



Rewarding Learning

General Certificate of Secondary Education  
2015–2016

Centre Number

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Candidate Number

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# Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

\*GSD31\*

**WEDNESDAY 25 MAY 2016, AFTERNOON**

## 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 blue or black ink only. **Do not write with a gel pen.**

Answer **all eleven** 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 **10**.

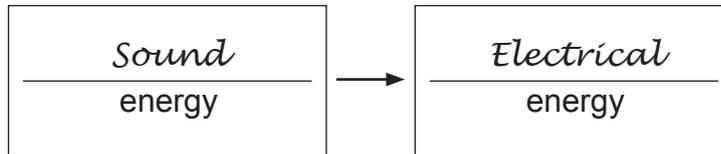
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\*20GSD3101\*

1 A microphone is **designed** to change sound energy into electrical energy, as shown below.

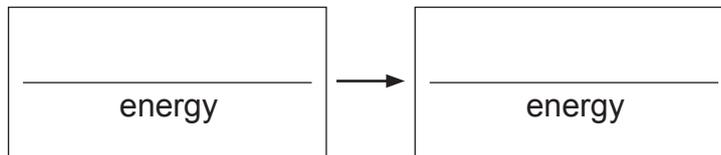
Microphone



1 A { æ ~ ^ i / A U q & A V @ \ • q &

Fill in the spaces below to show the main types of energy change each device is designed to bring about.

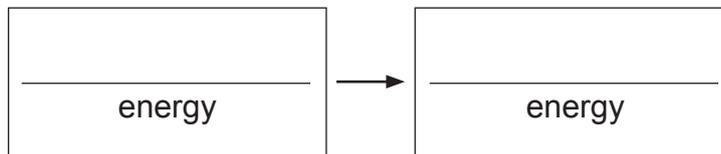
(i) Room heater



1 A U \ @ A U a @ \ A U q & A V @ \ • q &

[2]

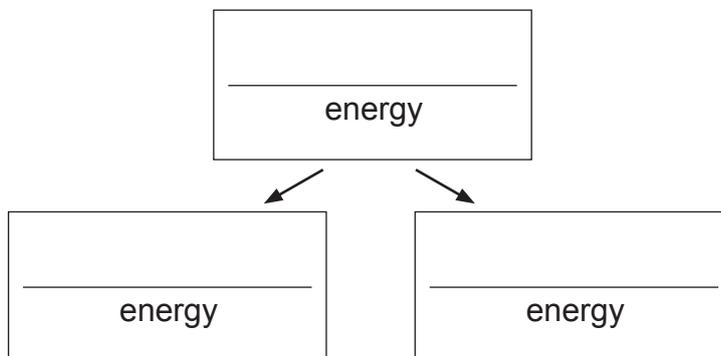
(ii) Match



1 A ç a s \* A U q & A V @ \ • q &

[2]

(iii) Television



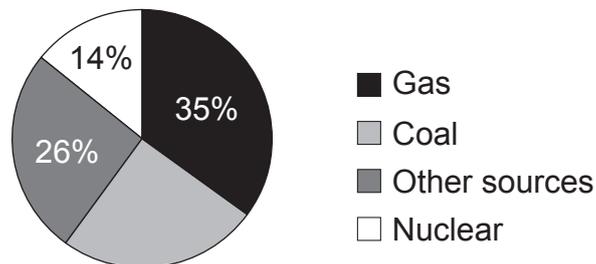
1 A ^ a } ^ { \ A U q & A V @ \ • q &

[3]



- 2 The chart below shows the sources of energy used to produce electricity in the U.K.

**Source of energy used to produce electricity**



Source: Chief Examiner

- (a) Calculate the percentage of the electricity produced from coal.

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

- (b) State one disadvantage, other than cost, of producing electricity from coal.

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

Electricity can also be produced from wind energy.

- (c) State one advantage and one disadvantage, other than cost, of producing electricity from wind energy.

Advantage: \_\_\_\_\_ [1]

Disadvantage: \_\_\_\_\_ [1]

- (d) The engine of a crane consumes 5000 J of chemical energy to produce 3000 J of useful output energy. Calculate the efficiency of the engine of the crane.

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

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

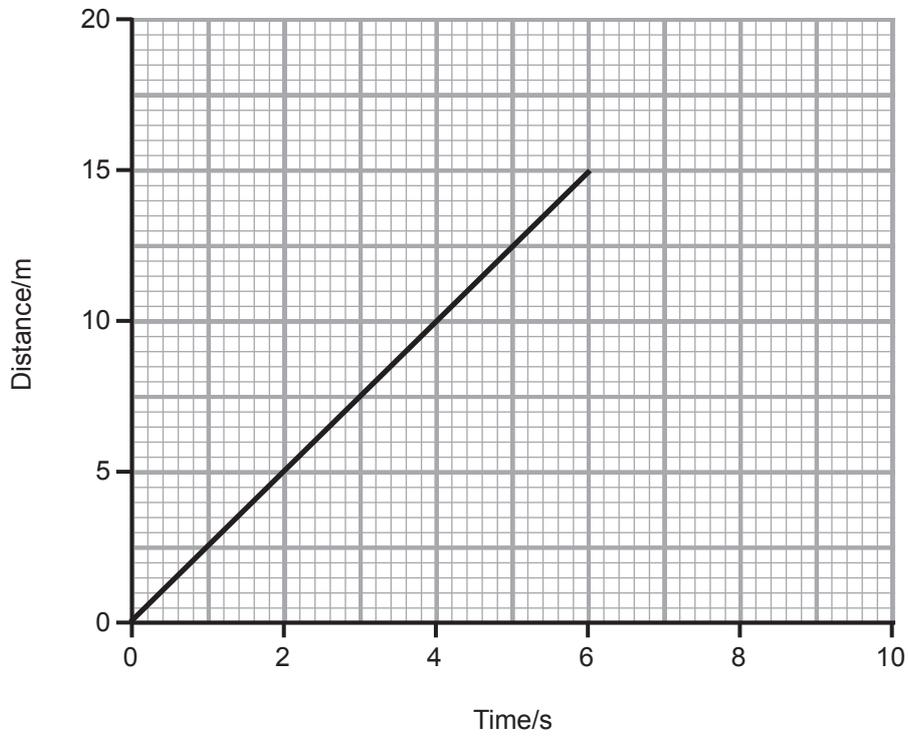
**[Turn over**



3 The graph of distance against time for a toy car is shown below.



© Claudio Divizia / Hemera / Thinkstock



(a) Use the graph to calculate the speed of the toy car.

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

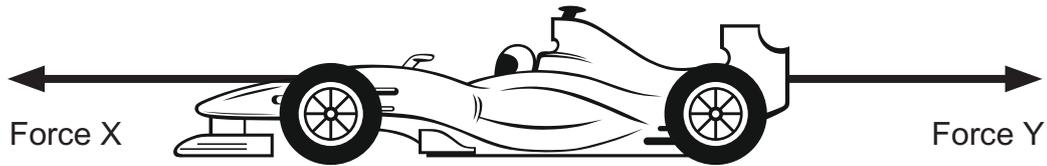
Speed = \_\_\_\_\_ m/s [3]

(b) The car stops after 6 seconds.  
Continue the graph for a further 4 seconds.

[1]



4 A racing car travels along a straight racetrack.



© Kreatiw / iStock / Thinkstock

gravity	weight	reaction force
driving force	mass	friction

(a) Select from the box the names of the forces X and Y.

Force X \_\_\_\_\_ Force Y \_\_\_\_\_ [2]

(b) If force X is equal to force Y, what can you say about the speed of the racing car?

Remember the racing car is moving.

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

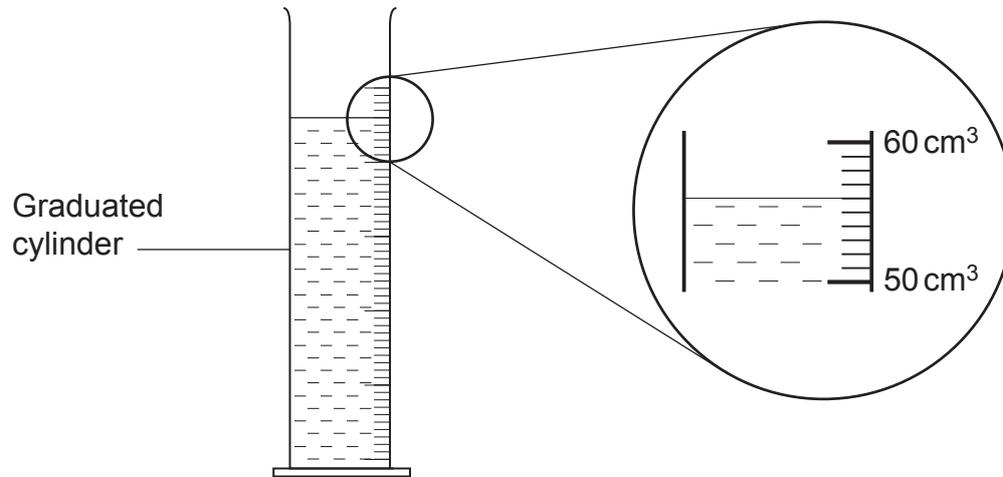
(c) The driver takes his foot off the accelerator pedal and the racing car begins to slow down.

How do the forces X and Y now compare?

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



- 5 A student pours 42 g of a liquid into a graduated cylinder and measures its volume.



Source: Principal Examiner

Use the information given above to calculate the density of the liquid.  
Give your answer to 2 decimal places.

Remember to include the unit.

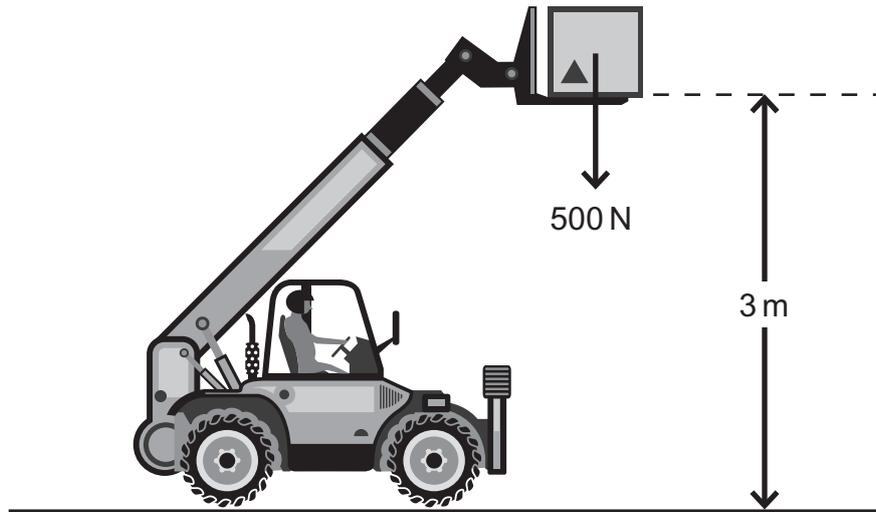
**You are advised to show your working out.**

Density of liquid = \_\_\_\_\_ [5]

[Turn over



- 6 A forklift truck raises a load of 500 N to a height of 3 m above the ground.



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- (a) Calculate the work done lifting the load.

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

Work = \_\_\_\_\_ J [3]



- (b) On another occasion, the engine of the forklift truck uses 5000 J of energy in a time of 20 s.  
Calculate the power of the engine of the forklift truck.  
Give your answer in kilowatts.

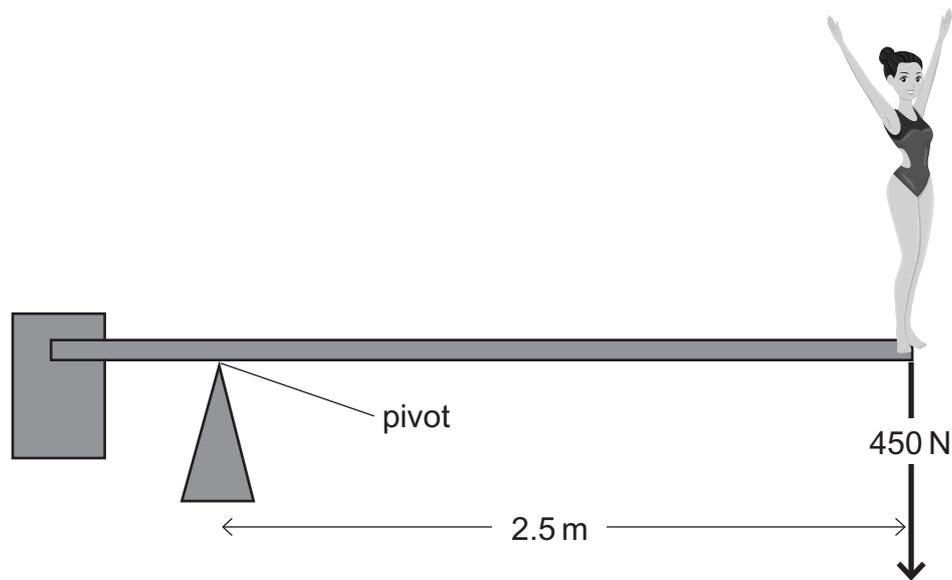
**You are advised to show your working out.**

Power = \_\_\_\_\_ kW [4]

[Turn over



- 7 Deirdre, who has a weight of 450 N, stands at the end of a diving board.



Source: Principal Examiner

- (a) Calculate the moment of Deirdre's weight about the pivot when she stands at the end of the diving board.

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

Moment = \_\_\_\_\_ Nm [3]

- (b) What is Deirdre's mass?

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

Mass = \_\_\_\_\_ kg [2]





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**(Questions continue overleaf)**

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[Turn over



\*20GSD3111\*

8 (a) This part of the question is about how mass, speed and radius affect the centripetal force acting on a stone whirled in a horizontal circular plane.

(i) How does the centripetal force depend on the mass of the stone?  
Tick (✓) the correct box.

Increases with mass

Remains constant with mass

Decreases with mass

[1]

(ii) How does the centripetal force depend on the speed of the stone?  
Tick (✓) the correct box.

Increases with speed

Remains constant with speed

Decreases with speed

[1]

(iii) How does the centripetal force depend on the radius of the circular path?  
Tick (✓) the correct box.

Increases with radius

Remains constant with radius

Decreases with radius

[1]



- (b) Calculate the kinetic energy of a snowboarder who has a mass of 50 kg and a speed of 3 m/s.

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

Kinetic energy = \_\_\_\_\_ J [3]

[Turn over



9 (a) The symbol for Thorium-234 is



(i) State the total number of protons and neutrons in a nucleus of Thorium-234.

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

(ii) How many protons does a nucleus of Thorium-234 contain?

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

(iii) What name is given to the total number of protons and neutrons in the nucleus of Thorium-234?

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

(iv) How many neutrons does a nucleus of Thorium-234 contain?

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

(b) A radioactive isotope has a half-life of 30 days. Initially there are 64 000 undecayed nuclei. How many undecayed nuclei will remain after 90 days?

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

Number of undecayed nuclei = \_\_\_\_\_ [3]





- 11 Theory shows that the gravitational potential energy (G.P.E.) of a body depends on its height (h) above the Earth's surface, according to the formula:

$$\text{G.P.E.} = k h \quad \text{Equation 11.1}$$

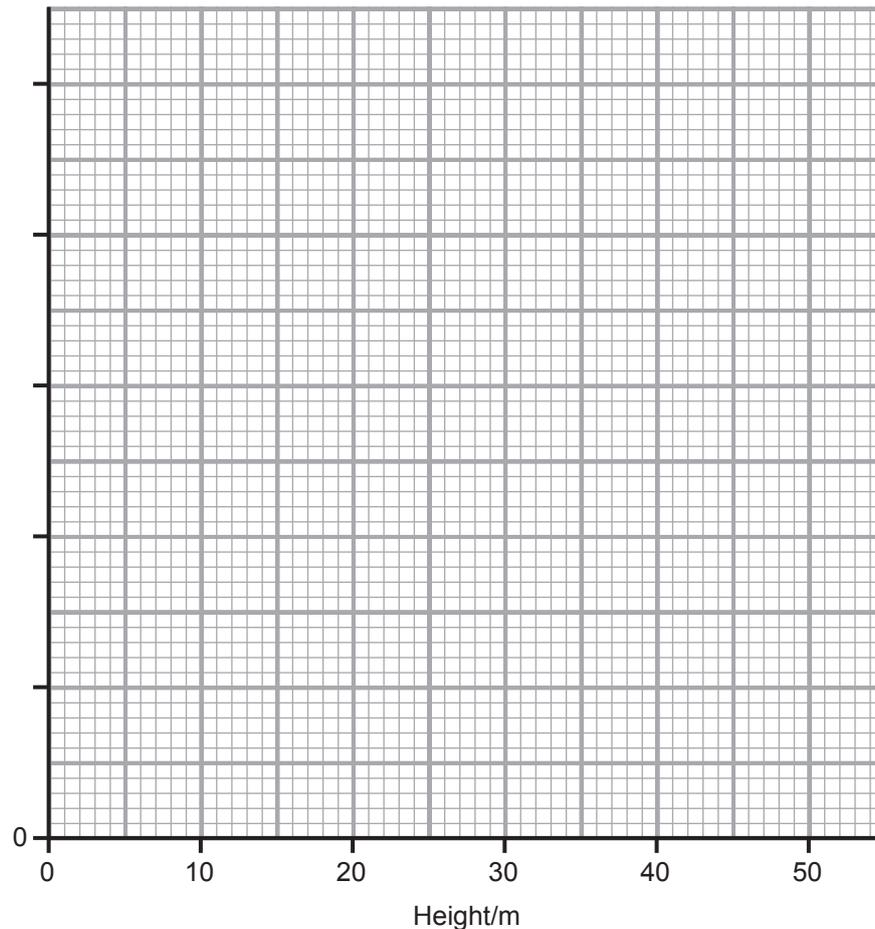
where k is a constant.

The following table shows the results for the gravitational potential energy (G.P.E.) of an object at different heights above the Earth's surface.

Height/m	0	10	20	30	40	50
G.P.E./J	0	50	100	150	200	250

You are asked to plot a graph of gravitational potential energy against height.

- (a) Choose a suitable vertical scale and label its axis. [2]
- (b) Plot the points on the grid of G.P.E. against height above the Earth's surface. [2]
- (c) Draw a line of best fit. [1]



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- (d) (i) From your graph state the relationship between G.P.E. and height above the Earth's surface.

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

- (ii) Explain fully how the graph shows this.

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

- (e) From your graph find the gravitational potential energy when the height is 45 m.

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

- (f) Use your graph to determine the constant  $k$ , in **Equation 11.1**.  
Remember to include the units for  $k$ .

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

$k =$  \_\_\_\_\_ Units = \_\_\_\_\_ [4]

\_\_\_\_\_  
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\_\_\_\_\_



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\*20GSD3119\*

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Question Number	Marks
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2	
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<b>Total Marks</b>	
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Examiner Number

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