



*Rewarding Learning*

General Certificate of Secondary Education  
2021–2022

Centre Number

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Candidate Number

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# Double Award Science: Physics

Unit P1

Foundation Tier



[GDW31]

\*GDW31\*

**FRIDAY 25 FEBRUARY 2022, MORNING**

## TIME

1 hour.

## 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 60.

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 **6**.



1 Energy can be changed from one form to another.

Complete the boxes below to show the main energy change that is happening in each case. An example has been completed for you.

Example: A radio



electrical  
energy



sound  
energy

A falling ball



energy



energy

A microphone



energy



energy

Burning wood



energy



energy

[6]

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2 This question is about the efficiency of a television.



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A television produces 5400 J of useful light and sound energy. The electrical input energy is 9000 J.

(i) Calculate the efficiency of the television.

**You are advised to show your working out.**

Efficiency = \_\_\_\_\_ [3]

(ii) Circle the correct unit, if any, for efficiency.

joule

watt

no unit

[1]

(iii) How much energy is wasted by the television?

\_\_\_\_\_ J [1]

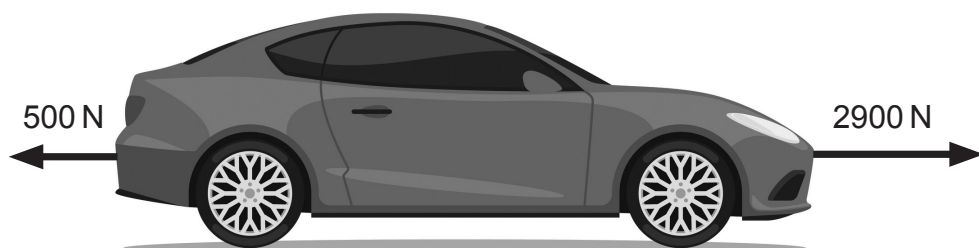
(iv) In what form is this energy wasted?

\_\_\_\_\_ [1]

**[Turn over**



- 3 (a) A car is driven in a straight line. The forces acting on the car are shown below.



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- (i) What is the size of the resultant force acting on the car?

Resultant force = \_\_\_\_\_ N [1]

- (ii) In which direction does this resultant force act?

Direction = \_\_\_\_\_ [1]

- (b) Another car accelerates forwards. The car has a mass of 1400 kg.

- (i) Calculate the resultant force that must be produced to cause the car to accelerate at  $2 \text{ m/s}^2$ .

**You are advised to show your working out.**

Resultant force = \_\_\_\_\_ N [3]

- (ii) Later in the car's journey, it is travelling at a constant speed in a straight line.

What is the size of the resultant force acting on the car at this time?

Resultant force = \_\_\_\_\_ N [1]



4 A rock has a mass of 440 kg.

(i) Calculate the weight of the rock.

**You are advised to show your working out.**

Weight = \_\_\_\_\_ N [2]

(ii) The volume of the rock is  $0.16 \text{ m}^3$ .

Calculate the density of the rock and give the unit.

Do not change the units of any quantities given in the question.

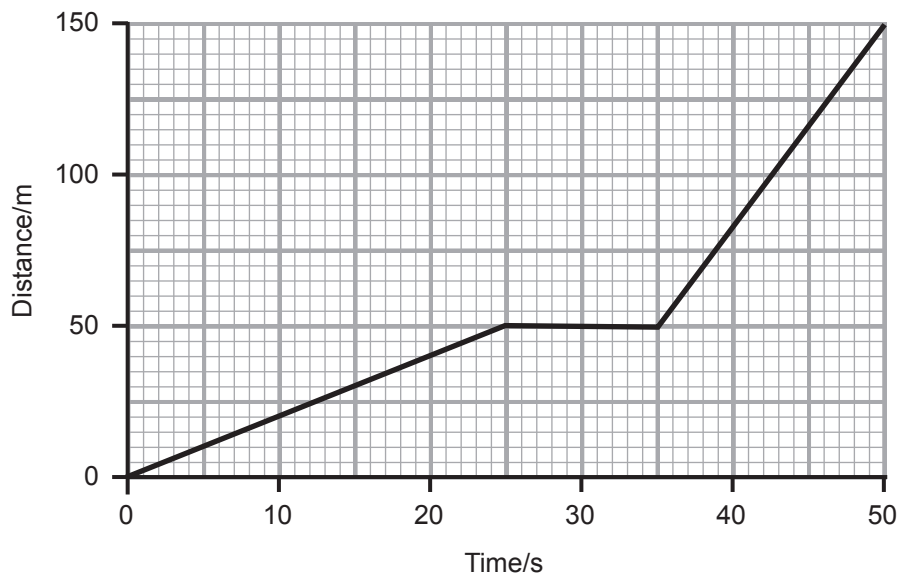
**You are advised to show your working out.**

Density = \_\_\_\_\_ [4]

[Turn over]



- 5 The graph of distance against time for part of a bike journey is shown below.



- (i) Describe the motion of the bike during the time period 25 to 35 seconds.

\_\_\_\_\_ [1]

- (ii) During which time period is the bike travelling the fastest?

\_\_\_\_\_ to \_\_\_\_\_ s [1]

- (iii) How far has the bike travelled after 30 seconds?

\_\_\_\_\_ m [1]

- (iv) Use values from the graph to calculate the speed of the bike over the first 25 seconds.

**You are advised to show your working out.**

Speed = \_\_\_\_\_ m/s [3]



- 6 This question is about the properties of radiation which comes from radioactive sources.

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

Which type of radiation has the greatest penetrating power and what material is best at blocking it?

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Which type of radiation is least penetrating and what is its range in air?

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What do we call the activity which is detected when no radioactive source is present?

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How is this activity accounted for when measuring the activity of a radioactive source which **is** present?

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[6]

[Turn over



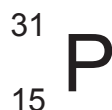
7 Atoms are made up of protons, neutrons and electrons.

(a) Complete the table below to show the relative mass and charge of each particle.

| Particle | Relative mass | Relative charge |
|----------|---------------|-----------------|
| Proton   |               |                 |
| Neutron  |               |                 |
| Electron |               |                 |

[6]

(b) The nucleus of a phosphorus atom is described below.



Complete the table below to show the number of each particle in the **nucleus** of the phosphorus atom.

| Particle | Number |
|----------|--------|
| Proton   |        |
| Neutron  |        |
| Electron |        |

What is the value of the mass number of this phosphorus atom?

\_\_\_\_\_ [4]



8 (a) This question is about nuclear energy.

For nuclear fission of a uranium nucleus to occur, it must first absorb a particle.  
Name this particle.

\_\_\_\_\_

Which nuclear process is the source of a star's energy?

\_\_\_\_\_

Name an isotope of hydrogen that can be used as a fuel for nuclear fusion.

\_\_\_\_\_

What is the major by-product of nuclear fusion?

\_\_\_\_\_

State an environmental advantage of producing energy by nuclear fusion.

\_\_\_\_\_ [5]

(b) How much more energy per kg does nuclear fusion release when compared to the energy released by nuclear fission?

Circle your answer.

4

4000

4 000 000 times

State two difficulties that must be overcome before nuclear fusion can be used to produce energy on a commercial scale on Earth.

1. \_\_\_\_\_

2. \_\_\_\_\_ [3]

[Turn over]



- 9 (a) State Hooke's Law **in words**. Do not use symbols in your answer.

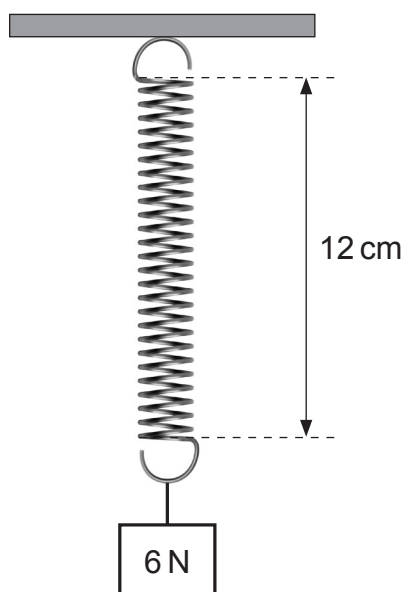
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[2]

- (b) When a force of 6 N is applied to a spring it has a total length of 12 cm.



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The spring has an unstretched length of 8 cm.

Calculate the spring constant.

**You are advised to show your working out.**

Spring constant = \_\_\_\_\_ N/cm [4]





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**THIS IS THE END OF THE QUESTION PAPER**

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

|             |  |
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| Total Marks |  |
|-------------|--|

Examiner Number

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