Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014

GCSE Physics

Unit 1

Foundation Tier

[GPH11]

GPH11

THURSDAY 12 JUNE, MORNING

TIME

1 hour 15 minutes.

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.
Complete in blue or black ink only. **Do not write in pencil or with a gel pen**.
Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.
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 **1(a)(iii)**.

Examiner Only	
Marks	Remark

1 **(a)** **(i)** In 2009 the sprinter Usain Bolt ran the 100 m sprint in a time of 9.58 s.
Calculate his average speed during this race.

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

Average speed = _____ m/s [2]

(ii) Explain why your answer is an average speed.

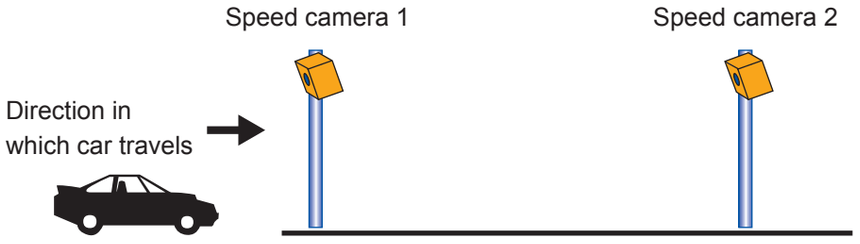
_____

_____

_____ [1]

Examiner Only	
Marks	Remark

(iii) To detect speeding motorists speed cameras are located on the roadside. One type of speed camera measures the average speed of a motorist.
Those motorists who exceed this average speed are prosecuted.
The diagram below represents the layout of the system.



Explain carefully and in detail how this system of speed cameras measures the average speed of a car.

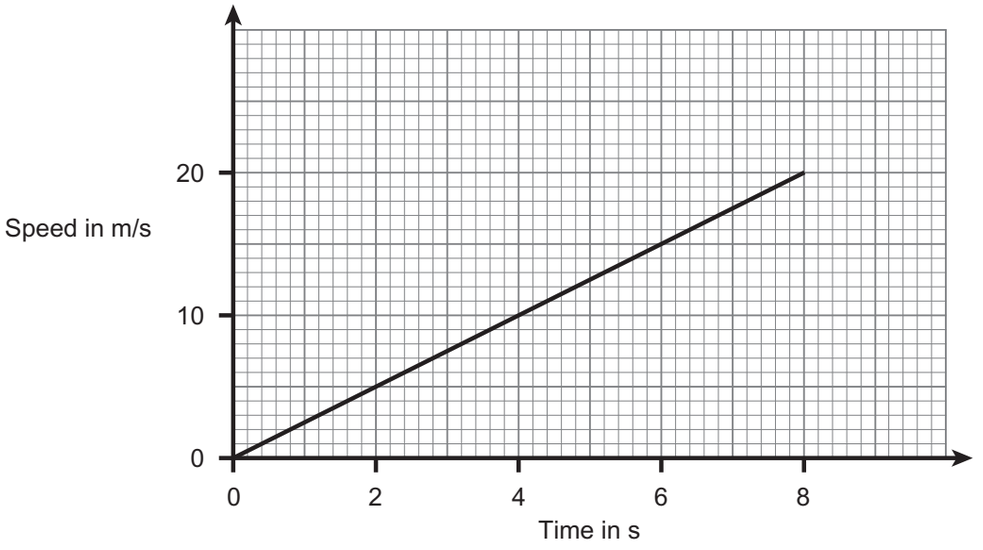
In this question you will be assessed on your written communication skills including the use of specialist terms.

[6]

[Turn over

(b) The speed–time graph for the motion of a car is shown below.

Examiner Only	
Marks	Remark



(i) Using the graph calculate the total distance travelled by the car in 8.0 s.

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

Distance = _____ m [3]

(ii) Calculate the acceleration of the car.

Remember to give the unit for acceleration.

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

Acceleration = _____ [3]

Examiner Only	
Marks	Remark
Total Question 1	

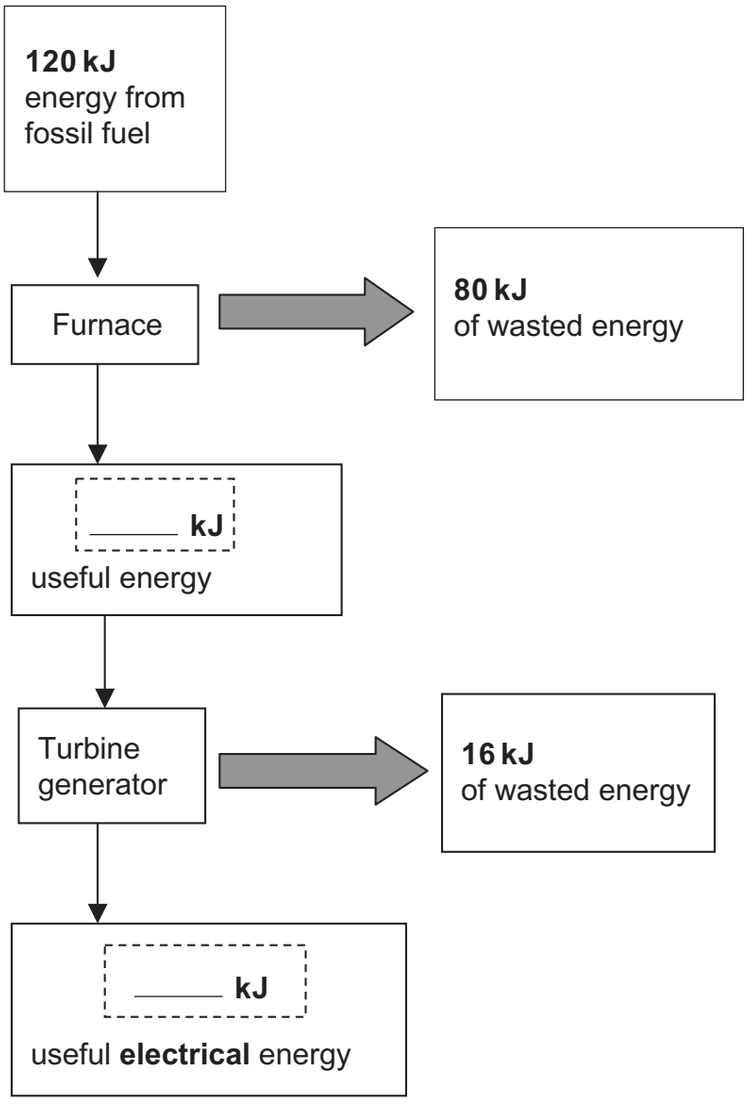
Examiner Only	
Marks	Remark

2 **(a)** State the Law of Conservation of Energy.

_____

_____ [1]

(b) Most of Britain's electrical energy comes from burning fossil fuels. The simplified diagram below is incomplete. It shows what happens when a fossil fuel is burnt in a typical power station.



(i) What type of input energy is used in a fossil fuel power station? Choose your answer from the types of energy listed below.

electrical : nuclear : heat : chemical : gravitational potential

_____ [1]

(ii) Use the Law of Conservation of Energy to calculate the numbers missing from the small dotted boxes. **Write these numbers in the appropriate boxes.** Use the space below for any calculations.

[3]

(iii) In the box below write down the equation you would use to find the efficiency of a device.

[1]

(iv) Use your equation to calculate the efficiency of the **turbine generator**.

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

Efficiency = _____ [3]

(v) What resource do fossil fuel power stations need that makes it desirable for them to be close to a river, or a lake or to be built on the coast?

_____ [1]

Examiner Only	
Marks	Remark
Total Question 2	

[Turn over

Examiner Only	
Marks	Remark

3 **(a)** **(i)** Lisa has a mass of 55 kg. Calculate her weight in newtons.

Weight = _____ N [2]

(ii) Mass and weight are two terms that are often confused.
Weight is measured in newtons and mass in kilograms.
State another way of distinguishing between the two terms.

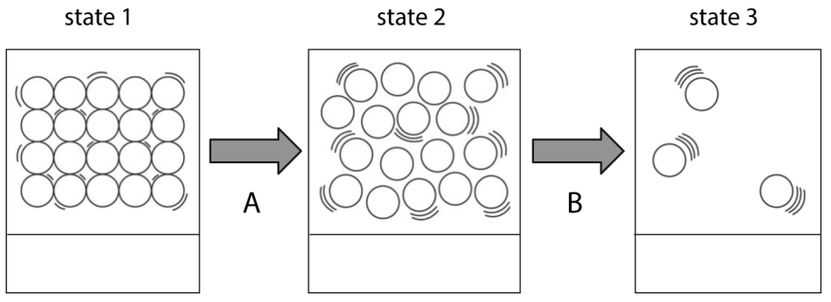
_____

_____

_____ [1]

(b) The diagram below shows three states of matter and the changes that take place when matter is heated.

(i) Label each diagram with the state of matter it represents. [3]



(ii) Name the processes happening as shown by the arrows.

A = _____ B = _____ [2]

(iii) How does the density of matter in state 1 compare with the density in state 2? Explain your answer.

_____

_____

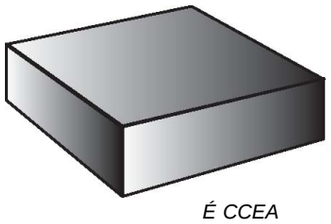
_____ [2]

(c) (i) The density of aluminium is 2.7 g/cm^3.
Explain, **without giving a formula**, what this means.

_____

_____ [1]

(ii) You are given a block of metal as shown in the diagram below.



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List the measurements you would make and the calculations you would carry out to find the density of the metal.

Measurements

1. _____

2. _____

3. _____

4. _____

Calculations

1. _____

2. _____ [4]

Examiner Only	
Marks	Remark
Total Question 3	

[Turn over

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Examiner Only	
Marks	Remark

4 **(a)** The diagram shows an athlete who is moving a hammer in a circle. The hammer is a heavy metal ball attached to a steel wire. The athlete grips the steel wire at the other end as shown below.

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(i) What name is given to the force that keeps objects moving in a circle?

_____ [1]

(ii) In what direction does this force act?

_____ [1]

(iii) In the case shown in the diagram what provides this force?

_____ [1]

(iv) The hammer moves in a circle with constant speed.
Explain why it would be **incorrect** to say it moves with a constant velocity.

_____

_____

_____ [1]

[Turn over

Examiner Only	
Marks	Remark

(v) The table below shows some of the factors that may affect the size of the force needed to move an object in a circle. Complete the table using the terms increases, decreases or has no effect. You should assume that only one factor at a time is changing.

Factor being changed	The effect on the size of the force
The speed is increased, the mass and radius remain constant	
The radius is increased, the mass and speed remain constant	
The direction of rotation is reversed, the speed, mass and radius remain constant	

[3]

(b) Golfers when hitting a golf ball sometimes want it to go as far as possible.
They achieve this by following through. This means the golf club exerts a force on the ball for as long as possible.

© iStock / Thinkstock

(i) Write down the equation that connects the momentum change that the ball experiences, the force acting on the ball and the time for which the force acts.

_____ [1]

(ii) At a particular point in its motion, the golf ball of mass 0.06 kg is moving with a velocity of 50 m/s. Calculate its momentum.

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

Momentum = _____ kg m/s [2]

Examiner Only	
Marks	Remark
Total Question 4	

[Turn over

Examiner Only	
Marks	Remark

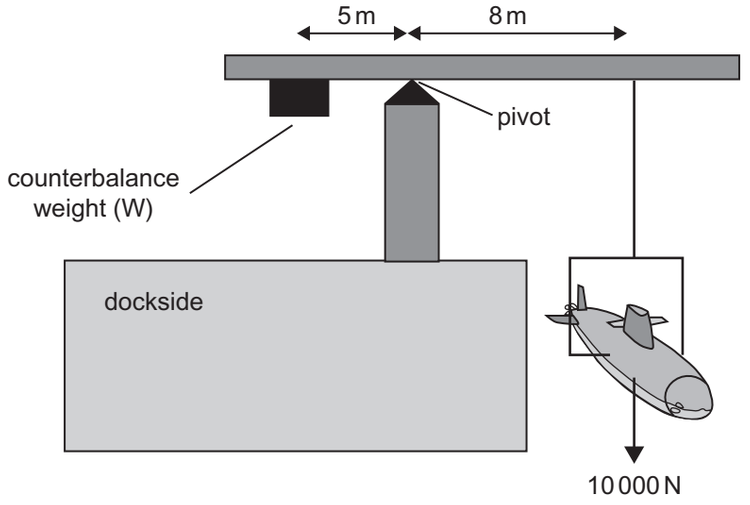
5 **(a)** **(i)** Write down the equation for calculating the moment of a force.

_____ [2]

(ii) In what unit is the moment of a force measured?

_____ [1]

(b) The diagram below represents a crane lifting a small submarine.
The submarine weighs 10 000 N.



(i) State the direction of the moment of the weight of the submarine about the pivot.

Moment is _____ [1]

(ii) Calculate the moment produced by the submarine.

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

Moment produced by submarine = _____ [1]

(iii) Calculate a value for the counterbalance weight, W, needed to prevent the crane toppling over.

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

Counterbalance weight W = _____ N [3]

(iv) To allow the crane to lift boats of different weights out of the water, the counterbalance weight can be moved to the left or right.
If a boat heavier than 10 000 N is to be lifted by the crane, in what direction should the counterbalance weight be moved? Explain your answer.

Direction of movement is _____

Explanation

_____

_____

_____

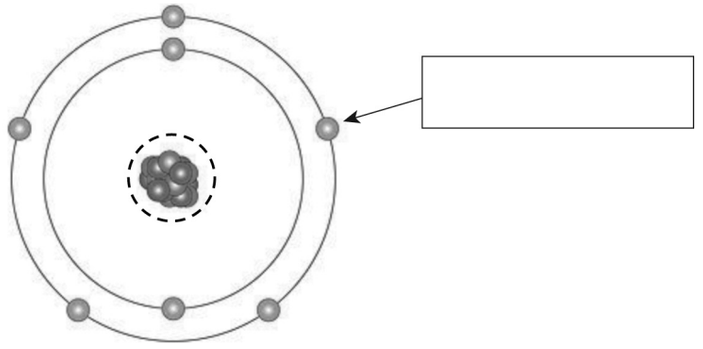
_____ [2]

Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

Examiner Only	
Marks	Remark

6 **(a)** The diagram shows the particles that make up the **atom** of an isotope of nitrogen.



© *Science Photo Library*

(i) Name the particle marked by the arrow. Write the name in the box provided. [1]

(ii) Name the part of the atom inside the dashed circle.

_____ [1]

(iii) Why are atoms electrically neutral?

_____

_____ [1]

(iv) Using information from the diagram above and your knowledge of the structure of a nucleus, complete the symbol below to show the composition of this nucleus of nitrogen.

$$^{15}_{\square}\mathrm{N}$$

[1]

(v) What does the number 15 represent?

_____

_____ [1]

(vi) How many neutrons are to be found in this nucleus of nitrogen?

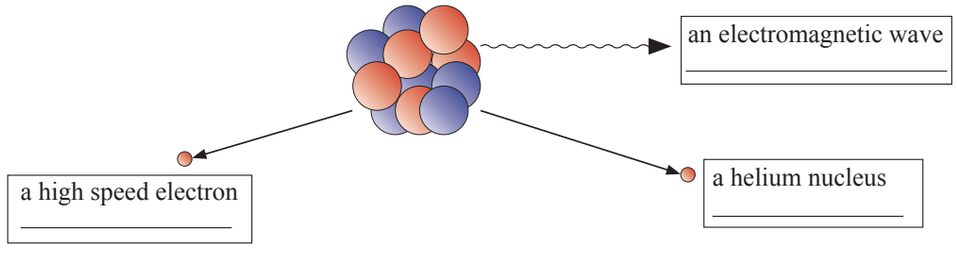
_____ [1]

(vii) Which one of the particles that make up an atom does **not** have an electrical charge?

_____ [1]

(b) The diagram shows a radioactive nucleus. This nucleus can disintegrate by emitting different types of radiation.

(i) Complete the diagram by naming the radiations that may be emitted.
Write their names in the box describing each of the radiations emitted.



[3]

(ii) Which radiation is stopped by a thin sheet of paper?

_____ [1]

Examiner Only	
Marks	Remark

[Turn over

Examiner Only	
Marks	Remark

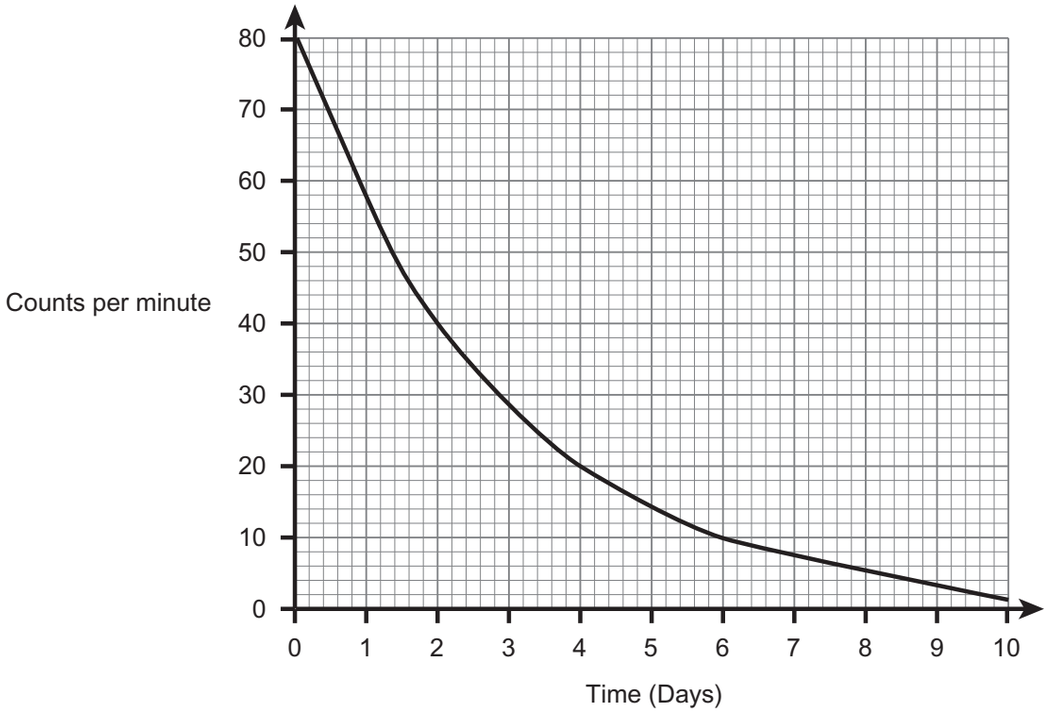
(iii) Which radiation can pass through the sheet of paper but is stopped by a thin sheet of aluminium?

_____ [1]

(iv) Which radiation can only be stopped by a thick block of lead?

_____ [1]

(c) The graph below shows how the activity of a radioactive substance changes with time.



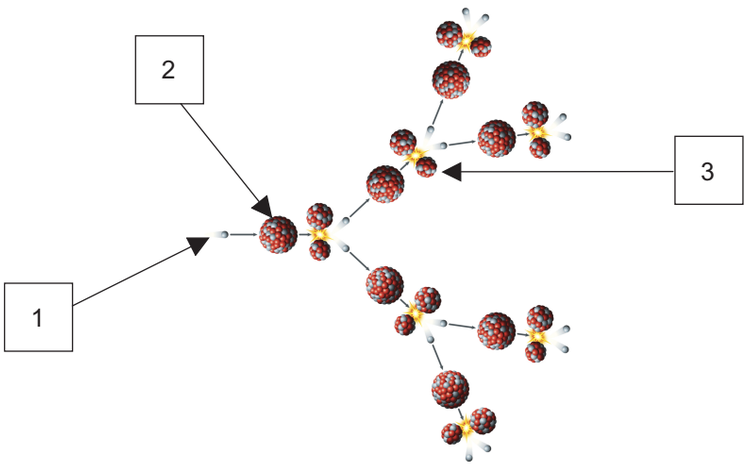
(i) What is the half-life of this radioactive substance?

_____ [1]

(ii) What would be the counts per minute after 2 half-lives have passed?

_____ [1]

(d) The diagram below illustrates a nuclear reaction that takes place in a nuclear reactor.



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(i) What is the name of this nuclear process?

_____ [1]

(ii) Name the particle marked 1. _____ [1]

(iii) Particle 1 is absorbed by nucleus 2.
State what nucleus 2 is and explain how nucleus 3 is formed.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

[Turn over

(iv) An important part of this process is the creation of a chain reaction. Describe what this is.

_____

_____

_____ [1]

Examiner Only	
Marks	Remark
Total Question 6	

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Question Number	**Marks**
1	
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