



Rewarding Learning

**General Certificate of Secondary Education
2013**

Science: Physics

Unit P1
Higher Tier

[GPH12]

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	
2	(a)	(i) (Average) speed = distance/time or $s = \frac{d}{t}$ = 76/4 = 19 (m/s)	[1] [1] [1] [3]	15
		(ii) $600 = m \times 10$ $m = 60$ (kg)	[1] [1] [2]	
		(iii) $F = m a$ $S = (ut) + \frac{1}{2} at^2$ $600 - 200 = 60 a$ $76 = \frac{1}{2} \times a \times 4^2$ $a = 400/60 = 6.7$ (m/s ²) $a = 9.5$ (m/s²) Allow ecf from (ii) for the mass	[1] [1] [1] [3]	
		$v = u + at$ No marks for eqn alone $38 = 0 + 4a$ [2]/[3] $a = 9.5$ (m/s ²)		
		(b) (i) Error is time = 10 s and velocity = 30 or point indicated on grid	[1]	
		(ii) Smooth curve drawn <i>No marks for short straight lines</i>	[1]	
		(iii) Acceleration = 18/2 or $a = \frac{v-u}{t}$ (not $v = u + at$) = 9 (m/s ²)	[1] [1] [2]	
		(iv) The gradient = the acceleration [1] gradient is decreasing – give [2] The gradient is changing – give [1] or graph levels off or plateaus	[2]	
		(v) 15s to 16s	[1]	

(e) Indicative content

1. Use a balance to find the mass/**or** weigh on a balance
2. Place water in measuring cylinder (and record volume)
Use of a beaker [0]
3. Place pendant 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

Eureka can method:

fill can
add necklace
collect and measure volume } [2]

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]

20

AVAILABLE
MARKS

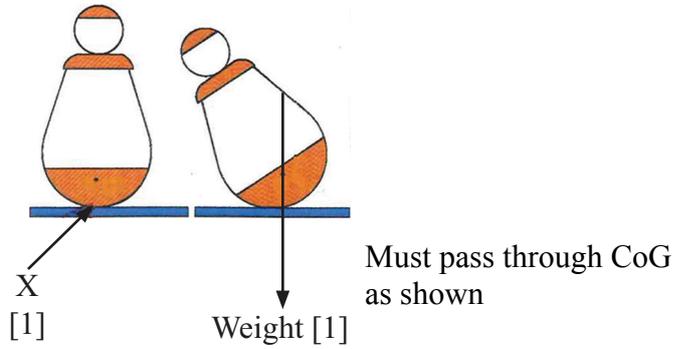
- 4 (a) (i) The mass (of the object) or weight [1]
- (ii) No [1], if they were proportional the ratios would be equal } [1]
 $9/32 = 0.28$ and $6.4/16 = 0.4$ any 2 calculations } [2]
 $4.5/8 = 0.56$ and $3.2/4 = 0.8$ }
- (b) (i) Force \times time = momentum change [1]
 $F \times 0.12 = 1500 \times 20$ [1]
 $F = 250\,000$ (N) [1] [3]
- Alternative**
- $$a = \frac{v - u}{t} = \frac{20}{0.12} = 167$$
- $$F = ma = 1500 \times 167$$
- $$= 250\,000$$
- (ii) The crumple zone **increases the time** [2]
This means that the force on the car/passengers is reduced [1] [3]
- (c) (i) Momentum = mass \times velocity = $(150 + 3) \times 20 = 3060$ (g cm/s)
[1] [1] [1] [3]
- (ii) Momentum before = momentum after [1]
 $3 \times v = 3060$ e.c.f. for momentum from (i) into (ii) [1]
 $v = 1020$ (cm/s) [1] [3]

AVAILABLE
MARKS

15

- 5 (a) (i) When an object is in equilibrium/balanced the clockwise moment = anticlockwise moment [1]
 [1] [2]
- (ii) $2 \times 15 = W \times 40$ Either gets [1], but equal to [2]
 [1] [1] needed for both marks
 $W = 0.75 \text{ (N)}$ [1] [3]

(b) (i) and (ii)



- (iii) The weight has a moment **or** weight/CoG outside base [2]
 clockwise moment **or** so returns to original position [1] [3]

AVAILABLE MARKS	
10	

			AVAILABLE MARKS	
6	(a) (i)	Activity/radiation from surroundings/walls/rocks/people or naturally occurring	[1]	
	(ii)	Subtract	[1]	
	(iii)	3.5 (cm)	[1]	
		Measurements fall to zero	[1]	[2]
	(iv)	Alpha	[1]	
		Short range or travels a few cms in air	[1]	[2]
	(v)	The removal/addition of an electron to an atom	[1]	
	(vi)	Powder can be breathed in/swallowed/air borne	[1]	
		<i>The above for 1 mark, the 2nd mark for any of the following:</i>		
		• very close to tissues		
		• not stopped by the skin/damages the lungs		
		• difficult to remove	[1]	[2]
	(b) (i)	5/6 points correctly plotted give [2] 3/4 points correctly plotted give [1]	[2]	
	(ii)	Draw smooth curve <i>Straight lines give [0]</i>	[1]	
	(iii)	The time for the activity/count rate to fall to half (the initial value)	[1]	
	(iv)	Value consistent with their curve 2.5 ± 0.2 hr	[1]	
	(v)	Radioactivity is a spontaneous/unpredictable/random process and measurements can vary	[1]	
	(c) (i)	Fission	[1]	
	(ii)	Uranium/plutonium	[1]	
	(iii)	Low carbon dioxide/sulfur dioxide or no contribution to global warming or less fossil fuels being used	[1]	
	(iv)	Less radioactive waste products	[1]	
		[^] —Essential		
		– do not accept No radioactive waste		
		Abundant fuel (water)	[1]	[2]
		Greenhouse gases – give [0]		
			Total	20
				100