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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]

GSD31

FRIDAY 14 NOVEMBER 2014, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** 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 **9(a)**.

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

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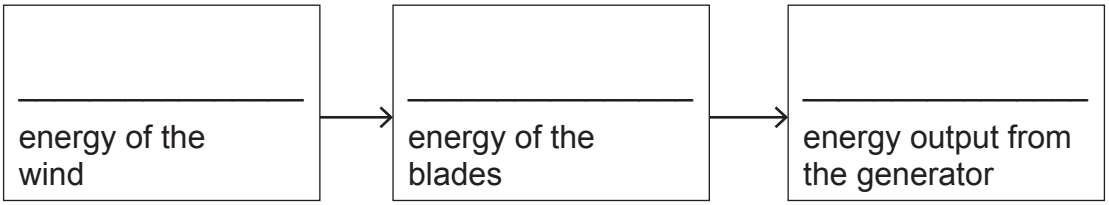
Marks	Remark

1 A wind turbine consists of a set of blades connected to a generator.

© Image Source Pink/Image Source/Thinkstock

(a) (i) Complete the energy flow diagram below.



[3]

(ii) Name two unwanted forms of energy output from the wind turbine.

1. _____

2. _____ [2]

Wind energy is regarded as a renewable energy resource.

(b) (i) What do you understand by the term renewable?

_____ [1]

(ii) Give an environmental advantage of using wind energy.

_____ [1]

(iii) Give a disadvantage of using wind turbines, other than cost.

_____ [1]

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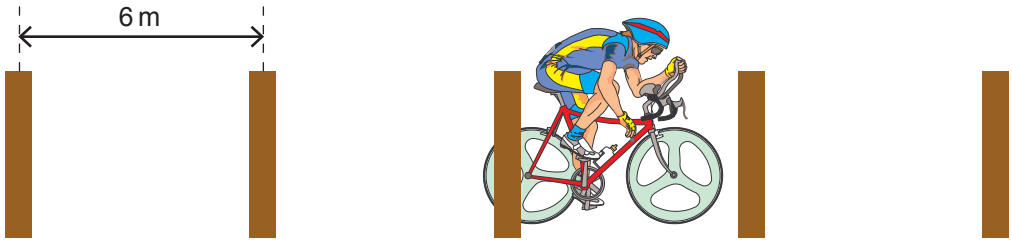
2 A student wants to measure the speed of a cyclist who cycles past a fence at constant speed.

She measures the distance between the posts and times how long the cyclist takes from the 1st post to the 5th post.



Source: Chief Examiner

(a) Name the two pieces of apparatus that the student would use for her measurements.

1. _____

2. _____ [2]

(b) The fence posts are 6 m apart and the time taken to travel the distance from the 1st post to the 5th post is 3 seconds.

Calculate the cyclist's speed.

You are advised to show your working out.

Speed = _____ m/s [4]

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Marks	Remark

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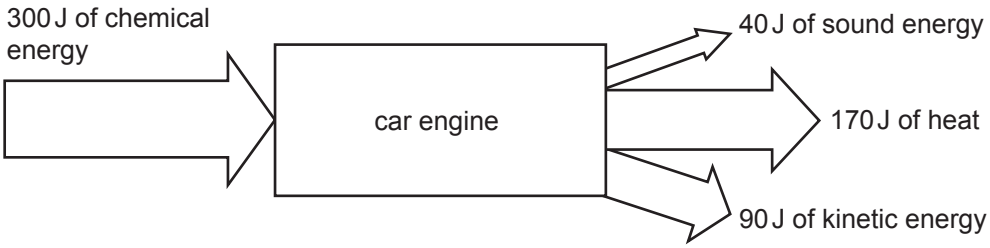
3 A car engine is designed to change **chemical** energy to **kinetic** energy. The input and output figures are given below.



Source: Chief Examiner

Calculate the efficiency of the engine.

You are advised to show your working out.

Efficiency = _____ [3]

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(Questions continue overleaf)

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4 A ball falls vertically through the air. The mass of the ball is 1.25 kg.

(i) Calculate the force of gravity pulling the ball downwards.

You are advised to show your working out.

Force of gravity = _____ N [2]

(ii) Give the name of a force which opposes the motion of the ball.

Name of force = _____ [1]

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(iii) The ball has a mass of 1.25 kg.
The resultant force acting downwards on the ball is 10 N.
Calculate its acceleration using the equation

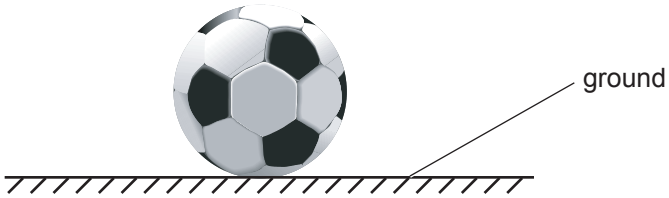
$$\text{acceleration} = \frac{\text{resultant force}}{\text{mass}}$$

Remember to include the units with your answer.

You are advised to show your working out.

Acceleration = _____ [3]

Later the ball comes to rest on the ground as shown.



(iv) The ground exerts a force on the ball. Give the size of this force and state its direction.

Size of force = _____ N

Direction _____ [2]

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5 **(a)** **(i)** What do you understand by the centre of gravity of a body?

_____

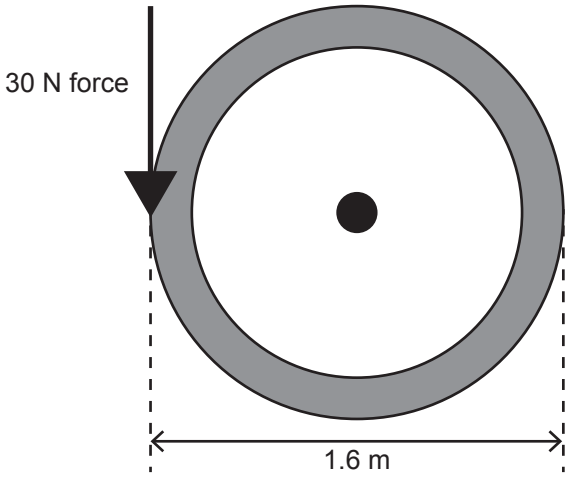
_____ [2]

(ii) In what way does raising the centre of gravity affect the stability of a body?

_____

_____ [1]

An engineer turns a wheel by exerting a downward force of 30 N at the outside edge of the wheel as shown. The diameter of the wheel is 1.6 m.



(b) Calculate the moment exerted, in Nm, about the **centre** of the wheel.

You are advised to show your working out.

Moment = _____ Nm [3]

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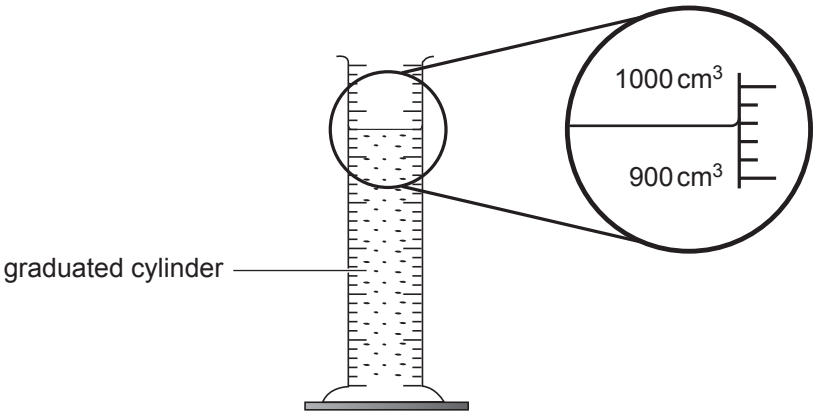
6 A student pours 768 g of a liquid into a graduated cylinder and measures its volume.



Use the information given above to calculate the density of the liquid in g/cm^3.

You are advised to show your working out.

Density of liquid = _____ g/cm^3 [4]

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7 **(i)** Name two **charged** particles which make up the atom. Give the relative charge in each case.

Particle _____ Charge _____

Particle _____ Charge _____ [4]

The letters A, B, C and D represent atomic nuclei.

$^{30}_{15}A$ $^{30}_{16}B$ $^{32}_{17}C$ $^{33}_{16}D$

(ii) Which of the atomic nuclei (A, B, C and D) are isotopes of each other?

_____ [1]

(iii) Explain your answer.

_____

_____ [2]

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8 When radiation travels through air it causes ionisation.

(a) What is ionisation?

_____

_____ [1]

(b) People who work with radioactive materials must take steps to protect themselves.

State two ways that workers can protect themselves.

1. _____

2. _____ [2]

Cobalt-60 is the name of a radioactive substance. The number 60 refers to the number of particles in the nucleus of the cobalt.

(c) **(i)** What do we call this number?

_____ [1]

(ii) Cobalt-60 has a half-life of 5 years. After how many years will its count-rate fall from 240 counts per minute to 30 counts per minute?

You are advised to show your working out.

Time = _____ years [3]

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9 **(a)** Describe an experiment you would carry out to measure personal power. Your description should include:

- the apparatus you would use;
- the measurements you would take.

You will be assessed on your written communication skills including the use of specialist terms.

[6]

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An electric motor lifts a load of 400 N through a distance of 6.0 m in 3 seconds.

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(b) (i) Calculate the power of the motor in watts.

You are advised to show your working out.

Power = _____ W [3]

(ii) Give your answer to **(b)(i)** in kilowatts.

Power = _____ kW [1]

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10 When a block of concrete sits on a surface it exerts a pressure.

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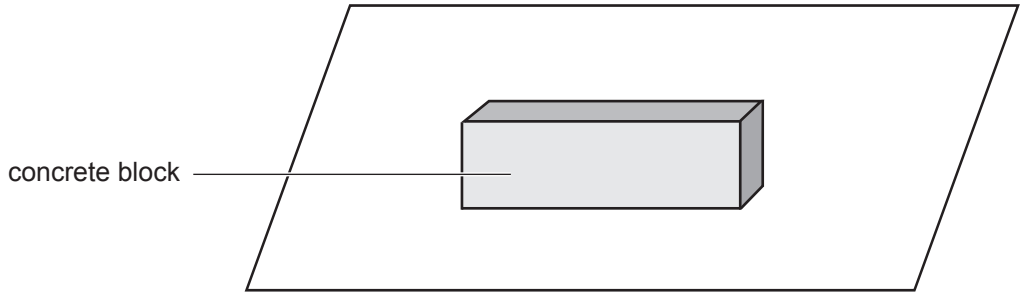
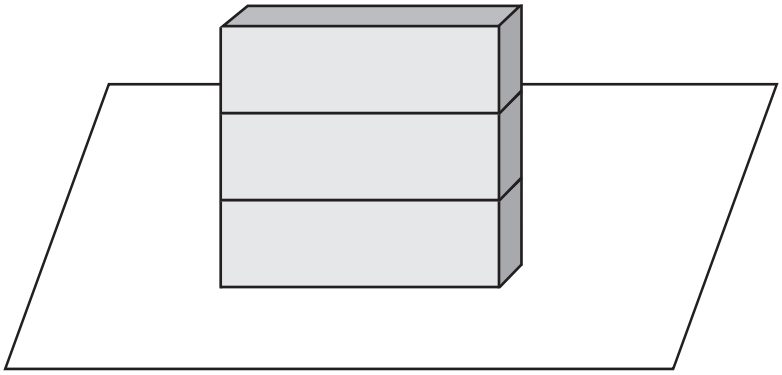


The pressure exerted is given by the equation:

$$\text{pressure} = \frac{\text{weight}}{\text{area}}$$

The weight is changed by adding similar blocks on top as shown below.



The weight of each block is 20 N and the area in contact with the surface is 1.5 m^2.

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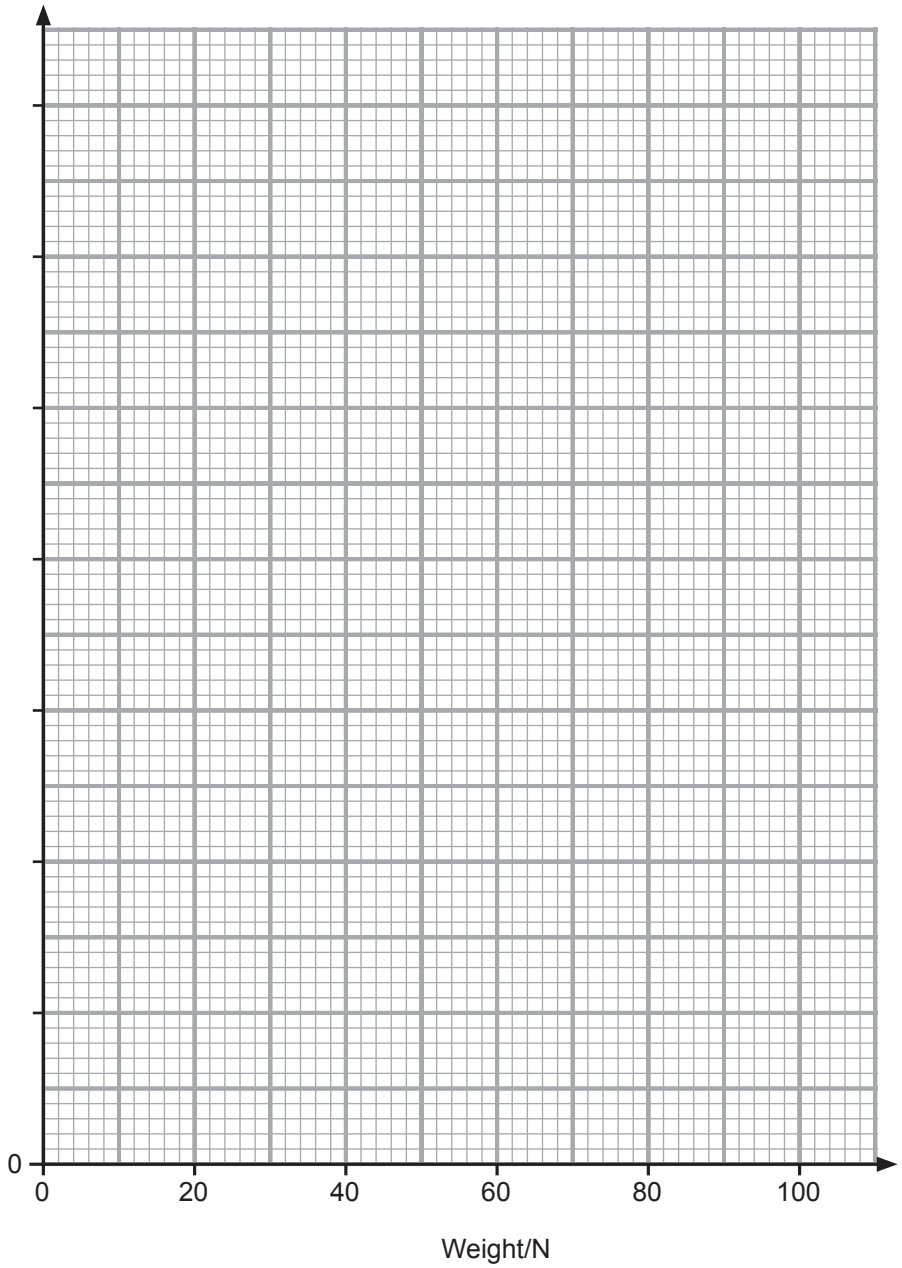
(i) Use the equation $\text{pressure} = \frac{\text{weight}}{\text{area}}$

to complete the table below.
Your values of pressure should be correct to the nearest whole number.

No. of blocks	1	2	3	4	5
Weight/N	20	40	60	80	100
Area/m^2	1.5	1.5	1.5	1.5	1.5
Pressure/ N/m^2	13				

[2]



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(ii) Choose a suitable scale for the pressure on the vertical axis of the graph (page 16) and label it. [2]

(iii) Plot a graph of pressure against weight. [2]

(iv) Draw the best fit line. [1]

The surface that the blocks are resting on will be damaged if the pressure is greater than 45 N/m^2.

(v) Use your graph to find the smallest number of blocks that will damage the surface.

Number of blocks = _____ [2]

(vi) Find the gradient of your graph.

You are advised to show your working out.

Gradient = _____ $/m^2$ [2]

THIS IS THE END OF THE QUESTION PAPER

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