New Specification

cea
Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Double Award Science: Physics

Unit P1

Higher Tier

GDW32

[GDW32]

FRIDAY 23 FEBRUARY 2018, MORNING

TIME

1 hour.

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	

11524

BLANK PAGE

1 A monkey climbs a tree.

© mariusz_prusaczyk / iStock / Thinkstock

(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]

11524

[Turn over

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) Name the particles that make up an alpha particle.

_____ [1]

(iii) What is a beta particle?

_____ [1]

Examiner Only
Marks | Remark

BLANK PAGE

(Questions continue overleaf)

5

3 **(a)** This is a question about a Hooke's Law investigation.
You are supplied with 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]

6

A helical spring has an unextended length of 200 mm. A load of 3 N produces an extension of 9 mm.

3 N

© Thinkstock Images / Stockbyte / Thinkstock

(b) Calculate the total length of the spring when an **additional** 2 N is added to the spring.

You are advised to show your working out.

Total length of spring = _____ mm [3]

[Turn over

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

Pivot

0.5 N

100 cm

X

10 cm
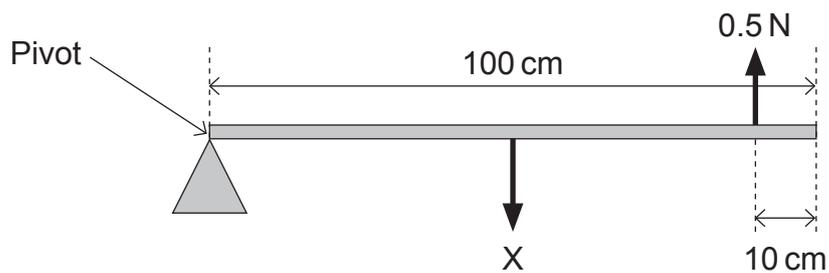
(i) A force X acts downwards at the mid-point of the ruler. Name this force.

_____ [1]

(ii) What name is given to 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]

5 A container has a weight of 2.0 N. Water is then added to the container.
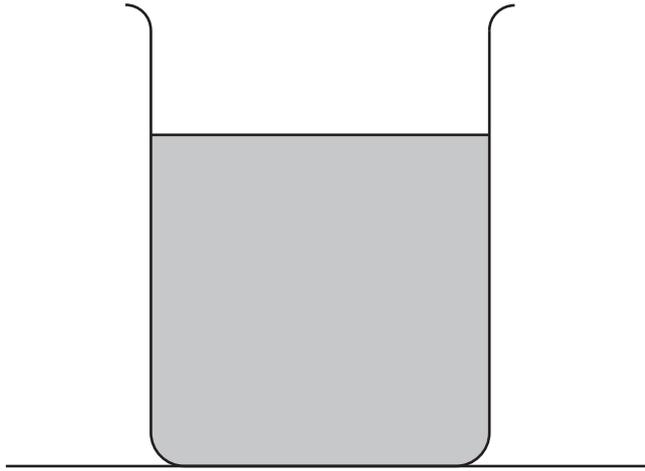
The container and water exert a pressure of 35 N/m^2 on the table.
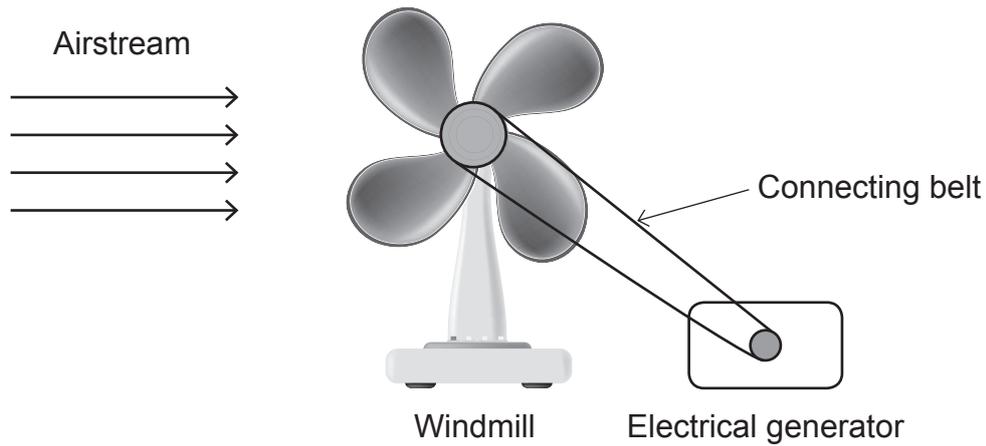The base area of the container is 0.2 m^2.

Calculate the weight of water which has been added.

You are advised to show your working out.
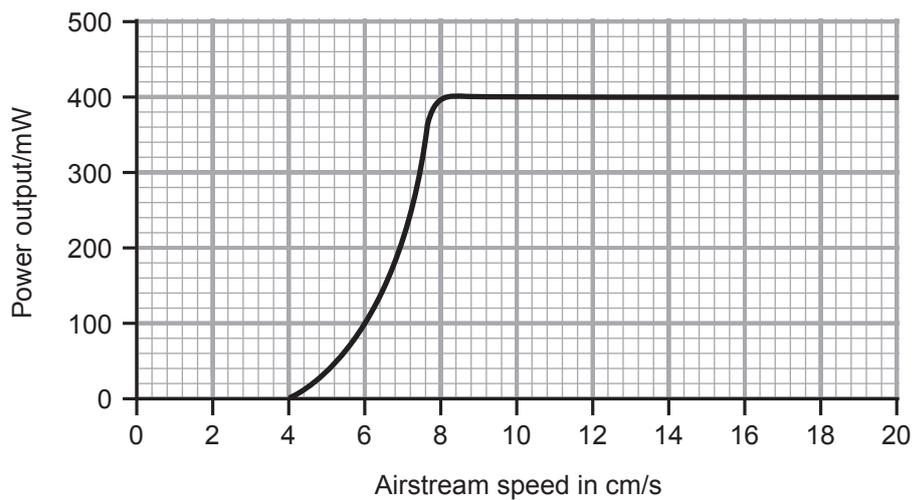
Weight of water added = _____ N   [4]

11524   **9**   **[Turn over**

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

Airstream

Connecting belt

Windmill   Electrical generator

© valeo5 / iStock / Thinkstock

The graph shows how the power output, in **milliwatts**, of the generator depends on the speed of the airstream which hits the windmill blades.

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

Airstream speed = _____ cm/s [1]

11524

10

(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 and 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]

11524

11

[Turn over

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.
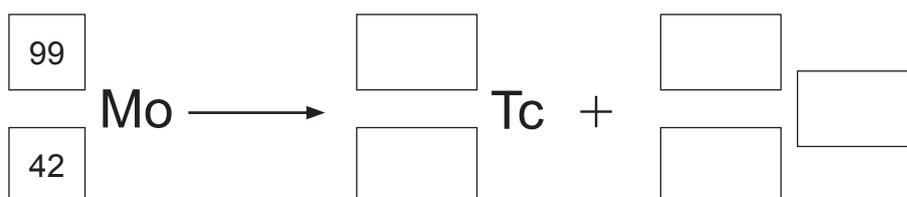
_____

_____ [4]

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

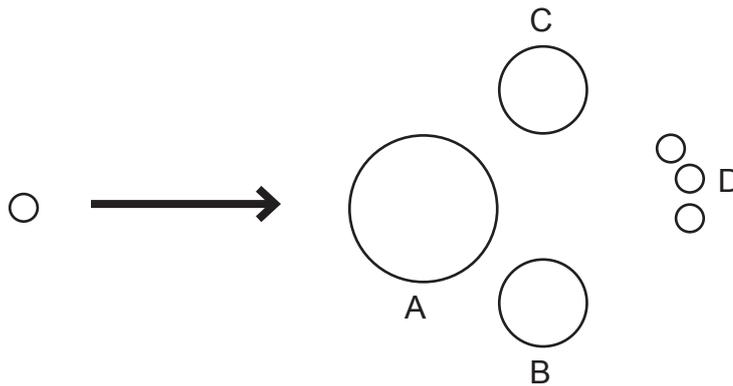**(b)** Write the symbol in the correct box below for the beta particle and then complete the decay equation.

$$^{99}_{42}\text{Mo} \longrightarrow \boxed{}\text{Tc} + \boxed{}\boxed{}$$

[5]

11524

12

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

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

[3]

[Turn over

8 The diagram below represents nuclear fission.

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

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

Particle _____ [1]

(ii) Name a suitable fuel.

_____ [1]

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

Particle _____ [1]

(iv) Name the particle which initiates the fission reaction.

_____ [1]

(b) A major benefit 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]

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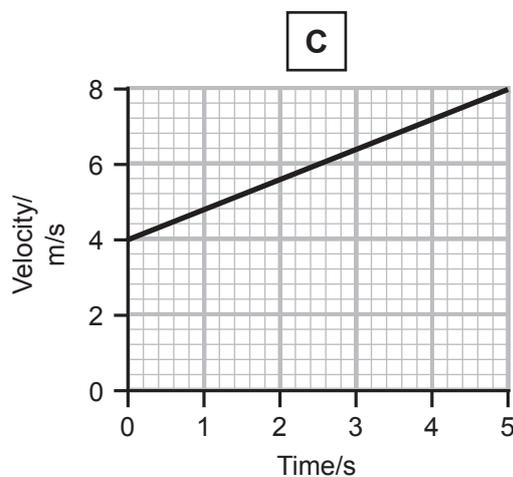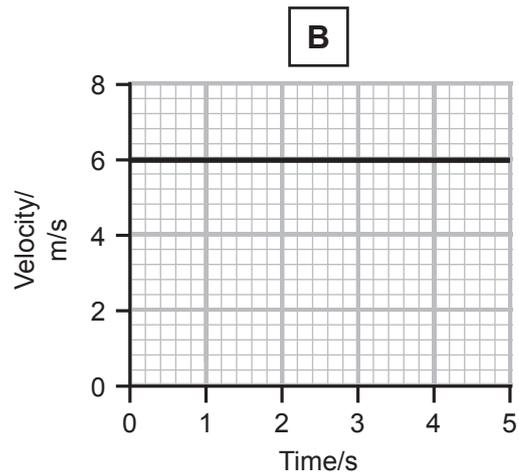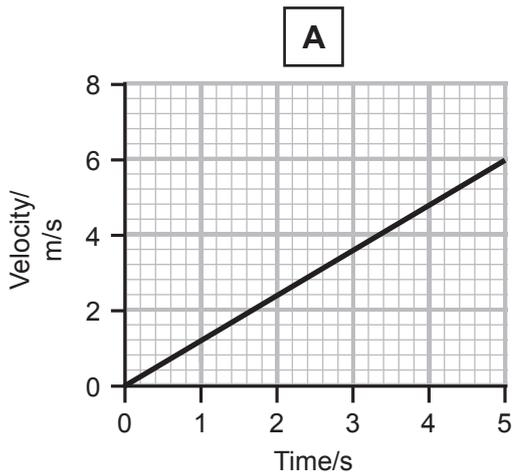The average velocity of the athlete is 6 m/s during this sprint.

(a) Calculate his initial velocity.

You are advised to show your working out.

Initial velocity = _____ m/s [3]

[Turn over

Below are velocity-time graphs for three objects.

A

B

C

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

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

Letter(s) _____ [2]

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

Letter(s) _____ [1]

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

Letter(s) _____ [1]

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

Letter _____ [1]

11524

16

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

11524

17

112901