

IGCSE Physics 4420 2H Mark Scheme (Results) Summer 2007

IGCSE

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Question 1			
Qu part	Answer(s)	Extra Information	Mark(s)
a(i)	C		1
a(ii)	sloping downwards	slowing down	1
a(iii)	constant	less than acceleration / decreases slowly / takes a longer time than the acceleration / (area) A is less than (area) C / (train) travels a greater distance while decelerating than when accelerating	1
b(i)	area (under graph)	A + B + C	1
b(ii)	horizontal non zero line below line on graph for the correct time	dop independent	1 1 1
			7 marks

Question 2			
Qu part	Answer(s)	Extra Information	Mark(s)
a(i)	resistor/resistance/rheostat power supply/battery/cell		1 1
a(ii)	= 0.4×20 = 8 (C)		1 1
b	lamp in parallel switch in series with second lamp	dop	1 1
			6 marks

Question 3			
Qu part	Answer(s)	Extra Information	Mark(s)
a	<u>angle</u> of incidence equals <u>angle</u> of reflection	(angle) i = (angle) r $\hat{i} = \hat{r}$ $\angle i = \angle r$	1
b(i)	correct ray striking window any ray reflected off at correct angle	independent	1 1
b(ii)	cover <u>outside</u> of window	open/close/tilt window/fit shutters (outside)	1
c(i)	infra-red	i.r ignore heat / radiation	1
c(ii)	ultraviolet	u.v	1
d	(same) speed / velocity	transverse	1
			7 marks

Question 4			
Qu part	Answer(s)	Extra Information	Mark(s)
a	50 000J of <u>chemical</u> 30 000 J of <u>heat / thermal</u> energy	ignore sound / chemical	1 1 1
b	= 700×2 (000) convert km to m = 1 400 000 (J)	1400 (J) scores 2	1 1 1
			6 marks

Question 5			
Qu part	Answer(s)	Extra Information	Mark(s)
a	magnetic field / flux (in coil) changes voltage / current <u>induced</u> / electromagnetic induction / emi	dop	1 1 1
b	pedal faster	more wire on coils use <u>stronger</u> magnet reduce gap(s)	1
			4 marks

Question 6			
Qu part	Answer(s)	Extra Information	Mark(s)
a	diffraction	accept phonetic spelling	1
b(i)	correct shape same wavelength two more wavefronts		1 1 1
b(ii)	increase wavelength decrease size of gap	or decrease frequency ignore speed do not credit 'make equal'	1 1
c(i)	outside audible range	frequency too high or it/25 000 (Hz) is ultrasound or range of (human) hearing is 20 to 20 000 (Hz) ignore reference to gap	1
c(ii)	$v = f\lambda$ $\lambda = 340 / 25\,000$ $= 0.0136 \text{ (m)}$	recall in any form manipulation and substitution or 0.014 (m)	1 1 1
			10 marks

Question 7			
Qu part	Answer(s)	Extra Information	Mark(s)
a(i)	left : analogue right : digital		1
a(ii)	analogue – continuous digital – on and off	allow continual / has any value / values / has many values 1 or 0 / only two values or allow two reasons for either analogue or digital	1 1
b	one advantage	clearer/less prone to interference can be reproduced / repaired / restored do not credit just ‘can be amplified’ ‘zero interference’	1
c	telecommunications	allow any feasible response e.g. CD players	1
			5 marks

Question 8			
a	for equilibrium/balance (1) (total) clockwise moment = (total) anticlockwise moment (1)	allow ‘turning effect’ for moment	2
b	40 (newtons) (2)	allow ‘load x 0.12 = 8 x 0.60’ for (1)	2
			4 marks

Question 9			
a	(a cathode ray) oscilloscope/ CRO		1
b	(the) frequency (of vibration/the wave)	(number of) cycles per second	1
c	amplitude (of vibration/the wave)	accept ‘its energy’ / intensity not ‘volume’	1
			3 marks

Question 10			
a	293 (K) allow 293 °(K)	not -293 (K) nor 293 °C (K)	1
b	910 (kPa)	or $850 \div 293 = \text{pressure} \div 313$ (1) or correctly transposed version (1) or 908.xxx (2) or error carried forward from part (a) no credit for working in °C	3
			4 marks

Question 11			
a	any two of <ul style="list-style-type: none"> • renewable/no fuel required • no (chemical/air) pollution • lake (behind dam) may be used for fishing/recreational purposes • lake may be used as a source of water • can be stored 	these are examples other appropriate points may also be credited	2
b	any two of <ul style="list-style-type: none"> • valley flooded • villages/farmland/habitats destroyed • not suitable if low (annual) rainfall • not suitable for lowland location • may be a long way from demand • may not operate in time of drought • eyesore 	these are examples other appropriate points may also be credited credit 'can result in flooding'	2
			4 marks

Question 12			
Qu part	Answer(s)	Extra Information	Mark(s)
a (i)	F (is larger) because the lorry is accelerating	or B is smaller because..... not just ' F '	1
a (ii)	(unbalanced) force = mass x acceleration / $F = ma$	or any correctly transposed version	1
a (iii)	1.2 (2) m/s^2 or ms^{-2} or N/Kg	or = $15\,000 \div 12\,500$ (1)	2 1
b	direction changes only two of: <ul style="list-style-type: none"> • (because) acceleration is (rate of) change of <u>velocity</u> • (and) velocity is speed in a particular direction • acceleration / velocity is a vector / not a scalar 	allow any specific direction change e.g. goes round a bend e.g. goes uphill	1 2
c(i)	(driver) has consumed alcohol/taken drugs/is tired/inexperienced/elderly	accept '... has been drinking' do not credit factors which may only affect the time before the driver reacts e.g. poor weather/visibility /eyesight/ hearing/ lack of concentration accept 'high speed' but not just 'speed'	1
c(ii)	poor brakes/ slippery road/ worn tyres	must be qualified, do not credit just 'brakes' for example accept 'high speed' but not just 'speed' note 'high speed' may be credited for d(i) and again for d(ii) do not credit any unqualified response e.g. just 'friction'	1
			10 marks

Question 13			
Qu part	Answer(s)	Extra Information	Mark(s)
a(i)	direct current		1
a(ii)	loudspeaker / speaker	do not accept a vague response such as 'in a radio'	1
b	(magnetic) field (1) north ... south (1) (electric) current (1) positive ... negative (1) motion/movement/force (1)	allow north (pole)...south (pole) or + and -	5
c	increase the strength/intensity of the magnetic field (1) increase the current (1)	accept 'use a more powerful magnet' accept 'increase the voltage/p.d.' do not credit references to 'resistance' or 'number of coils/turns'	2
			9 marks

Question 14			
Qu part	Answer(s)	Extra Information	Mark(s)
a(i)	normal	do not accept 'perpendicular' or 'vertical'	1
a(ii)	(angle) e / E		1
a(iii)	(angle of) refraction	accept phonetic spelling but not anything which could be taken for refelction	1
a(iv)	refractive index = sine of angle of incidence ÷ sine of angle of refraction	$n = \frac{\sin i}{\sin r}$	1
a(v)	continues in the same direction / does not bend	allow 'it's a straight line'	1
a(vi)	any one of <ul style="list-style-type: none"> • ray is on the normal • angle of incidence = 0° • angle of refraction = 0° • at 90° / right angles to the boundary / perpendicular 		1
b(i)	refraction towards normal (1) then refraction away from normal at the opposite face (1) emergent ray appears to be parallel to incident ray (1)		3
b(ii)	ray continues in a straight line to back force (1) reflects down and straight out at right angles (1)	dop	2
			11 marks

Question 15			
Qu part	Answer(s)	Extra Information	Mark(s)
a	gravitational/potential (1) kinetic/movement (1)	correct order essential ignore energy	2
b(i)	(some) energy transferred as thermal energy/heat	or some energy transferred as <u>internal</u> kinetic energy or friction (between/with) or energy changes not 100% efficient	1
b(ii)	higher the waterfall then the higher the temperature increase	allow ('temperature increase is directly) proportional (to the height' of the waterfall)	1
c(i)	axes labelled speed and kinetic energy / ke (1) with linear scales (1) both axes labelled with units (1) either all points correct (2) or four points correct (1) smooth curve of best fit to candidate's points (1)	to the nearest mm in any direction and not 'blobs' (more than 1 mm across) not dot-to-dot or tram-lined or thicker than 1 mm ignore 0 to 3 m/s	6
c(ii)	answer in range 3.7 to 4.0 inclusive	or correct from candidate's graph	1
			11 marks

Question 16			
a	fast random	both required with no additions allow any clear and unambiguous method of indication	1
b	hit/collide with it/the inside / walls creates/exerts a force on the surface/area (not walls)	or words to that effect or pressure = force ÷ area or $P = F/A$	1 1 1
c(i)	270 (2)	accept $150 \times 90 = \text{pressure} \times 50$ for (1)	2
c(ii)	mass remains constant / the same (1) temperature remains constant / the same (1)	or no gas escapes either order	2
c(iii)	kilopascal(s)	accept phonetic spellings	1
			9 marks

Question 17			
a	230 and 90 for thorium (1) 4 and 2 for helium (1)	any change to thorium symbol cancels this mark any change to helium symbol cancels this mark any change to uranium deduct (1) from positive total	2
b(i)	to allow/give/produce a (narrow) beam /in one direction (of alpha particles/radiation)	'so that they go straight to the gold (foil)' not 'all go straight.....'	1
b(ii)	<u>most</u> of the (gold) atom is empty space	do not credit just 'there is space in the gold'	1
b(iii)	<u>repelled</u> by the <u>centre/nucleus</u> (of an atom) (1) (as) both have positive / +ve / same charge (1)	or affected by electrostatic force (1) between the nucleus and the (alpha) particles (1)	2
b(iv)	centre/nucleus <u>very</u> small/tiny	not just '... small'	1
b(v)	(these were) further away from the centre/nucleus (1) (these were) moving faster (1)	either order or more (kinetic) energy	2
b(vi)	(tiny) spark/flash (of light)/scintillation	do not credit 'there was a colour change' ignore references to sound/noise	1
			10 marks