



Rewarding Learning

**General Certificate of Secondary Education
2016**

GCSE Physics

Unit 1
Foundation Tier

[GPH11]

MONDAY 20 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.

- 1 (a) (Force which) opposes motion/slow down/stop/resists motion/reduces speed
Surfaces rubbing – give [0] [1]
- (b) (i) As friction increases, acceleration decreases
or
Ratio (of friction to acceleration) is not constant/negative correlation [1]
Not doubling – acceptable
- (ii) Label: Friction (force)/N (or equivalent) [1]
Scale: to cover at least half of grid (if scale too large – [0] [1]
Points: 5 points [$\frac{1}{5}$] each round DOWN ± 1 square [2]
Straight line of best fit RULED through THEIR points [1]
Line of best fit touches both axes [1] [6]
- (iii) 0.58 to 0.62 (m/s^2) [1]
- (iv) 0 (m/s^2) [1]
- (v) From graph max friction = 35 to 37 N when acceleration = 0 [1]
So max forward force = 35 to 37 (N) [1] [2]
- (vi) Gradient = rise/run (or equivalent) Must be an equation – **not**
just rise/run [1]
= $(18 - 12)/(0.3 - 0.4)$ or equivalent [1]
= (-60) (kg) [1] [3]
Value consistent with their graph

AVAILABLE
MARKS

15

2 (a) **Indicative content:**

A non-renewable energy resource will run out (accept formed over millions of years)/has a limited supply
 A renewable energy source has limitless supply/will not run out/can be replaced in a lifetime/accept replenished
 Accept reference to lifetime
 Re-used not acceptable as meaning renewable

Oil is always available to produce energy/is reliable } oil more reliable (than wind) [2]
 Wind power can be intermittent or unreliable }
 Oil can produce a lot of energy (high energy density) } oil produces more energy (than wind) [2]
 Wind produces little energy (low energy density) }
 Oil responds quickly to demand }
 Non-renewable example – coal/gas/nuclear }
 Renewable example – tidal/wave/solar/biomass/HEP } must be named

Response	Mark
Candidates describe in detail using good SPG at least 5 points shown opposite. 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 SPG at least 3 points shown opposite. 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 shown opposite using good SPG. 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) $GPE = mgh$ [1]
 $= 440 \times 10 \times 12$ [1]
 $= 52\,800 \text{ (J)}$ [1] [3]

(ii) 52 800 (J) (ecf from (i)) [1]

(c) (i) $W = Fd$ [1]
 $= 40 \times 250$ [1]
 $= 10\,000 \text{ (J)}$ [1] [3]

(ii) Heat and Sound (any order [1] each) [2]

15

3 (i) $V = l \times b \times h$ or $= 1.5 \times 0.3 \times 0.4$ [1]
 $= 0.18$ [1]
 m^3 [1] [3]

(ii) mass = 1000×0.18 ecf from (i) for volume [1]
 $= 180 \text{ (kg)}$ [1] [2]

(iii) Weight of water = 1800 (N) Allow ecf for mass from (ii) [1]
 Total weight = $200 + 1800 = 2000 \text{ (N)}$ [1]
 Minimum force = $2 \times 2000 = 4000 \text{ (N)}$ [1] [3]

(iv) NA
 Glass
 Water [2]
 All three correct give [2]
 One correct give [1]

10

4	(a)	(i) Centripetal	[1]	
		(ii) Friction – required for 2nd mark Between tyres and the road	[1] [1]	[2]
		(iii) Labelled arrow (F) towards centre of circle (near car)	[1]	
		(iv) Labelled arrow (V) to the right (near car and between track curve)	[1]	
		(v) Momentum = mv	[1]	
		$= 700 \times 40$	[1]	
		$= 28\,000$	[1]	
		kg m/s	[1]	[4]
		Give the formula mark if no other work shown		
	(b)	(i) Momentum change = force \times time or $Ft = mv - mu$ or correct format Impulse gets [0]	[1]	
		(ii) The time (for the) momentum change is longer so the force on the driver is reduced . – Dependent marking	[1] [1]	[2]
		(iii) The (required) centripetal force decreases (as speed decreases).	[1]	
		(iv) Radius should be increased/gets larger/longer.	[1]	
		(v) The (required) centripetal force decreases (as the radius of the bend increases).	[1]	

AVAILABLE MARKS
15

			AVAILABLE MARKS		
5	(a)	(i) $F \times b$	[1]	10	
		(ii) EACH CORRECT LABEL – [1] each	[3]		
		(iii) Effort is further from pivot than the weight so can have a larger moment	[1]		
			[1] [2]		
		(b)	(i) Point [1] where the weight [1] of the object acts (appears)/gravity acts/mass is concentrated		[2]
(ii) To right of previous position but to left of pivot Above the previous position	[1] [1] [2]				
6	(a)	Proton mass 1 charge +(1)	[2]	15	
		Neutron mass 1 charge 0	[2]		
		Electron mass = $\frac{1}{1836}$ or $\frac{1}{1837}$ charge – or –1	[2] [6]		
		Name, mass, charge all correct for [2] Award [2] if all particles correctly named			
	(b)	Ball of positive charge	[1]		
		Negative charges (electrons) embedded in it.	[1] [2]		
	(c)	${}_{11}^{23}\text{Na}$	[2]		
	(d)	(i)	Radioactive ——— ———		[1]
			(ii) Alpha (α)		[1]
		High speed electron	[1]		
Gamma (γ) ray		[1] [3]			
(iii) The removal of an electron from an atom		[1]			
Total				80	