Rewarding Learning

General Certificate of Secondary Education
2011

Science: Double Award (Non-Modular)

Paper 3
Higher Tier

[G8406]

WEDNESDAY 25 MAY, MORNING

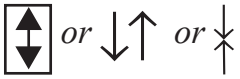
MARK SCHEME

					AVAILABLE MARKS
1	**(a)**	Distance = area under graph *or* d = v × t *or* d = s × t	[1]		
		= 3 × 15	[1]		
		= 45 (m)	[1]	[3]	
	(b)	Momentum = m × v *or* p = mv	[1]		
		= 3000 × 1.4	[1]		
		= 4200	[1]		
		kg m/s or Ns [1] Free-standing unit mark	[1]	[4]	7
2	**(a)**	Forces must be balanced/Weight = Friction		[1]	
	(b)	F = ma or RF = ma	[1]		
		0.6 = 0.3 × a	[1]		
		a = 2 (m/s^2)	[1]	[3]	4
3	**(a)**	2nd box (✓)		[1]	
	(b)	Geocentric [1] and heliocentric [1] either order		[2]	
	(c)	Responses 2 and 4 Mark positively then subtract [1] for each extra (✓)		[2]	5
4	**(a)**	**(i)** Milky Way		[1]	
		(ii) Universe		[1]	
	(b)	Jupiter and Saturn – either order		[2]	4
5	**(a)**	Gravity	[1]		
		Temperature *or* density *or* HEAT *or* thermal energy	[1]		
		Fusion	[1]	[3]	
	(b)	(Star) emits light	[1]		
		(Star) is bigger/massive	[1]	[2]	5

					AVAILABLE MARKS
6	**(a)**	Work done = Force × Distance moved or WD = F × s	[1]		
		= 500 × 3	[1]		
		= 1500 (J)	[1]	[3]	
	(b)	Efficiency = $\frac{\text{Energy Out}}{\text{Energy In}}$	[1]		
		0.6 = 2400/Input Energy Energy Input = 2400/0.6 (either)	[1]		
		= 4000 (J)	[1]	[3]	6
7	**(a)**	Strain or Elastic		[1]	
	(b)	KE = $\frac{1}{2}mv^2$	[1]		
		= $\frac{1}{2} \times 0.5 \times 30^2$	[1]		
		= 225 (J)	[1]	[3]	4
8	**(a)**	Conduction		[1]	
	(b)	(free) electrons		[1]	
	(c)	Particles (atoms) in plastic (near the hot coffee) vibrate more [1] The vibration passes along the plastic/jostle/ particles collide [1] (independent marking)		[2]	
	(d)	Use a lid/cover		[1]	5

AVAILABLE MARKS

9 **(a)** **(i)** Energy [1]

(ii)  [1]

(iii) **A** Transverse **B** Longitudinal [2]

(iv) 30 (cm) [1]

(v) 50 (cm) [1]

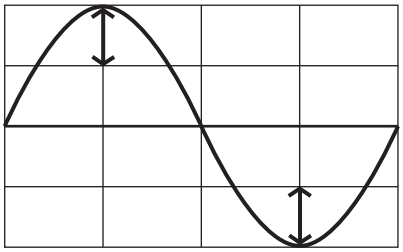
(vi) 8 (cm) [1]

(vii) 4 [1]

(viii) 4 (Hz) (allow ecf from **(vii)**) [1]

(b) $v = f \times \lambda$ [1]
$= 6 \times 0.4$ [1]
$= 2.4$ (m/s) [1] [3]

(c) Both amplitudes must be $1 <$ amplitude $\leqslant 2$ squares



loudness [1]
frequency [1]
} Independent marks

[2]

(d)

Statement	True	False
Sound and light travel at the same speed in air		✓
Light can travel through a vacuum	✓	
Sound is a longitudinal wave motion	✓	

One mark for each row [3]

(e) **(i)** Can cause loss of hearing *or* damage to ear drum *or* deafness [1]

(ii) Wear ear protectors/muffle the machine [1]

(iii) Decreases [1] [3]

20

					AVAILABLE MARKS
10	**(a)**	**(i)**	Incident ray to coin from bulb [1] Reflected ray into eye [1] Correct direction on either ray [1]	[3]	
		(ii)	Any named luminous object	[1]	
	(b)	**(i)**	Normal $\perp$ to block [1] Bending of ray on correct side of normal [1] Bending in correct sense i.e. $\hat{i} > \hat{r}$ [1]	[3]	
		(ii)	Incident ray normal to glass block i.e. collinear with incident ray on LHS	[1]	
		(iii)	The light travels faster in air than in glass (✓)	[1]	
	(c)	**(i)**	Splitting (of light) [1] into (different) colours/wavelengths/spectrum [1] } Dependent marking	[2]	
			Quality of written communication	[1]	
		(ii)	(Triangular) prism	[1]	
		(iii)	Spectrum	[1]	
		(iv)	(R) O Y G B I V in words and in correct order	[1]	
	(d)	**(i)**	Ultraviolet or UV	[1]	
		(ii)	X rays, gamma rays – either order	[1]	
	(e)	**(i)**	X-rays	[1]	
		(ii)	Visible	[1]	
		(iii)	Infra-red or IR	[1]	20

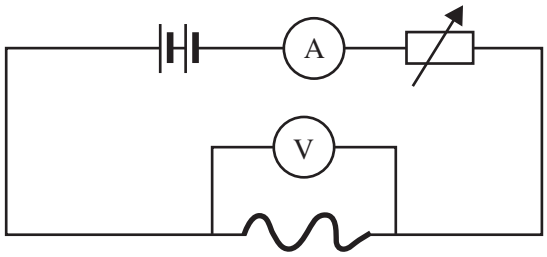
11 **(a)** **(i)** Electrons [1]

(ii) Positive [1]

(b) To stop charge building up [1] } Dependent
to prevent a spark [1] } marking [2]

(c) $Q = It$ [1]
$= 0.24 \times 300$ [1]
$= 72$ [1]
C Free-standing unit mark [1] [4]

(d)



(i) Both correct [1]

(ii) Change the current [1]

(iii) All points correct [1]

(iv) Best fit straight line [1]

(v) 20 mA (±2) [1]

(vi) 0.02 A (allow ecf from **(v)**) [1]

(vii) $R = V/I$ or $V = IR$ or equivalent [1]
$R = 0.8/0.02$ [1]
$R = 40\ \Omega$ ecf from **(vi)** i.e. for current only [1] [3]

(e) **(i)** 35 (Ω) [1]

(ii) 10 (Ω) [1]

(iii) 25 (Ω) [1]

AVAILABLE MARKS

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					AVAILABLE MARKS
12	**(a)**	**(i)**	A layer (or 2 layers) of insulation/plastic [1] Covering live parts [1]	[2]	
		(ii)	Earth (wire)	[1]	
	(b)		Quicker (response)/Safer [1] Easier to reset [1]	[2]	
	(c)	**(i)**	Changes *direction* } dependent [1] Continuously/periodically } marking [1]	[2]	
		(ii)	a.c. or alternating [1] d.c. direct [1] a.c. alternating [1]	[3]	
	(d)	**(i)**	C	[1]	
		(ii)	C	[1]	
		(iii)	A	[1]	
	(e)		$\frac{N_P}{N_S} = \frac{V_P}{V_S}$ (or equivalent) [1]		
			[1] $\frac{3600}{N_S} = \frac{240}{12}$ [1]	[2]	
			$N_S = 180$ [1]	[4]	
	(f)	**(i)**	Increases the voltage/decrease current [1] Reduce the energy lost [1]	[2]	
		(ii)	Voltage is stepped down/Make safe	[1]	20
				Total	**120**