Centre Number

Candidate Number

# Double Award Science: Physics

Unit P1

Foundation Tier

**[GSD31]**  *GSD31*

## WEDNESDAY 23 MAY 2018, AFTERNOON

**1** The box below lists the main energy resources used in the UK.

| | | |
|---|---|---|
| coal | solar | nuclear |
| gas | wind | oil |

Some energy resources are renewable and some are non-renewable.

**(i)** What is a **non-renewable** energy resource?

_____ [1]

**(ii)** Give the names of two **renewable** energy resources from the list.

_____ and _____ [2]

**(iii)** Harm to the environment is an important consideration when choosing an energy resource.
Tick (✓) the correct box below.

Renewable energy resources cause most harm to the environment. ☐

Non-renewable energy resources cause most harm to the environment. ☐

Both are equally harmful. ☐

[1]

**(iv)** In what way do fossil energy resources pollute the environment?

_____ [1]

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**(Questions continue overleaf)**

**2** A student uses a mobile phone.

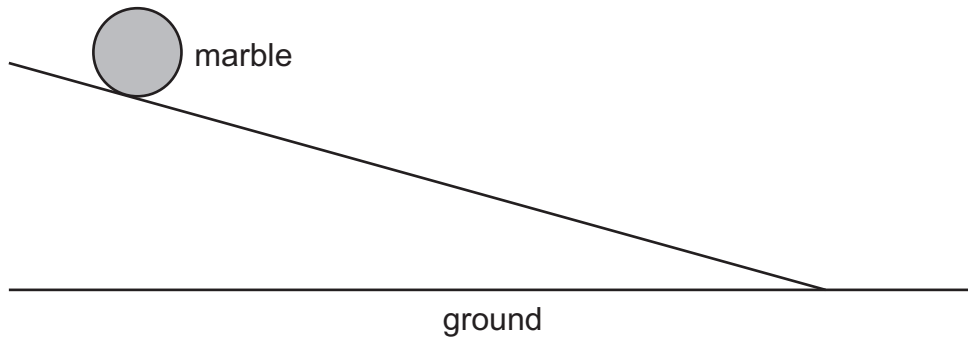**(a) (i)** Name two useful energy forms produced by a mobile phone.

_____ energy **and** _____ energy.   [2]

**(ii)** The mobile phone uses a battery.
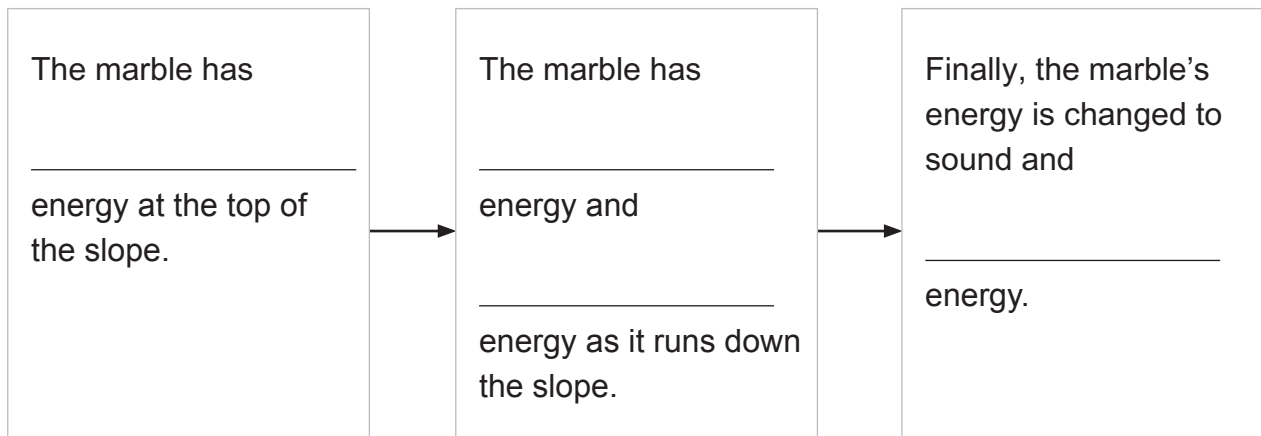Complete the sentence below.

The _____ energy stored in the battery provides

_____ energy to power the phone.   [2]

A marble runs from rest down a slope and finally comes to a stop.

marble

ground

**(b)** Complete the energy flow diagram below to describe the energy changes which take place.
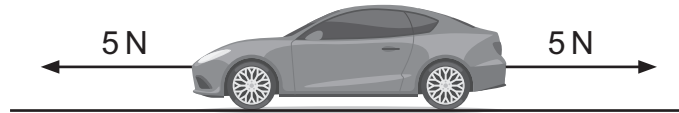
| The marble has _____ energy at the top of the slope. | → | The marble has _____ energy and _____ energy as it runs down the slope. | → | Finally, the marble's energy is changed to sound and _____ energy. |

[4]

**3** Three **identical** toy cars are shown.



6 N ← A → 5 N

5 N ← B → 5 N

3 N ← C → 1 N
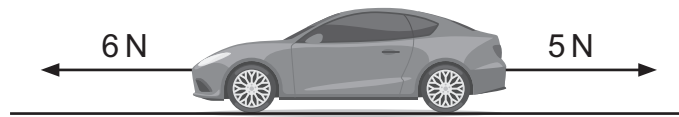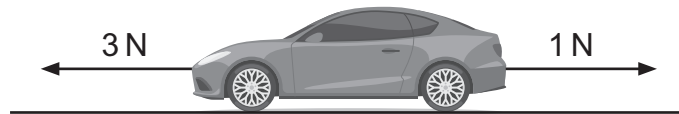
*© EgudinKa / iStock / Thinkstock*

**(a) (i)** Which car, A, B, or C could be at rest?

Car _____ [1]

**(ii)** Which car, A, B, or C could be moving at constant speed?

Car _____ [1]

**(b)** Each car has a mass of 0.5 kg. Use the equation,

$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

to calculate the maximum acceleration above.

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

Maximum acceleration = _____ m/s$^2$ [2]

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**(Questions continue overleaf)**

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**4** Weight and mass are different quantities and are measured in different units.
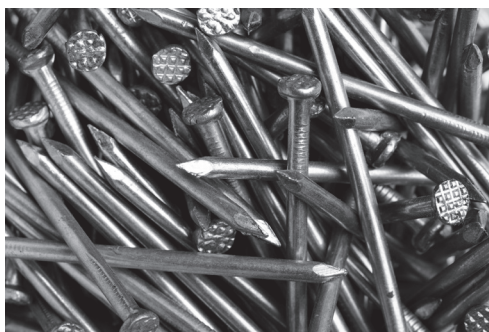
**(a)** What is the weight of 300 g?

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

Weight = _____ N   [3]

An iron nail has a mass of 3.0 g. One hundred of these nails have a volume of 37.5 cm³.



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**(b)** By first finding the total mass of the nails, calculate the density of the iron.
Do **not** change the units of mass and volume in your calculation.
Remember to include the unit with your answer.

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

Density = _____ [5]

In a different set of iron nails, each nail has a mass of 5.0 g.

**(c)** How will the density of these 5.0 g iron nails compare with the density of the 3.0 g iron nails? Choose by ticking (✓) the correct box below.

The 5.0 g nails will have a bigger density.  ☐
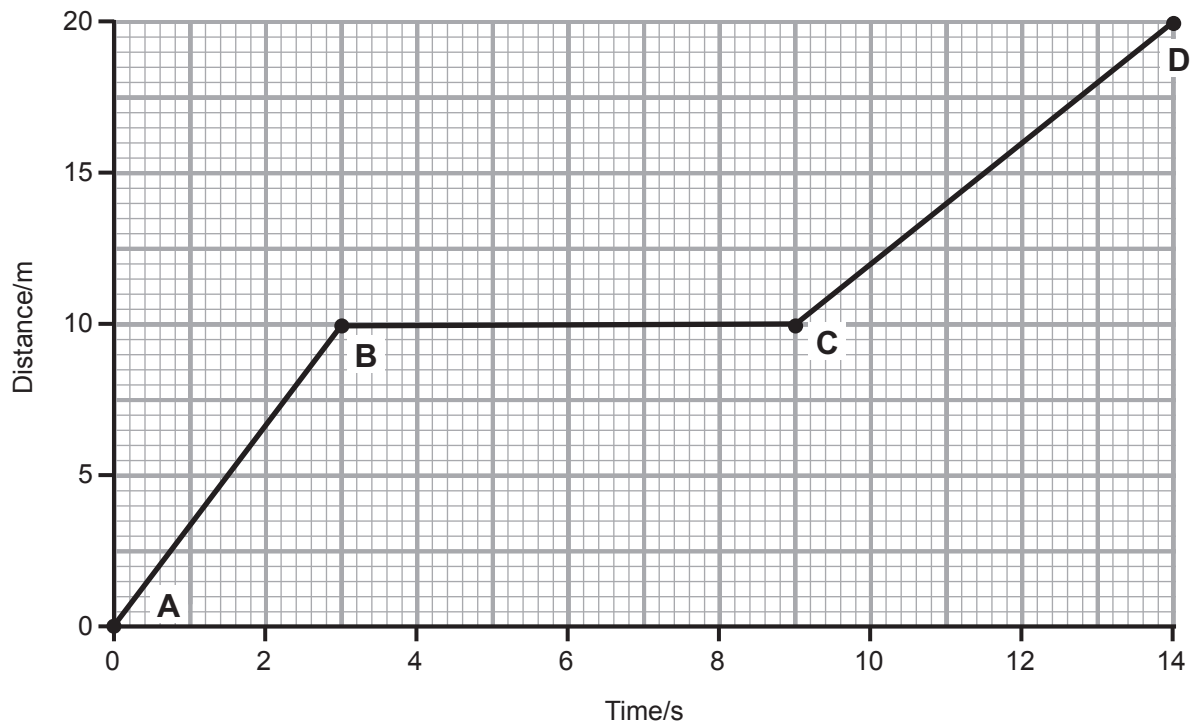
The 5.0 g nails will have a smaller density.  ☐

The 5.0 g nails will have the same density.  ☐

[1]

**[Turn over**

**5** A distance-time graph for a cyclist is shown.



**(a) (i)** Describe the motion of the cyclist during BC.

_____ [1]

**(ii)** During which region is the speed of the cyclist greatest?
Choose your answer by ticking (✓) the correct box.

Speed is greatest during      AB      ☐

                                              BC      ☐

                                              CD      ☐      [1]

**(iii)** Complete the following by ticking (✓) the correct box.
The feature of the graph which allowed you to answer part (ii) was:

The graph has the greatest gradient in this region; ☐

The graph has the smallest gradient in this region; ☐

The area under the graph was greatest in this region. ☐

[1]

**(iv)** State the distance travelled in the following time intervals.

Distance travelled in the first 3 seconds     _____ m

Distance travelled in the first 9 seconds     _____ m    [2]

**(b)** Use the graph to find the average speed of the cyclist over the whole journey.
Give your answer to one decimal place.

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

Average speed = _____ m/s   [3]

**[Turn over**

**6** The following incomplete sentence describes radioactive decay. Complete the sentence by filling in the blank spaces.

**(a)** A nucleus decays because it is _____ and so emits

_____ particles or _____ particles

or _____ radiation. [4]

A radioactive substance has 8400 undecayed nuclei and 90 minutes later 1050 of these nuclei remain undecayed.

**(b)** Calculate the half-life of the material.

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

Half-life = _____ minutes [3]

**7** Describe the structure of the atom.

In your answer state:

- the names of the particles which make up the atom;
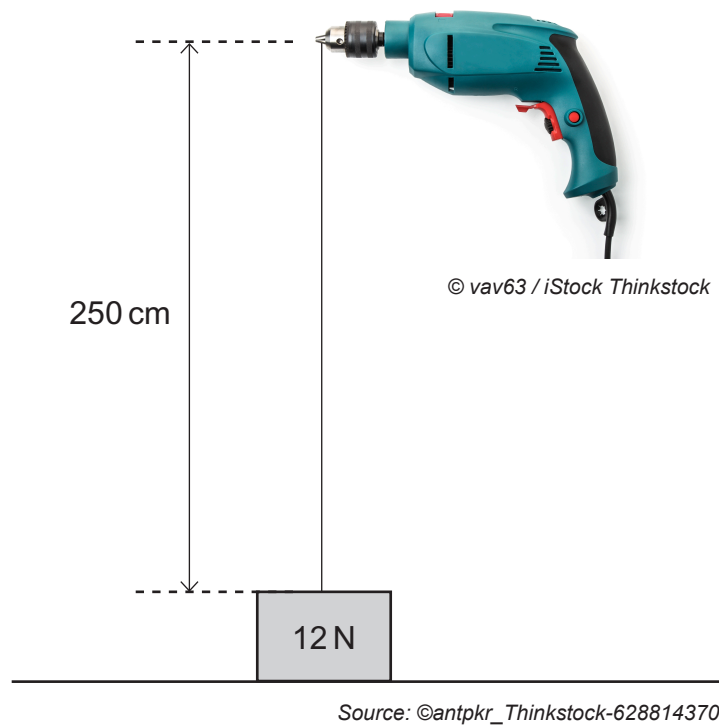- where these particles are located.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

**8** An electric drill is used to lift a weight of 12 N through a height of 250 cm.



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250 cm

12 N

Source: ©antpkr_Thinkstock-628814370

**(a) (i)** Calculate the work done.

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

Work done = _____ J   [4]

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**(ii)** It takes 3 seconds to raise the weight.
Calculate the power developed by the motor.
Remember to include the unit.

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

Power developed = _____ [4]

On another occasion the electric motor uses 3000 J of electrical energy to lift a weight. The total energy wasted is 1200 J.

**(b)** Calculate the efficiency of the electric drill.

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

Efficiency = _____ [4]

**9**   The electrical resistance of a piece of metal wire changes with temperature.
It is suggested that the resistance of the wire is directly proportional to its temperature in °C.
This relationship could be written in the form:

$$R = kt \qquad \textbf{Equation 9.1}$$

where R is the resistance in ohms, t is the temperature in °C and k is a constant.
To test this, the resistance of the wire is found at different temperatures.

The results are recorded below.

| t/°C | 100 | 200 | 300 | 400 | 500 |
|------|-----|-----|-----|-----|-----|
| R/ohms | 100 | 125 | 150 | 175 | 200 |
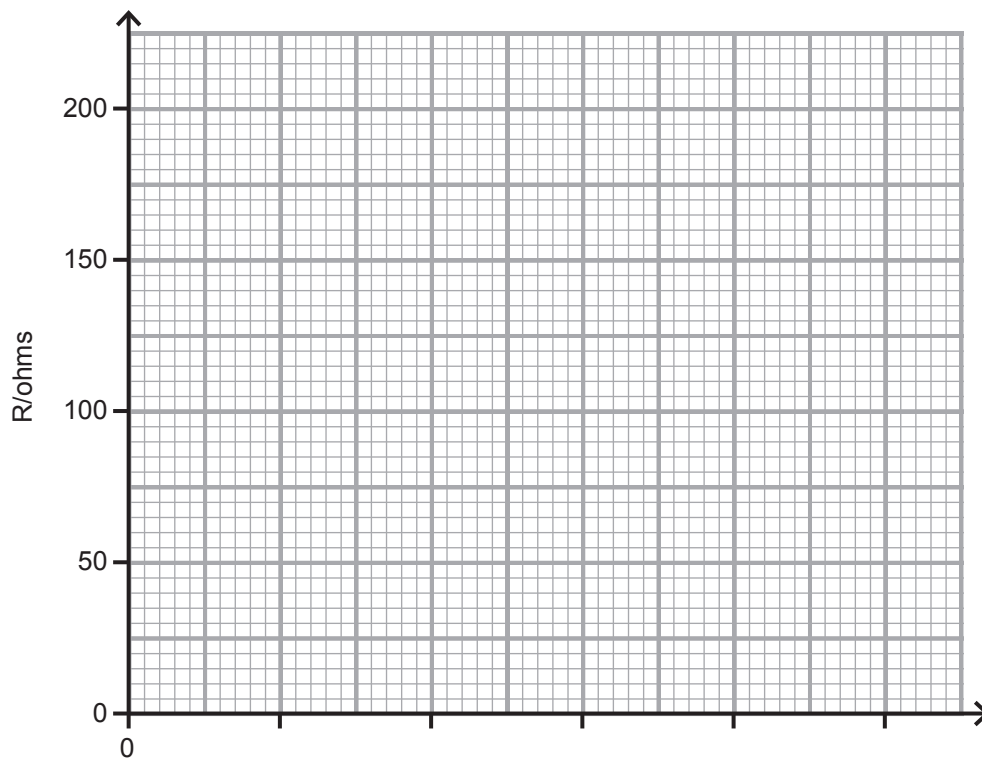


**(i)**   Choose a scale for the horizontal axis and label it. [2]

**(ii)**   Plot the points on the grid. [2]

**(iii)** Draw the line of best fit and continue the line until it cuts the vertical axis. [1]

**(iv)** Use the graph to find the resistance of the wire at 0 °C.

**You are advised to show how you get your answer.**

Resistance = _____ ohms [2]

**(v)** Does your graph confirm the theory described by **Equation 9.1**?

Yes  /  No          Circle your choice.

Explain your answer.

_____ [1]

**(vi)** Find the gradient of your graph and include the unit.

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

Gradient = _____

Unit = _____ [3]

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