



Rewarding Learning

**General Certificate of Secondary Education
2011**

Science: Physics

Paper 1
Higher Tier

[G7604]

WEDNESDAY 25 MAY, MORNING

**MARK
SCHEME**

- 1 (i) Average speed = distance/time [1]
= 36/3 [1]
= 12 (cm/s) [1]
- (ii) Initial speed = $2 \times$ ave speed or ave speed = $\frac{1}{2}(u + v)$ [1]
= 24 (cm/s) 12 = $\frac{1}{2} \times (u + 0)$ [1]
ecf for Av speed
- (iii) Straight line of negative slope [1]
From (0,24) to (3,0) 1 each point [2]
Allow ecf for velocity from (ii)
- (iv) $a = (v - u)/t$ or equivalent [1]
= $(0 - 24)/3$ ecf from (ii) for u [1]
= - 8 ignore - sign. [1]
- (v) $F = ma$ or $F = md$ e.c.f. for a [1]
= 0.075×0.08 [failure to convert g to kg and cm/s^2 to m/s^2] [4]
= 0.006 (N) give a max of 4 marks] [1]
- (vi) Gravity/weight/component of weight [1]
- (vii) They are equal/same [1]
- (viii) Average speed = 12 (cm/s) ecf from (i) [1]
Average velocity = 0 [1]
- (ix) Momentum = mass \times velocity (speed) ecf for velocity [1]
= 0.075×0.2 [1]
= 0.015 failure to convert to kg give 3 marks [1]
kg m/s [1]

AVAILABLE
MARKS

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- 2 (a) Renewable – wind/wave/tidal/geothermal/biomass/hydro(electric)/solar or Sun
Non-renewable – any fossil fuel/nuclear/uranium/peat [3]
½ each round down
- (b) (i) 14580 J [1]
- (ii) PE = mgh [1]
14580 = 90 × 10 × h ecf from (i) [2]
H = 16.2 (m) [1]
- (iii) KE = ½ mv² no ecf [1]
= ½ × 90 × 15² [1]
= 10125 (J) [1]
- (iv) Energy wasted = 14580 – 10125 [1]
= 4455 (J) Allow ecf from (iii) for KE [1]
and from (i) for P.E.
- (c) (i) Black [1]
- (ii) Infra-red or IR [1]
- (iii) B and A receives heat by convection *and* radiation [1] [2]
B and C receives heat by radiation only [1]
- (d) Shiny outside Poor emitter of radiation [1]
Shiny inside Good reflector/poor absorber of radiation [1]
- (e) In metals(copper) electrons [1]
and collide with ions (atoms) either [1] [4]
In glass atoms [1] vibrate more/faster [1]
- QWC [2]

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Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar the main points shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	2
Candidates make some reference to the main points shown above using satisfactory spelling, punctuation and grammar. The form and style is of a satisfactory standard and they have made some reference to specialist terms.	1
Candidates make little reference to the main points shown above using limited spelling, punctuation and grammar. The form and style is of a limited standard and they have made no use of specialist terms.	0

- 3 (a) (i) I same distance behind mirror as O in front (± 1 div) (2 mm) [1]
accept a dot unlabelled
- (ii) Ray from O to mirror [1]
Reflected ray comes from I no ecf for position of I [1]
- (b) (i) Parallel rays converge to a point to the right of lens on p-axis [1]
Focal length marked distance from lens to this point [1]
- (ii) Both parallel rays diverge [1]
- (iii) Place lens in front of a screen [1]
Move lens toward/away from screen or adjust position [1]
Until sharp image is seen/image is in focus [1]
Identify or measure distance from lens to screen/lens to image [1]
- (iv) Mark and label both focal points 3 cm from lens [1]
(Accept dots for label)
- (v) Ray from top of object through centre of lens undeviated [1]
Ray parallel to principal axis refracted through focus [1]
Rays produced *back* until they meet [1]
Top of image marked at intersection, bottom on [1]
principal axis [1]
Arrow from object on at least one ray [1]
Contradictory arrow no mark – only on real rays
- (vi) Light only appears to come from it/cannot be projected to a [1]
screen/Rays do not meet to form it
- (vii) Height consistent with candidate's diagram [1]
- (viii) Image distance consistent with candidate's diagram [1]
- (ix) Eye marked to the right of the lens [1]
- (c) (i) Straight line from X to hypotenuse of prism [1]
REFLECTED RAY at right angles to incident ray [1]
- (ii) Total internal reflection occurs at prism/TIR occurs [1]
angle of incidence in the glass is greater than the critical angle [2]

AVAILABLE
MARKS

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- 4 (a) (i) He lost electrons [1]
- (ii) STATEMENT (2) is correct [1]
- (iii) $Q = It$ or equivalent (wrong equation no marks) [1]
 $I = 8 \times 10^{-6} / 1 \times 10^{-3}$ incorrect physics) [1]
 $= 8 \times 10^{-3}$ or 0.008A or 8 mA [1]
or $\frac{1}{125}$ A
- (b) (i) Earth to metal case/sole/parts [1]
Live to the fuse [1]
If live touches metal case [1]
Surge of/Large current flows/low resistance path/current goes
through earth wire [1]
Blows fuse [1]
- (ii) $P = IV$ or equivalent [1]
 $I = 2200/240$ [1]
 $= 9.17$ (9.2) (A) 9 1/6 (A) [1]
- (c) (i) $R = V/I$ [1]
 $= 1.5/0.25$ [1]
 $= 6$ (Ω) [1]
- (ii) Bulbs in parallel [1]
Battery in series with bulbs [1]
Switch in series with battery [1]
All symbols correct [1]
- (d) (i) Ammeter in series with box [1]
Voltmeter in parallel with box [1]
Variable resistor (for a series of values) [1]
Correct symbols providing circuit includes sealed box [1]
accept \textcircled{V} or \textcircled{A} in series
- (ii) Diode [1]

AVAILABLE
MARKS

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5	(a)	(i)	Electron	(1/1840)	-1	8	Outside nucleus	
			Neutron	1	0	9	In the nucleus	[6]
			Proton	1	+1	8	In the nucleus	
			½ each round up					
		(ii)	$^{17}_9\text{O}$ ringed					[1]
		(iii)	Has not same number of protons/atomic number					[1]
	(b)	(i)	The activity/reading reaches a maximum/increases/starts					[1]
		(ii)	Activity recorded without any source present/activity from surrounding materials					[1]
		(iii)	$^{24}_{11}\text{Na} + \gamma$					[3]
		(iv)	Every half life the activity halves worth [1] 15 hr = 500 30 hour = 250 45 hours = 125					[3]
		(v)	15 hrs long enough <i>to be detected</i>					[1]
			1 minute too short <i>to be detected</i>					[1]
			1 year <i>dangerous radiations</i> for too long					[1]
	(c)	(i)	Fission (correct spelling)					[1]
			Heavy nucleus splitting/breaking (up)					[2]
			if (Heavy) atom splitting only [1] (Large)					
		(ii)	Fusion (correct spelling)					
			Light joining					[1]
			nuclei joining					[1]
								[1]

AVAILABLE MARKS
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