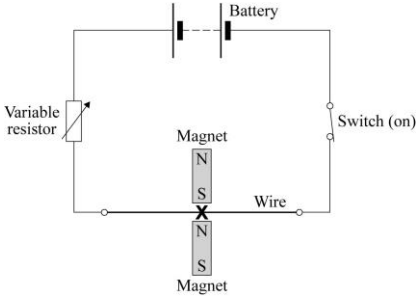


# ELECTROMAGNETISM

## MARK SCHEMES

Question 1			
question	answers	extra information	mark
(a)	centre of the X midway between the poles	<p>intention correct as judged by eye</p> <p>example</p> 	1
(b)	move the poles further apart	<p>accept turn for move</p> <p>accept ends / magnets for poles</p> <p>accept use weaker magnets</p> <p>do not accept use smaller magnets</p>	1
(c)(i)	<p>add more cells (to the battery)</p> <p>or reduce the resistance (of the variable resistor)</p>	<p>do not accept 'use a bigger battery'</p> <p>accept increase the potential difference / voltage</p> <p>accept increase the current</p> <p>do not accept any changes to the magnets, to the wire or to their relative positions</p>	1

(c)(ii)	reverse (the polarity of) the battery	accept turn the battery / cells round  accept swap the connections to the battery  do <b>not</b> accept any changes to the magnets, to the wire or to their relative positions	1
<b>Total</b>			<b>4</b>
<b>Question 2</b>			
(a)	electromagnet	do <b>not</b> accept just magnet  accept solenoid  accept coil	1
<b>Question 3</b>			
(a)(i)	increase		1
(a)(ii)	A and B and B and C	both required for the mark either order	1
(a)(iii)	any <b>two</b> from:  • size of nail <b>or</b> nail material  • current	allow (same) nail  allow (same) cell allow p.d.	2

	<ul style="list-style-type: none"> <li>• (size of) paper clip</li> <li>• length of wire</li> </ul>	<p>same amount of electricity is insufficient</p> <p>accept type/thickness of wire</p>	
<b>(b)</b>	<p>4</p> <p>B picks up the same number as C, so this electromagnet would pick up the same number as A</p> <p><b>or</b></p> <p>direction of current does not affect the strength of the electromagnet</p>	<p>allow it has got the same number of turns as A</p>	<p>1</p> <p>1</p>
<b>(c)</b>	2	allow 1 or 3	1
<b>Total</b>			<b>7</b>
<b>Question 4</b>			
<b>(a)</b>	so the results can be compared fairly	fair test is insufficient	1
<b>(b)</b>	<b>J L M</b>	all 3 required and no other	1
<b>(c)(i)</b>	<p>for a given current the number of paper clips increases by the same factor as the number of turns</p> <p>plus a mathematical explanation using the data eg a current of 1 A with 10 turns picks up 3 clips, a current of 1 A</p>		<p>1</p> <p>1</p>

	with 20 turns picks up 6 clips		
<b>(c)(ii)</b>	30	allow <b>1</b> mark for showing correct use of figures eg 20 turns x 5 = 100 turns	2
<b>(c)(iii)</b>	check the new data/repeat the experiment  to identify any anomalous results  then reconsider the prediction / hypothesis in the light of new evidence		1  1  1
<b>Total</b>			<b>9</b>

**Question 5**

*Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2.*

<b>0 marks</b>	<b>Level 1 (1-2 marks)</b>	<b>Level 2 (3-4 marks)</b>	<b>Level 3 (5-6 marks)</b>
No relevant content.	There is a brief explanation of how a current is caused to flow in the starter motor circuit.	There is some explanation of how a current is caused to flow in the starter motor circuit.	There is a clear and detailed explanation of how a current is caused to flow in the starter motor circuit.
<b>examples of the physics points made in the response</b>  current flows through the coil / electromagnet	<b>extra information</b>  accept electromagnet switches on		

<p>magnetic field produced</p> <p>(short side of) iron bar attracted to electromagnet</p> <p>contacts pushed together (by iron bar)</p> <p>starter motor circuit completed</p> <p>current flows through starter motor</p> <p><b>or</b></p> <p>p.d. across starter motor</p>		
<p>Total</p>		<p>6</p>