Rewarding Learning

General Certificate of Secondary Education
2012

Science: Physics

Unit P1
Foundation Tier

[GPH11]

FRIDAY 15 JUNE, AFTERNOON

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 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]		[3]	
			or thinking distance doubles when speed doubles *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

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

					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**