



General Certificate of Secondary Education

Physics 4451

PHY3H Unit Physics 3

Mark Scheme

2009 examination – January series

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PHY3H

Question 1

question	answers	extra information	mark
1(a)	20000	accept any unambiguous indication	1
1(b)	kilohertz	credit misspellings credit '1000 hertz' or '1000 Hz' accept 1000 oscillations/beats/waves <u>per second</u>	1
1(c)(i)	cleaning (e.g. something delicate such as a watch)	or quality control/ flaw detection credit any appropriate extra Specification response e.g. sonar	1
1(c)(ii)	pre-natal (scanning)	do not credit just 'scanning'/medical scanning credit any appropriate extra Specification response e.g. destruction of (kidney) stones or cleaning teeth	1
1(d)	8 (μs)		1
1(e)	distance (1) between the <u>boundary</u> and the detector (1)	accept 'between the <u>boundary</u> and the source' accept any correct use of speed = distance/time	2

Question 1 continues on the next page

PHY3H**Question 1 continued**

question	answers	extra information	mark
1(f)	<p>examples</p> <p>publish/tell doctors/the public (1)</p> <p>... their evidence/results/research/data (1)</p> <p>carry out more research/tests (1)</p> <p>... to make sure/check reliability (1)</p>	<p>allow a wide variety of appropriate responses</p> <p>valid point (1)</p> <p>appropriate example/qualification/expansion/etc. (1)</p> <p>allow just 'stop using them/ultrasonic waves' (1)</p> <p>allow using them (only) for industrial purposes (1)</p>	2
Total			9

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Question 2

question	answers	extra information	mark
2(a)	any two from: <ul style="list-style-type: none"> • inversely proportional • as the load gets bigger the (maximum safe) distance gets less • load \times distance = 60 (kNm) 	allow 'as the mass increases the distance decreases' accept an unspecified response e.g. 'big load at a short distance' for (1)	2
2(b)	yes, because $30 \times 2 = 60$ (2)	accept for (1) a correct but insufficiently explained response e.g. 'yes because it's safe' accept for (2) a correct response which is sufficiently explained e.g. 'yes, because 60 (kNm) at 1 metre is safe and 30 (kNm) is half the load at twice the distance' do not accept 'no' and do not accept just 'yes' do not accept 'yes, because 30 is between 24 and 2 is between 2.5 and 1.5' do not accept 'the car/cable may break' or other dangers	2

Question 2 continues on the next page

PHY3H**Question 2 continued**

2(c)	the crane may/will topple over/fall <u>over</u> /forward		1
2(d)	results of experiments on this mobile crane	accept any unambiguous indication	1
Total			6

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Question 3

question	answers	extra information	mark
3(a)(i)	(quickly) becomes magnetised	<p>or (quickly) loses its magnetism</p> <p>or 'it's (a) magnetic (material)'</p> <p>any reference to conduction of electricity/heat nullifies the mark</p>	1
3(a)(ii)	<p>any four from:</p> <ul style="list-style-type: none"> • insulation prevents electricity/current flowing through the iron/core • <u>alternating</u> current/a.c. in the primary (coil) • produces a <u>changing</u> magnetic field (in the iron/core) • (and hence magnetic) field in the secondary (coil) • induces/generates/produces an <u>alternating</u> potential difference/p.d./voltage across the secondary (coil) • (and hence) <u>alternating</u> current/a.c. in the secondary (coil) 	<p>or 'insulation so electricity/current only flows in the wires/turns/coils'</p>	4

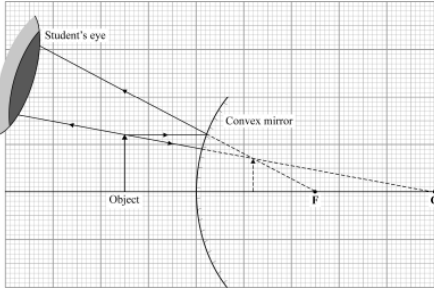
Question 3 continues on the next page

PHY3H**Question 3 continued**

question	answers	extra information	mark
3(b)	80 (turns)	or credit (1) for any equation which <u>if correctly evaluated</u> would give 80 example $\frac{230}{5.75} = \frac{3200}{\text{number of turns}}$	2
Total			7

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Question 4

question	answers	extra information	mark
<p>4(a)</p>	<p>ray from the top of the object in a straight line to C (1)</p> <p>ray from the top of the object and parallel to the principal axis reflected from the mirror as if from F (1)</p> <p>where these lines intersect vertically to the axis (to form the image) (1)</p> <p>direction of four <u>real</u> rays correctly shown (1)</p>	<p>example</p>  <p>note this mark depends on the first two marks being correct</p> <p>two from the object towards the mirror two towards the student's eye note the rays only need to go towards the eye any arrows shown on 'rays' behind the mirror invalidate this mark</p>	<p>4</p>
<p>4(b)</p>	<p>image is formed by the intersection of virtual/imaginary rays</p>	<p>or the construction lines only show where the image appears to be/where light seems to come from or the image is behind the mirror or (real) rays do not pass through the image or (real) rays do not cross</p> <p>ignore reference to a 'screen'</p>	<p>1</p>
<p>Total</p>			<p>5</p>

PHY3H**Question 5**

question	answers	extra information	mark
5(a)(i)	Uranus is twice the distance from the Sun as Saturn (1) (but) 6.8 is not half of 9.6 (1)	or 'Saturn is half the distance from the Sun as Uranus' or '(but) 9.6 is not twice 6.8' or 'the products are not the same'	2
5(a)(ii)	the greater the (average) distance from the Sun the less the (average orbital) speed (of the planet) (2)	or the converse or should have concluded that distance is inversely proportional to the square of the orbital speed allow a correct but non comparative statement e.g. 'a far away planet moves slowly', for (1)	2
5(b)	<u>average</u> distance/speed given (1) (because) the distance/speed is not constant/will vary (slightly)(because the orbit is an ellipse not a circle) (1)		2
Total			6

PHY3H**Question 6**

question	answers	extra information	mark
6(a) E	(from present/recent) data/evidence/observations of (the rate of change in) Phobos'/ the moon's orbit (1) (and) continued/extended/ extrapolated (the pattern/trend for the next 100 million years) (1)	or appropriate example of data (1) and its correct use (1) example (present) distance from Phobos to Mars (1) ÷ (average) rate of approach (1)	2
6(b) E	(it is) increasing (1) Phobos/the moon will be nearer (to Mars) (1)	or the radius/circumference/ diameter of the orbit of Phobos/ the moon will decrease/be less only credit 2nd mark if the first mark is correct	2
6(c) E	it will increase/be more (1) (because) Phobos/the moon will get/be closer to Mars/ the planet (1)	only credit 2nd mark if the first mark is correct note part(s) of this response may be included as the answer to part (b) read both before marks are awarded	2
Total			6

PHY3H**Question 7**

question	answers	extra information	mark
7(a)	fusion (1) of hydrogen/H (atoms)(1)	do not credit any response which looks like 'fission' or the 'word' 'fussion' credit only if a nuclear reaction	2
7(b)	fusion of other/lighter atoms/elements (1) during super nova/explosion of star(s) (1)	reference to big bang nullifies both marks	2
7(c)	explosion of star(s)/super nova (1) at the end of the 'life' of star(s) / when they 'die' (1)	reference to big bang nullifies both marks reference to the star running out of energy/material nullifies both marks	2
Total			6