



*Rewarding Learning*

**General Certificate of Secondary Education**

**2012**

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**Science: Double Award (Non-Modular)**

Paper 3  
Higher Tier

**[G8406]**

**FRIDAY 15 JUNE, AFTERNOON**

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**MARK  
SCHEME**

			AVAILABLE MARKS
1	$F_R = ma$ [1] [1] $350 = 500 \times a$ [1] $a = 0.7 \text{ (m/s}^2\text{)}$ [1]	[4]	4
2	(i) [1] for constant velocity line to 50 seconds [1] for deceleration line to 70 seconds  (ii) $a = \frac{\Delta v}{t}$ <b>or</b> equivalent ( <b>or</b> gradient) [1] $= \frac{8}{10}$ [1] $= 0.8 \text{ (m/s}^2\text{)}$ [1]	[2]     [3]	5
3	(a) Arrow from A towards centre of Earth  (b) The force on A is less than the force on B (Third box ticked)  (c) Gravity/centripetal (force)/gravitational/weight  (d) The force on A will increase (Third box ticked)  (e) Tangent to circle going through B	[1]  [1]  [1]  [1]  [1]	5
4	(a) Galaxy  (b) 1 [1], 4, 3 [1]  (c) Any two named e.m.s. members [1] each	[1]  [2]  [2]	5
5	(a) Universe has a starting point  (b) Steady State <b>or</b> String  (c) Lack of sufficient fuel [1] logistics [1] time required [1] (any <b>two</b> )  (d) Fusion	[1]  [1]  [2]  [1]	5
6	(a) For a body in equilibrium <b>or</b> balanced [1] clockwise moment(s) = anticlockwise moment(s) [1]  (b) $CM = ACM$ [1] [1] $40 \times d = 24 \times 150$ [1] $d = 90 \text{ (cm)}$ [1]	[2]     [4]	6

			AVAILABLE MARKS	
7	(a)	We feel the infrared and see the red light (Middle box ticked)	[1]	5
	(b)	Sensor A receives energy by convection [1] and B does not [1]	[2]	
	(c)	(i) Readings the same	[1]	
		(ii) Sensors receiving radiation only or convection no longer acting	[1]	
8	(i)	$W = F \times d$ [1] $W = 320 \times 0.2$ [1] ( $W = 64$ J)	[2]	5
	(ii)	$KE = \frac{1}{2} mv^2$ [1]  $\frac{1}{2} \times 0.5 \times v^2 = 64$ [1]  $v = 16$ (m/s) [1]	[3]	
9	(a)	(i) Energy	[1]	5
		(ii) $\longleftrightarrow$	[1]	
		(iii) 3	[1]	
		(iv) 3 Allow e.c.f. from (iii)	[1]	
		(v) 0.5 (m)	[1]	
		(vi) $v$ (or speed) = $f \times \lambda$ [1] $= 3 \times 0.5$ [1] $= 1.5$ (m/s) [1] Allow e.c.f. from (iv) and (v)	[3]	
		(vii) Sound or Ultrasound	[1]	
	(b)	(i) Vibrations are at right angles/perpendicular	[1]	
		(ii) Light or (any named member of e.m.s.) or water waves	[1]	
	(c)	(i) The gong vibrates	[1]	
		(ii) It decreases	[1]	
		(iii) Sound waves require a medium or Sound waves do not travel through a vacuum	[1]	
		(iv) Vibrations/sound will travel through the glass	[1]	

- (d) (i) 20 (Hz) [1]  
(ii) 20 000 (Hz) or 20 kHz [1]  
(iii) It decreases [1]  
(iv) Damage to eardrums [1]  
(v) Use ear protection/ear plugs/defenders [1]

AVAILABLE  
MARKS

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10 (a) (i)

Object	Luminous	Non-Luminous
Star	✓	
Moon		✓
Planet		✓
White paper		✓

[1] each [4]

- (ii) A [1]
- (b) (i) Normal, correctly drawn [1]  
(ii) 50° [1]
- (c) (i) Undeviated ray at first interface [1]  
refracted [1]  
correctly [1] [3]  
(ii) Decreases [1]
- (d) (i) Dispersion [1]  
(ii) Violet, Indigo, Blue, Green, Yellow, Orange, Red [2]  
Deduct [1] if correct but reversed  
(iii) Spectrum [1]
- (e) (i) Gamma or  $\gamma$  [1]  
(ii) Infrared or IR [1]  
(iii) Gamma or  $\gamma$  [1]  
(iv) Ultraviolet or UV [1]  
(v) Radio waves [1]

20

- 11 (a) (i)** Electrons move [1] due to friction/rubbing [1] [2]  
 Quality of written communication [1]
- (ii)** Charges are similar [1]
- (iii)** Similar charges repel [1]
- (b)** Charge (Q) = Current (I) × time (t) [1]  
 $0.6 = I \times 0.2$   
**or**  $I = 0.6/0.2$  } Correct substitutions [1]  
 $= 3 \text{ (A)}$  [1] [3]
- (c)** 10 [1]  
 40 [1]  
 30 [1] [3]
- (d) (i)** 5 correct points ( $\pm \frac{1}{2}$  square) [1]
- (ii)** Best fit straight line through (0,0) ( $\pm \frac{1}{2}$  square) [1]
- (iii)** Voltage =  $2.4 \pm 0.1$  (V) **or** e.c.f. from **(ii)** [1]
- (iv)** Current = 0.06 (A) [1]
- (v)**  $R = V/I$  [1]  
 $= 2.4/0.06$  [1] e.c.f. from **(iii)** and **(iv)**  
 $= 40 \text{ } (\Omega)$  [1] [3]
- (e)** Curve with increasing positive gradient [1] through (0,0) [1] [2]

AVAILABLE  
MARKS

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12 (a) (i) Earth	[1]
(ii) Neutral – blue Both required	[1]
(iii) Live – brown Both required	[1]
(iv) It is the live wire or It is the high voltage wire	[1]
(v) Double insulated	[1]
(b) (i) Metal body can become “live”	[1]
(ii) (Metal) body is connected to earth wire Low resistance path (to earth)/current flows to <b>earth</b> Large current flows Fuse blows Any <b>three</b>	[3]
(c) (i) No (relative) movement	[1]
(ii) Switch circuit off [1] Move circuit X or Y [1] Replace with a.c. supply [1]	[3]
(d) (i) Voltage circled	[1]
(ii) To step down the current [1] and save energy (or heat) losses [1]	[2]
(e) $\frac{N_p}{N_s} = \frac{V_p}{V_s}$ [1] or equivalent formula	
$\frac{10560}{N_s} [1] = \frac{132}{25} [1]$	
$N_s = 2000 [1]$	[4]

**Total**

AVAILABLE  
MARKS

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**120**