Rewarding Learning

General Certificate of Secondary Education
2023

GCSE Physics

Unit 1
Foundation Tier

[GPY11]

THURSDAY 25 MAY, 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)	Time = distance/speed	[1]		
			$= \frac{10}{20}$	[1]		
			= 0.5 (s)			
			Must be an equation for partial credit	[1]	[3]	
		(ii)	Average speed = $\frac{(\text{inital speed} + \text{final speed})}{2}$	[1]		
			$= \frac{(20 + 0)}{2}$	[1]		
			= 10 m/s			
			Must be an equation for partial credit	[1]	[3]	
		(iii)	Rate of change of speed = $\frac{(0 - 20)}{4}$	[1]		
			= (–)5 (ignore the minus)	[1]		
			m/s^2	[1]	[3]	
	(b)	(i)	Average speed = $\frac{\text{distance moved}}{\text{time taken}}$	[1]		
			$= \frac{6000}{450}$	[1]		
			= 13.3 m/s			
			Must be an equation for partial credit	[1]	[3]	
		(ii)	Slowest between 150 s and 300 s	[1]		
			Least slope	[1]	[2]	
	(c)	(i)	4 s to 6 s Constant speed	[1]		
			7 s to 10 s Deceleration/slowing	[1]	[2]	
		(ii)	Distance = area under graph between 0 s and 6 s	[1]		
			$= \frac{1}{2}(4 \times 3) + (3 \times 2) = 6 + 6$	[2]		
			[1] for each area			
			= 12 (m)	[1]	[4]	20
			Alternative trapezium method			
			Distance = area under graph between 0 s and 6 s			
			$= \frac{(2 + 6)}{2} \times 3$			
			= 12 (m)			

						AVAILABLE MARKS
2	**(a)**	**(i)**	Weight		[1]	
		(ii)	They are equal		[1]	
		(iii)	Resultant force = 1800 – 1000 = 800 N	[1]		
			To the left	[1]	[2]	
		(iv)	F = ma	[1]		
			800 = 1600 × a	[1]		
			a = 0.5 m/s^2	[1]	[3]	
			Must be an equation for partial credit			
			Allow ecf for F from (iii)			
	(b)	**(i)**	Moment = force × (perpendicular) distance from pivot		[1]	
		(ii)	ACM = CM	[1]		
			$6 \times 20 = W_{Box} \times 30$ or $W_{Box} = \frac{120}{30}$	[2]		
			$W_{Box} = 4N$	[1]	[4]	
			If position used and not distance then award [1] out of [4]			
			The answer would be 2.25 N			
	(c)	**(i)**	The extension is (directly) proportional to the force applied (accept load)	[1]		
			provided the limit of proportionality is not exceeded	[1]	[2]	
		(ii)	2 N causes an extension of 8 cm	[1]		
			1 N causes an extension of 4 cm	[1]	[2]	
			Alternative method			
			F = ke, (5 – 3)2 = k × 8 k = 0.25			
			1 N = 0.25 × e, e = 4 cm			
		(iii)	Unstretched length = 18 – 3 × 4 or 18 –12 or 26 – 20	[1]		
			= 6 cm	[1]	[2]	18
3	**(a)**		Wood has a larger volume or lead has smaller volume			
			Volume must appear in answer		[1]	
	(b)	**(i)**	Fixed	[1]		
		(ii)	Vibration/Vibrates	[1]		
		(iii)	Gaps between the particles/weak forces			
			Bigger/larger distances between particles: Spaces	[1]		
		(iv)	Weak or zero force between the particles/weak forces			
			Bond = Forces	[1]	[4]	
	(c)	**(i)**	Volume = length × breadth × height			
			or = 2 × 5 × 2	[1]		
			= 20 (cm^3)	[1]	[2]	
		(ii)	D = M/V Must be an equation for partial credit	[1]		
			= 18/20	[1]		
			= 0.90 g/cm^3	[1]	[3]	10

AVAILABLE MARKS

4 **(a)**

Light bulb	electricity → light	[1]	
Bunsen burner	chemical → heat	[1]	
Wind turbine generator	kinetic → electricity	[1]	
Solar panel	light → electricity	[1]	[4]

(b) **(i)** Energy can be changed from one form to another [1]
Total amount of energy does not change [1] [2]
or
Energy cannot be created or destroyed

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

$= \frac{720}{1200}$ [2]

= 0.6 or 60%

Do not accept 0.6% or 60

Accept Efficiency = UOE/TIE

Must be an equation for partial credit [1] [4]

(c) **(i)** E_p = mgh [1]

= 0.2 × 10 × 2 [1]

= 4.0 (J)

Must be an equation for partial credit [1] [3]

(ii) $E_k = \frac{1}{2} mv^2$ [1]

$= \frac{1}{2} \times 0.2 \times 5^2$ or $\frac{1}{2} \times 0.2 \times 25$ [1]

= 2.5 (J)

Must be an equation for partial credit [1] [3]

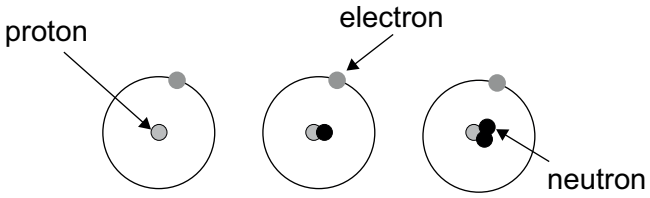
(d) **Indicative content**

Methods Conduction, convection, radiation
Radiator Conduction in the metal by electrons
Room Convection in the air
Shiny foil Reflects radiant heat/radiation/Is a poor absorber of radiant heat
Cavity Polystyrene/insulating foam/mineral wool/Polystyrene beads, Urea formaldehyde foam
Glazing Conduction/Cavity-Conduction is reduced
Concrete Carpet or wooden floor

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]

22

					AVAILABLE MARKS
5	**(a)**	**(i)**		[3]	
		(ii)	$^{1}_{1}H$ $^{2}_{1}H$ $^{3}_{1}H$	[3]	
	(b)	**(i)**	Alpha [1] Beta [1] Gamma [1] Symbols not acceptable	[3]	
		(ii)	Gamma	[1]	10
				Total	**80**