Rewarding Learning

General Certificate of Secondary Education
2011

Science: Double Award (Modular)

Paper 3
Higher Tier

[G8206]

WEDNESDAY 25 MAY, MORNING

MARK SCHEME

					AVAILABLE MARKS
1	**(a)**	**(i)**	Distance = area under graph *or* d = v × t *or* d = s × t [1] = 3 × 15 [1] = 45 (m) [1]	[3]	
		(ii)	Momentum = m × v *or* p = mv [1] = 3000 × 1.4 [1] = 4200 [1] kg m/s or Ns free-standing unit mark [1]	[4]	
	(b)	**(i)**	Forces must be balanced/Weight = Friction	[1]	
		(ii)	F = ma or RF = ma [1] 0.6 = 0.3 × a [1] a = 2 (m/s^2) [1]	[3]	
	(c)	**(i)**	Strain/elastic	[1]	
		(ii)	KE = $\frac{1}{2}$ mv^2 [1] = $\frac{1}{2}$× 0.5 × 30^2 [1] = 225(J) [1]	[3]	15
2	**(a)**	**(i)**	2nd box (✓)	[1]	
		(ii)	Geocentric [1] and heliocentric [1]	[2]	
		(iii)	Responses 2 and 4 Mark positively then subtract [1] for each extra (✓)	[2]	
	(b)		Gravity [1] Temperature *or* density *or* heat *or* thermal energy [1] Fusion [1]	[3]	
	(c)		(Star) emits light/luminous [1] (Star) is bigger/massive [1]	[2]	
	(d)	**(i)**	Conduction	[1]	
		(ii)	(free) electrons	[1]	
		(iii)	Particles (atoms) in plastic (near the hot coffee) vibrate *more* [1] The vibration passes along the plastic/jostle/ particles collide [1] } Independent marking	[2]	
		(iv)	Use a lid/cover	[1]	15

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

(ii)  [1]

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

(iv) 30 (cm) [1]

(v) 50 (cm) [1]

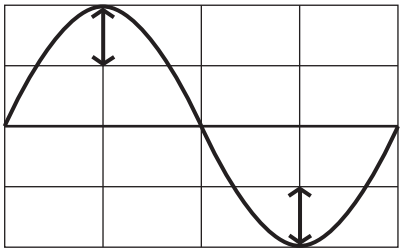
(vi) 8 (cm) [1]

(vii) 4 [1]

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

(b) $v = f \times \lambda$ or $s = f\lambda$ [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]

AVAILABLE MARKS

20

						AVAILABLE MARKS
4	**(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		[1]	
		(iii)	The light travels faster in air than in glass		[1]	
	(c)	**(i)**	Splitting (of light) [1] } Dependent			
			into (different) colours/wavelengths/spectrum [1] } 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

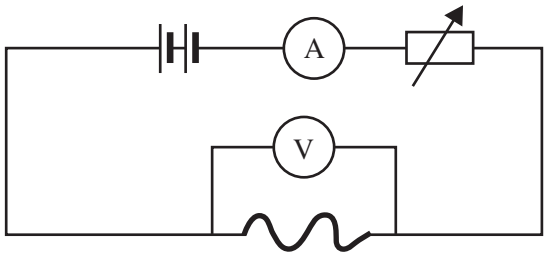
5 **(a)** **(i)** Electrons [1]

(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)



$a \neq A$

(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]

(e) **(i)** 35 (Ω) [1]

(ii) 10 (Ω) [1]

(iii) 25 (Ω) [1]

AVAILABLE MARKS

20

					AVAILABLE MARKS
6	**(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)**	Dependent marking { Changes *direction* [1] Continuously/periodically [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] } Independent marks	[2]	
		(ii)	Voltage is stepped down/Make safe	[1]	20
				Total	**110**