KS3 Science

Electromagnetism

Mark Scheme

Time available: 33 minutes
Marks available: 40 marks

1. (a) • iron

1 (L6)

• nothing happens

*accept 'nothing' **or** 'no force' **or** 'it does not attract or repel'*

***both** answers are required for the mark*

copper

1 (L6)

• repel
a magnet

accept 'move apart'

***both** answers are required for the mark*
*do **not** accept 'magnetic'*

1 (L6)

(b) any **two** from

• more turns in the coil

accept 'more coils'

• increase the current **or** voltage

accept 'increase power'

*accept 'add more cells **or** batteries'*
'use another battery' is insufficient

accept 'use thicker wire'
'use more wire' is insufficient

• coils closer together

accept 'make the coils tighter'
'use less wire' is insufficient
'make the wire tighter' is insufficient

references to the iron rod are insufficient

2 (L6)

[5]

2. (a) • the core becomes magnetised

accept 'the disc becomes magnetised'
accept 'there is a magnetic field'
accept 'it becomes an (electro)magnet'
accept 'the stronger the current the stronger the magnet'
*do **not** accept 'the iron core becomes magnetic'*
*do **not** accept 'the magnet gets stronger'*

1 (L7)

any **one** from

• the core attracts the iron disc

accept 'the disc is pulled down'
'the disc moves down' is insufficient as it does not imply that a force is exerted

• there is more force on the iron disc

accept 'the magnet exerts a force on the disc'
'there is a force on the disc' is insufficient as it does not refer to the origin of the force

1 (L7)

(b) any **one** from

• it would melt

accept 'it would fuse'
'the coil would break' is insufficient

• it would get too hot

accept 'it could catch fire'
accept 'it would blow'
'it would get hot' is insufficient

1 (L7)

(c) • the greater the current, the greater the force **or** field

accept the converse

answers must refer to a pattern describing a continuous variable

*do **not** accept 'it becomes more magnetic'*

• the more turns, the greater the force **or** field

accept the converse

*accept 'the more turns, the more powerful **or** stronger the magnet'*

answers must include a comparison

'the more turns, the more powerful it is' is insufficient

accept 'the electromagnet with 200 turns is stronger'

accept 'doubling the turns more than doubles the force'

award one mark if the answer refers to a number of coils rather than number of turns

2 (L7)

[5]

3.

(a) • both picked up the same number **or** four paper-clips

accept 'they both picked up the same number'

accept 'same amount of paper-clips'

accept 'there were 5 out of 9 paper-clips left for both'

accept 'the same mass of paper-clips'

'they hold the same clips' is insufficient

1 (L5)

(b) any **one** from

• it does not stay magnetised

• it can be turned off

accept 'you cannot turn steel off'

• objects do not stay attached to it

• iron loses its magnetism

• steel stays magnetised

1 (L6)

(c) (i) any **one** from

- the greater the distance the lower the reading
- the further away the smaller the reading

accept the converse
accept 'at big distance the field is weaker' or the converse
accept 'at 50 mm the reading is lower'
accept the converse
*do **not** accept 'the bigger the distance the smaller the amps **or** current'*

1 (L6)

(ii) • the greater the current the stronger the electromagnet

1 (L6)

(iii) any **one** from

- change the number of turns
- change the thickness of the wire
- change the diameter of the core

accept 'use more coils'
accept 'use fewer or less coils'
*accept 'put the coils closer together' **or** the converse*
accept 'change the metal of the coils'
accept 'use a different sized core'
*accept 'use nickel **or** cobalt core'*
accept 'use a different core'
'use bigger coils' is insufficient
'use more wire' is insufficient
*do **not** accept 'add more batteries'*

1 (L6)

[5]

4. (a) (i) • add more coils **or** turns

*accept 'put coils **or** turns closer together'*
*do **not** accept 'move it closer'*

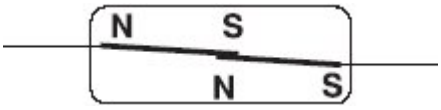
1 (L6)

- increase the current

*accept 'increase the number of cells **or** batteries'*
*accept 'increase the voltage **or** power'*

1 (L6)

(ii)



all four *poles must be correct for the mark*

1 (L7)

(b) (i) any **one** from

- steel stays magnetised
- iron loses its magnetism
- the switch would stay closed
- the switch would not spring open

1 (L7)

(ii) • copper is a better conductor than iron

accept the converse

accept 'copper has a lower resistance'

accept 'iron ***or*** *the reed switch has a greater resistance'*

1 (L7)

[5]

5. (a) (i) 75

accept '50 × 1.5'

1 (L7)

Nm

do ***not*** *accept lower case n*

1 (L7)

(ii) 750

accept ' $\frac{50 \times 1.5}{0.1}$ *'* ***or*** *'50 × 15'*

accept the numerical answer to part ***(i)*** *÷ 0.1*

1 (L7)

(b) any **one** from

- a current flows in the coil
- the coil **or** the iron core becomes magnetised

accept 'there is a magnetic field'
***or** 'the electromagnet switches on*
*do **not** accept 'the core becomes magnetic'*

1 (L7)

any **one** from

- the counterweight is attracted to the coil **or** core **or** the electromagnet
- the electromagnet produces a bigger moment

accept 'the left-hand side of the barrier moves down'
'the right-hand side moves up' is insufficient

1 (L7)

[5]

6. (a) they will repel **or** it will push the magnet away **or** it will push the coil

accept 'it will change the direction of the force'
accept 'it will make the magnet twist around and attract'
*do **not** accept 'the magnet moves away'*

1 (L7)

(b) (i) any **one** from

- because the magnet is heavier **or** the paper clip is lighter

accept 'because the magnet is heavy'

- so the moments are equal

1 (L7)

(ii) current in the coil produces a magnetic field

accept 'the coil becomes an electromagnet'
***or** 'the coil is magnetised'*

1 (L7)

- the magnet is attracted **or** repelled

*accept 'the field **or** coil exerts a force on the magnet'*

1 (L7)

(iii) any **one** from

- the straw is deflected more **or** moves more
- the reading is higher **or** goes up

1 (L7)

any **one** from

- it increases the magnetic field
- it makes the electromagnet stronger
- it attracts **or** repels the magnet more strongly

1 (L7)

[6]

7. (a) any **one** from

- the current flows in opposite directions so there is no magnetic field

  *do **not** accept 'the currents in A and B cancel out so there is no field'*
  ***or** 'the coils are wound in opposite directions*

- because the two magnetic fields **or** forces cancel out

  *do **not** accept 'they cancel out'*

1

(b) there is no current in coil A

accept 'there is current in coil B only'
***or** 'the currents in the coils are different'*
***or** 'coil A will lose its magnetic field'*
*do **not** accept 'there is current in coil B'*

1

the magnetic fields no longer cancel

accept 'the iron core becomes magnetised'
***or** 'the magnetic fields are different'*

1

the armature will be attracted **or** pulled towards the core

answers may be in any order

1

[4]

8. (a) there is current in the coil

accept 'a current flows' or 'electricity flows'
or *'circuit completed'*

1

it becomes an electromagnet
or iron core becomes magnetised

1

iron bolt is attracted to the electromagnet

accept 'iron core' ***or*** *'magnet' for electromagnet*

1

(b) any **two** from

- the current stops

  do ***not*** *accept 'electricity switched off'* ***or*** *'circuit breaks'*

- there is no more magnetism

- bolt pushed back by spring

2

[5]