



*Rewarding Learning*

**General Certificate of Secondary Education  
2012**

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**Science: Physics**

Paper 2  
Foundation Tier

**[G7603]**

**MONDAY 25 JUNE, AFTERNOON**

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**MARK  
SCHEME**

## Subject-specific instructions

- 1 In numerical problems, the marks for intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the correct final answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote units for intermediate numerical quantities.

Note that this “correct answer” rule does not apply to formal proofs and derivations, which must be valid in all the stages shown in the mark scheme to obtain full credit.

- 2 Do not reward wrong physics. No credit is given for substitution of numerical data, or subsequent arithmetic, in a physically incorrect equation.

However, answers to later parts of questions that are consistent with an earlier incorrect numerical answer, and are based on a physically correct equation, must gain full credit. Annotate this by writing **ECF** (Error Carried Forward) by your text marks.

- 3 The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer mark, but  $10^n$  errors (e.g. writing 550 nm as  $550 \times 10^{-6}$  m) count only as arithmetical slips and lose the answer/unit mark.

			AVAILABLE MARKS	
<b>1</b>	<b>(a)</b>	<b>(i)</b> Accelerating [1] At rest/moving at constant speed [1]	[2]	20
		<b>(ii)</b> Friction (between object and turntable) [1] Towards the centre (of the turntable) [1]	[2]	
		<b>(iii)</b> Friction is not large enough to provide the needed centripetal force [1] At a tangent [1]	[2]	
	<b>(b)</b>	<b>(i)</b> 4 N causes extension = $22 - 10 = 12$ cm [1] 16 cm is an extension of 6 cm [1] Unknown weight = 2 N [1]	[3]	
		<b>(ii)</b> Elastic limit of spring has been exceeded	[1]	
	<b>(c)</b>	<b>(i)</b> Speed = gradient = distance/time [1] = $60/20$ [1] = 3 (m/s) [1]	[3]	
		<b>(ii)</b> 5 seconds	[1]	
		<b>(iii)</b> 120 m	[1]	
		<b>(iv)</b> Average speed = $120/35$ [2] e.c.f. from <b>(iii)</b> = 3.4 m/s [1]	[3]	
		<b>(v)</b> Displacement = 0 [1] They are back where they started from [1]	[2]	

- 2 (a) (i) Unlimited supply/suitable alternative/never runs out/replaced in a lifetime  
but **exclude** can be used again [1]
- (ii) It uses electricity [1]  
which is not a renewable energy resource [1] [2]  
or reference to use of fossil fuels [2] or non-renewable
- (iii) Explanation consistent with pollution response [1]
- (iv) Potential to Kinetic to Electrical  
Wasted Heat and Sound  
[1] for each energy correctly named [5]
- (v) The (sum of) the heat + sound + electrical =  
the potential of the water in the high lake [1]
- (b) (i) It should bend upwards/towards contact  
move up [0] [1]
- (ii) The metal with greater rate of expansion should be further from the  
contacts or on the bottom [1]  
outside [0] inside [0]
- (c) (i) Heat is conducted (from the processor) by the metal [1]  
**Air** is heated by **convection** [1]  
**Heat** is also **radiated** from the structure [1] [3]  
Giving conduction, convection, radiation [1]  
2 out of 3 give [2] for QWC
- Quality of written communication [2]

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar the main points shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	[2]
Candidates make some reference to 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]
Response not worthy of credit.	[0]

- (ii) Black is the best emitter of radiant heat absorber [0] [1]  
emitter **and** absorber [1]

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- (d) (i) Convection current shown rising from centre to the top [1] and curving downwards to the base [1] [2]
- (ii) Body – metal a good conductor of heat [1]  
Handle – plastic – insulator [1] [2]
- (iii) Molecules/atoms [1]  
vibrate more when heated [1]  
vibrations passed along to neighbouring molecules/atoms [1] [3]

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25

- 3 (a) Candle flame [1]  
Star [1]  
If more than 2 ringed deduct [1] for each incorrect one [2]

(b) (i) Extended/large [1]

(ii) Circular/round [1]

(iii) Ray from top of source glancing bottom of ball [1]  
Ray from bottom of source glancing top of ball [1] } must be extended to screen [2]  
Poorly drawn rays [-1]

(iv) Region of partial shadow identified – correct rays before this can be given [1]

(v)

	Shadow's size decreases	No change in size of shadow	Shadow's size increases
Using a larger screen		✓	
Moving the screen away from the ball			✓
Moving the light source away from the ball	✓		

[3]

(c) (i) Focal length is distance between principal focus (focal point) and (optical centre of) lens [1]

(ii) Apparatus: ruler, (white paper) screen [1]  
Move lens (or screen) further from screen (or lens) until [1]  
Image of distant object seen on screen [1]  
Image is sharp [1]  
Measure distance between lens and screen to find focal length [1] [5]

(d) (i)

Gamma	X-rays	UV	Visible	IR	Microwaves	Radio
[ $\frac{1}{2}$ ] each <b>round down</b>						

[2]

(ii) All travel (at same speed) in vacuum [1]

(iii) Causes burns [1]

20

- 4 (a) Permanent magnet not strong enough  
Permanent magnet cannot be turned off/retains magnetism [1]
- (b) (i) Switch on current/close switch [1]
- (ii) Reduce number of turns [1]  
Reduce the current/reduce number of cells [1]  
Remove the iron core [1] [3]
- (c) (i) A iron [1]  
B iron [1] [2]
- (ii) Conducts electricity [1]  
Springy/flexible [1] [2]
- (iii) Open and close/make and break [1]
- (d) Closing first switch allow current to flow around first circuit [1]  
the electromagnet is energised [1] and attracts iron armature  
the contacts of second switch is closed [1] [3]
- (e) (i) BC – No None [1]  
CD – Yes Up [1] [2]
- (ii) Electric motor/generator/moving coil meter [1]
- (f) Top left DC [1]  
Top right AC [1]  
Bottom left DC [1]  
Bottom right AC [1] [4]

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20

5	(a)	(i)	Galaxies	[1]	<b>AVAILABLE MARKS</b>	
		(ii)	Stars or star systems	[1]		
		(iii)	Gravity	[1]		
		(iv)	Nuclear fusion	[1]		
		(v)	Hydrogen and helium [1] each	[2]		
	(b)	(i)	A number of planets [1] in orbit around a star (sun) [1]	[2]		
		(ii)	Venus [1] Jupiter [1]	[2]		
		(iii)	Heliocentric – Sun at the centre (of the solar system) [1] Geocentric – Earth at the centre (of the solar system) [1]	[2]		
		(iv)	Retrograde motion or looping of the planets Strange motion [0]	[1]		
	(c)	(i)	Shading to the left	[1]		
		(ii)	B	[1]		
						15
				<b>Total</b>		<b>100</b>