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Mark Scheme (Results)
Summer 2010

GCE O

GCE O Physics (7540) Paper 01

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Summer 2010

7540/01 O-LEVEL PHYSICS MARK SCHEME – SUMMER 2010

aps accept phonetic spelling

ecf error carried forward

dna do not allow

dop depend on previous

nwn no working necessary

ora or reverse argument

owtte or words to that effect

Question Number		Answer	Mark
1(a)	mass	6000 kg **UP** (6122 kg/6116 kg)	**(1)**
(b)(i)	Maximum deceleration	a = 8000/6000 8000/6122 8000/6116 = 1.3 m/s^2 or –1.3 m/s^2 **UP** accept 4/3 m/s^2 Award first mark only for 8000/60 000 or 000 Award both marks for any number of dp which rounds to 1.3 with unit e.g. 1.33 /1.31/1.3067/1.308	**(2)**
(b)(ii)	Elastic spring	So it returns to/goes back to/regains original length/size/shape/position OWTTE reject bald "so it goes back"	**(1)**
(c)	More damage	1. stopping distance / time less 2. acceleration/deceleration great(er) Or large(r) change of speed or velocity Or allow Same <u>change</u> of momentum/ large(r) <u>change</u> of momentum 3. stopping force/force (on gates) great(er) independent marks Large(r) rate of change of momentum would score marks 1 and 2 Allow reverse arguments Ignore impact	**(1)** **(1)** **(1)**

(Total 7 marks)

Question Number		Answer	Mark
2 (a)	**Uniform acceleration**	straight line (graph)/constant gradient/uniform slope Or speed increases at a constant rate (accept correct numerical explanation from graph eg the speed increases by 2m/s every 0.3 seconds)	**(1)**
(b)	**acceleration**	acceleration = 6/0.8 = 7.5 m/s^2 **UP** award first mark only for attempt to use any other part of the straight line unless it gives 7.5 e.g. (6-1.2)/(0.8-0.2)=8m/s^2 scores 1 mark	**(1)** **(1)**
(c)	**graph**	curve with decreasing gradient from 0.8, 6 to 2.4s(± half square) Allow abrupt change at top end. Must look like curve all the way any continuous line to 2.4 (± half square), 11.5 (accept any line ending between 11.2 and 11.6) horizontal line from candidates line to 9.7s (accept any ending between 9.6 and 9.8) Ignore vertical line down from 9.7	**(1)** **(1)** **(1)**

(Total 6 marks)

Question Number		Answer	Mark
3 (a)	**volume removed**	0.005 x 0.005 x 0.03 or 0.005^2 x 0.03 or $2.5 \times 10^{-5} \times 3 \times 10^{-2}$ = (.00000075 cm^3) no mark no UP	**(1)**
(b)	**mass removed**	. 00000075 x 1.1 = 0. 000 000 825 g / 8.25×10^{-7} g **UP**	**(1)** **(1)**
(c)	**energy transferred**	0.000000825 x 2.1 x 90 ecf from 3(b) =0.000156/0.0001559 J / 1.5592×10^{-4} J /1.55925×10^{-4} J **UP** **Use of (90 + 273 loses both marks)**	**(1)** **(1)**

(Total 5 marks)

Question Number		Answer	Mark
4 (a) Clip a-b	**Moment about pivot**	60 x 2.5 = 150 Nm **UP**	**(1)** **(1)**
(b)	**force on fabric**	F x 0.5 = 150 **ecf** F= 300 or 300(N) apply unit penalty for any unit other than N Allow use of ratio of distances is 5 so force = 5 x 60 = 300	**(1)** **(1)**
(c)	**Heavy beam**	greater/larger/more (force) / more than (b) /increase weight (of beam) would provide a clockwise moment /(total) clockwise moment would increase / answer to 4(a) would increase	**(1)** **(1)**
(d)	**greater force**	Any **two** from • Pivot near(er) clamp/fabric /sample Or move pivot to left **ora** • longer distance from sand to pivot • heavier beam/container ignore more fabric or longer clamp or surface area or shorter beam or greater weight of sand Ignore longer beam unless it is clear that this will increase distance from sand to pivot	**(1)** **(1)** **(1)**

(Total 8 marks)

Question Number		Answer	Mark
5 (a)(i)	**Assumption of area**	(cross-sectional) area uniform/constant/ remains the same	**(1)**
(a)(ii)	**Assumption of pressure**	(pressure) constant/ uniform/unchanged/ remains the same	**(1)**
(a)(iii)	**Assumption for mass**	(mass) constant/ uniform/unchanged/ remains the same	**(1)**
(b)	**Length at 97^0C**	Use of correct equation for V(or l) and T (symbols or numbers) Correct conversion to K (300 and 370) (i.e. 5/300 = l/370) l = 6.2/ 6.16/ 6.17 cm **UP** Accept any number of dp which would round up to 6.2 cm Award first mark only for 5/27=l/97 leading to 17.96 or 18(cm) Or bald 17.96 or 18(cm) Accept any number of dp which would round up to 18cm Use of anything other than 27 and 97 scores 0/3	**(1)** **(1)** **(1)**

(Total 6 marks)

Question Number	Answer	Mark
6(a)	• Name : electron(s) reject beta • Type of charge : negative /negative charge/ - / -ve / -1	**(1)** **(1)**
6(b)(i)	• insulator	**(1)**
6(b)(ii)	Any two from • charges / electrons unable to be conducted /move/ flow (to or away from A) **ora** • (move)to/from earth /ground / bench • (A) would be neutral/ uncharged if stands were conducting eg (negative) charges / electrons would have gone/moved to earth or ground or (metal) bench Or Charges can't move between sphere and earth or ground or (metal) bench (These statement on their own score both marks) Both marks dependent on (b)(i) being correct No credit for otherwise the stand would be charged	**(1)** **(1)** **(1)**
6(c)	• like charges repel • Electrons/negative charges move (from left) to right / away (from A) on B *Ignore positive charges move left* Ignore unlike charges attract Ignore B is uncharged	**(1)** **(1)**

(Total 7 marks)

Question Number	Answer	Mark
7(a)(i)	• 4 A **UP**	**(1)**
7(a)(ii)	• very high resistance/infinite /too high	**(1)**
7(a)(iii)	• 2 × 9 = 18 V UP	**(1)**
7(b)(i)	• No	**(1)**
7(b)(ii)	• H hotter / more heat in H **ora** dop • use of $V^2 \div R$ or VI or I^2R Or H=72 W and G=36 W Max of 1 mark if V^2 / R is used and (b)(i) is wrong	**(1)** **(1)**

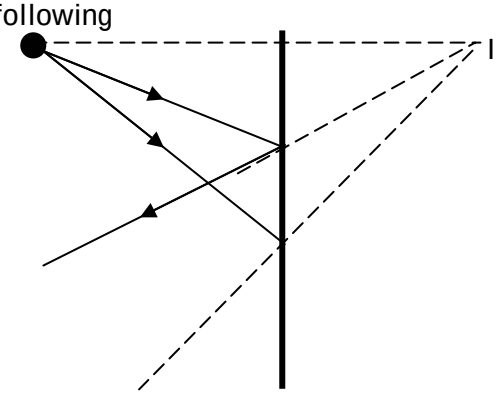
(Total 6 marks)

Question Number	Answer	Mark
8(a)(i)	• clockwise	**(1)**
8(b)(i)	• upwards / to top of page *allow correctly drawn arrow o diagram* ignore outwards or left or right	**(1)**
8(b)(ii)	• (Fleming's) left hand (rule) reject answer containing grip	**(1)**
8(c)(i)	• increase current (or *I*) • reduce separation of wires • allow wires of lower resistance / thicker wire Ignore longer wires or stronger magnets or more wires	**(1)** **(1)** **(1)**
8(c)(ii)	• become a force of repulsion	**(1)**

(Total 6 marks)

Question Number	Answer	Mark
9(a)(i)	• bends/diffracts/spreads out <u>differently</u> or first diagram has longer/larger wavelength • longer <u>wavelength</u> <u>diffracts</u> <u>more</u> ora Ignore change of speed, depth or density or frequency Ignore wavelength changes at gap No credit for more refraction	**(1)**
9(a)(ii)	• bends/diffracts/spreads out differently • smaller the <u>gap</u> greater diffraction ora reject more diffraction due to different wavelength or change of wavelength due to gap	**(1)** **(1)**
9(b)	• VHF small(est)/smaller wavelength • less bending/ less diffraction (over hill) /cannot move <u>round</u> hill Ignore VHF cannot pass through hill or cannot refract round hill	**(1)** **(1)**

(Total 6 marks)

Question Number	Answer	Mark
10(a)	• angle of incidence = angle of reflection Accept angle of incident ray = angle of reflected ray reject incident ray=reflected ray or refractive angle • both rays and normal in same plane Reject incident angle, reflected angle and normal are all in same plane /plain Reject refracted ray	**(1)** **(1)**
10(b)(i)	Any two from the following  • I labelled opposite object and the same distance behind mirror as object is in front by eye • Upper line extended back to candidates image • second line drawn from candidates I passing through mirror at point of incidence of lower ray • line perpendicular to mirror joining object to image Any two points by eye, rays solid or dotted. Image at or in front of mirror scores 0/2. Image below level where upper ray meets mirror 0/2 Ignore incorrect direction arrows	**(1)** **(1)** **(1)** **(1)**
10(b)(ii)	• virtual	**(1)**
10(c)(i)	• **A**	**(1)**
10(c)(ii)	• (Objects are seen because) light travels (from the object) (in)to the eye dop if part c(i) is not A then c(ii) scores 0	**(1)**

(Total 7 marks)

Question Number	Answer	Mark
11(a)	• short range /stopped by 4 to 10cm (of air)/stopped by a few cm (of air) Ignore stopped by paper or solids or less penetrating (power) • heavy/high ionisation / most ionising ignore ionises quickly or bald ionises medium	**(1)** **(1)**
11(b)	• high voltage / 5000V/ <u>electric</u> shock • radioactive source/ radiation from source /ionising radiation Ignore safety precautions or effect on food	**(1)**
11(c)	Any two from the following • G-M tube /Geiger (counter/meter/tube) • cloud chamber • photographic plate/ film • Dosimeter/ scintillation counter Ignore ratemeter or radioactive counter	**(1)** **(1)** **(1)** **(1)**

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS

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