Rewarding Learning

General Certificate of Secondary Education
2013

Science: Physics

Unit P1
Foundation Tier

[GPH11]

THURSDAY 13 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 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)**	Unlimited supply/can be replaced in a human lifetime [1] 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 [1] Motor converts electricity to kinetic energy [1] Fan gives the air kinetic energy/heat produced/sound produced All 3 stated give [2] [2] Any 2 of 3 [1]	[4]	
	(c)	**(i)**	KE = $\frac{1}{2}$ mv^2 [1] = $\frac{1}{2}$ × 2000 × 3^2 [1] = 9000 (J) [1]	[3]	
		(ii)	Work = Force × distance [1] = 1000 × 50 [1] W = 50 000 (J) [1]	[3]	
		(iii)	Work has to be done against friction [1] some of work/energy to be converted to heat [1]	[2]	15
			Because of friction without reference to work/energy give [1]		

					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

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

						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

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

Total

AVAILABLE MARKS

20

80