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New Specification

Rewarding Learning

General Certificate of Secondary Education
2018

GCSE Physics

Unit 1
Higher Tier

[GPY12]

FRIDAY 15 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

In marking the examination papers, examiners should be looking for a quality of 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.

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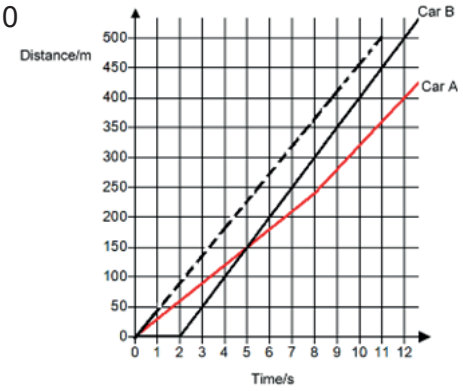
					AVAILABLE MARKS
1	(a)	(i)	100 (m)	[1]	
		(ii)	5 (s)	[1]	
		(iii)	(**Average**) speed = distance/time = 500/10 50/12 = 41.67(42) = 50 (m/s) award [2]/[3]	[2] [1] [3]	
		(iv)	Straight line starting at 0,0 ending at 11 , 500 	[1] [1] [2]	
	(b)	(i)	Measure the interval between each 1 m If it is getting shorter the ball is accelerating	[1] [1] [2]	
		(ii)	Repeat the timings **and** average	[1]	
	(c)	(i)	1 (s)	[1]	
		(ii)	(Distance) = area under graph = $\frac{1}{2}$ × 8 × 1 + 4 × 1 + $\frac{1}{2}$ × 3 × 4 or 4 + 4 + 6 = 14 (m) 26 m is worth [1]	[1] [1] [1] [3]	
		(iii)	The gradient changes or is not a straight line changes of steepness	[1]	
	(d)	(i)	Average velocity = $\frac{\text{(initial + (final velocity)}}{2}$ [1] $\frac{(0 + 28)}{2}$ = 14 (m/s)	[1] [1] [1] [3]	
		(ii)	Time = Distance/speed [1] or T = $\frac{d}{v}$ [1] = 70/14 [1] = 5 (s) [1] ecf from **(i)**	[2] [1] [3]	
		(iii)	v = u + at or equivalent Acceleration = (28 – 0)/5 = 5.6 (m/s^2) Allow ecf for time from **(ii)** ignore minus	[1] [1] [1] [3]	24

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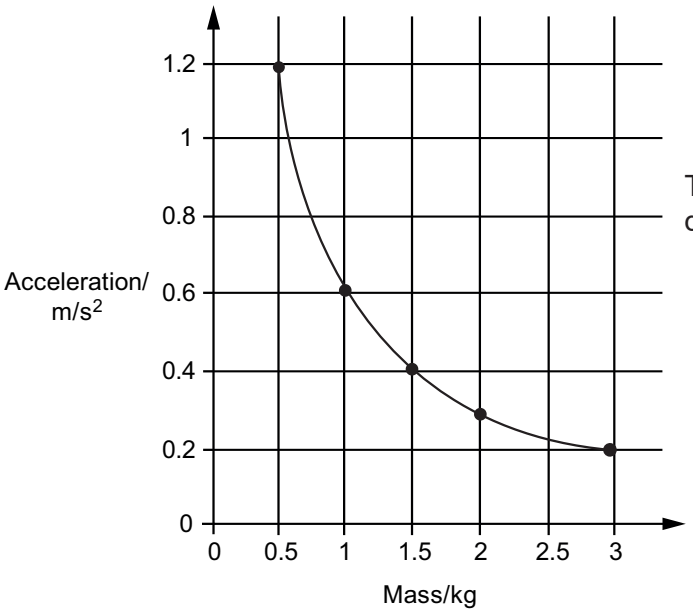
AVAILABLE MARKS

2 **(a)** **(i)** F_R Resultant force = 1250 – 250 = 1000 (N) [1]
F = ma [1]
1000 = 750 × a [1]
a = 1.33 (m/s^2) or 1.3 or $1\frac{1}{3}$ or $\frac{4}{3}$ [1] [4]

(ii) The mass is less/fuel has been used/downhill [1]

(b) **(i)** Both axes labelled [1]
with units [1]
Four points plotted (± 1 div) [1]
Consistent with the smooth curve – joining dots – give [0] [1]
Good scale, at least half the grid on both axes [1]
Transposed axes [–1] [5]



Transposed axes deduct 1 mark

(ii) ma = constant [1]

(c) **(i)** 1N causes an ext = 4 cm [1]
Unextended length = 10 – 4 = 6 cm [1] [2]

(ii) F = ke or 1 = k × 4 [1]
k = 0.25 [1]
Unit N/cm [1] [3]

(iii) F = 0.25 × 10 allow ecf from **(ii)** [1]
= 2.5 (N) [1] [2]

(d) **(i)** CM = ACM or $F_1d_1 = F_2d_2$ [1]
25 × 35 = F × 5 [1]
F = 175 (N) [1] [3]

(ii) P = F/A or F = PA [1]
F = 36 × 5 [1]
= 180 (N) [1] [3]

24

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					AVAILABLE MARKS
3	**(a)**	**(i)**	(85 g) given 50 cm^3 125g 40 g [$\frac{1}{2}$] each round up	[2]	
		(ii)	D = M/V No ecf from **(i)** [1] = 40/50 [1] = 0.8 4/5 [1] g/cm^3 or kg/m^3 – must be consistent with number [1]	[4]	
		(iii)	Read to (bottom of) meniscus/or to eye level bottom of the curve	[1]	
	(b)		In water molecules slide past each other/or move around/freely/ move in all directions [1] In glass the molecules vibrate in fixed positions [1] [1]	[3]	
	(c)		0 °C to 4 °C volume DECREASES [1]		
			4 °C to 80 °C volume INCREASES [1]	[2]	12

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AVAILABLE MARKS

4 (a) Indicative content

Apparatus:

Stopwatch/stopclock/timer measuring stick – [0]

metre stick/rule(r)/tape measure

Measurements:

Height of staircase/height of riser and number of risers

Distance – [0] must be a vertical distance

or height of bench and number of step-ups

Time to run up stairs **or** time to complete step-ups

Horizontal distance – [0] and associated time – [0]

Calculation:

Work = weight × height or W = F × D

Power = work/time or W/t

(Equations may be combined: power = weight × height/time = $\frac{mgh}{t}$ gets both points)

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **at least 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 or 4** 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 **1 or 2** 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)

Tidal power	Renewable
Biomass	Renewable
Wind power	Renewable
Nuclear power	Non-renewable

[$\frac{1}{2}$] each round up [2]

(c) Chemical ➔ Electrical [1]

↓

Light Sound/Heat or Vibrational/or kinetic [1] [2]

must

(d) Efficiency = useful output/total input [1]

= 60/100 = 144/240 [1]

= 0.6 or 60% [1] [3]

any unit following 0.6 award [2]/[3]

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					AVAILABLE MARKS
(e)	**(i)**	$E_p = mgh$	[1]		
		$= 1200 \times 10 \times 40$	[1]		
		$= 4.8 \times 10^5$ (480 000) (J) or 480 kJ	[1]	[3]	
	(ii)	$E_k = \frac{1}{2}mv^2$ reverse calculation is worth [3]	[1]		
		$2.4 \times 10^5 = \frac{1}{2} \times 1200 \times v^2$ $\frac{1}{2} \times 1200 \times v^2 = 2.4 \times 10^5$	[1]		
		$v^2 = \frac{2.4 \times 10^5}{600} = 400$	[1]	[3]	
	(iii)	2.4×10^5 = Force × distance or Work = Force × distance	[1]		
		ΔKE = Force × distance			
		Force = $2.4 \times 10^5/30$	[1]		
		= 8000 (N)	[1]	[3]	
		Alternative Ave. vel. = $\frac{20}{2} = 10$ Time to stop = $\frac{30}{10}$ [1]			
		$a = \frac{v - u}{t} = \frac{20}{3}$ [1] = 6.7 F = ma = 1200 × 6.7 = 8000 [1]			
(f)	**(i)**	Both upward curves/lines start at the same point – at end of line shown and copper above glass	[1]		
	(ii)	Electrons gain energy	[1]		
		(Transfer the energy by) collisions with atoms/ions/particles	[1]	[2]	25

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AVAILABLE MARKS

5 **(a)** Half-life = 1.4 to 1.6 award [1] for evidence of halving [2]
1.3 or 1.7 give [1] only

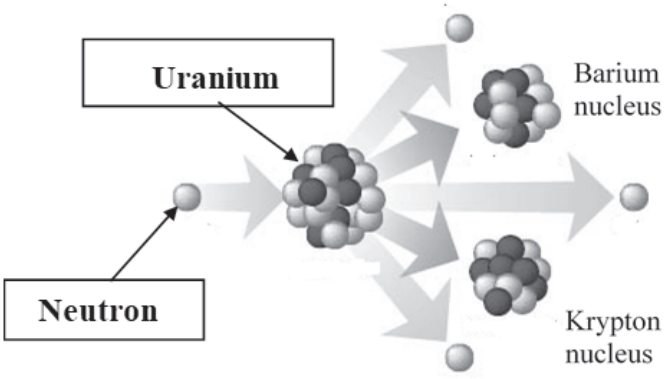
(b) **Indicative content**
Gamma ray or beta source because γ rays unaffected by aluminium
Alpha – [0]
Only one that penetrates the aluminium
Long half-life – e.g. several years
So its activity remains constant/Source not changed often
As the count rate decreases pressure (force) is increased } or converse
To make metal thinner

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **at least 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 or 4** 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 **1 or 2** 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]

(c) **(i)** Neutron [1]

Uranium or thorium or plutonium or proton [1] [2]



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(ii) Kinetic energy (of smaller nuclei)/heat [1]

(iii) extra/more/further/fission/neutrons [1] released cause further fissions/ collisions absorbed by other nuclei/reactions (of uranium) [1] [2]

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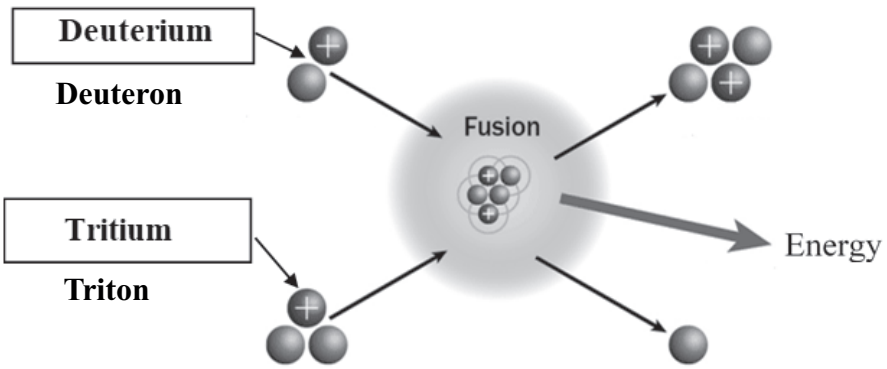
(d) Deuterium [1]
Tritium [1] [2]



Do not accept $^{3}_{1}H$ or $^{2}_{1}H$

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Total

AVAILABLE MARKS

15

100