant (non-zero) acceleration?

Letter(s) _____ [2]

(ii) What graph(s) shows constant velocity?

Letter(s) _____ [1]

(iii) In what graph(s) are the forces acting on the object balanced?

Letter(s) _____ [1]

(iv) If each object has the same mass, what graph shows the object moving with greatest kinetic energy at 5 seconds?

Letter _____ [1]

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Each body in the three graphs has a mass of 3 kg.

(c) Find the resultant force acting on the object in graph C.

You are advised to show your working out.

Resultant force = _____ N [6]

THIS IS THE END OF THE QUESTION PAPER

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