Rewarding Learning

General Certificate of Secondary Education
2018

GCSE Physics

Unit 1
Higher Tier

[GPH12]

FRIDAY 15 JUNE, MORNING

MARK SCHEME

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.

						AVAILABLE MARKS
1	**(a)**	**(i)**	(Average) speed = distance/time or s = d/t	[1]		
			= 300/100	[1]		
			= 3	[1]		
			m/s	[1]	[4]	
		(ii)	Straight line starting from (0, 0)	[1]		
			From 0,0 to 90, 200	[1]	[2]	
	(b)		Measure the time interval between each 1 m	[1]		
			If it is getting shorter the ball is accelerating	[1]		
			Repeat the timings and **average**	[1]	[3]	
	(c)	**(i)**	Acceleration = $\frac{4}{5}$ or a = $\frac{v - u}{t}$	[1]		
			= 0.8 (m/s^2)	[1]	[2]	
		(ii)	Distance = area under the graph	[1]		
			= $\frac{1}{2}$ (4 × 5) + 4 × 10 + $\frac{1}{2}$ (4 × 5) or 10 + 40 + 10	[1]		
			= 60 m	[1]	[3]	
		(iii)	**Displacement** = 0		[1]	
	(d)	**(i)**	v = (u +) at or v = (0 +) 1.2 × 8	[1]		
			= 9.6 (m/s)	[1]	[2]	
		(ii)	$s = \frac{1}{2}(u + v)t \rightarrow \frac{1}{2} \times 9.6 \times 8$ $v^2 = u^2 + 2as \rightarrow 9.6^2 = 0 + 2 \times 1.2 \times s$ $s = ut + \frac{1}{2} at^2 \rightarrow s = 0 + \frac{1}{2} \times 1.2 \times 8^2$	[1] + [1] eqtn subs	[2]	
			s = 38.4 (m)	[1]	[3]	20

2 **(a)** **(i)** F = ma or equivalent [1]

1000 = 750 × a [1] for each subs [2]

a = 1000/750 = 1.3(3) (m/s^2) [1] [4]

(ii) Momentum before collision = momentum after collision [1]

750 × 20 = (750 + 1250) × V or 15000 = 2000 × V [2]

V = 7.5 m/s [1] [4]

(b) **Indicative content**

1. Easily bent/small force to change its shape
2. Momentum change = force × time
3. Duration of collision increased so force is reduced
4. Work = force × distance or W = Fd
5. The distance over which the collision increases so force is reduced
6. Energy cannot be created or destroyed
7. Heat and sound produced

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **at least 5 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 points** shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[3]–[4]
describe in detail using good spelling, punctuation and grammar **1 or 2 points** shown above. The form and style are of a high standard and specialist terms are used appropriately at all times.	[1]–[2]
Response not worthy of credit	[0]

[6]

(c) **(i)** Repeat **and** average [1]

(ii) Both axes labelled with units [1]

Four points plotted (± 1 div) [$\frac{1}{2}$] each round down [2]

Smooth curve [1] [4]

(ii) Acceleration DECREASES [1]

20

AVAILABLE MARKS

						AVAILABLE MARKS
3	**(a)**	**(i)**	Mass of glass = 265 – 165 = 100 g	[1]		
			Volume = 100 – 60 = 40 cm^3	[1]		
			D = Density = Mass/Volume = (100/40) = 2.5 g/cm^3	[1]		
			or kg/m^3 if there is attempt to use kg and m^3	[1]		
		(ii)	Read to the bottom of meniscus	[1]	[5]	
	(b)		In water – molecules move past each other or move freely	[1]		
			In glass molecules vibrate about fixed position/cannot move freely	[1] [1]	[3]	
	(c)	**(i)**	100 °C to 4 °C volume decreases and	[1]		
			4 °C to 0 °C the volume increases	[1]		
		(ii)	100 °C to° 4 °C – density increases	[1]		
			4 °C to 0 °C – density decreases	[1]	[4]	12

AVAILABLE MARKS

4 (a) Indicative content

Apparatus:
Stopwatch/stopclock/timer
metre stick/rule(r)/tape measure
Measurements:
Height of staircase/height of riser and number of risers or vertical height **or** height of bench and number of step-ups
Time to run **up** stairs **or** time to complete step-ups
Calculation:
Work = weight × height or mgh or force × distance
Power = work/time
(Equations may be combined: power = weight × height/time gets both points)

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar **at least 5 points**. 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 **at least 3 points**. 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** using good spelling, punctuation and grammar. 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) Renewable or definition of renewable [1]

(ii) Produces a greenhouse gas/Produces carbon dioxide/
Contributes to global warming [1]

(iii) Chemical [1]

(iv) input energy = output energy/efficiency [1]
(or equivalent)
= 2.4/0.8 [1]
= 3 (MJ) [1]
Wasted energy = 3 – 2.4 = 0.6 (MJ) [1] [4]

(c) (i) KE or Work = Force × Distance [1]
8.1×10^6 = Force × 270 [1]
Force = 8.1×10^6 /270 [1]
= 30 000 (N) [1] [4]

(ii) Heat and Sound (any order) [1] 18

						AVAILABLE MARKS
5	**(a)**	(The point) where the weight of the object acts or appears to act.			[1]	
	(b)	When an object is in equilibrium/balanced		[1]		
		(sum of the clockwise moments is equal to the sum of the anticlockwise moments)		[1]		
		about the same point or pivot or about a point or about any point			[2]	
	(c)	**(i)** 8 (cm)			[1]	
		(ii) W × 2 = 0.4 × 8 (1 mark each side)		[2]		
		allow ecf for distance from **(i)**				
		W = 1.6 (N)		[1]	[3]	
		Allow ACM = CM if no further working				
		(iii) 2.0 (N) allow ecf from **(ii)**			[1]	
		(iv) Moment = 0.4 × 8 (or 1.6 × 2)		[1]		
		= 3.2	ecf from **(ii)** for 1.6 × 2	[1]		
		N cm		[1]		
		Clockwise or CW		[1]	[4]	12

					AVAILABLE MARKS
6	**(a)**	**(i)**	(Nuclear) Fission } spelling must be correct (Nuclear) Fusion } spelling must be correct	[1] [1] [2]	
		(ii)	$^{1}_{0}X$	[2]	
		(iii)	neutron – no ecf from **(ii)**	[1]	
		(iv)	same no. of protons different no. of neutrons	[1] [1] [2]	
	(b)	**(i)**	Subtract the background from the readings or subtract from count rate	[1]	
		(ii)	Halving the count rate, e.g. 500 to 250 half-life = 1.6 ± 0.1 (1.4 or 1.8 give 1 mark only)	[1] [2] [3]	
	(c)	**(i)**	Gamma or γ Only one that penetrates the body (to the outside) or escapes from the body	[1] [1] [2]	
		(ii)	The count rate would increase (close to the bleed) or high reading or greatest reading	[1]	
		(iii)	B Would remain active long enough to give a reading without causing too much cell damage OR A short half-life not enough time get a reading and C too long a half-life would continue to damage cells	[1] [1] [1] [3]	
		(iv)	Protective clothing/as small a quantity as possible/keep large distance from the substance/reduce the time in proximity/do the task as quickly as possible	[1]	18
				Total	**100**