## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

## MARK SCHEME for the May/June 2012 question paper for the guidance of teachers

## 9702 PHYSICS

9702/23

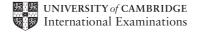
Paper 2 (AS Structured Questions), maximum raw mark 60

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1 (a) displacement is a vector, distance is a scalar B1 displacement is straight line between two points / distance is sum of lengths moved / example showing difference **B1** [2] (either one of the definitions for the second mark) (b) a body continues at rest or at constant velocity unless acted on by a resultant (external) force B1 [1] **B**1 (c) (i) sum of  $T_1$  and  $T_2$  equals frictional force these two forces are in opposite directions **B1** [2] (allow for 1/2 for travelling in straight line hence no rotation / no resultant torque) (ii) 1. scale vector triangle with correct orientation / vector triangle with correct orientation both with arrows **B1 B**1 [2] scale given or mathematical analysis for tensions 2.  $T_1 = 10.1 \times 10^3 (\pm 0.5 \times 10^3) \text{ N}$   $T_2 = 16.4 \times 10^3 (\pm 0.5 \times 10^3) \text{ N}$ **A1 A1** [2] 2 (a) weight =  $452 \times 9.81$ component down the slope = 452 × 9.81 × sin 14° M1  $= 1072.7 = 1070 \,\mathrm{N}$ A0 [1]

(b) (i) 
$$F = ma$$
 C1  
 $T - (1070 + 525) = 452 \times 0.13$  C1  
 $T = 1650 (1653.76) N$  any forces missing 1/3 A1 [3]

(ii) 1. 
$$s = ut + \frac{1}{2}at^2$$
 hence  $10 = 0 + \frac{1}{2} \times 0.13t^2$  C1  $t = [(2 \times 10) / 0.13]^{1/2} = 12.4$  or 12s A1 [2]

2. 
$$v = (0 + 2 \times 0.13 \times 10)^{1/2} = 1.61 \text{ or } 1.6 \text{ m s}^{-1}$$
 A1 [1]

3 (a) 
$$V = h \times A$$
  
 $m = V \times \rho$   
 $W = h \times A \times \rho \times g$   
 $P = F / A$   
 $P = h \rho g$   
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4 (a) electric field strength is the force per unit positive charge (acting on a stationary charge) **B1** [1] (b) (i) E = V/dC1  $= 1200 / 14 \times 10^{-3}$  $= 8.57 \times 10^4 \text{V m}^{-1}$ **A1** [2] (ii) W = QV or  $W = F \times d$  and therefore  $W = E \times Q \times d$ C1  $= 3.2 \times 10^{-19} \times 1200$  $= 3.84 \times 10^{-16} \text{ J}$ **A1** [2] C1 (iii)  $\Delta U = mgh$  $= 6.6 \times 10^{-27} \times 9.8 \times 14 \times 10^{-3}$  $= 9.06 \times 10^{-28} \text{ J}$ Α1 [2] (iv)  $\Delta K = 3.84 \times 10^{-16} - \Delta U$  $= 3.84 \times 10^{-16} \text{ J}$ **A1** [1] (v)  $K = \frac{1}{2}mv^2$ C1  $v = [(2 \times 3.8 \times 10^{-16}) / 6.6 \times 10^{-27}]^{1/2}$  $= 3.4 \times 10^5 \,\mathrm{m \, s^{-1}}$ Α1 [2] 5 (a) (i) sum of currents into a junction = sum of currents out of junction **B1** [1] **B**1 [1] (ii) charge (b) (i)  $\Sigma E = \Sigma IR$ C1 20 - 12 = 2.0(0.6 + R) (not used 3 resistors 0/2)  $R = 3.4 \Omega$ Α1 [2] (ii) P = EIC1  $= 20 \times 2$ = 40 WΑ1 [2] (iii)  $P = I^2R$ C1  $P = (2)^2 \times (0.1 + 0.5 + 3.4)$ = 16W **A1** [2] (iv) efficiency = useful power / output power C1 24 / 40 = 0.6 or  $12 \times 2 / 20 \times 2$  or 60%[2] Α1

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6	(a)		fraction bending/spreading of light at edge/slit s occurs at each slit		B1 B1	[2]
		(ii) co	nstant phase difference between each of the waves		B1	[1]
	(	• • •	hen the waves meet) the resultant displacement is toplacements of each wave	the sum of	the B1	[1]
	(b)	n = 3.5	$\lambda = 1 / 450 \times 103 \times 630 \times 10^{-9}$		C1 M1 A1	[3]
	(c)	more c	is less than $\lambda$ red rders seen rder is at a smaller angle than for the equivalent red		M1 A1 A1	[3]
7	(a)	additio	per reduces count rate hence $\alpha$ n of 1 cm of aluminium causes little more count rate reduadiation is $\gamma$	ction hence	B1 only B1	[2]
	(b)	look fo	tic field perpendicular to direction of radiation r a count rate in expected direction / area if there were nega d radiation present. If no count rate recorded then β not pre	•	B1 B1	[2]