Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024–2025

# Double Award Science: Physics

Unit P1

Foundation Tier

**[GDW31]**

*GDW31*

**WEDNESDAY 13 NOVEMBER 2024, 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 and use a dark HB pencil for drawings and graphs.
**Do not write with a gel pen.**
Answer **all ten** 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.
You may use a scientific calculator.
Quality of written communication will be assessed in Question **9**.

14850

**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 of the cases below.
An example has been completed for you.

Example: An electric radio

| | | |
|---|---|---|
| *electrical* energy | → | *sound* energy |

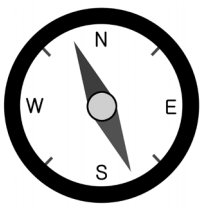
A falling ball

| | | |
|---|---|---|
| energy | → | energy |

A lit Bunsen burner

| | | |
|---|---|---|
| energy | → | energy |

The magnetic field of the Earth causing a compass needle to move




| | | |
|---|---|---|
| energy | → | energy |

[6]

**2** This question is about the efficiency of a hairdryer.

The hairdryer produces 4800 J of **useful** heat energy. The total electrical input energy is 6000 J.

**(i)** Calculate the efficiency of the hairdryer.

**Show your working out.**

Efficiency = _____

Circle the correct unit, if any, for efficiency.

**watt** **joule** **no unit**

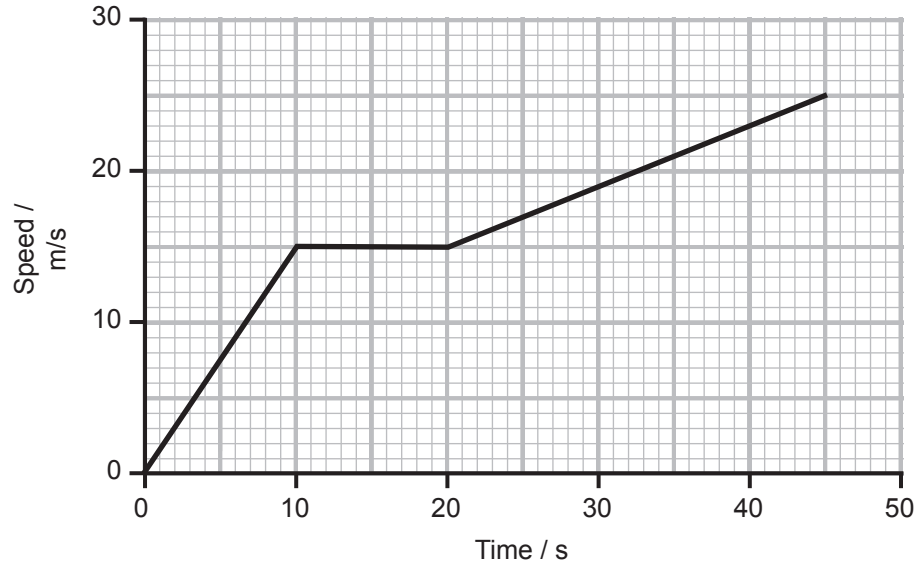
[4]

**(ii)** How much energy is wasted by the hairdryer?

_____ J [1]

**[Turn over**

**3** The graph of speed against time for part of a car journey is shown below.




**(i)** Describe the motion of the car during the time period 20 to 45 seconds.

_____

During which time period is the car travelling at a constant speed?

_____ to _____ s [2]

**(ii)** Use values from the graph to calculate the rate of change of speed of the car during the time period 0 to 10 seconds.

**Show your working out.**

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

**(iii)** Use values from the graph to calculate the distance travelled by the car during the time period 0 to 10 seconds.

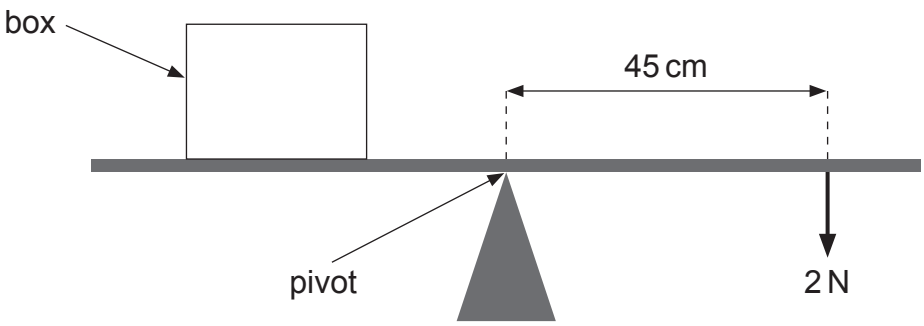
**Show your working out.**

Distance travelled = _____ m [3]

**[Turn over**

**4** A uniform beam is pivoted at its midpoint.

A box is placed on the beam and a 2 N force applied on the opposite side of the pivot.
The beam is balanced, as shown below.




**(i)** Place a cross (✗) at the centre of gravity of the box. [1]

**(ii)** Calculate the moment produced by the 2 N force about the pivot.

Include the unit in your answer.

Do not change any units.

**Show your working out.**

Moment = _____ [4]

**5** Atoms are made up of three different types of particles.

**(a)** Complete the table below by inserting the name, relative mass and relative charge of each particle.

| Particle | Relative mass | Relative charge |
|---|---|---|
| | 1 | |
| Neutron | | |
| | $\frac{1}{1840}$ | |

[6]

**(b)** Define an isotope, **in terms of the particles** that make up the nucleus.

_____

_____

_____ [2]

**[Turn over**

**6** **(a)** Some concrete paving slabs are shown below.

The concrete used has a density of 2400 kg/m$^3$ and the volume of a single slab is 0.02 m$^3$.

Calculate the mass of a single slab.

**Show your working out.**

Mass of a slab = _____ kg [3]

**(b)** Metal rods are made by pouring hot liquid metal into a mould and allowing it to cool and become solid metal.

Place a tick (✓) in the correct box to complete the statements below.

The density of liquid metal is

| | |
|---|---|
| greater than the density of solid metal. | ☐ |
| the same as the density of solid metal. | ☐ |
| less than the density of solid metal. | ☐ |

The distances between the particles in liquid metal are

| | |
|---|---|
| greater than the distances between the particles in solid metal. | ☐ |
| the same as the distances between the particles in solid metal. | ☐ |
| less than the distances between the particles in solid metal. | ☐ |

[2]

**[Turn over**

**7** A plane flies in a straight line at a constant height.

**(i)** The plane **accelerates** forwards.
How do the forward and backward forces compare?

Tick (✓) the correct box.

| | |
|---|---|
| The forward force is greater than the backward force. | ☐ |
| The forward force is smaller than the backward force. | ☐ |
| The forward force is the same size as the backward force. | ☐ |

If the forward force acting on the plane is positive, how would the backward force be described?

Tick (✓) the correct box.

| | |
|---|---|
| positive | ☐ |
| negative | ☐ |
| neutral | ☐ |

What is the name of the backward force that opposes the motion of the plane?

_____ [3]

**(ii)** The plane remains at a **constant height**.
How do the upward and downward forces compare?

Tick (✓) the correct box.

The upward force is greater than the downward force. ☐

The upward force is smaller than the downward force. ☐

The upward force is the same size as the downward force. ☐

[1]

**(iii)** The weight of the plane is 7570 N.

Calculate the mass of the plane.

**Show your working out.**

Mass = _____ kg [3]

**[Turn over**

**8** A helicopter is used to lift a load.

The helicopter has a mass of 660 kg and the load has a mass of 470 kg.

The helicopter and load accelerate vertically upwards at 7 m/s$^2$.

Calculate the resultant force acting on the combined helicopter and load.

**Show your working out.**

Resultant force = _____ N [4]

**9** Some nuclei are radioactive and emit radiation.

Give the names of the **three** types of radiation and describe what each type consists of.

Write your answers in the appropriate spaces below.

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

Name of radiation _____

Consists of _____

_____

_____

Name of radiation _____

Consists of _____

_____

_____

Name of radiation _____

Consists of _____

_____

_____ [6]

**[Turn over**

**10** Radioactive decay can be described in terms of half-life.

**(a)** Explain the meaning of the term half-life.

_____

_____

_____ [2]

**(b)** A radioactive isotope of thorium is known to have an activity of 3200 Bq.

When the radioactive isotope is brought into a laboratory, the **total** activity is measured to be 3218 Bq.

What is the value of background activity in the laboratory?

Background activity = _____ Bq [1]

**(c)** A sample of uranium-229 has a mass of 0.8 g.

After 174 minutes, the mass of the sample is found to have decreased to 0.1 g.

Find the half-life of uranium-229.

**Show your working out.**

Half-life = _____ minutes [3]

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

**BLANK PAGE**

**DO NOT WRITE ON THIS PAGE**

*Sources:*
*Q1. . . . . ©Gettyimages × 3*
*Q2. . . . . ©Gettyimages*
*Q4. . . . . Principal Examiner*
*Q6(a) . . ©Gettyimages*
*Q7. . . . . ©Gettyimages*
*Q8. . . . . ©Gettyimages*

## DO NOT WRITE ON THIS PAGE

| For Examiner's use only | |
|---|---|
| **Question Number** | **Marks** |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| **Total Marks** | |

**Examiner Number**

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.