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Mark Scheme (Results)
January 2010

GCE O

GCE O Physics (7540) Paper 01

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Abbreviations used in mark schemes:
OWTTE - or words to that effect
dop **-** depending on previous
ecf **-** error carried forward
UP - unit penalty

Question Number		Acceptable Answers	Mark
1. (a)	**gaps**	(i) vector (ii) scalar size / magnitude	**1** **1** **1**
(b)	**vector** **scalar**	acceleration or momentum or weight area or density or temperature	**1** **1**
(c) (i)	**type of force**	air friction or air drag or air resistance reject friction on its own	**1**
(ii)	**total force** **direction**	8(N) **no UP** to the right/to the East independent marks	**1** **1**
(iii)	**acceleration**	$a = 8 \div 6$ $= 1.3\ m/s^2$ Accept 4/3 m/s or 1 1/3 m/s **UP** allow **ecf** from (ii) or start from scratch	**1** **1**

(10 marks)

Question Number		Acceptable Answers	Mark
2. (a) (i)	**greatest acceleration**	**C**	**1**
(ii)	**explain**	greatest rate of increase in separation of dots / dots get further apart rapidly **dop** Need a correct comparison implied to score	**1**
(b)	**average speed**	measurement of length from **B** using distance between <u>end</u> dots / 69.5 ±0.5 mm/ 7 cm correct determination of time / 0.3 s (i.e. time for 15 gaps) Use of speed = <u>candidates distance</u> / candidates time 6.95 cm / 0.3 s = 23 cm/s **UP ecf** Allow any number of sf which rounds to 23	**1** **1** **1**
(c)	**av speed** **acceleration**	Need whole tape/some dots too close together (to count separately)/ difficult to count (all) dots OWTTE any section of tape will suffice OWTTE	**1** **1**

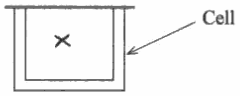
(7 marks)

Question Number		Acceptable Answers	Mark
3. (a)	**process**	conduction radiation **reject** evaporation or convection	**1** **1**
(b) (i)	**warm air rises**	density lower (than surrounding air) or air expands/ volume increases cool air is denser ignore warm air is lighter ignore molecules or particles expand or less dense ignore kinetic energy (of molecules)	 **1**
(ii)	**shc**	heat required to raise temperature of unit mass by 1 degree Accept c= E/(m ΔT)	**1**
(iii)		Sea accept water	**1**

(5 marks)

Question Number		Acceptable Answers	Mark
4. (a) (i)	**BC**	contracting /volume getting smaller/ volume decreasing/ melting/ changing state/ changing from ice to water/ turning into a liquid **reject** expanding or volume increasing **reject** changing from water to ice or freezing	**1**
(ii)	**expansion**	DE	**1**
(iii)	**explain**	greater slope or gradient / gradient or slope steeper/ very steep **dop** **reject** volume increases a lot	**1**
(b)	**max density P**	**D**	**1**
(c)	**substance**	water / ice/ H_2O accept clean or fresh or pure water **reject** dry ice or liquid	**1**

(5 marks)

Question Number		Acceptable Answers	Mark
5. (a)	**X**	inside cell 	**1**
(b)	**name**	Brownian (motion) Brown (motion) **reject** zigzag or random motion	**1**
(c)	**describe**	(bright) dots / specks (of light) reject smoke particles reject air particles or molecules moving randomly / irregularly (allow if seen in (d) independent marks	**1** **1**
(d)	**higher temp**	(move) faster /quicker/ greater KE **reject** more vigorous or more randomly or more particles	**1**

(5 marks)

Question Number		Acceptable Answers	Mark
6. (a)	**Sign**	negative, minus, -, -ve	**1**
(b)	**reason**	*Any four points from* 1. electrons (have) negative (charge) 2. like charges repel/ negative repels negative (charge)/ electrons repelled 3. metal rod is a conductor/ has free electrons 4. electrons move down/away from cap/towards leaf 5. rod <u>and</u> leaf have same/negative charge 6. leaf <u>repelled</u> from rod no ecf from (a) **Max 4**	**1** **1** **1** **1** **1** **1**
(c)	**Perspex**	no change/same as before/still repels / no difference /accept same	**1**

(6 marks)

Question Number		Acceptable Answers	Mark
7. (a)	**Ammeters**	(i) A2 = 0.25/.25 (A/amp) (ii) A3 = 0.50/0.5/.5 (A/amp) **UP** if a different unit is given	**1** **1**
(b)	**V1**	3 (V/volt) **UP** if a different unit is given	**1**
(c)	**resistance**	= 3/0.25 (ecf/ecf) = 12 Ω **UP** (*Note – this clip shows answers to (a) and (b) to allow ecf.*	**1** **1**
(d)	**Voltmeter reading**	O V/zero/very small/ negligible ammeter has very small/zero/negligible resistance Independent marks	**1** **1**

(7 marks)

Question Number			Acceptable Answers	Mark
8.	(a)(i)	**metal** **reason**	(soft) iron / mu-metal / ferrite / nickel cobalt / stalloy easy to magnetise/strongest (electro)magnet **dop** ignore iron is a conductor **reject** steel or magnetises quickly	**1** **1**
	(a)(ii)	**metal** **reason**	copper /accept gold, silver or Aluminium low(est) resistance/good conductor /lots of free electrons **dop** reject conducts easily	**1** **1**
	(b)	**direction**	Y to X	**1**
	(c)	**stronger**	larger current more turns/coils allow thicker wire or turns closer together use of stronger magnet loses mark	**1**

(6 marks)

Question Number			Acceptable Answers	Mark
9.	(a)(i)	**Radiation**	gamma/ γ (if symbol used must be unambiguous ie not alpha α or β or X-rays)	**1**
	(a)(ii)	**reason**	(gamma)(only one that) can penetrate steel pipe/ high penetrating power/ alpha or beta would be stopped/absorbed by pipe **dop**	**1**
	(b)	**precautions**	any **two** from • short exposure • distance/ don't get too close/handle with tongs • shielding for workers/wear lead apron/gloves (not just protective clothing) • keep source in lead box (when not in use) • Do not eat or drink • Do not point at people **Max 2**	**1** **1** **1** **1** **1** **1**
	(c)	**replacement time**	two half lives/ 1 $\rightarrow$ ½ $\rightarrow$ ¼ time = 2 x 5.5 = 11 years **UP** 5.5/2 twice leading to 2 years is 0/2	**1** **1**

(6 marks)

Question Number			Acceptable Answers	Mark
10.	(a)	**Wavefronts**	semi circles or curves similar spacing as before gap (by eye) for at least two adjacent gaps **dop**	**1** **1**
	(b)	**water waves**	transverse	**1**
	(c)	**wavelength**	$4 = 0.80 \times \lambda$ $\lambda = 5.0$ m **UP**	**1** **1**
	(d)	**speed** **wavelength**	(i) no change/same/ unchanged/ same as before/ 4 m/s /No effect (ii) no change/ same/ unchanged/ same as before/ 5 m/s / no effect/ ecf from 10(c) Note the clip shows 10(c) and 10(d)(i) to allow ecf	**1** **1**

(7 marks)

Question Number			Acceptable Answers	Mark
11.	(a)	**no change of direction**	angle of incidence zero/ along the normal/ incident at 90^0 to surface/ 90^0 to tangent/ along the normal/ through the normal	**1**
	(b)	**angle**	1.8 = sin (emergent angle)/sin 30 sin (emergent angle) = 1.8 sin 30 = 0.9 emergent angle 64/64.2/64.1/64.16/ 64.158 **No UP**	**1** **1** **1**
	(c)	**critical angle**	sin C = 1/1.8 = 0.55555 C = 34/ 33.7/33.8/33.75/33.749 **No UP**	**1** **1**

(6 marks)

Total for Paper: 70 marks

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