



# **General Certificate of Secondary Education**

## **Physics 4451**

### **PHY3F Unit Physics 3**

## **Mark Scheme**

*2009 examination – January series*

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**PHY3F****Question 1**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>1(a)</b>	grid	accept any unambiguous indication	1
<b>1(b)(i)</b>	A (only)		1
<b>1(b)(ii)</b>	D (only)		1
<b>1(c)</b>	more than	accept any unambiguous indication	1
<b>Total</b>			<b>4</b>

**Question 2**

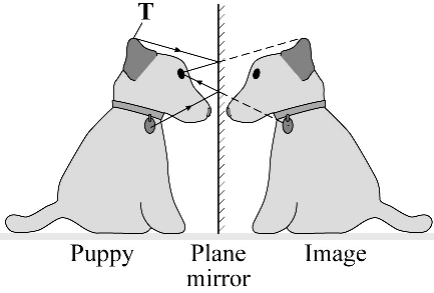
<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>2(a)</b>	C (only)		1
<b>2(b)</b>	A (only)		1
<b>Total</b>			<b>2</b>

**PHY3F****Question 3**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
3(a)	either its direction or its speed		1
3(b)(i)	friction		1
3(b)(ii)	centripetal		1
3(b)(iii)	increase		1
3(b)(iv)	increase		1
3(c)	<p>examples</p> <p>(yes) noisy (1) disturbs people living nearby (1)</p> <p>(yes) encourages people to drive fast (1) which makes (road) accidents more serious/likely (1)</p> <p>(no) leads to improvements in safety features (1) such as better brakes (1)</p> <p>(don't know) noisy (1) but new tyres have a better grip (1)</p>	<p>whichever box has been ticked, the mark(s) is/are for an appropriate response</p> <p>note, accept responses which assume that the public may use the racetrack</p>	2
<b>Total</b>			<b>7</b>

## PHY3F

## Question 4

question	answers	extra information	mark
4(a)	<p>reflection at the mirror of ray from tip of real puppy's ear to real puppy's eye (1)</p> <p>accurate (1)</p> <p>arrow to show correct direction (1)</p>	<p>may be drawn freehand</p> <p>ruler must have been used and the reflected ray is an extension of the straight line from point virtual ear however the virtual part of the line need not be shown</p> <p>only one arrow needs to be shown but there must be no contradiction</p> <p>example of (3) mark response</p>  <p style="text-align: center;">Puppy      Plane mirror      Image</p>	3
4(b)	flat	<p>accept 'it's not curved/bent'</p> <p>accept 'it's straight'</p>	1

**PHY3F****Question 4 continued**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
4(c)(i) & (ii)	convex (1) concave (1)	if correct names but order reversed (1)	2
<b>Total</b>			<b>6</b>

**Question 5**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
5(a)(i)	gases (1) gravity (1)	correct order essential for credit	2
5(a)(ii)	fusion		1
5(a)(iii)	billions		1
5(b)	Milky Way	u.c. initials not essential	1
<b>Total</b>			<b>5</b>

**PHY3F****Question 6**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>6(a)</b>	electric drill, electric fan, electric food mixer and electric screwdriver	all four ticked and no others (2)  <b>either</b> all four of these ticked and only one other (1)  <b>or</b> any three of these ticked and none/one/two of the others (1)	2
<b>6(b)(i)</b>	reverse (the direction of the) current (1)  reverse (the direction of the) magnetic field (1)	<b>or</b> reverse the connections (to the battery)  <b>or</b> reverse the (magnetic) poles /ends  do <b>not</b> credit 'swap the magnets (around)'	2

**Question 6 continues on the next page**

**PHY3F****Question 6 continued**

<b>6(b)(ii)</b>	<p>any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• increase the strength of the magnet(s)/ (magnetic) field</li> <li>• increase the current</li>   <li>• reduce the gap (between coil/armature and poles/ magnets)</li>   <li>• increase the turns (on the coil/armature)</li> </ul>	<p>do <b>not</b> credit 'use a bigger magnet'</p> <p>allow 'increase the voltage/p.d.'</p> <p>allow add cells/batteries</p> <p>allow increase the (electrical) energy</p> <p>allow increase the power supply</p> <p>allow 'decrease the resistance'</p> <p>allow 'increase charge'</p> <p>allow ' increase the electricity'</p> <p>do <b>not</b> credit 'use a bigger battery'</p> <p>allow increase the (number of) coils</p> <p>do <b>not</b> credit 'use a bigger coil'</p>	2
<b>Total</b>			<b>6</b>



## PHY3F

## Question 7

question	answers	extra information	mark
7(a)	20000	accept any unambiguous indication	1
7(b)	kilohertz	credit misspellings credit '1000 hertz' or '1000 Hz' accept 1000 oscillations/beats/waves <u>per second</u>	1
7(c)(i)	cleaning (e.g. something delicate such as a watch)	<b>or</b> quality control/ flaw detection credit any appropriate extra Specification response e.g. sonar	1
7(c)(ii)	pre-natal (scanning)	do <b>not</b> credit just 'scanning'/medical scanning/ scanning a baby credit any appropriate extra Specification response e.g. destruction of (kidney) stones or cleaning teeth	1
7(d)	8 ( $\mu$ s)		1
7(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 7 continues on the next page

**PHY3F****Question 7 continued**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
7(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
<b>Total</b>			<b>9</b>

## PHY3F

## Question 8

question	answers	extra information	mark
8(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>inversely proportional</li> <li>as the load gets bigger the (maximum safe) distance gets less</li> <li>load <math>\times</math> distance = 60 (kNm)</li> </ul>	allow 'as the mass increases the distance decreases' accept an unspecified response e.g. 'big load at a short distance' for (1)	2
8(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 <b>not</b> accept 'no' and do not accept just 'yes'  do <b>not</b> accept 'yes, because 30 is between 24 and 40 and 2 is between 2.5 and 1.5'  do <b>not</b> accept 'the crane/ cable may break' or other dangers	2
8(c)	the crane may/will topple over/fall <u>over/forward</u>		1
8(d)	results of experiments on this mobile crane	accept any unambiguous indication	1
<b>Total</b>			<b>6</b>