



General Certificate of Secondary Education

Physics 4451

PHY3H Unit Physics 3

Mark Scheme

2008 examination – June series

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Question 1

question	answers	extra information	mark
(a)(i)	(angle of) refraction	take care not to credit 'angle of reflection'	1
(a)(ii)	normal	do not credit 'horizontal'	1
(b)	either (photographic) <u>film</u> or CCD(s) (charge-coupled device(s)) / CMOS(s) (sensor(s)) / (active) pixel sensor(s)	accept 'LDR(s)' / 'light dependent resistor(s)' not lux meter do not accept light sensor(s)	1
(c)(i)	converging	or 'convex'	1
(c)(ii)	either (0).35 or (0).4(1...)	do not give any credit for an answer greater than 1 or 7 ÷ 20 for 1 mark or clear evidence that appropriate measuring / counting, has been made for 1 mark	2
(d)	otherwise it will have no effect on the light detector or otherwise no (real) light will fall on the light detector	or 'a virtual / imaginary image will have no effect on the light detector' allow error carried forwards for 'light detector' allow so it can be formed on the film	1
total			7

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Question 2

question	answers	extra information	mark
(a)(i)	the higher the altitude the longer the period	<p>or the converse</p> <p>or there is a positive correlation</p> <p>do not credit any reference to 'direct proportion'</p> <p>ignore references to speed / size of orbit</p> <p>allow the higher the altitude the longer <u>it takes to orbit</u></p> <p>do not credit if ambiguity between distance and time</p>	1
(a)(ii)	<p>responses must refer to the (quality) of the data rather than comments on satellites</p> <p>any two from:</p> <ul style="list-style-type: none"> • only four pairs (of results / data / evidence) • the data is (all) for low or high altitudes (with nothing in the middle) • conclusion only valid in the range (shown, of 300 ↔ 36 000 or 1.5 ↔ 24) • the Internet is not always a reliable source 	or 'not enough / insufficient data'	2
(b)	there is a centripetal force	<p>accept force towards centre / Earth</p> <p>or 'the Moon is accelerating towards the (centre of) Earth'</p>	1
	the force (for this) is provided by gravity / gravitational attraction between the Moon and the Earth	accept 'caused by gravity'	1

Question 2 continues on the next page

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Question 2 continued

question	answers	extra information	mark
(c)	there is <u>empty</u> space / a vacuum	or no medium / particles / air / gas (to carry the sound / vibrations) do not accept any named gas or sound(s) do not travel through a vacuum	1
(d)	the response may be in agreement or disagreement or may support a 'balanced' argument either any general point with appropriate amplification for 2 marks or two general points 1 mark each	eg costs a lot (1) the money could be spent on ... (1) eg we may find new resources (1) eg we may contact aliens (1)	2
total			8

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Question 3

question	answers	extra information	mark
(a)	810 000 newton-metres / Nm	allow $45\,000 \times 18$ for 1 mark	2 1
(b)	any three from: <ul style="list-style-type: none"> • their weight / mass can be altered / adjusted • so that the crane remains stable • so that the (total) clockwise moment equals the (total) anticlockwise moment • because not all containers are the same weight / mass • because not all containers will be / need to move the same distance (from the crane) • to keep the centre of mass (of the upper crane and container) in/above the base of the tower • so that the crane remains in equilibrium/balanced 	ignore references to force throughout allow does not topple do not allow just ‘moments are equal’ do not allow ‘not all containers are the same size / volume’	3
total			6

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question	answers	extra information	mark
(a)(i)	(nuclear) fusion	allow minor misspellings but do not credit any response which could be fission	1
(a)(ii)	(in) stars	accept supernova / red giants / white dwarves do not allow the Sun	1
(a)(iii)	(by) supernova / explosion of star	do not credit just 'explosion(s)'	1
(b)	the (available) evidence: supports this idea or does not contradict this idea or can be extrapolated to this idea		1
total			4

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Question 5

question	answers	extra information	mark
(a)	any two points: <ul style="list-style-type: none"> humans cannot hear ultrasound it has a <u>very</u> high frequency / pitch above the (upper) limit for humans / above 20 000 Hz 	do not credit features which are true of sound in general eg longitudinal waves do not credit just 'has a high frequency / pitch'	2
(b)(i)	ultrasound / waves are reflected Pulse A indicates / is the crack Pulse B indicates / is the back (of the block or crack)	... are bounced is insufficient, but ... echo is acceptable need to mention both A and B to get this mark	1 1
(b)(ii)	90 (mm)	accept any answer in the range 88 – 92 (mm)	1
total			5

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Question 6

question	answers	extra information	mark
(a)	10 500	allow 1 mark for $75 \times 32\,200 \div 230$	2
(b)	<p>any three from:</p> <ul style="list-style-type: none"> • alternating current (a.c.) in the primary (coil) • produces a changing magnetic field / flux (in the core) • which is made of (laminated soft) iron • this induces • an alternating potential difference across the secondary coil 	<p>must be idea of inducing something in the secondary coil</p> <p>accept voltage for potential difference</p>	3
total			5

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Question 7

question	answers	extra information	mark
	coil cuts through the magnetic field or 'conductor cuts through the lines of force' or 'conductor cuts through the space between the magnets / poles'		1
	a potential difference is induced (across ends of the coil)	do not credit idea that potential difference flows in coil	1
	coil is part of a circuit		1
	potential difference causes a current in the circuit / lamp	allow 'this / the voltage causes a current in the circuit / lamp'	1
	slip rings and brushes enable the coil to be connected without twisting the leads / wires	do not credit just 'so the lamp lights'	1
total			5

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Question 8

question	answers	extra information	mark
(a)	any two ideas: <ul style="list-style-type: none"> • (acceleration occurs when) the direction (of each capsule) changes • velocity has direction • acceleration is (rate of) change of velocity 		2
(b)	to(wards) the centre (of the wheel)		1
(c)	centripetal	allow minor misspellings but do not credit a response which could be 'centrifugal'	1
(d)	the greater the radius / diameter / circumference (of the wheel) the smaller the (resultant) force (required)	accept 'the size' both parts required for the mark accept converse	1
total			5