cea

Rewarding Learning

General Certificate of Secondary Education

Double Award Science:
Physics

Unit P1

Higher Tier

[GDW32]

GDW32

Assessment

Assessment Level of Control:
Tick the relevant box (✓)

Controlled Conditions	
Other	

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
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 **1(a)**.

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1 **(a)** Name the three particles which make up an atom.
For each particle state its relative charge.

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

Particle 1

_____

_____

_____

Particle 2

_____

_____

_____

Particle 3

_____

_____

_____ [6]

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(b) The nucleus of an element X may be written as shown below.

$$_Z^A X$$

Complete the statements below.
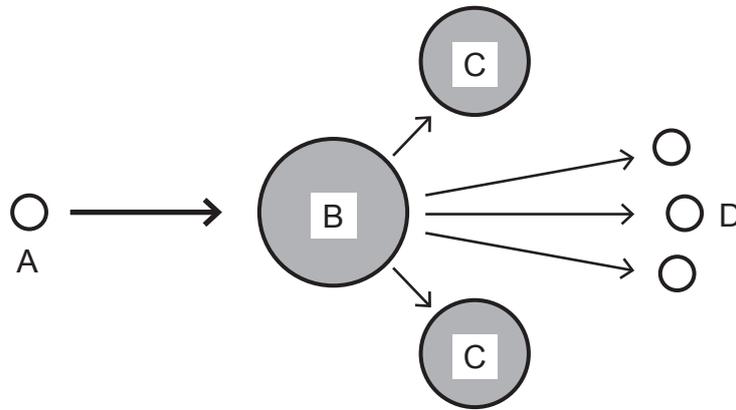
A is the _____ number.

Z is the _____ number.

Consider an isotope of X.
Which of the three, A, X or Z, will have changed?

Answer = _____ [3]

[Turn over

2 Fission and fusion are nuclear reactions which produce energy.
The diagram represents one type of nuclear reaction where B is the nuclear fuel.

Source: Principal Examiner

(a) What nuclear process is represented above?

Process _____ [1]

(b) Name the particle A.

Particle A _____ [1]

(c) What happens to particle A when it strikes B?

_____ [1]

(d) Name a fuel represented by B.

Fuel B _____ [1]

(e) The particles labelled D in the diagram play an important role in the nuclear reaction. What is this role?

_____ [1]

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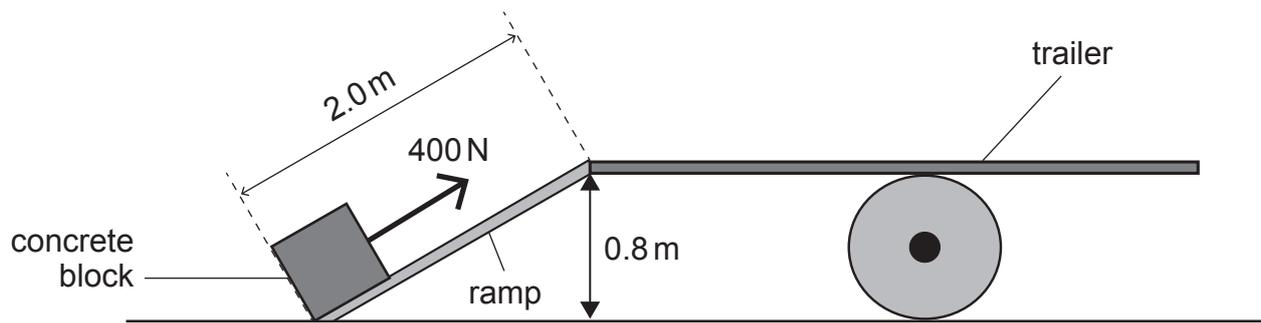**DO NOT WRITE ON THIS PAGE**

(Questions continue overleaf)

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3   A concrete block is pulled up a ramp onto a trailer.

Source: Principal Examiner

(a) Use the information shown in the diagram to calculate the work done by the 400 N force.

You are advised to show your working out.
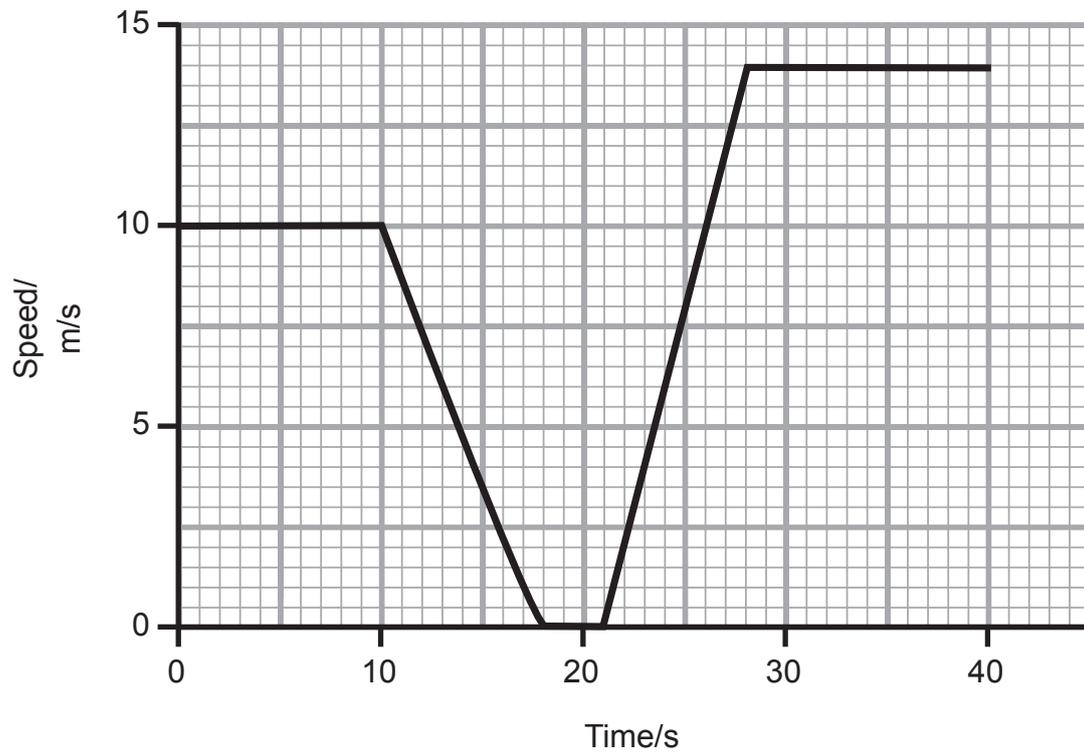
Work done = _____ J   [4]

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(b) On another occasion 600 J of useful work is done on a different block of concrete.
The efficiency of the process is 0.8.
Calculate the total input energy needed to do this work.

You are advised to show your working out.

Total input energy = _____ J   [3]

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4   The speed-time graph for part of a bike journey is shown below.

(i) Describe the motion of the bike during the time interval 10 s to 18 s.

_____

Between which times is the bike stopped?

_____ to _____ s   [2]

(ii) Calculate the bike's rate of change of speed between 21 and 28 seconds.

You are advised to show your working out.

Rate of change of speed = _____ m/s^2 [3]

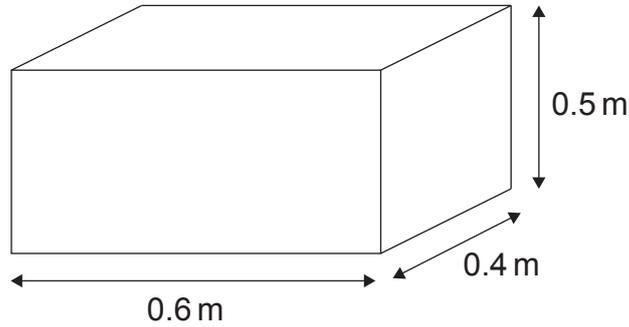**(iii)** How far does the bike travel between 10 and 18 seconds?

You are advised to show your working out.

Distance travelled = _____ m   [3]

[Turn over

5 A tank has the dimensions shown below.

0.5 m

0.4 m

0.6 m

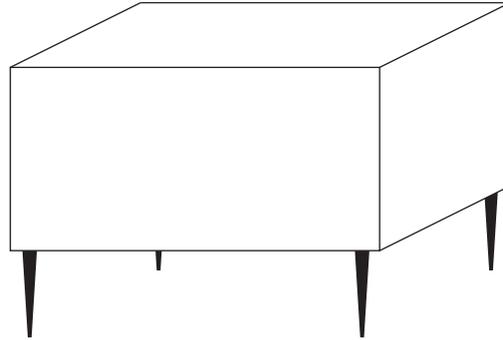**(i)** When the tank is filled with liquid, the pressure exerted by the liquid on the bottom of the tank is 5000 Pa.

Use the information above to calculate the mass of the liquid in the tank.

You are advised to show your working out.

Mass of liquid = _____ kg   [5]

(ii) The tank is placed on a stand with 4 narrow legs.

Has the pressure on the ground now increased, decreased or remained the same?
Place a tick (✓) in the correct box.

Increased ☐   Decreased ☐   Remained the same ☐

Explain your choice.

_____

_____ [2]

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6 **(a)** State, using symbols, the equation for Newton's second law.
State what each symbol represents.

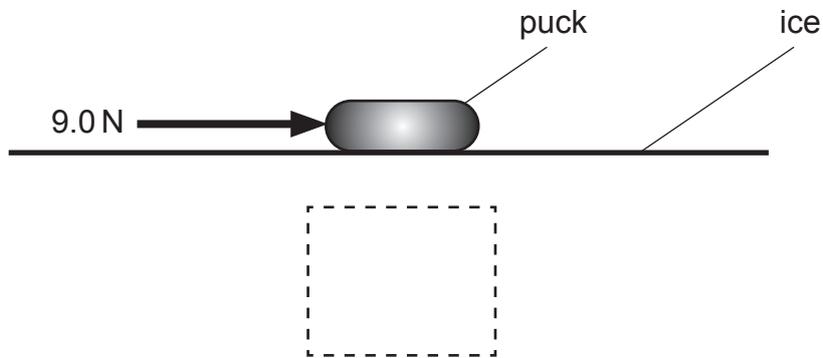_____

_____

_____

_____ [5]

(b) An ice hockey player hits a puck along the ice with a force of 9.0 N which causes it to move.

puck   ice

9.0 N →

Source: Principal Examiner

(i) In the dotted box draw an arrow to show the direction of the force of friction on the moving puck. [1]

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(ii) The puck has a mass of 190 g. The player hits the puck with a force of 9.0 N and the size of the friction force is 0.5 N.

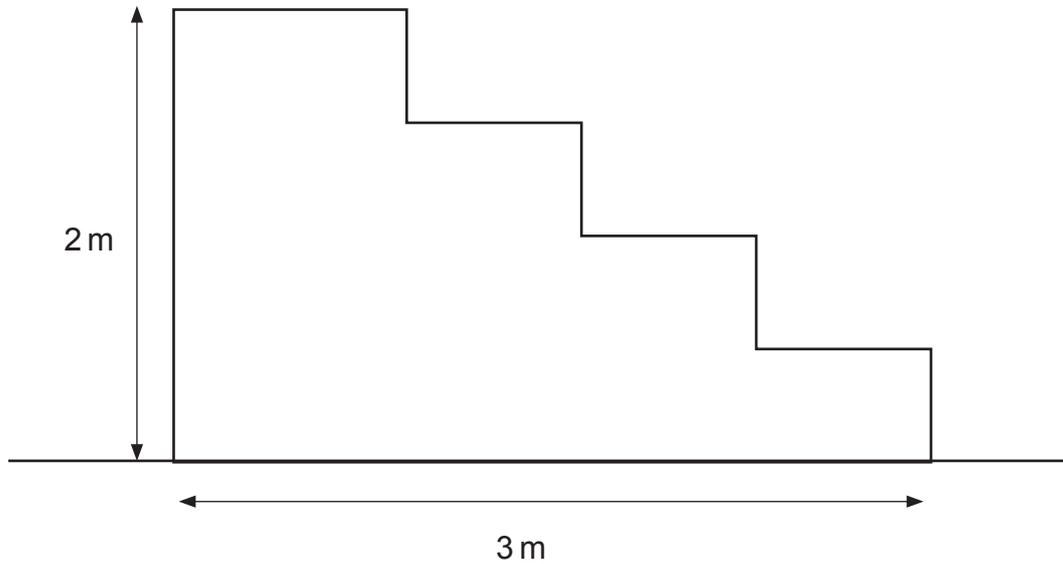Calculate the acceleration of the puck.
Give your answer to the nearest whole number.

You are advised to show your working out.

Acceleration = _____ m/s^2 [4]

7   A man carries a box up some stairs.

(a) The mass of the man is 70 kg. When he reaches the top of the stairs the combined gravitational potential energy of the man and box is 1520 J. Calculate the mass of the box.

You are advised to show your working out.

Mass of box = _____ kg   [4]

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(b) On another occasion a box of mass 8 kg has a gravitational potential energy of 400 J at the top of a flight of steps. The box is dropped from rest and falls vertically.
Calculate the speed of the box when it hits the ground.

You are advised to show your working out.

Speed = _____ m/s   [5]

[Turn over

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8   This question is about radioactivity.

   (i)   Why are some nuclei radioactive?

   _____ [1]

   (ii)   There are three types of radiation emitted by radioactive sources.
   They are described in the table below.
   In the second column write the name of the radiation described.

Description	Type of radiation
Electromagnetic wave of high energy	
Fast electrons	
Particles consisting of two protons and two neutrons	

   [3]

   (iii)   What type of radiation is used in each of the following applications?

   Detecting leaks in water pipes deep underground.

   _____

   Smoke alarms.

   _____

   Sterilising medical equipment.
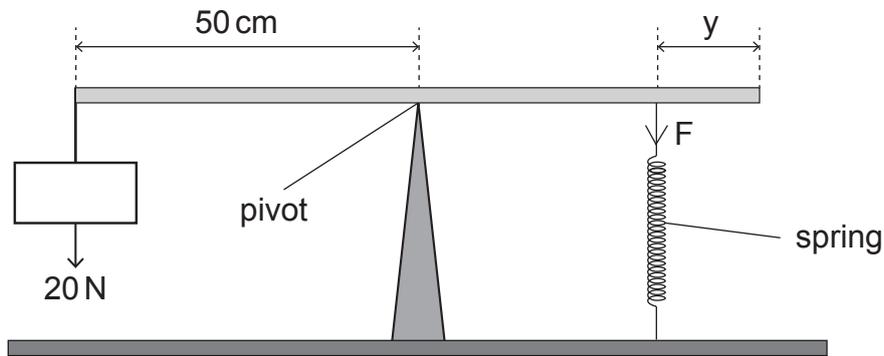
   _____

   [3]

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9 A metre stick is kept in a horizontal position by a force of 20 N acting at one end and a stretched spring acting at the other end. The pivot acts at the midpoint of the metre stick.

The spring has a spring constant of 6.25 N/cm and has been extended by 4 cm. By first finding the downward force F in the spring, calculate the distance y.

You are advised to show your working out.

Force F in the spring = _____ N

Distance y = _____ cm   [8]

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