

# IGCSE Physics 4420 2H Mark Scheme (Results) Summer 2008

IGCSE

## IGCSE Physics 4420 2H



## IGCSE PHYSICS 4420-2H MARK SCHEME

Question Number	Correct Answer	Acceptable Answers	Mark
1 (a)(i)	0.8 (seconds)	4/5 second 8/10 second	1 (1)

Question Number	Correct Answer	Acceptable Answers	Mark
1 (a)(ii)	3.2 (seconds)	3 1/5 allow ecf from (i) 4.0 - previous answer	1 (1)

Question Number	Correct Answer	Acceptable Answers	Mark
1 (a)(iii)	<i>one line</i>  horizontal line beyond 0.8  less steep slope down (to the $x$ axis) dop	       <i>two separate lines or one of these lines</i>  labelled 1 mark for each correct	  1  1    (2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (b)(i)	air (resistance) mass of car speed (of the car) brakes tyre pressure area of tyre streamlining	drag weight (force of) gravity size shape velocity (of car)	wind (resistance) temperature	1           (1)

Question Number	Correct Answer	Reject	Mark
1 (b)(ii)	intentionally straight vertical arrow pointing downwards from, above, below or through point X	arrow from middle of car	1   (1)

(Total 6 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)(i)	infra red  <i>allow phonetic spelling</i>	i.r. IR	microwaves ultraviolet	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)(ii)	gamma (rays/radiation)	γ gama	X-rays	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b)(i)	same speed (in a vacuum) same velocity (in a vacuum)  <i>or (travel at) speed of light (travel at)velocity of light</i>	travel through a vacuum or empty space	transverse	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b)(ii)	water (waves)/waves on water/tidal waves/sea waves/ocean waves	waves on (slinky) spring shaken/moved up and down or side to side waves on a rope moved up and down or side to side  <i>S waves ignore 'seismic'</i>  mexican wave	P waves analogue wave waves on a CRO	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (b)(iii)	90°	normal/ perpendicular right angles		1
	<i>energy independent marks</i>	information or data wavefront/front	crest/vibration/direction/ pattern	1  (2)

(Total 6 marks)

Question Number	Correct Answer	Acceptable answers	Reject	Mark
3 (a)(i)	voltage = current $\times$ resistance or current = voltage/resistance or resistance = voltage/current	$V = IR$ $I = V/R$ $R = V/I$	$V = C \times R$	1 (1)
3 (a)(ii)	4.5 nwn  volts or V or J/C or $JC^{-1}$ or $A\Omega$			1  1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
3 (b)	decrease  increase	   Increase decrease scores 1  decrease decrease scores 1  increase increase scores 1	1  1 (2)

(Total 5 marks)

Question Number	Correct Answer	Reject	Mark
4 (a)(i)	(semiconductor)diode	LED light emitting diode	1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(ii)	50 50	both required		1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(iii)	one cell is connected the wrong way	two cells cancel one another/not all facing the same way	battery	1
	some of the voltage is across/used up by diode/component Y/ammeter(s)/(connecting) wire /switch	reference to resistance of these components /cells / whole circuit	voltage used up by/voltage across <i>voltmeter/lamp</i>  voltmeter does not have infinite resistance  <i>ignore reference to current and energy</i>	1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
4 (b)	<i>any <u>three points</u></i>		
	current increases	voltage increases	1
	increases temperature	increases heat / molecular movement	1
	increases resistance		1
	line or slope becomes less steep	non-ohmic / / not proportional to V/ decrease rate of increase /current levels off	(3)

(Total 7 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(i)	not moving (or vibrating) none zero	no <u>kinetic</u> energy no momentum	a response which suggests any kind of movement	1  (1)

Question Number	Correct Answer	Acceptable Answers	Mark
5 (a)(ii)	-273 (°C)	minus 273 -273.15	1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(iii)	373 (K)	373.15(K)	373°C	1 (1)

Question Number	Correct Answer	Reject	Mark
5 (b)	particles knock /jostle /collide	diffusion	1
	smaller/invisible /air/water particles		1
	cause a change of direction dop only as 3 <sup>rd</sup> mark		1
			(3)

(Total 6 marks)

Question Number	Correct Answer	Acceptable Answers	Mark
6 (a)(i)	electrons    electrons	both required	1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (a)(ii)	<i>points in either order</i> polythene is an (electrical) insulator  (so) slow to discharge /retains charge	poor / bad (electrical) conductor  'charge (or electrons)leak away /move slowly (to earth)'	poor conductor of heat	1  1  (2)
6 (a)(iii)	copper is an (electrical) conductor (so charge is earthed)		copper is a good conductor of heat	1  (1)

Question Number	Correct Answer	Reject	Mark
6 (b)	spark/sparking	flame	1 (1)

(Total 5 marks)



Question Number	Correct Answer	Acceptable Answers	Mark
7 (a)	clear indication on the graph that a suitable interval has been chosen		1
	1 ½ (hours)	i.e. an interval between a value and half that value	1
	90 (minutes)	87 93 or 96 ecf conversion of previous answer to minutes	1
			(3)

Question Number	Correct Answer	Reject	Mark
7 (b)	<i>any <u>two</u> points</i>		
	(isotope) ingested / swallowed/eaten /taken in /injected		1
	(gamma) radiation emitted	X-rays alpha beta	1
	trace / track / detect (radiation) / follow progress		1
			(2)

(Total 5 marks)

Question Number	Correct Answer	Acceptable Answers	Mark
8 (a)	induced		1
	magnetic field	flux (linkage)	1
	responses only in this order		(2)

Question Number	Correct Answer	Acceptable Answers	Mark
8 (b)	$\frac{\text{(number of ) primary turns}}{\text{(number of) secondary turns}}$	$\frac{\text{primary coils}}{\text{secondary coils}}$ $= I_S / I_P$	1  (1)

Question Number	Correct Answer	Mark
8 (c)(i)	Just before the transmission line	1  (1)

Question Number	Correct Answer	Mark
8 (c)(ii)	Just after the transmission line	1  (1)

(Total 5 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (a)(i)	gradient	slope	area	1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (a)(ii)	$6.0 \div 0.25$ $= 24$ $m/s^2$ or $m/s/s$ or $ms^{-2}$ <i>ignore minus signs</i>	Nwn N/kg or $Nkg^{-1}$		1 1 1 (3)
9 (a)(iii)	$F = m \times a$ $= 70 \times 24$ $= 1680 \text{ (N)}$	ecf from (a)(ii) nwn	$70 \times 10$ $700 \times 24$ score 0/3	1 1 1 (3)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
9 (b)	<i>any <u>three</u> points</i> same change in velocity (in) more time less acceleration or deceleration ora less force ora	comes to a stop over a longer distance $24 \text{ ms}^{-2}$ is too high <i>allow 'slower deceleration'</i>	damage to joints effect of area of contact and pressure impact reduced	1 1 1 1 (3)

(Total 10 marks)

Question Number	Correct Answer	Acceptable Answers	Mark
10 (a)	recall $n = \sin i \div \sin r$		1
	$\sin i = 1.5 \times \sin 40^\circ$	$\sin^{-1}(1.5 \sin 40^\circ)$	1
	$i = 74.6^\circ$ or $75^\circ$	$73.7^\circ$ or $74^\circ$ nwn (rounding $\sin 40^\circ$ to 0.64)	1
		$i = 40^\circ$ $r = 25.3^\circ$ scores 1 <sup>st</sup> mark only	(3)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (b)(i)	intentional straight line from point of incidence above existing refracted ray		bending away from normal	1 (1)
10 (b)(ii)	$n$ less	less dense/slow down less/less bent	bends away from normal	1
	$r$ is more	turns less to normal refracts less	greater refracted 'ray'	1
		<i>Calculation of <math>r = 47.9^\circ</math> scores both marks</i>		(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (c)	external normal correctly drawn		arrow(s) on normal	1
	$i$ correctly marked between incident ray and drawn normal	ecf		1
	<i>independent marks</i>			(2)

(Total 8 marks)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
11 (a)	fracture energy = initial gpe - final gpe  i.e. $E = I - F$ <u>in words</u>	$I = E + F$ $F = I - E$ <u>in words</u>	division or product of phrases	1  (1)

Question Number	Correct Answer	Acceptable Answers	Mark
11 (b)(i)	$60 \times 10 \times 0.5$  = 300 (J) nwn	$60 \times 9.81 \times 0.5 = 294.3(j)$ $60 \times 9.8 \times 0.5 = 294(j)$	1  1 (2)
11 (b)(ii)	300 / same as (i)	ecf	1 (1)
11 (b)(iii)	$\frac{1}{2}mv^2 =$ answer from (i) or (ii)  = 3.16 (m/s)	ecf	1 1 (2)
11 (b)(iv)	friction / air resistance / drag  not all gpe changed to ke	energy lost to a stated form e.g heat and/or sound	1 (1)
11 (b)(v)	300 - 70  = 230 ( J ) or 0.230 kJ	allow ecf from b(i) no ecf from (a)	1 1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
11 (c)(i)	metal any metal  <i>ignore 'spring'</i>	metal spring  metal wire	1  (1)

Question Number	Correct Answer	Reject	Mark
11 (c)(ii)	linear region correctly marked		1 (1)
11 (c)(iii)	<u>dop</u> proportionality between force(or mass or load or weight) and extension OWTTE	elastic behaviour	1 (1)

(Total 12 marks)

Question Number	Correct Answer	Reject	Mark
12 (a)	(Fleming's) left hand (rule)	(Fleming's)right hand left hand grip rule left hand corkscrew rule	(1)

Question Number	Correct Answer	Mark
12 (b)(i)	I out of page correct direction anywhere in circuit	1 (1)
Question Number	Correct Answer	Mark
12 (b)(ii)	M downwards allow B as a label	1 (1)
Question Number	Correct Answer	Mark
12 (b)(iii)	F to the right must ecf from b(i)&(ii)	1 (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
12 (c)	stronger magnet	magnets closer	bigger magnets electromagnet	1
	more current	larger voltage/ more batteries	bigger battery	1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
12 (d)(i)	current/voltage varies	diagram with at least 1½ cycles about axis scores 3	1
	about axis	'current changes direction' scores 1	1
	pattern repeated dop  <i>maximum of 2 marks if no diagram</i>	single cycle sine wave seen anywhere e.g. on a.c. supply scores 1	1 (3)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
12 (d)(ii)	(moves)backwards and forwards (quickly) vibrate (not up and down)	(moves)right and left side to side (quickly)	changes direction	1
	at (a frequency of) 50 Hz  <i>independent marks</i>	at high frequency appears stationary		1 (2)

(Total 11 marks)

Question Number	Correct Answer	Mark
13 (a)(i)	n 1 0	1 1 (2)

Question Number	Correct Answer	Mark
13 (a)(ii)	Be 9 4	1 1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
13 (b)(i)	He	Helium 2 protons & 2 neutrons	1 (1)

Question Number	Correct Answer	Acceptable Answers	Mark
13 (b)(ii)	electron ignore $\beta^+$	symbol e- or $\beta^-$	1 (1)

Question Number	Correct Answer	Acceptable Answers	Mark
13 (c)(i)	same no of protons <i>ignore 'electrons'</i>	same atomic number or Z	1
	different no of neutrons or N dop  <i>exception : 'same element with different number of neutrons'</i> scores 1	different mass number or A different nucleon number	1  (2)

Question Number	Correct Answer	Acceptable Answers	Mark
13 (c)(ii)	U-238 $\rightarrow$ Th-234	final product has atomic number 92 score 1 if no other mark scored	1
	Th-234 $\rightarrow$ Pa-234		1
	Pa -234 $\rightarrow$ U-234		1
	bald answer (2)		(3)

(Total 11 marks)

Question Number	Correct Answer	Reject	Mark
14 (a)	daughter		1
	two/ three/more/ a few/several / some	fast / $\geq 4$ / 1	1
	chain		1
	speed/velocity/ <u>kinetic</u> energy/momentum		1
			(4)

Question Number	Correct Answer	Acceptable Answers	Mark
14 (b)(i)	slow down neutrons/particles (not nuclei)	absorbs (kinetic) energy of neutrons/particles	1
	enable fission to occur	reaction is more efficient OWTTE increase rate of collision	1
			(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
14 (b)(ii)	absorb neutrons	stop neutrons		1
	stop / reduce / control the rate of fission or reaction			1
				(2)

(Total 8 marks)



Question Number	Correct Answer	Mark
15 (a)(i)	$p = 100 \times 450 / 300$ $= 150(\text{kPa})$ nwn <i>any unit must be correct</i>	1 1 (2)

Question Number	Correct Answer	Acceptable Answers	Mark
15 (a)(ii)	same mass	same amount of gas no gas lost	1
	same volume	same size (container)	1
		'same density' scores 1 mark if no other mark scored	(2)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
15 (b)(i)	<u>increased</u>	faster	'decreased' scores 0/2	1
	<u>average speed dop</u>	average (kinetic) energy average velocity speed of most of the molecules sum of speeds total of speeds		1
				(2)

Question Number	Correct Answer	Mark
15 (b)(ii)	( Kelvin ) temperature is <u>proportional</u> to the (average or total) <u>kinetic</u> energy of its molecules.	1
		(1)

(Total 7 marks)

Question Number	Correct Answer	Reject	Mark
16 (a)	energy charge	Joules coulomb	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
16 (b)(i)	$Q = I \times t / 0.60 \times 2$ = 1.2 (C) nwn			1 1 (2)
16 (b)(ii)	$1.5 \times 1.2$ = 1.8 (J) nwn	allow ecf		1 1 (2)
16 (b)(iii)	no heat/energy lost in wires or internal resistance or cell	cell has no internal resistance/ all cell's voltage across resistor/wires have no resistance	no heat loss  100% efficient	1  (1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
16 (c)	double cell voltage	3V add another cell		1
	quarter resistance value	0.625 $\Omega$ 4 $\times$ resistance wire area 2 $\times$ diameter or radius $\frac{1}{4}$ $\times$ resistance wire length		1  (2)

(Total 8 marks)

PAPER TOTAL 120 MARKS