CCEA GCSE PHYSICS

PHYSICS



EXAM QUESTION PACK

UNIT P1 FOUNDATION TIER GPH11 PAPERS

STEMUP

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Rewarding Learning

General Certificate of Secondary Education
2016

GCSE Physics

Unit 1
Foundation Tier

[GPH11]

MONDAY 20 JUNE, MORNING

MARK SCHEME

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General Marking Instructions and Mark Grids

Introduction
Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

Quality of candidates' responses
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Flexibility in marking
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Positive marking
Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark scheme
Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

					AVAILABLE MARKS
1	**(a)**	(Force which) opposes motion/slows down/stop/resists motion/reduces speed Surfaces rubbing – give [0]	[1]		
	(b)	**(i)** As friction increases, acceleration decreases or Ratio (of friction to acceleration) is not constant/negative correlation Not doubling – acceptable	[1]		
		(ii) Label: Friction (force)/N (or equivalent) Scale: to cover at least half of grid (if scale too large – [0]) Points: 5 points [$\frac{1}{\square}$] each round DOWN $\pm$ 1 square Straight line of best fit RULED through THEIR points Line of best fit touches both axes	[1] [1] [2] [1] [1]	[6]	
		(iii) 0.58 to 0.62 (m/s^2)	[1]		
		(iv) 0 (m/s^2)	[1]		
		(v) From graph max friction = 35 to 37 N when acceleration = 0 So max forward force = 35 to 37 (N)	[1] [1]	[2]	
		(vi) Gradient = rise/run (or equivalent) Must be an equation – **not** just rise/run = (18 – 12)/(0.3 – 0.4) or equivalent = (–)60 (kg) Value consistent with their graph	[1] [1] [1]	[3]	15

AVAILABLE MARKS

2 (a) Indicative content:

A non-renewable energy resource will run out (accept formed over millions of years)/has a limited supply
A renewable energy source has limitless supply/will not run out/can be replaced in a lifetime/accept replenished
Accept reference to lifetime
Re-used not acceptable as meaning renewable

Oil is always available to produce energy/is reliable
Wind power can be intermittent or unreliable
} oil more reliable (than wind) [2]

Oil can produce a lot of energy (high energy density)
Wind produces little energy (low energy density)
Oil responds quickly to demand
} oil produces more energy (than wind) [2]

Non-renewable example – coal/gas/nuclear
Renewable example – tidal/wave/solar/biomass/HEP } must ne named

Response	Mark
Candidates describe in detail using good SPG **at least 5 points** shown opposite. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good SPG **at least 3 points** shown opposite. The form and style are of a high standard and specialist terms are used appropriately on some occasions.	[3]–[4]
Candidates make some reference to **one of the points** shown opposite using good SPG. The form and style are of a satisfactory standard but there is limited use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(b) (i) GPE = mgh [1]
= 440 × 10 × 12 [1]
= 52 800 (J) [1] [3]

(ii) 52 800 (J) (ecf from **(i)**) [1]

(c) (i) W = Fd [1]
= 40 × 250 [1]
= 10 000 (J) [1] [3]

(ii) Heat and Sound (any order [1] each) [2]

15

3 (i) V = l × b × h or = 1.5 × 0.3 × 0.4 [1]
= 0.18 [1]
m^3 [1] [3]

(ii) mass = 1000 × 0.18 ecf from **(i)** for volume [1]
= 180 (kg) [1] [2]

(iii) Weight of water = 1800 (N) Allow ecf for mass from **(ii)** [1]
Total weight = 200 + 1800 = 2000 (N) [1]
Minimum force = 2 × 2000 = 4000 (N) [1] [3]

(iv) NA
Glass
Water [2]
All three correct give [2]
One correct give [1]

10

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						AVAILABLE MARKS
4	**(a)**	**(i)**	Centripetal		[1]	
		(ii)	Friction – required for 2nd mark	[1]		
			Between tyres and the road	[1]	[2]	
		(iii)	Labelled arrow (F) towards centre of circle (near car)		[1]	
		(iv)	Labelled arrow (V) to the right (near car and between track curve)		[1]	
		(v)	Momentum = mv	[1]		
			= 700 × 40	[1]		
			= 28 000	[1]		
			kg m/s	[1]	[4]	
			Give the formula mark if no other work shown			
	(b)	**(i)**	Momentum **change** = force × time or Ft = mv – mu		[1]	
			or correct format Impulse gets [0]			
		(ii)	The time (for the) momentum change is **longer**	[1]		
			so the force on the driver is **reduced**. – Dependent marking	[1]	[2]	
		(iii)	The (required) centripetal force decreases (as speed decreases).		[1]	
		(iv)	Radius should be increased/gets larger/longer.		[1]	
		(v)	The (required) centripetal force decreases (as the radius of the bend increases).		[1]	15

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						AVAILABLE MARKS
5	**(a)**	**(i)**	F × b		[1]	
		(ii)	EACH CORRECT LABEL – [1] each		[3]	
		(iii)	Effort is further from pivot than the weight so can have a larger moment	[1] [1]	[2]	
	(b)	**(i)**	Point [1] where the weight [1] of the object acts (appears)/gravity acts/mass is concentrated		[2]	
		(ii)	To right of previous position but to left of pivot Above the previous position	[1] [1]	[2]	10
6	**(a)**		Proton mass 1 charge +(1)		[2]	
			Neutron mass 1 charge 0		[2]	
			Electron mass = $\frac{1}{1836}$ or $\frac{1}{1837}$ charge – or –1		[2]	[6]
			Name, mass, charge all correct for [2] Award [2] if all particles correctly named			
	(b)		Ball of positive charge Negative charges (electrons) embedded in it.	[1] [1]	[2]	
	(c)		$^{23}_{11}Na$		[2]	
	(d)	**(i)**	Radioactive —— ——		[1]	
		(ii)	Alpha (α) High speed electron Gamma (γ) ray	[1] [1] [1]	[3]	
		(iii)	The removal of an electron from an atom		[1]	15
					Total	**80**

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Rewarding Learning

General Certificate of Secondary Education
2015

GCSE Physics

Unit 1

Foundation Tier

[GPH11]

FRIDAY 12 JUNE, AFTERNOON

MARK SCHEME

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Awarding zero marks
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Types of mark scheme
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						AVAILABLE MARKS
1	(a)	(i)	Displacement is distance moved in a certain direction **or** Displacement is a vector, distance is not		[1]	
		(ii)	Accelerating Constant speed Decelerating		[3]	
	(b)	(i)	The distance or gap between the balls is increasing		[1]	
		(ii)	Ave speed = distance/time	[1]		
			= 1.2/0.5 no marks for use of "g"	[1]		
			= 2.4 (m/s)	[1]	[3]	
		(iii)	Final speed = 2 × 2.4 – 0 [1] per sub [1] per side of equation	[2]		
			= 4.8 (m/s)	[1]	[3]	
			Allow **ecf** for average speed			
		(iv)	Rate of change of speed = Change of speed/time	[1]		
			Accept $a = \frac{v-u}{t}$ or $\frac{u-v}{t}$			
			only if progressed and ignore –ve			
			Not $a = \frac{v+u}{t}$			
			Could use: $v^2 = u^2 + 2as$ [1]			
			$a = \frac{4.8^2 - 0}{2 \times 1.2}$ [1]			
			= 9.6 [1] m/s^2 [1]			
			or			
			$s = \frac{1}{2}at^2$ [1]			
			$1.2 = \frac{1}{2} \times a \times (0.5)^2$ [1]			
			a = 9.6 [1] m/s^2 [1]			
			(4.8 – 0)/0.5	[1]		
			= 9.6	[1]		
			m/s^2	[1]	[4]	15
			Allow **ecf** for final speed			
2	(a)	(i)	Kinetic	[1]		
			Sound	[1]		
			Electrical	[1]	[3]	
		(ii)	Efficiency = useful output energy/total input energy	[1]		
			= 300/1000 = 0.3	[1]	[2]	
	(b)	(i)	Cut-in marked and Cut-off marked Must be identified on speed axis		[2]	
		(ii)	Maximum efficiency = 0.51 to 0.52 Accept 0.505 → 0.524	[1]		
			Ratio = 0.3	[1]	[2]	

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(c) Indicative content

1. Measure the weight (do not accept force) lifted or mention of a known weight
2. Measure the (vertical) height it is raised or distance lifted etc.
3. Determine the time taken for one lift or the time to complete a number of lifts, if consistent with their calculation of power.
4. Calculate the work done = weight × distance
   or = weight × distance × (number of lifts)
5. Power = work done/time

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **all 5 points** shown above and the precaution is clearly stated. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar **3 points** shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to **one or two of the main points** shown above using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some reference to specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6] 15

AVAILABLE MARKS

3 (a) (i) Density = mass/volume [1]

$D = \frac{M}{V}$ give [0], unless symbols explained.

(ii) Density = 30/60 [1]
= 0.5 (g/cm^3) [1] [2]

(b) (i) **Fill**/pour water into cylinder [1]
Fill bottle [1]
Read difference [1]
Read volume of water/take reading
} use of sand gets [0] [3]

(ii) **Read** volume of water in measuring cylinder (**required**) [1]
Place bottle in cylinder [1]
Note the difference in the levels [1]
} If cylinder filled only 2nd mark available [3]

(iii) Subtract the volume of inside from the volume of bottle [1] 10
or Volume of bottle filled with sand – volume of sand
Must be in correct order vol **(ii)** – vol **(i)**

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						AVAILABLE MARKS
4	(a)	(i)	Prevents passenger being thrown forward against windscreen **or** similar response **or** increases (collision) time and decreases force/deceleration		[1]	
		(ii)	Airbag or crumple zone or steel cage or ABS or stability control, or traction control		[1]	
		(iii)	Momentum = mass × velocity **or** p = mv		[1]	
			= 48 × 15	Numerical ans must	[1]	
			= 720	be consistent with unit	[1]	
			kg m/s or Ns		[1]	[4]
	(b)	(i)	Friction		[1]	
			between tyres and track		[1]	[2]
		(ii)	Towards centre of circle/track			[1]
	(c)	(i)	Increases		[1]	
			Decreases		[1]	
			Increases		[1]	
			Stays the same		[1]	[4]
		(ii)	Tangent at bung carefully drawn		[1]	
			to the right		[1]	[2]
						15
5	(a)	(i)	P marked clearly on shoulder			[1]
		(ii)	The bucket			[1]
		(iii)	ACM = CM		[1]	
			200 × 0.5 = 80 × d		[1]	
			d = 1.25 m		[1]	
			Distance from **X** = 0.25 m		[1]	[4]
			or			
			ACM = CM 200 × 0.5 = 80(1.5 – **X**) } [3]			
			X = 0.25 m [1]			
	(b)	(i)	G clearly marked in base or more towards base in lower half of vertical tube			[1]
		(ii)	Wide base or large base area		[1]	
			Heavy base		[1]	
			provides a low CoG	Any 3	[1]	[3]
			C of G in centre			
						10

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						AVAILABLE MARKS
6	**(a)**	**(i)**	Proton, Neutron and Electron (3 × [1])		[3]	
		(ii)	$^{3}_{2}He$ both figures required and in the correct position		[1]	
	(b)	**(i)**	Fission – correct spelling essential		[1]	
		(ii)	**Reasons must be consistent with their choice** e.g. **Yes** – is a long term energy supply, would provide long term employment, employment of technical skilled persons, employment during the construction process,reduces the demand for fossil fuels/ conserves fossil fuel stocks/lots of energy from little fuel/reliable cost arguments → [0], efficiency → [0], No CO_2 → [0] But SO_2 → [1] **No** – produces toxic waste, terrorist attack, could increase radiation in the area, possibility of leakage/high decommissioning cost/radioactive waste causes cancer or **just** radioactive waste explosion [0] **Detail** required potential for disaster (2 × 1)		[2]	
	(c)		It will **strip/remove** electrons off atoms only remove or add electrons → [0]		[1]	
	(d)	**(i)**	Gamma – must be stated to get 2nd mark	[1]		
			(Only) gamma will pass through the steel/alpha and beta will not pass through the steel Accept source	[1]	[2]	
			Most penetrating – [0]			
		(ii)	If the steel is too thick the detector registers a reduction/if the steel is too thin the detector registers an increase – this point required	[1]		
			The control unit increases the pressure or force on the rollers/the control unit decreases the pressure or force on the rollers	[1]	[2]	
			Constant reading means constant thickness } give [1] so constant pressure			
	(e)		1 day = 24 hr = 2 half-lives	[1]		
			200 → 100 → 50	[2]	[3]	15
			If evidence of halving give [1] if answer not present			
					Total	**80**

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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)**.

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24GPH1101

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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.

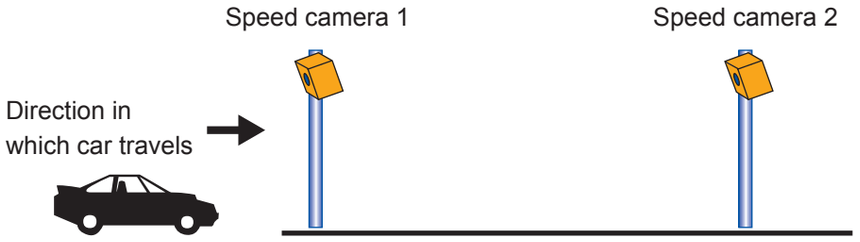
_____

_____

_____ [1]

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(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]

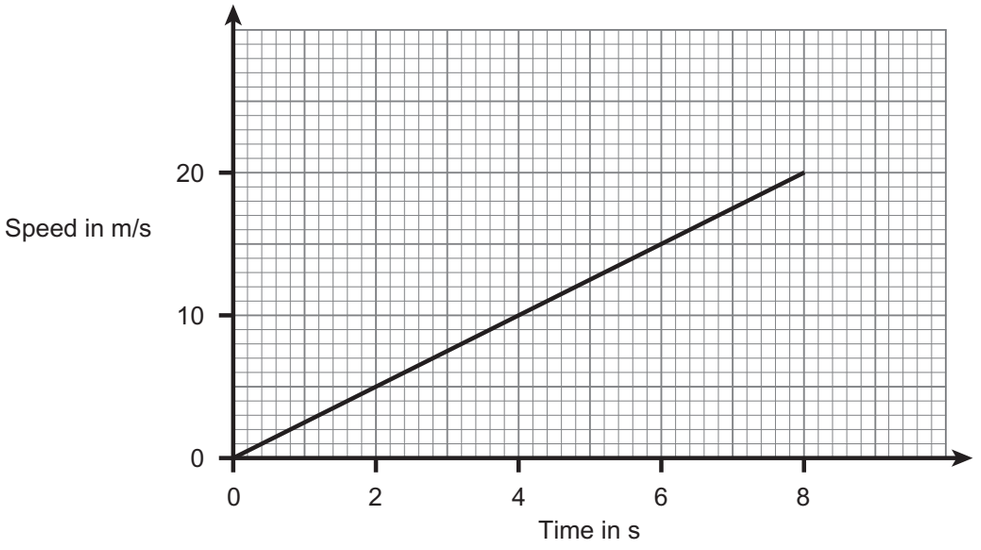
Examiner Only	
Marks	Remark

[Turn over

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(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]

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(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	

[Turn over

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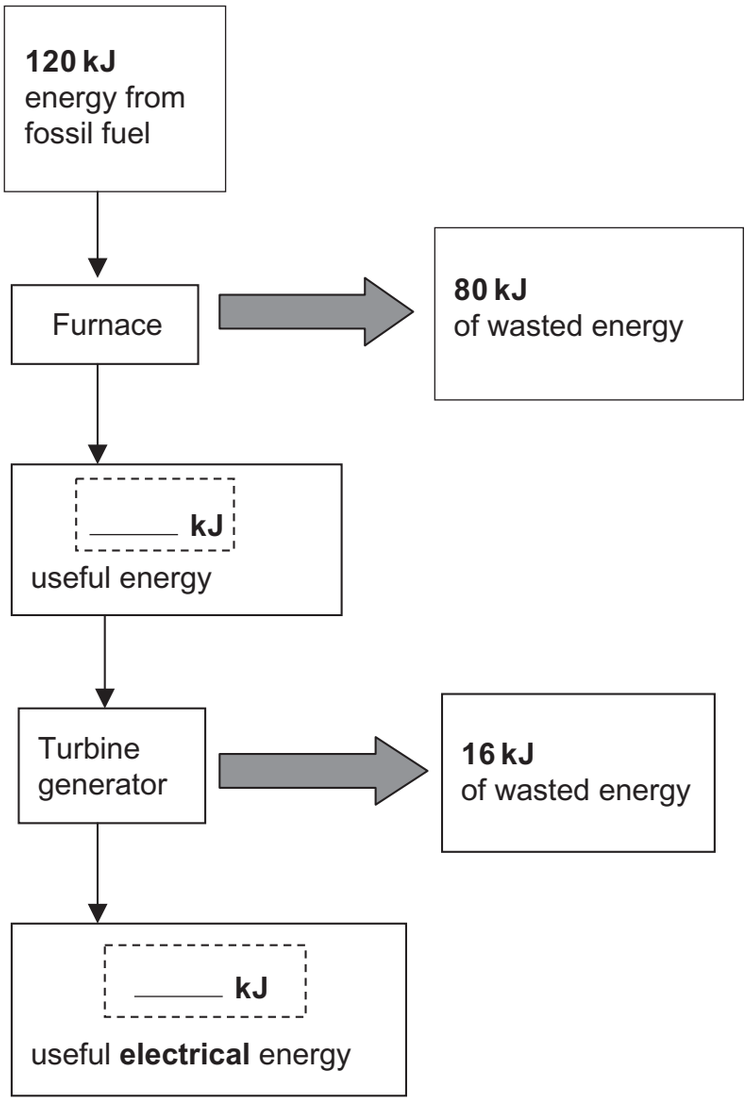
Examiner Only	
Marks	Remark

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.



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(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

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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.

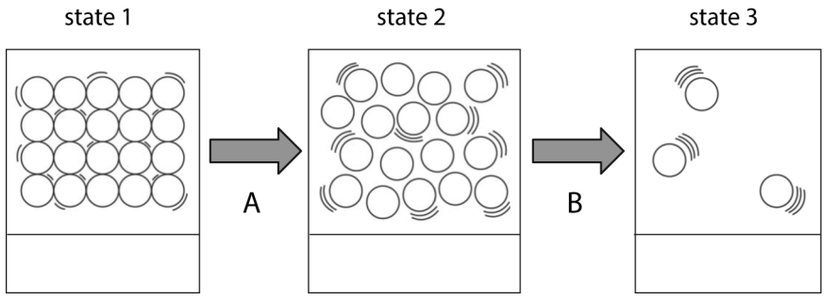
_____

_____

_____ [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]

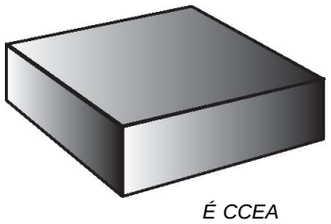
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(c) (i) The density of aluminium is 2.7 g/cm^3.
Explain, **without giving a formula**, what this means.

_____

_____ [1]

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



É CCEA

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

24GPH1109

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DO NOT WRITE ON THIS PAGE

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

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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

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Examiner Only	
Marks	Remark

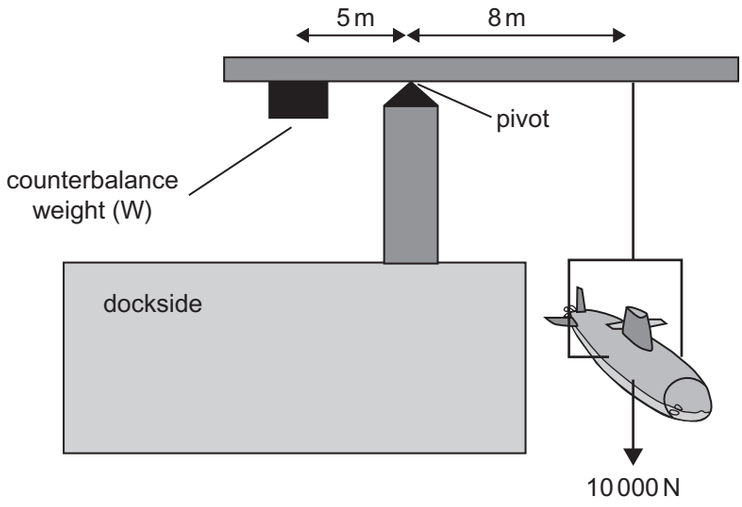
5 **(a)** **(i)** Write down the equation for calculating the moment of a force.

_____ [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]

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(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]

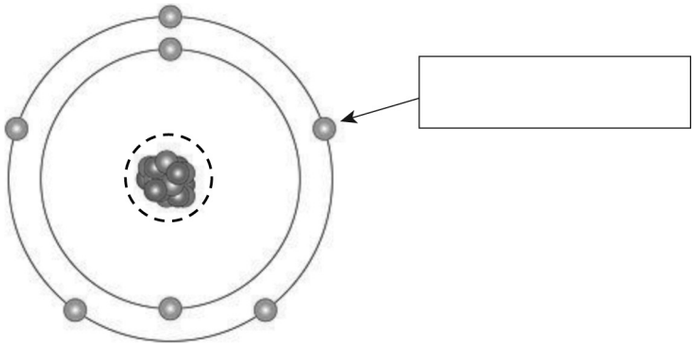
Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

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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]

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(v) What does the number 15 represent?

_____

_____ [1]

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

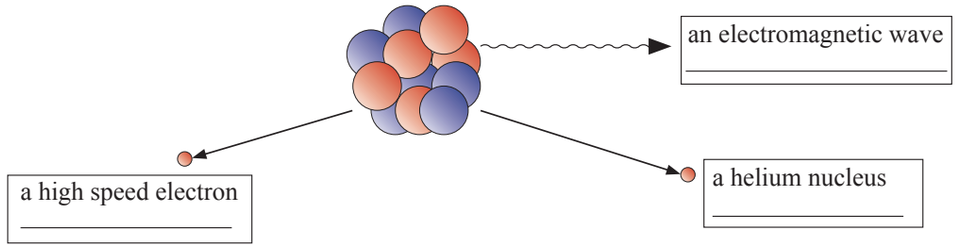
_____ [1]

(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.



© CCEA

[3]

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

_____ [1]

Examiner Only	
Marks	Remark

[Turn over

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Examiner Only	
Marks	Remark

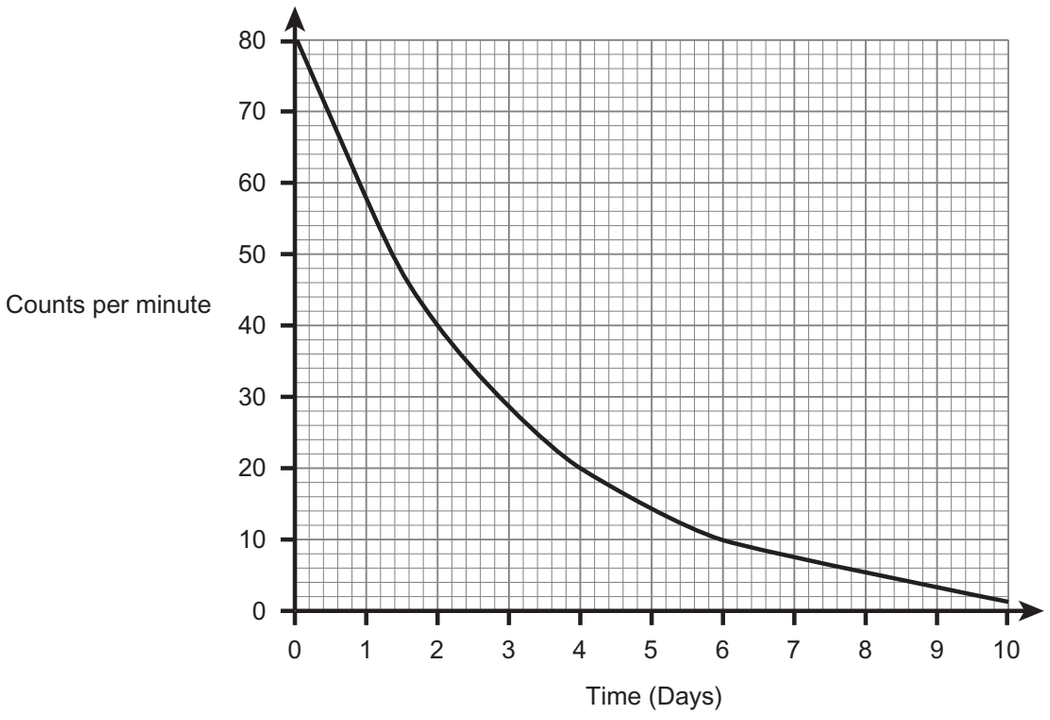
(iii) Which radiation can pass through the sheet of paper but is stopped by a thin sheet of aluminium?

_____ [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?

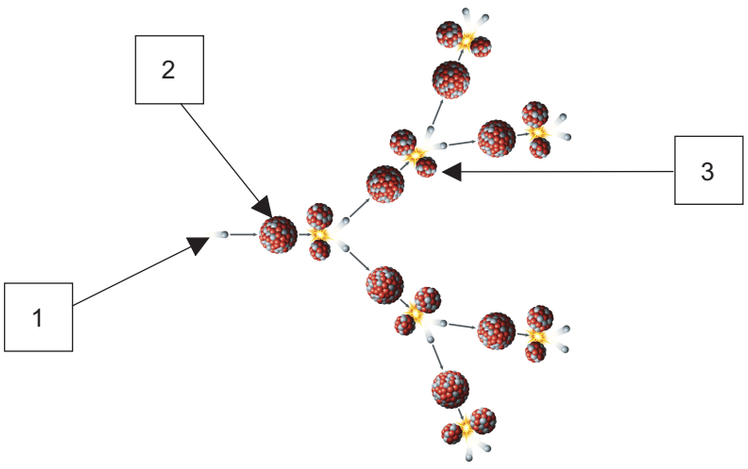
_____ [1]

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

_____ [1]

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



É PeterHermesFurian/iStock/Thinkstock.com

(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

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(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	
2	
3	
4	
5	
6	
Total Marks	

Examiner Number

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Rewarding Learning

General Certificate of Secondary Education
2014

GCSE Physics

Unit 1
Foundation Tier

[GPH11]

THURSDAY 12 JUNE, MORNING

MARK SCHEME

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General Marking Instructions and Mark Grids

Introduction
Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

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Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks
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Types of mark scheme
Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

1 (a) (i) Average speed = 100/9.58 [1]
= 10.44 (10.4) [1] [2]

(ii) His speed changes during the race/he has accelerated [1]

(iii) **Indicative content**
Timer starts when car passes camera 1
Timer stops when car passes camera 2
Time interval calculated/known
Distance between cameras is known/measured
Average speed = distance/time interval

Response	**Mark**
Candidates describe in detail using good spelling, punctuation and grammar **all the main points** shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar **3 or 4 of the points** shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to **one or two of the main points** shown above using satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made some reference to specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(b) (i) Distance = area under graph **or** Dist = Ave speed × time [1]
$= \frac{1}{2}(8) \times 20$ $= \frac{20}{2} \times 8$ [1]
= 80 (m) [1] [3]

(ii) Acceleration = slope or gradient [1]

$= \frac{20}{8} = 2.5$ [1]

Unit mark m/s^2 [1] [3]

15

AVAILABLE MARKS

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						AVAILABLE MARKS
2	**(a)**	Energy cannot be created or destroyed (Both needed)			[1]	
	(b)	**(i)** Chemical			[1]	
		(ii) 40 (kJ) (useful heat energy) 24 (kJ) (electrical) 40–16 give [1] Allow e.c.f. from first answer	[1] [2]		[3]	
		(iii) Efficiency = $\frac{\text{useful output energy}}{\text{total input energy}}$ Work or power can be used in place of energy Output/input score [0]			[1]	
		(iv) 24/40 Allow e.c.f. from **(b)(ii)**. = 0.6 **or** 60% 0.6% score [0] but gains the substitution marks	[2] [1]		[3]	
		(v) Water			[1]	10
3	**(a)**	**(i)** W = 55 × 10 or W = mg 550 (N)	[1] [1]		[2]	
		(ii) Weight is the force due to gravity Mass is the amount of matter **or** mass does not change **or** weight can change **or** weight has direction or is a vector mass is a scalar			[1]	
	(b)	**(i)** Left to right: solid liquid gas			[3]	
		(ii) A = melting B = evaporation/vaporisation			[2]	
		(iii) State 1 more dense Particles are closer	[1] [1]		[2]	
	(c)	**(i)** 1 cm^3 of aluminium has a mass of 2.7 g			[1]	
		(ii) Measurements Calculations	length breadth width mass volume = l × b × d density = $\frac{\text{mass}}{\text{volume}}$	[$\frac{1}{2}$] each, round down [2] [1] [1]	[4]	15

						AVAILABLE MARKS
4	**(a)**	**(i)**	Centripetal		[1]	
		(ii)	Towards the centre (of the circle)/centre seeking Towards person = [0]		[1]	
		(iii)	Tension (in the cable)		[1]	
		(iv)	The **direction** is changing **or** velocity is a vector $v = \frac{dist}{t}$ = [0]		[1]	
		(v)	Increases Decreases No effect/same	[1] [1] [1]	[3]	
	(b)	**(i)**	Momentum **change** = Force × Time or Ft = m(v – u) or any correct rearrangement of **Not** F = ma		[1]	
		(ii)	Momentum = Mass × Velocity Award equation mark if no further work shown = 0.06 × 50 = 3 (kg m/s)	 [1] [1]	 [2]	10
5	**(a)**	**(i)**	Moment = Force × Distance from pivot Perpendicular distance stated	[1] [1]	 [2]	
		(ii)	N m **or** N cm **or** N mm		[1]	
	(b)	**(i)**	Clockwise		[1]	
		(ii)	Moment = 10 000 × 8 = 80 000 (ignore unit)		 [1]	
		(iii)	ACM = CM W × 5 = 80 000 **or** W = 80 000/5 W = 16 000 (N)	[1] [1] [1]	 [3]	
		(iv)	W moves LEFT or further away – wrong direction ⇒ [0] Creating a larger moment/turning effect **or** Compensates for increased moment/turning effect of heavier boat Any mention of clockwise moment ⇒ [0] Idea of increasing force ⇒ [0]		[1] [1]	10

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						AVAILABLE MARKS
6	**(a)**	**(i)**	Electron		[1]	
		(ii)	The nucleus		[1]	
		(iii)	Same number of electrons as protons **or** equal numbers of positive and negative charges		[1]	
		(iv)	7		[1]	
		(v)	Number of neutrons plus protons **or** number of nucleons		[1]	
		(vi)	8 Allow e.c.f. from **(iv)**		[1]	
		(vii)	Neutron		[1]	
	(b)	**(i)**	Electromagnetic wave = gamma ray Helium nucleus = alpha particle High speed electron = beta particle	[1] [1] [1]	[3]	
		(ii)	Alpha		[1]	
		(iii)	Beta		[1]	
		(iv)	Gamma		[1]	
	(c)	**(i)**	2 (days)		[1]	
		(ii)	20 No e.c.f. from **(i)**		[1]	
	(d)	**(i)**	(Nuclear) **fission** Must be correct spelling		[1]	
		(ii)	Neutron		[1]	
		(iii)	The uranium nucleus (particle 2) or plutonium – must name nucleus breaks (into small) nuclei (particle 3)/fragments/splits/fissions	[1] [1]	[2]	
		(iv)	The neutrons released in the breakup cause other (uranium) nuclei to fission No e.c.f. from **(ii)**		[1]	20
					Total	**80**

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Rewarding Learning

General Certificate of Secondary Education
2013

Science: Physics

Unit P1
Foundation Tier

[GPH11]

THURSDAY 13 JUNE, MORNING

MARK SCHEME

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						AVAILABLE MARKS
1	**(a)**	**(i)**	Unlimited supply/can be replaced in a human lifetime Can be used again give [0]		[1]	
		(ii)	Nuclear Non-renewable Oil Non-renewable Tidal Renewable Natural gas Non-renewable [$\frac{1}{2}$] each round up		[2]	
	(b)		Solar cell converts sunlight to electricity Motor converts electricity to kinetic energy Fan gives the air kinetic energy/heat produced/sound produced All 3 stated give [2] Any 2 of 3 [1]	[1] [1] [2]	[4]	
	(c)	**(i)**	$KE = \frac{1}{2}\,mv^2$ $= \frac{1}{2} \times 2000 \times 3^2$ $= 9000$ (J)	[1] [1] [1]	[3]	
		(ii)	Work = Force × distance $= 1000 \times 50$ $W = 50\,000$ (J)	[1] [1] [1]	[3]	
		(iii)	Work has to be done against friction some of work/energy to be converted to heat Because of friction without reference to work/energy give [1]	[1] [1]	[2]	15

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					AVAILABLE MARKS
2	**(i)**	Average speed = distance/time	[1]		
		= 76/4	[1]		
		= 19 (m/s)	[1]	[3]	
	(ii)	Weight **or** gravity		[1]	
	(iii)	600 = m × 10	[1]		
		m = 60 (kg)	[1]	[2]	
	(iv)	Resultant force = 600 – 200	[1]		
		= 400 (N)	[1]		
		Direction is downwards	[1]	[3]	
	(v)	There is a non-zero resultant force			
		or The forces do not cancel each other		[1]	10

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3 (a) (i) Density = mass/volume [1]

(ii) Volume = $(3 \times 3 \times 3) = 27\ cm^3$ [1]
Density = 240.3/27 No e.c.f. for V [2]
$= 8.9\ (g/cm^3)$ [1] [4]

(b) A C D [2]
Any two blocks give [1], *all three give* [2]
more than 3 give a maximum of [1]

They have the same density [1]
because ratio M/V the same for each [1]
or they are on same straight line that passes through 0,0
or in proportion **or** supported by calculations [4]

(c) Indicative content

1. Use a balance to find the mass. Must link measurement to equipment
2. Place water in measuring cylinder and record volume or use Eureka can (displacement)
3. Place necklace in the water; the change of volume is volume of necklace
   Point 3 could be described as read new volume and subtract volume readings
4. Use formula D = M/V
5. Precaution – avoid splashing
   or repeat and average
   or ensure it is completely covered
   or read to bottom of meniscus

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **all the main points** shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	[5]–[6]
Candidates describe in detail using good spelling, punctuation and grammar **at least three of the main points** shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
Candidates make some reference to **one or two of the main points** shown above using satisfactory spelling, punctuation and grammar. The form and style is of a satisfactory standard and they have made some reference to specialist terms	[1]–[2]
Response not worthy of credit	[0]

[6] 15

AVAILABLE MARKS

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						AVAILABLE MARKS
4	**(a)**	**(i)**	The tension in the string		[1]	
		(ii)	F marked on the string towards the centre and V at a tangent *Both must be correct, no label no mark*		[1]	
		(iii)	It acts at right angles to the velocity (direction of motion) **or** Force pulls the ball toward the centre		[1]	
		(iv)	Momentum = mass × velocity = 0.1 × 8 = 0.8 (kg m/s)	[1] [1] [1]	[3]	
	(b)	**(i)**	Momentum change = force × time **or** equivalent		[1]	
		(ii)	The crumple zone increases the time for this This means that the force on the car/passengers is reduced	[2] [1]	[3]	10
5	**(a)**	**(i)**	When an object is in equilibrium/balanced the clockwise moment = anticlockwise moment	[1] [1]	[2]	
		(ii)	P marked at string and wood		[1]	
		(iii)	X at the centre (judge by eye)		[1]	
		(iv)	70 cm from B		[1]	
		(v)	$2 \times 15 = W \times 40$ [1] [1] Equal to is essential for [2] $W = 30/40 = 0.75$ (N)	[2] [1]	[3]	
	(b)		NO The weight does not have an ACM **or** weight acts inside the wheel *NO without an attempted explanation give* [0]	[1] [1]	[2]	10

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AVAILABLE MARKS

6 (a) (i)

Name of the particle	Relative charge	Relative mass	Location in the atom
Electron	–1 [1]	$\frac{1}{1840}$	Orbits the nucleus [1] **or** is outside the nucleus
Proton	+1	1 [1]	In the nucleus [1]
Neutron	0 [1]	1 [1]	In the nucleus

[1] each [6]

(ii) protons and electrons [1]

(b) (i)

Type of radiation	Name
Electromagnetic wave	gamma **or** symbol γ [1]
Fast moving electrons	beta **or** symbol β [1]
Helium nuclei	alpha **or** symbol α [1]

[3]

(ii) The nucleus [1]

(c) (i) Gamma or γ [1]

(ii) Lead/concrete [1]

(d) (i) Activity from the surroundings/walls/rocks/people [1]

(ii) A named source of background activity [1]

(iii) Background is subtracted from measured activity [1]

(iv) 3.5 (cm) [1]
Measurements fall to zero [1] [2]

(v) Alpha [1]
Short range (a few cms in air) [1] [2]
↑ Only awarded if alpha identified

20

Total **80**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012

Science: Physics

Unit P1

Foundation Tier

[GPH11]

GPH11

FRIDAY 15 JUNE, AFTERNOON

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.
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 **3(a)(iii)**.

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

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Examiner Only	
Marks	Remark

1 **(a)** The diagram shows one solar panel consisting of a number of sections.
The solar panel is made up of a number of photocells.
The photocells produce electricity directly from sunlight.
Solar panels are placed on the roof of a house.



© Zoonar / Thinkstock

On a cloudless summer day the solar power shining on the panel is 6000 W.

(i) How much energy per second is shining on the solar panel?

Energy per second = _____ J [1]

(ii) The output electrical power from the solar panel is 1200 W.
Calculate the efficiency of the solar panel.
You are advised to show clearly how you get your answer.

Efficiency = _____ [2]

(b) The diagram shows weightlifting equipment found in most gyms.



© *Polka Dot / Thinkstock*

(i) When using the equipment John lifts a weight of 200 N through a distance of 1.5 m.
Calculate the amount of work that John does.
You are advised to show clearly how you get your answer.

Work = _____ J [3]

(ii) John repeats the exercise. He does 10 complete lifts in a time of 30 seconds.
Calculate the power John produces during this time.
Remember to include the unit for power.
You are advised to show clearly how you get your answer.

Power = _____ [4]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

2 Speed limits in the Republic of Ireland are given in km/h.

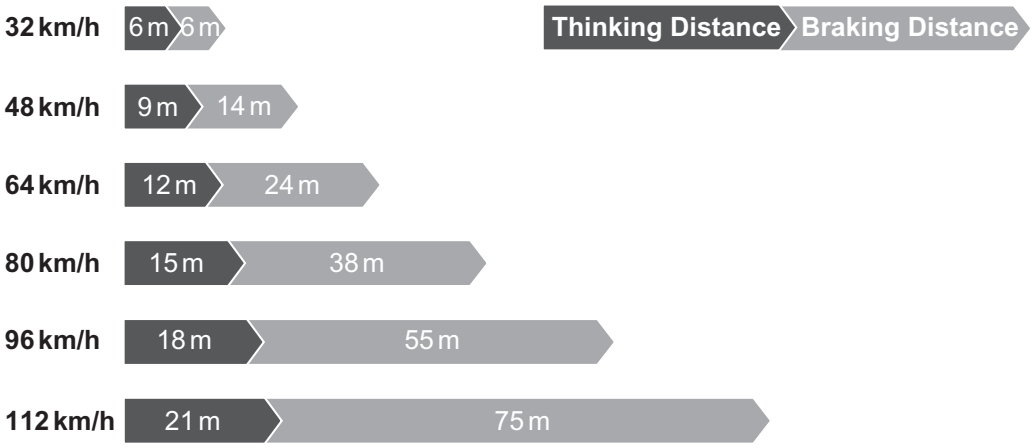
(i) Show that a speed of 80 km per hour is equal to a speed of 22.2 m/s.
(Hint: 1 hour = 3600 seconds)

[3]

The **stopping distance** of a car is the **thinking distance** added to **the braking distance**.

The **thinking distance** is the distance the car travels before the driver reacts (reaction time) to a hazard on the road and applies the brakes.

The chart below shows the results of a study of stopping distance by an alert driver, on a dry day using a car with good tyres and good brakes.



km/h means kilometres per hour

(ii) The speed of two cars following each other on a motorway is 112 km/h.

Should the car in front suddenly brake it is advisable for the following car to leave a gap. The average length of a car is 4 m. Use the data from the chart to calculate the size of the required gap.
Give your answer in **complete** car lengths.

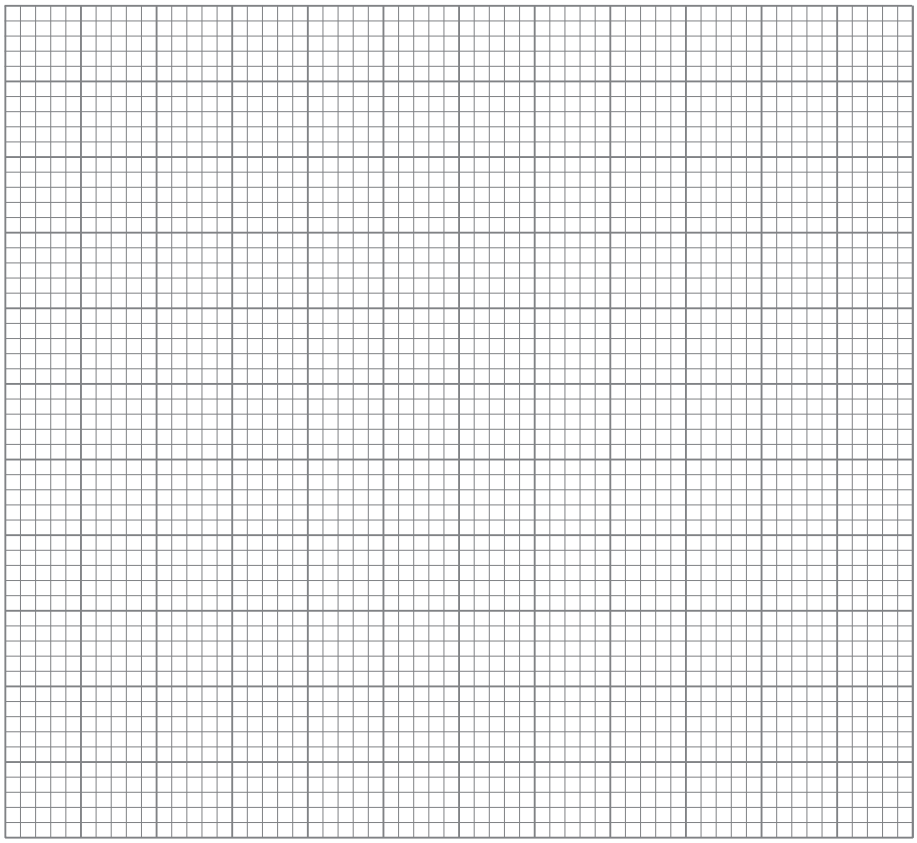
You are advised to show clearly how you get your answer.

Required gap = _____ car lengths [3]

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The **thinking distance** is the distance the car travels before the driver reacts (reaction time) to a hazard on the road and applies the brakes.

(iii) On the grid below plot a graph of thinking distance in m (*y*-axis) against the speed in km/h (*x*-axis).



[4]

(iv) What conclusion can you come to about the relationship between the thinking distance and the speed of the car?
Explain your answer.

_____

_____

_____ [3]

(v) Write down an equation which allows you to calculate the thinking distance for a particular speed in km/h.

[2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 (a) (i) Write down the equation you would use to find the momentum of an object.

[1]

(ii) When a force acts on an object it causes a change in the object's momentum. Write down an equation you would use to find the change in momentum if you knew the size of the force and time for which it acts on the object.

[1]

(iii) Many modern cars are fitted with crumple zones. The diagram below shows what happens when a modern car crashes.



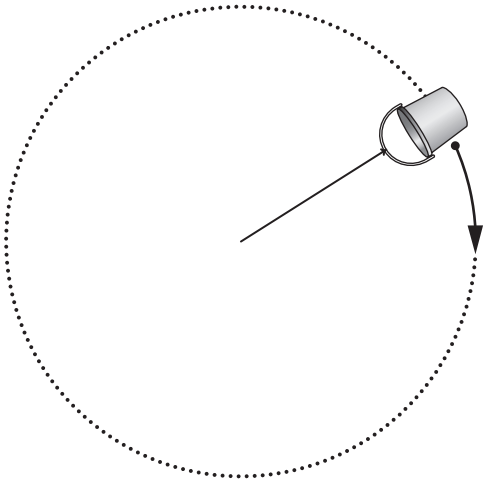
© Hemera / Thinkstock

Explain, **carefully**, how a crumple zone makes it safer for the people inside the car when it is brought to a stop during a collision. **In this question you will be assessed on your written communication skills including the use of specialist science terms.**

[6]

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(b) The diagram shows a bucket tied to a length of rope. The bucket is swung in a circle.



(i) On the diagram mark the direction of the centripetal force which makes the bucket move in this circle. [1]

(ii) Describe carefully what happens to the bucket, if the rope should break.

_____

_____ [2]

(iii) The size of the centripetal force needed to make an object move in a circle depends on a number of factors. For each of the factors listed below state if the centripetal force is affected by it. Write your answer in the box provided.
Use **Y** if the centripetal force is affected and **N** if it is not.

Factor	Affected Y/N
The mass of an object	
Radius of the circle	
The speed of the object	
The direction of motion	

[4]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** The terms mass and weight are often used in everyday speech as having the same meaning.

(i) John says “My weight is 75 kg”. Explain what is wrong with this statement.

_____

_____ [1]

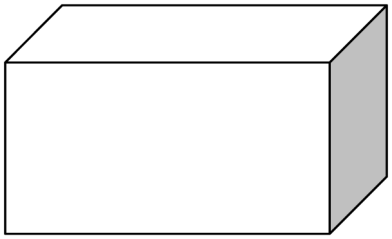
(ii) John’s friend David stands on bathroom scales which give a reading of 65 kg. Find David’s weight.

Weight = _____ [1]

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Examiner Only	
Marks	Remark

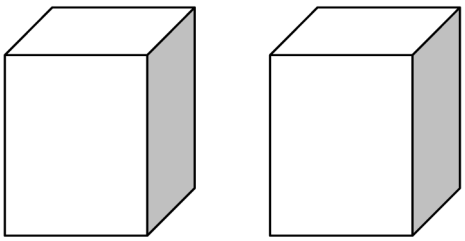
(b) The block of ice shown below has a mass of 320 g and a volume of 360 cm^3.



(i) Calculate a value for the density of ice.
You are advised to show clearly how you get your answer.

Density = _____ g/cm^3 [2]

(ii) The block of ice is now cut into two halves.
What effect will this have on the density of each half?



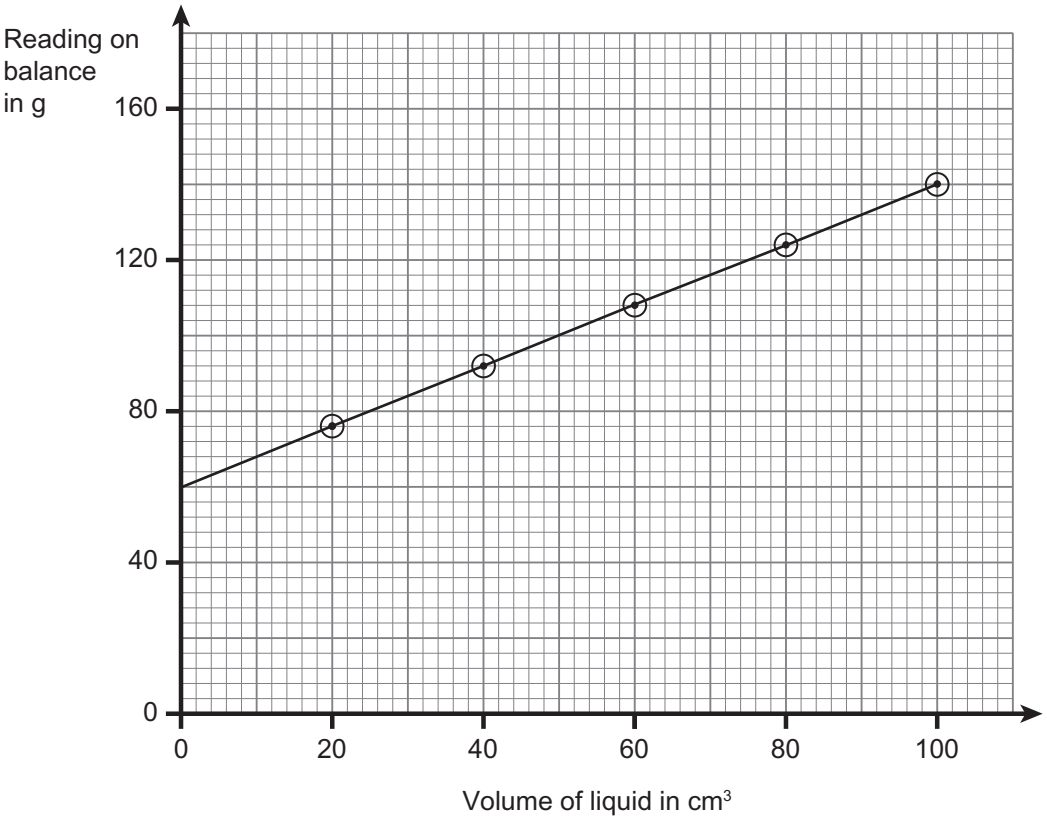
_____ [1]

Examiner Only	
Marks	Remark

(c) Linda is given a measuring cylinder and an electronic balance. She places the empty measuring cylinder on the electronic balance and adds different volumes of liquid. Each time she measures the volume of the liquid she also records the reading on the electronic balance. She plots her results as a graph as shown below.



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(i) What is the mass of the empty measuring cylinder?

_____ g [1]

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The table shows four different liquids and their densities.

Liquid	Density in g/cm^3
Petrol	0.7
Castor Oil	0.9
Water	1.0
Ethanol	0.8

(ii) Using the data from the graph and your answer to part **(i)** identify the liquid Linda used.
You **must** show clearly how you get your answer.

Liquid = _____ [4]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

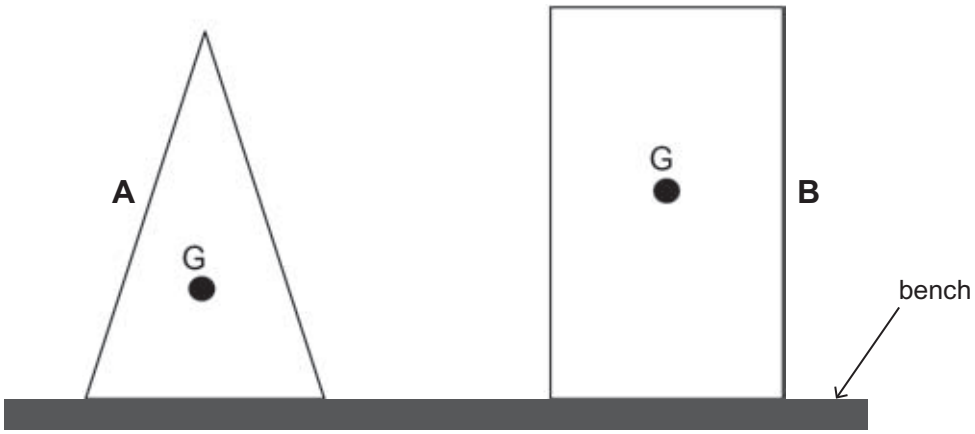
5 **(a)** **(i)** What is meant by the centre of gravity of an object?

_____

_____

_____ [2]

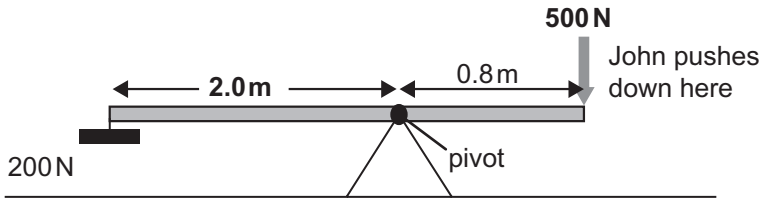
(ii) The two objects shown below have bases of the same width.
The position of the centre of gravity of each is marked G.
Which is the more stable?
Explain your answer.



_____

_____ [2]

(b) John builds a simple weightlifting device as shown below.
The pivot can be moved along the metal bar.



(i) For the arrangement shown above calculate the moment of the force that John exerts.

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

Moment = _____ Nm [3]

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(ii) To reduce the force that John exerts but keep the same moment he moves the pivot.
In what direction should he move it?
Explain **fully** your answer.

Direction _____

Explanation _____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

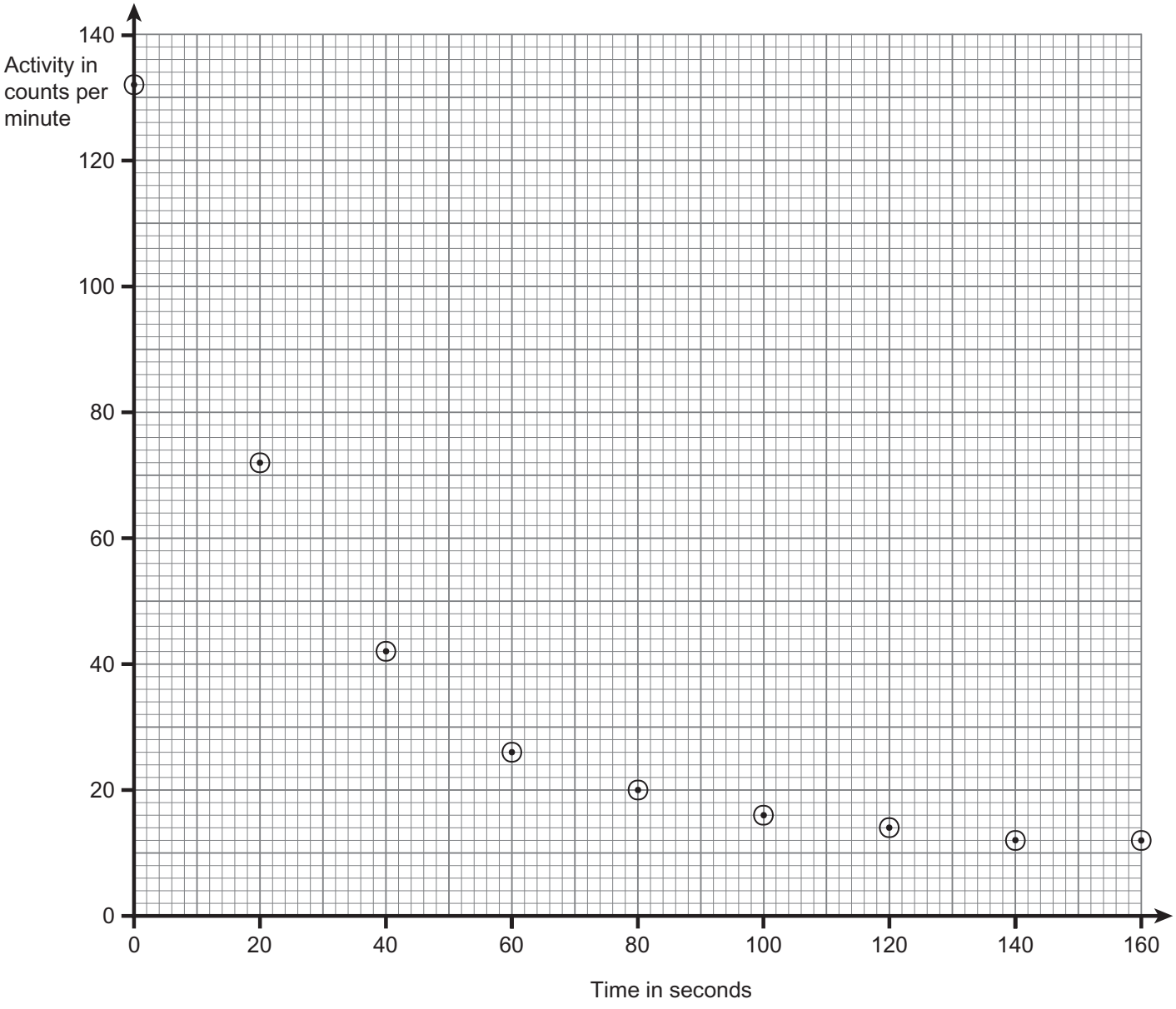
Examiner Only	
Marks	Remark

6 **(a)** Complete the table below by naming the three different radiations emitted by radioactive substances and state the nature of each.

Name of radiation emitted	Nature of radiation (electromagnetic wave or particle)

[6]

(b) When measuring the half-life of a radioactive substance, measurements of the activity were taken every 20 seconds.
These measurements are shown plotted on the grid below.



(i) Complete the graph by drawing the best fit **curve**. [1]

(ii) Using the measurements shown on the graph, find the value of the background activity.
Explain how you arrive at your answer.

Background activity = _____ counts per minute

_____

_____ [2]

(iii) Using your value for the background activity, determine the activity due **only** to the radioactive substance at the **start of the experiment**.

Activity = _____ counts per minute [2]

(c) A radioactive substance has a half-life of **12 years**.

Which of the following statements is/are true?

Using **T** for true and **F** for false write your answer in the space provided.

For a sample of this substance **after 12 years**;

Statement	True or False
Its activity will be half of what it was at the start.	
Its activity will be double what it was at the start.	
Its activity will be zero.	

For a sample of this substance **after 24 years**;

Statement	True or False
All of the radioactive nuclei will have decayed.	
Its activity will be zero.	
Its activity will be $\frac{1}{4}$ of what it was at the start.	

[3]

Examiner Only

Marks	Remark

(d) The full symbol for a particular nucleus of carbon is $^{14}_{6}C$

Complete the table below naming the particles in this nucleus of carbon and give the number of each in the nucleus.

Particle	Number in the nucleus

[4]

(e) Four unknown nuclei are labelled W, X, Y and Z.
Their full symbols are given below.

$^{30}_{15}W$ $^{30}_{16}X$ $^{32}_{17}Y$ $^{33}_{16}Z$

(i) Which, if any, of these nuclei are isotopes of the same element?

_____ [1]

(ii) Explain your answer.

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only

Marks	Remark

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New Specification

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Unit P1
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[GPH11]

FRIDAY 15 JUNE, AFTERNOON

MARK SCHEME

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General Marking Instructions and Mark Grids

Introduction
Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

Quality of candidates' responses
In marking the examination papers, examiners should be looking for a quality response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking
Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, the examiners should seek the guidance of the Supervising Examiner.

Positive marking
Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks
Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark scheme
Mark Schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

						AVAILABLE MARKS
1	**(a)**	**(i)**	6000 (J)	[1]		
		(ii)	Efficiency = useful output power/total input power out/in – [0] $\frac{\text{output}}{\text{input}}$ – [0] = 1200/6000 *Either line gets the mark. Accept energy or work* [1] = 0.2 or 20% [1] [2] *0.2% award [1]* $\frac{E_{out}}{E_{in}}$ –[1] $\frac{\text{useful output}}{\text{total input}}$ [1]			
	(b)	**(i)**	Work = force × distance moved [1] = 200 × 1.5 [1] = 300 (J) [1]		[3]	
		(ii)	Power = work/time award if no further working [1] = 3000/30 or 300/3 [1] = 100 [1] W [1]		[4]	
			Allow ecf for work from **(i)**			10
2	**(i)**		80 km = 80 000 m $\frac{80}{3.6}$ –[0] unless explanation given [1]			
			80 km/hr = 80 000/3600 = 22.2 (m/s) give credit to $\frac{22.2 \times 1000}{3600}$ [2]		[3]	
	(ii)		21/4 cv 5.25 – [2] [2] Round up to 6 car lengths [1]		[3]	
	(iii)		X axis – speed and Y axis – thinking distance [1] *Both labels needed – units not required* Points plotted Poor scale – penalty [1] [2] Best fit line through origin maximise use of the grid [1]		[4]	
	(iv)		They are proportional [1] Straight line and it passes through origin [2] or thinking distance doubles when speed doubles		[3]	
			Thinking distance increases as speed increases award [1]			
	(v)		Thinking distance = constant × speed [1] constant = gradient **or** ratio of thinking distance/speed **or** constant = 0.19 cv $\frac{1}{5.3}$ [1]		[2]	15

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3 (a) (i) Momentum = mass × velocity [1]
speed is not acceptable

(ii) Momentum change = force × time **or** equivalent equation [1]

(iii) **Indicative content**
Crumple zone collapses **or** material collapses easily/car crumples
Car stops in a longer time or in a longer distance
momentum change = force × time **or** Energy change = force × distance
So the force is reduced
Less chance of injury to passengers

Response	**Mark**
Candidates describe in detail using good spelling, punctuation and grammar **at least 4 main points** shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	**[5]–[6]**
Candidates describe in detail using good spelling, punctuation and grammar **at least 3 of the main points** shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	**[3]–[4]**
Candidates make some reference to **one or two of the main points** shown above using satisfactory spelling, punctuation and grammar. The form and style is of a satisfactory standard and they have made some reference to specialist terms.	**[1]–[2]**
Response not worthy of credit	**[0]**

[6]

(b) (i) Arrow on the rope towards centre [1]

(ii) Moves away/flies off [1]
at a tangent [1] [2]
Moves at a tangent gets [2]

(iii)

Mass	Y	[1]	
Radius	Y	[1]	
Speed	Y	[1]	
Direction	N	[1]	[4]

15

AVAILABLE MARKS

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						AVAILABLE MARKS
4	**(a)**	**(i)**	Weight should be mass **or** my weight is 750 N **or** an indication that mass is measured in kg and weight is N		[1]	
		(ii)	65 × 10 = 650 N		[1]	
	(b)	**(i)**	D = M/V = 320/360	[1]		
			= 0.89 (g/cm^3)	[1]	[2]	
		(ii)	None		[1]	
	(c)	**(i)**	60 (g) no tolerance		[1]	
		(ii)	Mass of liquid = 140 – 60 *or equivalent*	[1]		
			Density = 80/100 mim needed *or equivalent from graph*	[1]		
			= 0.8 mim needed	[1]		
			Liquid = ethanol	[1]	[4]	10
5	**(a)**	**(i)**	The point on/in/near the object	[1]		
			where its weight acts or appears to act	[1]	[2]	
		(ii)	A	[1]		
			It has a lower CoG	[1]	[2]	
	(b)	**(i)**	Moment = force × distance (from pivot)	[1]		
			= 500 × 0.8	[1]		
			= 400 (Nm)	[1]	[3]	
		(ii)	Direction: To the left or away from him Explanation: 200 N has a smaller moment its distance from pivot is less **or** He can exert a smaller force to give same moment since Its distance from pivot is greater		[3]	10

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					AVAILABLE MARKS
6	**(a)**	alpha particle or helium nucleus beta particle or an electron gamma em radiation or em wave [1] each		[6]	
	(b)	**(i)** Smooth curve drawn *short straight lines give* [0]		[1]	
		(ii) 12 ± 1	[1]		
		The graph levels at 12	[1]	[2]	
		(iii) 132 – 12 *background consistent with value in* **(ii)**	[1]		
		= 120 Accept 118–122	[1]	[2]	
	(c)	True False False False False True [$\frac{1}{2}$] *each round down*		[3]	
	(d)	neutrons = 8 protons = 6			
		Both particles named	[2]		
		Correct number of each	[2]	[4]	
	(e)	**(i)** X and Z *if others included no marks*		[1]	
		(ii) They have same number of protons/atomic number		[1]	20
				Total	**80**

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