Rewarding Learning

General Certificate of Secondary Education
2012

Science: Double Award (Non-Modular)

Paper 3
Higher Tier

[G8406]

FRIDAY 15 JUNE, AFTERNOON

MARK
SCHEME

1 F_R = ma [1]
      [1] 350 = 500 × a [1]
          a = 0.7 (m/s^2) [1]   [4]   4

2 (i) [1] for constant velocity line to 50 seconds
          [1] for deceleration line to 70 seconds   [2]

(ii) a = $\frac{\Delta v}{t}$ **or** equivalent (**or** gradient) [1]

          = $\frac{8}{10}$ [1]

          = 0.8 (m/s^2) [1]   [3]   5

3 (a) Arrow from A towards centre of Earth   [1]

(b) The force on A is less than the force on B (Third box ticked)   [1]

(c) Gravity/centripetal (force)/gravitational/weight   [1]

(d) The force on A will increase (Third box ticked)   [1]

(e) Tangent to circle going through B   [1]   5

4 (a) Galaxy   [1]

(b) 1 [1], 4, 3 [1]   [2]

(c) Any two named e.m.s. members [1] each   [2]   5

5 (a) Universe has a starting point   [1]

(b) Steady State **or** String   [1]

(c) Lack of sufficient fuel [1] logistics [1] time required [1] (any **two**)   [2]

(d) Fusion   [1]   5

6 (a) For a body in equilibrium **or** balanced [1]
          clockwise moment(s) = anticlockwise moment(s) [1]   [2]

(b)   CM = ACM [1]
          [1] 40 × d = 24 × 150[1]
                  d = 90 (cm) [1]   [4]   6

7347.01   **2**

					AVAILABLE MARKS
7	**(a)**	We feel the infrared and see the red light (Middle box ticked)		[1]	
	(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]	5

8   **(i)**   W = F × d [1]
              W = 320 × 0.2 [1]
              (W = 64 J)   [2]

       (ii) KE = $\frac{1}{2}$ mv^2 [1]

             $\frac{1}{2}$ × 0.5 × v^2 = 64 [1]

             v = 16 (m/s) [1]   [3]   5

9	**(a)**	**(i)** Energy		[1]	
		(ii) ←——→		[1]	
		(iii) 3		[1]	
		(iv) 3 Allow e.c.f. from **(iii)**		[1]	
		(v) 0.5 (m)		[1]	
		(vi) v (or speed) = f × λ [1]			
		= 3 × 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]	

AVAILABLE MARKS

(d) (i) 20 (Hz) [1]

(ii) 20 000 (Hz) **or** 20 **k**Hz [1]

(iii) It decreases [1]

(iv) Damage to eardrums [1]

(v) Use ear protection/ear plugs/defenders [1]   20

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** γ [1]

(ii) Infrared **or** IR [1]

(iii) Gamma **or** γ [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]
$0.6 = I × 0.2$
or $I = 0.6/0.2$ } Correct substitutions [1]
$= 3$ (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 ± 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)**
$= 40$ (Ω) [1]   [3]

(e) Curve with increasing positive gradient [1] through (0,0) [1]   [2]   20

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 **earth**
Large current flows
Fuse blows
Any **three** [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) $\dfrac{N_p}{N_s} = \dfrac{V_p}{V_s}$ [1] **or** equivalent formula

$\dfrac{10560}{N_s}$ [1] $= \dfrac{132}{25}$ [1]

$N_s = 2000$ [1] [4] 20

Total **120**