4. Electricity and magnetism

4.1 Simple phenomena of magnetism

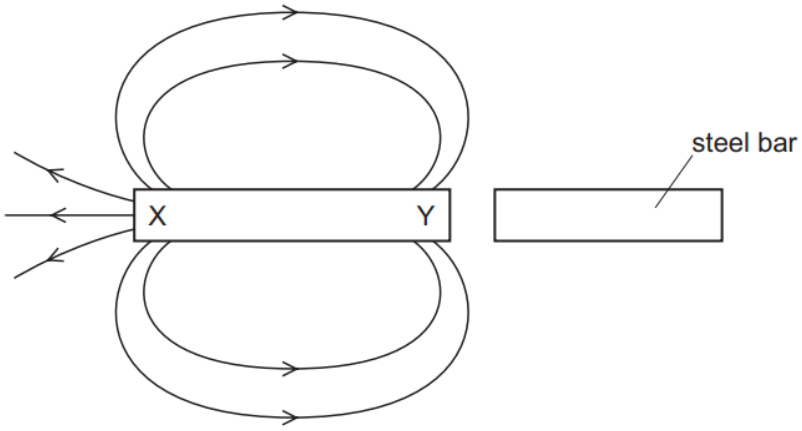
Paper 1 and 2

Question Paper

Paper 1

Questions are applicable for both core and extended candidates

1 A bar magnet is next to a steel bar. Some of the magnetic field lines due to the magnet are shown.



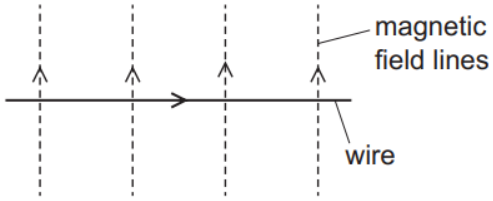
What are the correct poles of the magnet and would the steel bar attract or repel the bar magnet?

	X	Y	force
A	N pole	S pole	attraction
B	N pole	S pole	repulsion
C	S pole	N pole	attraction
D	S pole	N pole	repulsion

2 The diagrams show a current-carrying wire with an arrow in the direction of the current.

Which diagram shows the magnetic field produced by the current?

A



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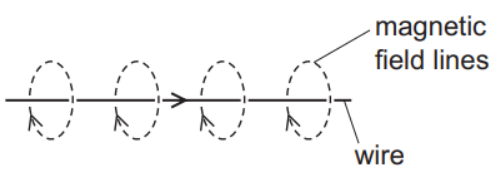

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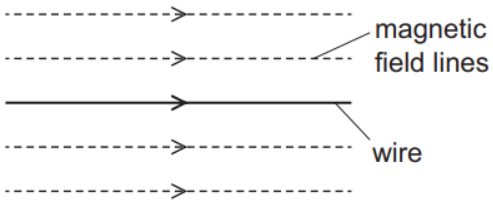

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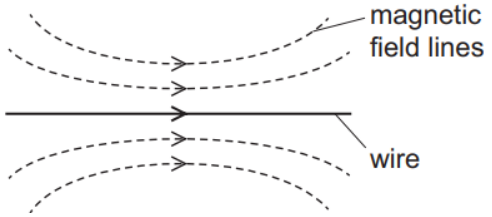
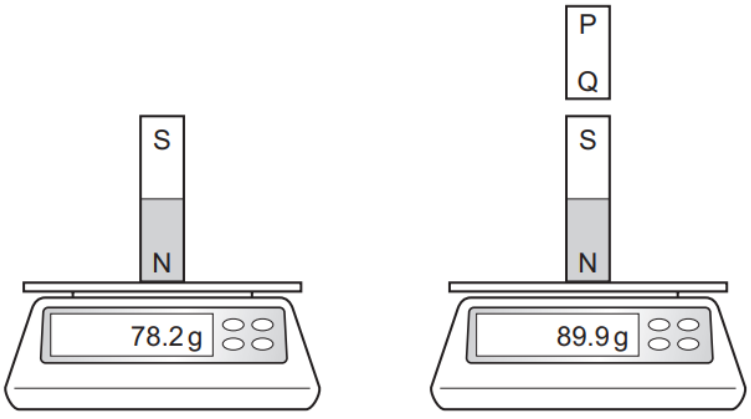


3 The diagram shows what happens when a bar PQ is brought near to a permanent magnet which is standing on a balance.



What could bar PQ be?

A an iron bar or a permanent magnet with P a N pole

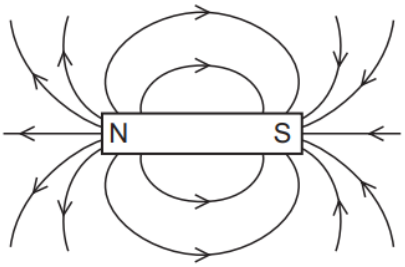
B an iron bar or a permanent magnet with Q a N pole

C an iron bar only

D a permanent magnet only

4 Which diagram shows the pattern and the direction of the magnetic field lines around a bar magnet?

A



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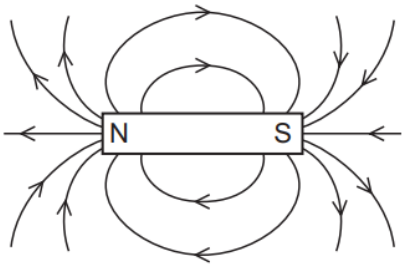

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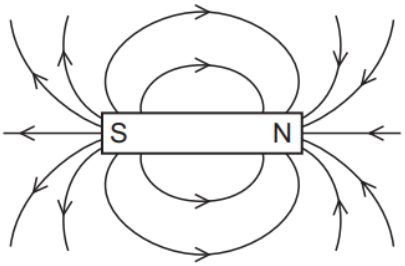

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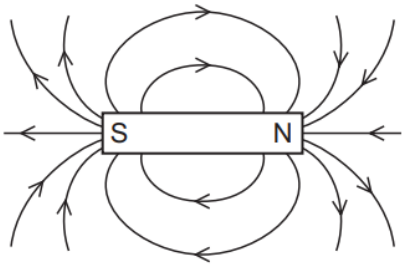


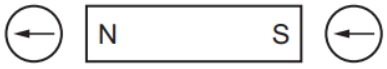
5 Small compasses are used to determine the direction of a magnetic field.

Which diagram shows the direction that the compass needles point when placed near the N and S poles of a bar magnet?

A

B

C



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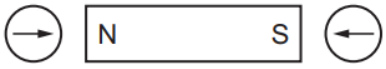


6 Which metal could be used for a permanent magnet and which metal could be used for the core of an electromagnet?

	permanent magnet	core of electromagnet
A	iron	copper
B	iron	steel
C	steel	copper
D	steel	iron

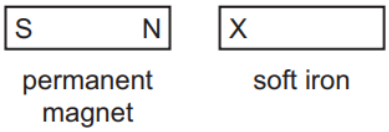
7 A hard magnetic material can be used to make a permanent magnet.

A soft magnetic material can be used to make a temporary magnet.

Which row shows whether iron and steel are hard or soft magnetic materials?

	iron	steel
A	hard	hard
B	hard	soft
C	soft	hard
D	soft	soft

8 An unmagnetised piece of soft iron is placed close to a strong permanent magnet, as shown.

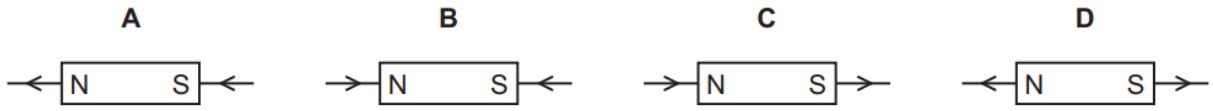


What is the induced polarity of end X of the soft iron and in which direction does the magnetic force act on the soft iron?

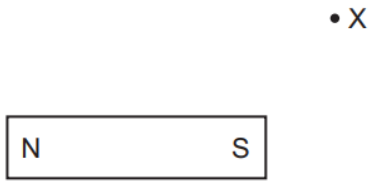
	polarity of end X	direction of force on the soft iron
A	N	to the left
B	N	to the right
C	S	to the left
D	S	to the right

9 The magnetic field of a bar magnet can be represented by magnetic field lines.

Which diagram shows two magnetic field lines correctly?

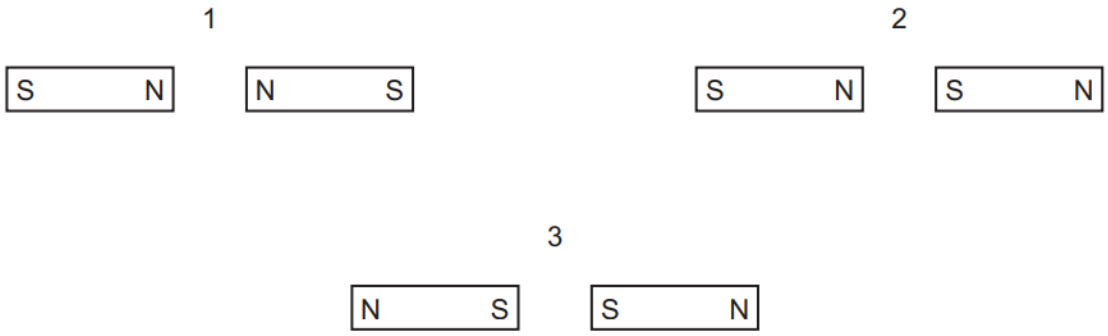


10 Point X is near to a bar magnet, as shown.



Which arrow indicates the direction of the magnetic field of the bar magnet at point X?

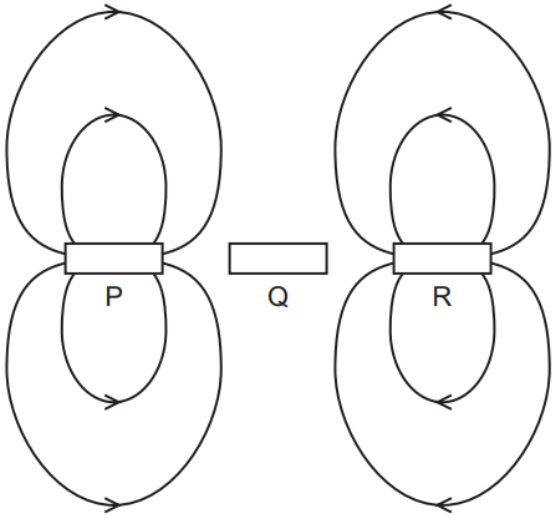
11 The three diagrams each show two magnets.



In which diagrams do the two magnets attract each other?

A 1 only **B** 1 and 3 **C** 2 only **D** 2 and 3

12 The diagram shows the magnetic fields around three objects, P, Q and R, placed close to each other.



Which row shows the nature of each of the objects?

	P	Q	R
A	permanent magnet N S	copper rod	permanent magnet N S
B	permanent magnet N S	copper rod	permanent magnet S N
C	permanent magnet N S	iron rod	permanent magnet N S
D	permanent magnet N S	iron rod	permanent magnet S N

13 Iron filings are picked up by an electromagnet.

The current in the electromagnet is switched off and the filings fall on a plastic bench.

A plastic comb is rubbed with a woollen cloth and held just above the iron filings.

Some of the filings jump and stick to the comb.

Which statement correctly explains the last observation?

A The comb has been electrically charged by rubbing with the cloth.

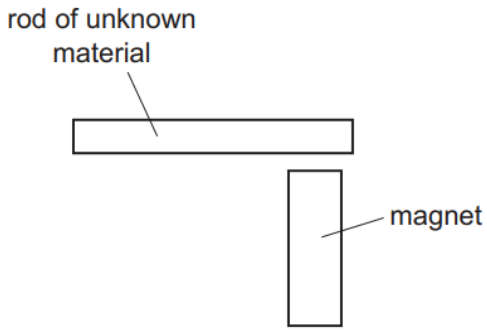
B The comb has been magnetised by rubbing with the cloth.

C The filings have been electrically charged by the electromagnet.

D The filings have been magnetised by the electromagnet.

14 A bar magnet is brought near to a rod of unknown material.

The unknown rod is attracted to both ends of the bar magnet.



Which material is the bar made from?

A aluminium

B magnetised steel

C unmagnetised iron

D plastic

15 Which material is magnetic?

A aluminium

B copper

C iron

D silver

16 Diagram 1 shows a small compass needle with its poles marked. It is not near any magnetic materials.

Diagram 2 shows a bar magnet with its poles marked. The compass needle is placed at point P.

diagram 1

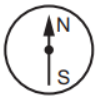
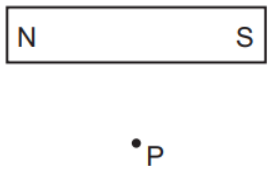


diagram 2



In which direction will the N pole of the compass needle point?

A to the left

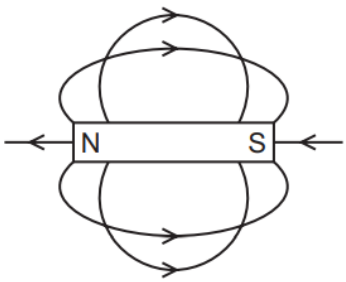
B to the right

C down the page

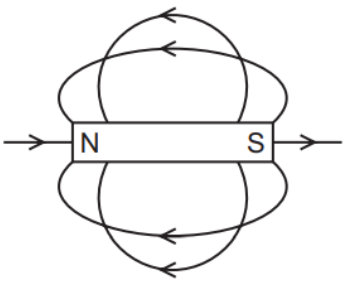
D up the page

17 Which diagram shows the pattern and direction of the magnetic field lines around a bar magnet?

A



B



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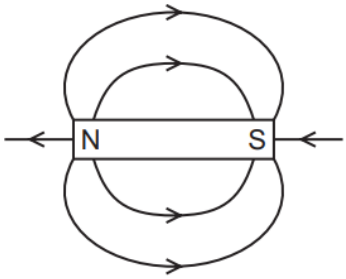

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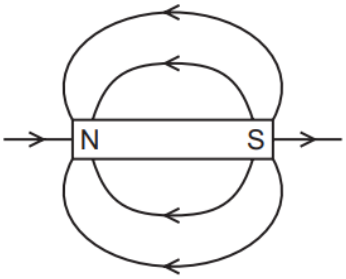


18 Two metal rods each have a painted end. The painted ends are placed next to the N pole and S pole of a bar magnet in turn.

The rods are made from iron, aluminium or magnetised steel.

rod	placed next to	observation
1	N pole of bar magnet	attracts
1	S pole of bar magnet	attracts
2	N pole of bar magnet	nothing happens
2	S pole of bar magnet	nothing happens

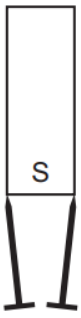
What are rod 1 and rod 2 made from?

	rod 1	rod 2
A	magnetised steel	aluminium
B	iron	magnetised steel
C	aluminium	iron
D	iron	aluminium

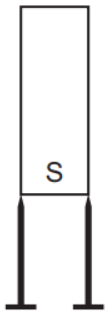
19 Two soft-iron pins are suspended from the S pole of a bar magnet.

Which diagram shows how the pins are deflected?

A



B



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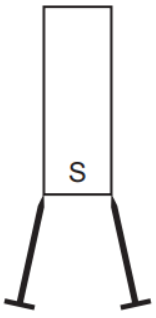
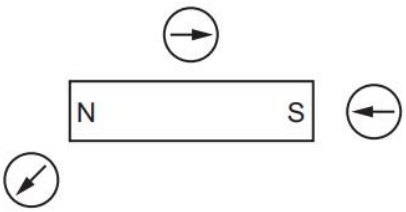


D

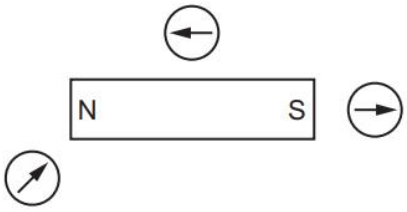
20 A student uses three small plotting compasses to investigate the magnetic field around a bar magnet.

Which diagram shows the directions in which the compass needles point?

A



B



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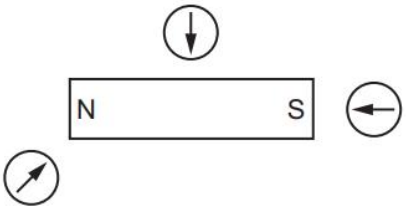

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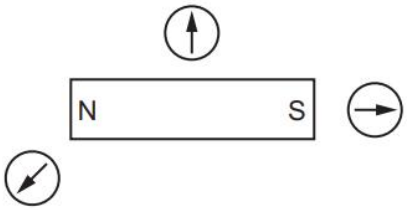
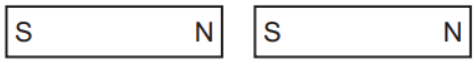


21 A student sets up four experiments using bar magnets and other metal objects. The N and S poles of the bar magnets are labelled N and S.

1



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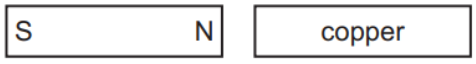

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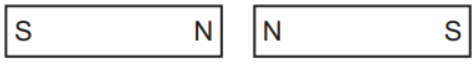


Which pairs attract each other?

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

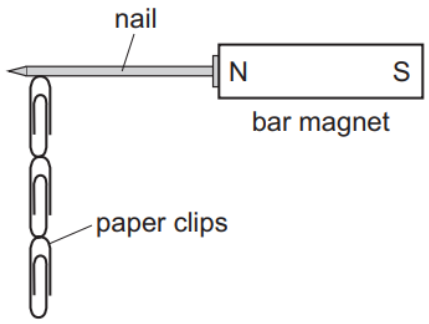
22 A permanent magnet is to be made.

Which row gives the correct material to use and the correct reason for choosing this material?

	material	reason
A	soft iron	easy to demagnetise
B	soft iron	hard to demagnetise
C	steel	easy to demagnetise
D	steel	hard to demagnetise

23 Four nails **A**, **B**, **C** and **D** are tested to find which makes the strongest permanent magnet.

One of the nails is placed against a bar magnet and the number of paper clips which the nail can support is recorded.



The bar magnet is then removed and the number of paper clips remaining attached to the nail is recorded. Each nail is tested individually.

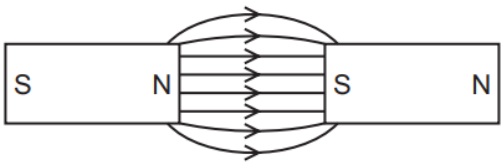
Which nail becomes the strongest permanent magnet?

	number of paper clips attached to the nail	
	bar magnet present	bar magnet removed
A	2	0
B	2	1
C	4	3
D	5	2

24 The diagrams show two bar magnets which are attracting each other.

Which diagram shows the magnetic field pattern between the poles?

A



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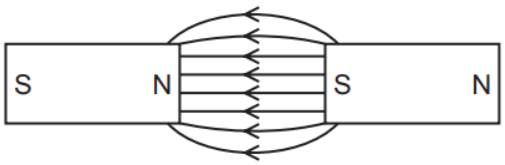

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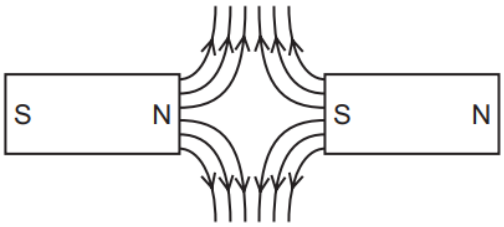

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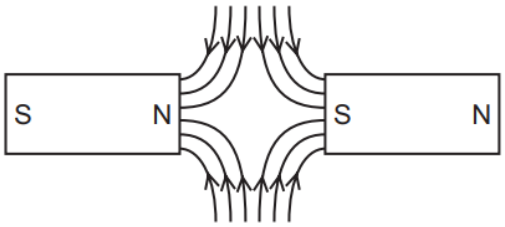


25 A student has a bar magnet. He brings the magnet close to an object. The magnet and the object repel each other.

What must the object be?

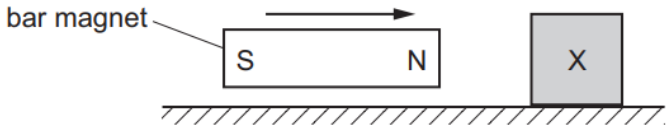
A another permanent magnet

B any magnetic material

C a block of wood

D a piece of copper

26 A bar magnet is slowly moved towards an unmagnetised metal object X.



When it is a few centimetres away, the object begins to slide towards the magnet.

Why does this happen?

A X is a non-magnetic material and magnetism is induced in it.

B X is a non-magnetic material and magnetism is not induced in it.

C X is a magnetic material and magnetism is induced in it.

D X is a magnetic material and magnetism is not induced in it.

27 Why is soft iron used for the core of an electromagnet?

A Soft iron easily becomes a permanent magnet.

B Soft iron is a good electrical conductor.

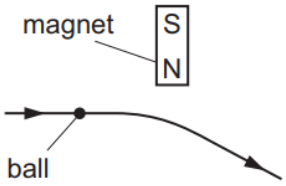
C Soft iron is a poor thermal conductor.

D Soft iron loses its magnetism when the current in the coil is switched off.

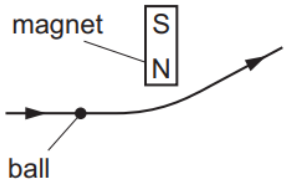
28 An iron ball on a horizontal wooden table rolls near the north pole of a bar magnet which is lying on the table.

Which diagram shows the most likely path of the ball, as seen from above the table?

A



B



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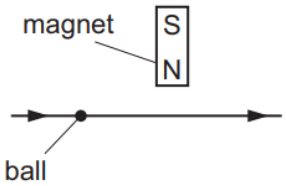
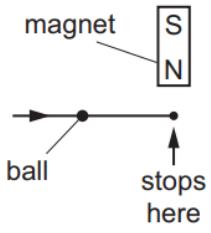


D



29 A soft iron bar is a long way from any magnetic field.

How can the material of the bar be described?

A It is magnetic and strongly magnetised.

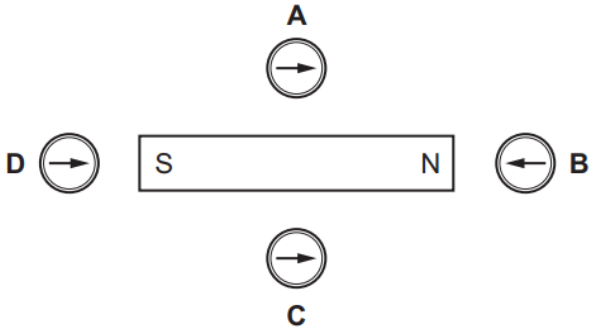
B It is magnetic and unmagnetised.

C It is non-magnetic and strongly magnetised.

D It is non-magnetic and unmagnetised.

30 The diagram shows a bar magnet and four plotting compasses.

Which compass shows the direction of the magnetic field due to the magnet?



31 Iron is used for the core of a transformer and steel is used to make a bar magnet.

Which statement explains these uses of iron and of steel?

A Iron is a magnetic material and steel is a non-magnetic material.

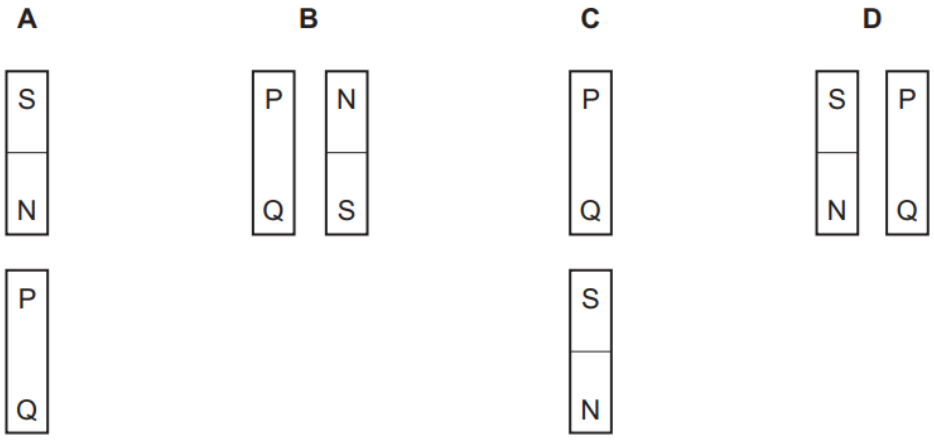
B Iron is a permanent magnetic material and steel is a temporary magnetic material.

C Iron is a temporary magnetic material and steel is a permanent magnetic material.

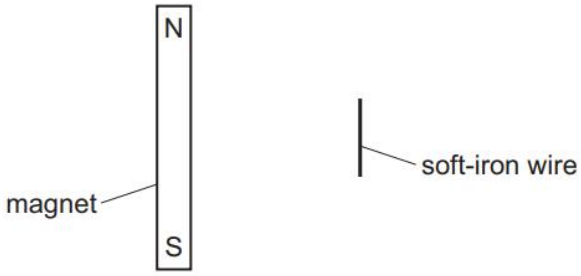
D Iron is a non-magnetic material and steel is a magnetic material.

32 An iron bar PQ is placed close to a bar magnet.

In which diagram does end P become an induced north pole?



33 The diagram shows a bar magnet at rest on a smooth horizontal surface. A length of soft-iron wire is held parallel to the magnet.



The wire is released.

What happens?

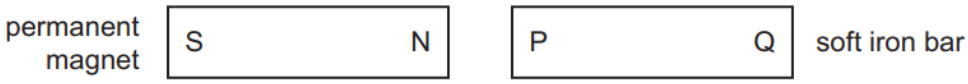
A The wire moves away from the magnet.

B The wire moves towards the magnet.

C The wire's centre stays in its present position and the wire rotates through 90° in a clockwise direction.

D The wire's centre stays in its present position and the wire rotates through 90° in an anticlockwise direction.

34 A permanent magnet is placed close to a bar of soft iron.



What are the polarities of end P and of end Q?

	end P	end Q
A	N	N
B	N	S
C	S	N
D	S	S

35 Which metal is used for the core of an electromagnet?

A copper

B iron

C magnesium

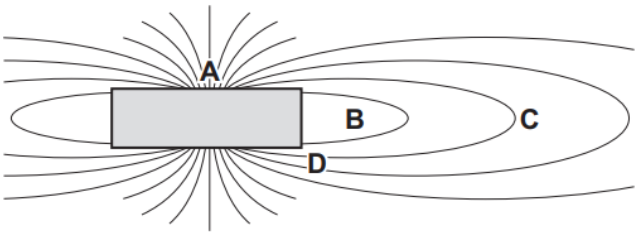
D steel

Paper 2

Questions are applicable for both core and extended candidates unless indicated in the question

36 The diagram shows part of the magnetic field around a strong magnet. **(extended only)**

In which position does a magnetic pole experience the strongest force?



37 Which statement is **not** a method for magnetising an iron bar?

A Place the bar next to a magnet and hammer the bar.

B Place the bar inside a solenoid. Switch on an alternating current (a.c.) in the coil and gradually reduce the current.

C Place the bar inside a solenoid. Switch on a direct current (d.c.) in the coil and gradually reduce the current.

D Stroke the bar repeatedly with a magnet.

38 Which statement about the direction of a magnetic field at a point is correct?

A It is the direction of the force on an N pole placed at that point.

B It is the direction of the force on an S pole placed at that point.

C It is the direction of the force on a positive charge placed at that point.

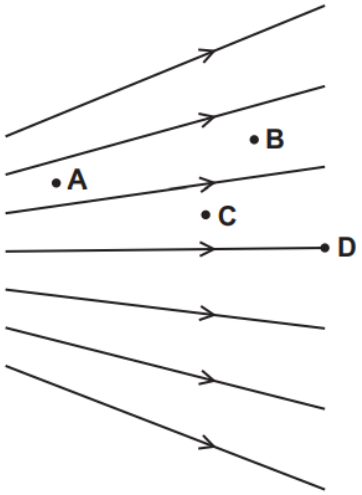
D It is the direction of the force on a negative charge placed at that point.

39 Which row describes suitable materials for use in a temporary magnet and in a permanent magnet?

	temporary magnet	permanent magnet
A	soft iron	soft iron
B	soft iron	steel
C	steel	soft iron
D	steel	steel

40 A magnetic field is represented in the diagram by magnetic field lines. **(extended only)**

At which point is the magnetic field strongest?



41 A steel bar is placed in an East-West direction for it to be demagnetised. No other magnet is nearby.

Which method is **not** suitable?

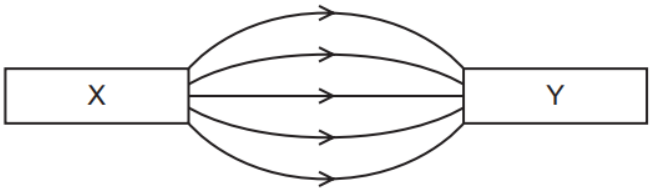
A Hammering the bar.

B Heating the bar to a very high temperature.

C Slowly taking the bar out of a coil that carries an alternating current.

D Slowly taking the bar out of a coil that carries a direct current.

42 Two magnets X and Y are placed end to end on a bench. The diagram shows the magnetic field pattern between the poles of the magnets.



Which row shows the direction of the forces exerted on X and Y by the magnetic field?

	force on X	force on Y
A	→	→
B	→	←
C	←	→
D	←	←

43 A piece of steel is slightly magnetised. It is hit several times with a hammer.

What effect will this have on the steel?

	the steel is parallel to a strong magnetic field	the steel is at right-angles to a weak magnetic field
A	it becomes magnetised more strongly	it becomes magnetised more strongly
B	it becomes magnetised more strongly	it loses its magnetism
C	it loses its magnetism	it becomes magnetised more strongly
D	it loses its magnetism	it loses its magnetism

44 Which method does **not** demagnetise a bar magnet?

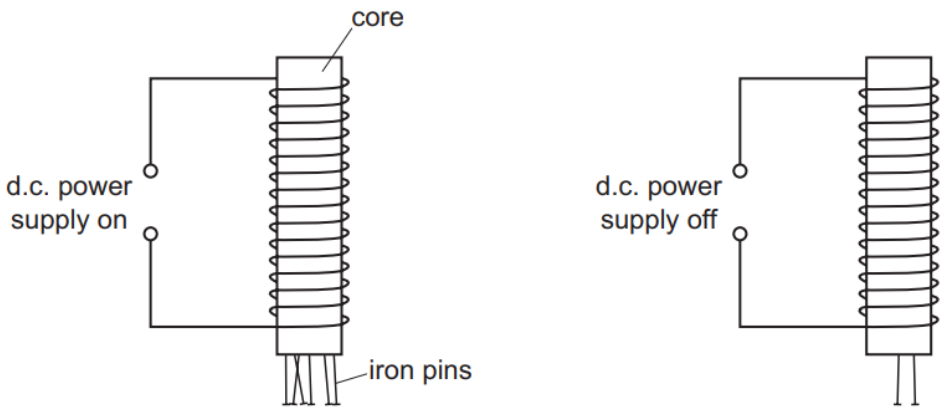
A Heat the bar magnet and place it in the east-west direction to cool.

B Place the bar magnet in the east-west direction and hammer it.

C Place the bar magnet in a coil connected to an a.c. supply and slowly withdraw it.

D Place the bar magnet in a coil connected to a d.c. supply and slowly withdraw it.

45 A student counts how many iron pins an electromagnet picks up when its power supply is switched on. Then, she counts how many pins are picked up when the power supply is switched off.



She repeats the experiment using cores made of different materials. The results are shown.

Which core is made out of soft iron?

	pins picked up with the power supply on	pins picked up with the power supply off
A	0	0
B	2	7
C	8	5
D	12	0