



**General Certificate of Secondary Education**

**Physics 4451**

**PHY3H Unit Physics 3**

**Mark Scheme**

*2008 examination – June series*

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## PHY3H

## Question 1

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

## PHY3H

## Question 2

question	answers	extra information	mark
(a)(i)	the higher the altitude the longer the period	<p><b>or</b> the converse</p> <p><b>or</b> there is a positive correlation</p> <p>do <b>not</b> 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 <b>not</b> 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 <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• only four pairs (of results / data / evidence)</li> <li>• the data is (all) for low or high altitudes (with nothing in the middle)</li> <li>• conclusion only valid in the range (shown, of 300 ↔ 36 000 or 1.5 ↔ 24)</li> <li>• the Internet is not always a reliable source</li> </ul>	<b>or</b> 'not enough / insufficient data'	2
(b)	there is a <b>centripetal</b> force	<p>accept force towards centre / Earth</p> <p><b>or</b> '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

## PHY3H

## Question 2 continued

question	answers	extra information	mark
(c)	there is <u>empty</u> space / a vacuum	<b>or</b> no medium / particles / air / gas (to carry the sound / vibrations) do <b>not</b> accept any named gas  <b>or</b> sound(s) do not travel through a vacuum	1
(d)	the response may be in agreement or disagreement or may support a 'balanced' argument  <b>either</b> any general point with appropriate amplification for <b>2</b> marks  <b>or</b> two general points <b>1</b> 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

## PHY3H

## Question 3

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

**PHY3H****Question 4**

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

## PHY3H

## Question 5

question	answers	extra information	mark
(a)	any <b>two</b> points: <ul style="list-style-type: none"> <li>humans cannot hear ultrasound</li> <li>it has a <u>very</u> high frequency / pitch</li> <li>above the (upper) limit for humans / above 20 000 Hz</li> </ul>	do <b>not</b> credit features which are true of sound in general eg longitudinal waves  do <b>not</b> credit just 'has a high frequency / pitch'	2
(b)(i)	ultrasound / waves are reflected  Pulse <b>A</b> indicates / is the crack  Pulse <b>B</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



## PHY3H

## Question 6

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

## PHY3H

## Question 7

question	answers	extra information	mark
	coil cuts through the magnetic field <b>or</b> 'conductor cuts through the lines of force' <b>or</b> 'conductor cuts through the space between the magnets / poles'		1
	a potential difference is induced (across ends of the coil)	do <b>not</b> 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 <b>without twisting</b> the leads / wires	do <b>not</b> credit just 'so the lamp lights'	1
total			5

## PHY3H

## Question 8

question	answers	extra information	mark
(a)	any <b>two</b> ideas: <ul style="list-style-type: none"> <li>• (acceleration occurs when) the direction (of each capsule) changes</li> <li>• velocity has direction</li> <li>• acceleration is (rate of) change of velocity</li> </ul>		2
(b)	to(wards) the centre (of the wheel)		1
(c)	centripetal	allow minor misspellings but do <b>not</b> 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