Magnetism & Electromagnetism

Question Paper

Level	O Level
Subject	Physics
Exam Board	Cambridge International Examinations
Unit	Electricity and Magnetism
Topic	Magnetism & Electromagnetism
Booklet	Question Paper

Time Allowed: **49 minutes**

Score: **/41**

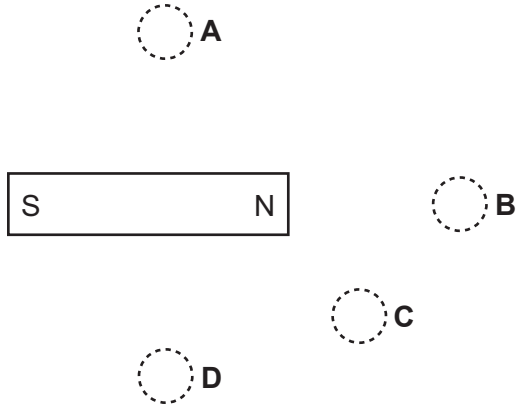
Percentage: **/100**

Grade Boundaries:

1 Four plotting compasses are placed near a bar magnet. You may ignore any effects of the Earth's magnetic field.

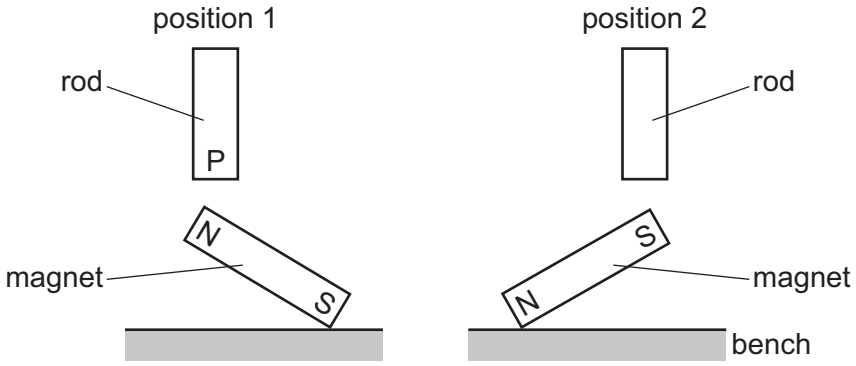
One compass appears like this  .

What is a possible position for this compass?



2 One end of a rod picks up the N-pole of a bar magnet when in position 1.

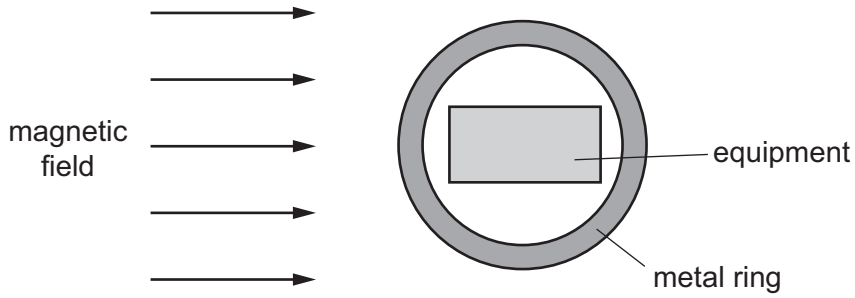
The same end of the rod picks up the S-pole of the bar magnet when in position 2.



Which material is the rod made from and what is the pole at end P of the rod when in position 1?

	material	pole at P
A	iron	N-pole
B	iron	S-pole
C	steel	N-pole
D	steel	S-pole

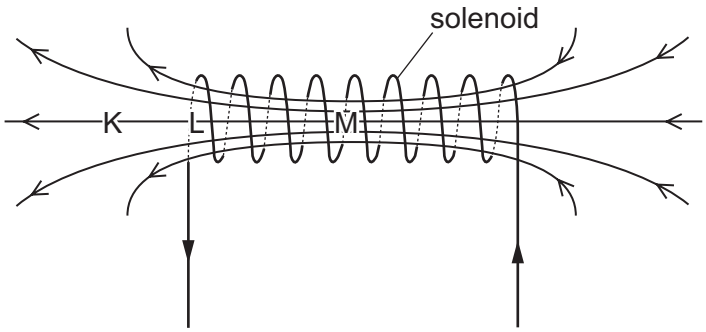
3 A metal ring screens a piece of equipment from a magnetic field.



Which metal should be used for the ring, and why?

	metal	reason
A	copper	the metal carries the field lines around the equipment
B	copper	the metal is non-magnetic
C	iron	the metal carries the field lines around the equipment
D	iron	the metal is non-magnetic

4 The diagram shows the magnetic field pattern of a current in a solenoid.



When the current in the solenoid is increased, where is there an increase in the magnetic field strength?

A K, L and M

B K and L only

C M and L only

D M only

5 What is a suitable metal for the core of an electromagnet?

A aluminium

B copper

C iron

D steel

6 Which material can be picked up by a magnet?

A aluminium

B copper

C iron

D plastic

7 A piece of electrical equipment is sensitive to magnetic fields and is screened from them. To do this, it is enclosed in a box.

Which material should be used to make the box?

A copper

B iron

C plastic

D steel

8 What always produces a permanent bar magnet?

A an iron bar in a coil carrying alternating current (a.c.)

B an iron bar in a coil carrying direct current (d.c.)

C a steel bar in a coil carrying alternating current (a.c.)

D a steel bar in a coil carrying direct current (d.c.)

9 A metal bar PQ hangs from a thin thread and always comes to rest with end P pointing north. Another bar XY of the same metal settles in no definite direction.

What happens if the two bars are brought near one another?

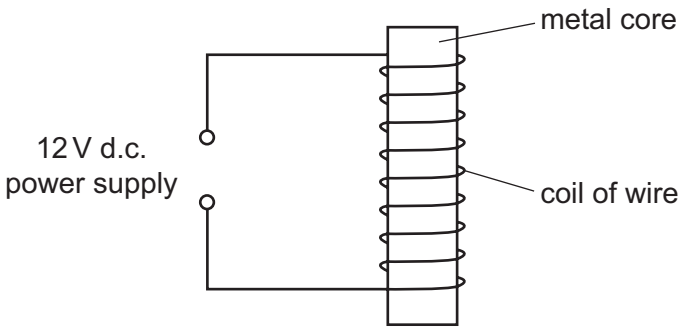
A End P and end Q both attract end X.

B End P attracts end X but repels end Y.

C End P neither attracts nor repels end X.

D End P repels end X but attracts end Y.

10 The diagram shows a 12 V d.c. power supply connected across a coil with a metal core.



The core becomes a magnet when the current is switched on. It remains a magnet after the current is switched off.

From which metal is the core made?

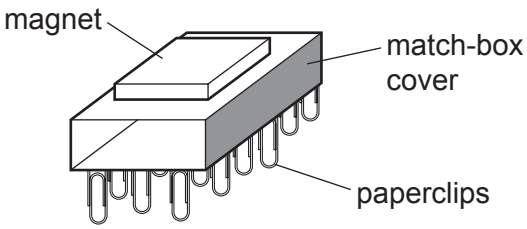
A aluminium

B copper

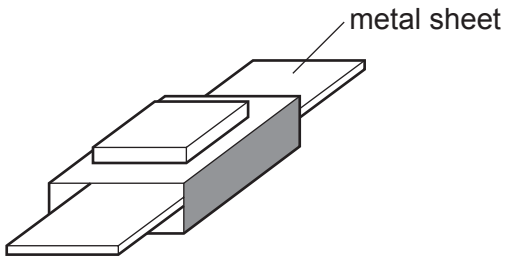
C soft iron

D steel

11 A teacher sticks a magnet to the top surface of a match-box cover. The bottom surface is placed in a small tray of iron paperclips. As the match-box cover is lifted up, a large number of paperclips are held on the bottom surface.



Sheets of metal are placed inside the match-box cover, between the magnet and the paperclips.



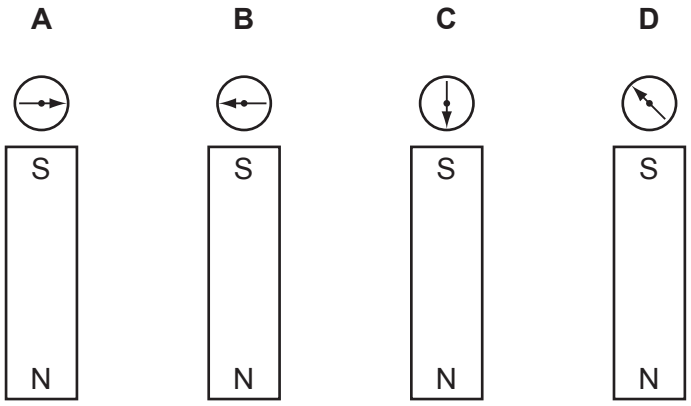
When sheet X is placed inside, the paperclips stay attached. When sheet Y is placed inside, all the paperclips fall off.

Which metals are the sheets made from?

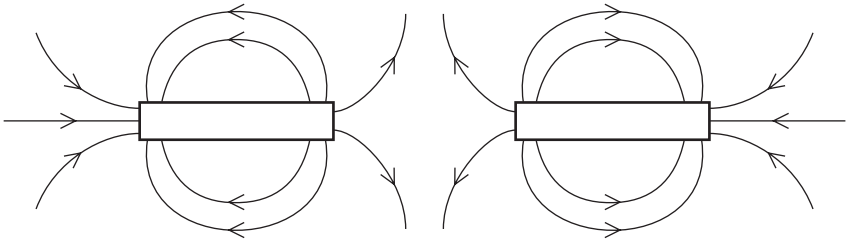
	sheet X	sheet Y
A	aluminium	copper
B	copper	iron
C	iron	aluminium
D	iron	copper

12 The diagrams show a small compass close to a strong bar magnet.

Which diagram shows the correct compass direction?



13 The magnetic field around two bar magnets is shown.



Which diagram represents the correct arrangement of magnetic poles?

A N S N S

B N S S N

C S N N S

D S N S N

14 Which material is used to magnetically screen electrical equipment from unwanted magnetic fields?

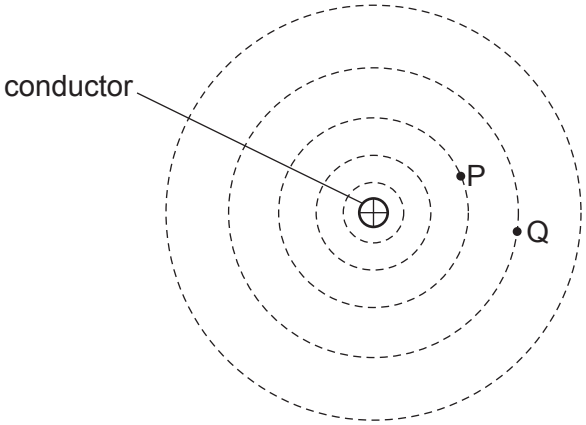
A aluminium

B copper

C iron

D steel

15 The diagram shows the shape of the magnetic field lines near a current-carrying conductor.

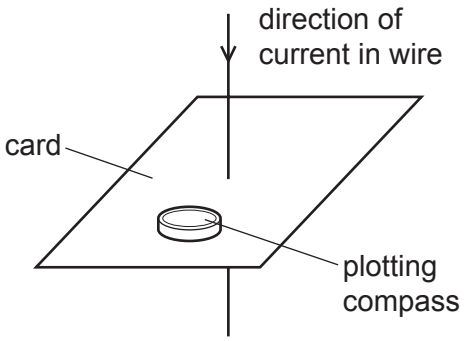


The current in the conductor is into the plane of the diagram.

Which row correctly states the direction of the field lines and compares the strengths of the field at points P and Q?

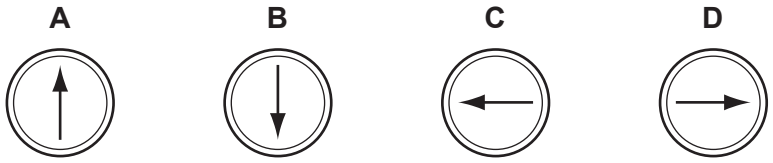
	direction of field lines	the field is stronger at
A	clockwise	P
B	clockwise	Q
C	anticlockwise	P
D	anticlockwise	Q

16 A vertical wire passes at right angles through a piece of card. There is a large current in the wire in the direction shown.



A plotting compass is placed on the card.

Which diagram shows the direction in which the needle of the plotting compass points?



17 A magnet is placed close to an iron bar.

The iron bar becomes an induced magnet.

Which magnetic poles are formed at the ends X and Y of the bar?

	end X	end Y
A	N	N
B	N	S
C	S	N
D	S	S

18 Which list contains an example of a non-magnetic material, a magnetic material and a magnetised material?

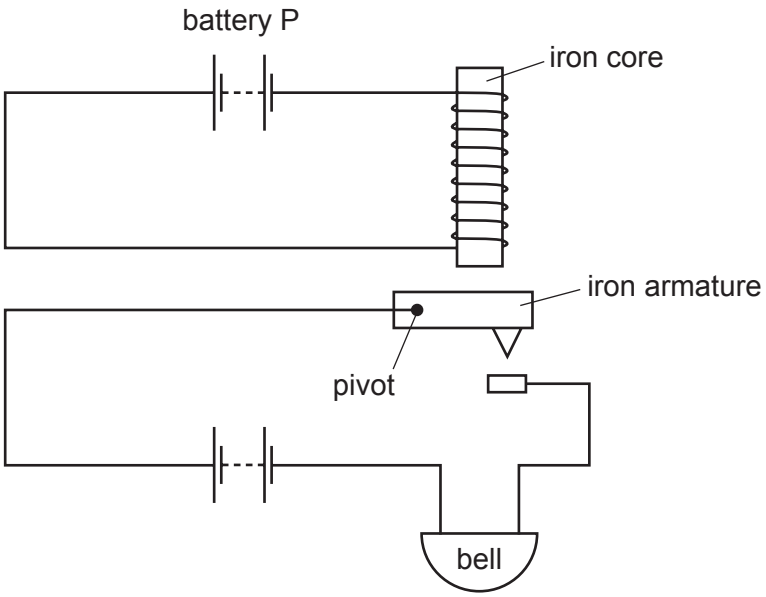
A copper, iron, a compass needle

B copper, iron, polythene

C iron, steel, a compass needle

D iron, steel, polythene

19 The diagram shows an alarm system.



What happens when battery P is disconnected?

	iron armature	bell
A	falls	rings
B	falls	stops ringing
C	moves up	rings
D	moves up	stops ringing

20 Which properties make materials suitable for use as a core in an electromagnet?

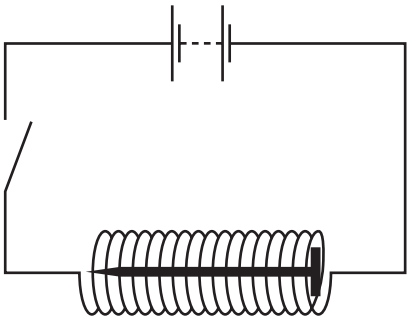
A difficult to magnetise and easy to demagnetise

B difficult to magnetise and retains magnetic strength

C easy to magnetise and retains magnetic strength

D easy to magnetise and easy to demagnetise

21 An iron nail can be magnetised using a coil.



How can the nail be demagnetised?

A leaving the apparatus switched on for a long time

B removing the nail from the coil while using an a.c. supply

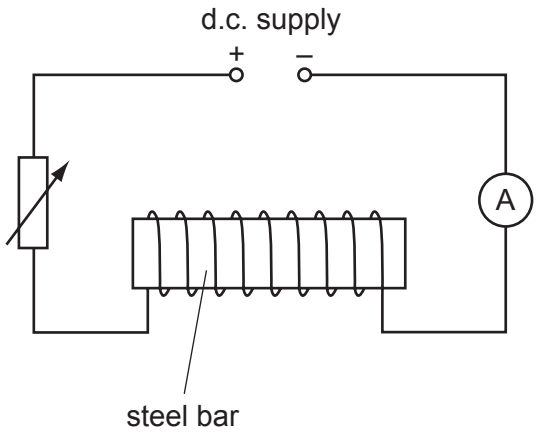
C using a coil with fewer turns

D using more cells

22 Which row describes the ease with which iron or steel can be magnetised and demagnetised?

	metal	magnetised	demagnetised
A	iron	difficult	easy
B	iron	easy	difficult
C	steel	difficult	difficult
D	steel	easy	easy

23 The diagram shows how a steel bar can be magnetised.



Which statement describes how the steel bar can be demagnetised?

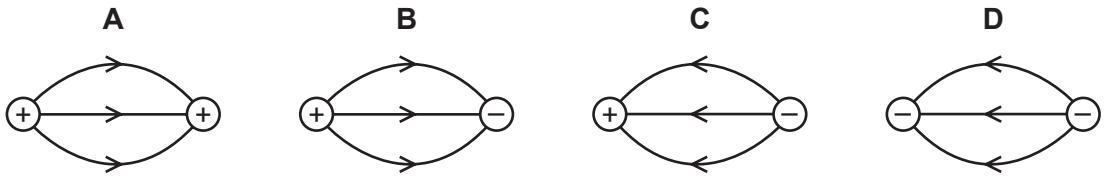
A Reverse the d.c. supply and gradually decrease the current in the circuit.

B Reverse the d.c. supply and gradually increase the current in the circuit.

C Use an a.c. supply and gradually decrease the current in the circuit.

D Use an a.c. supply and gradually increase the current in the circuit.

24 Which diagram correctly shows the electric field lines between two point charges?

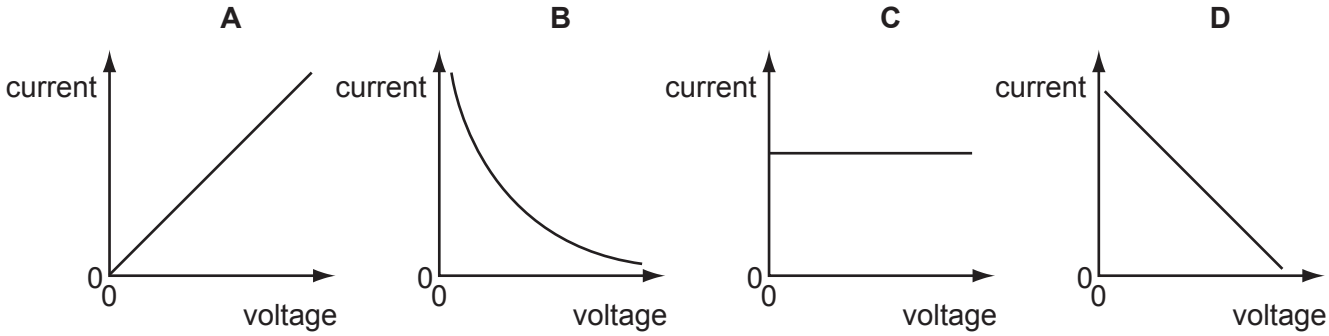


25 A piece of polythene is rubbed with a cloth duster. The polythene becomes negatively charged and the cloth becomes positively charged.

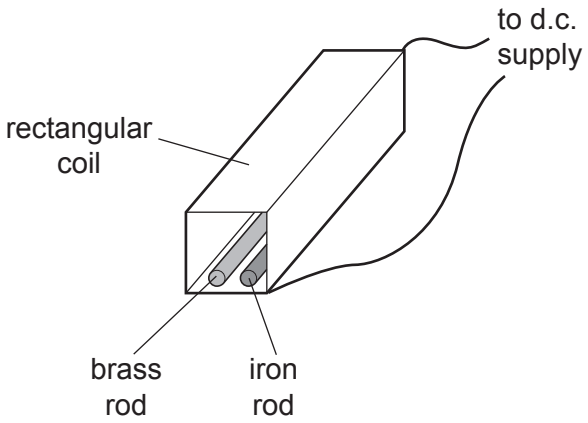
What happens to the polythene and to the cloth to cause this?

	polythene	cloth
A	gains electrons	gains protons
B	gains electrons	loses electrons
C	loses protons	gains protons
D	loses protons	loses electrons

26 Which graph shows how the current changes when the voltage across a fixed resistance is varied?



27 The diagram shows a brass rod and an iron rod beside each other at the bottom of a rectangular coil.



What happens when a d.c. current passes through the coil?

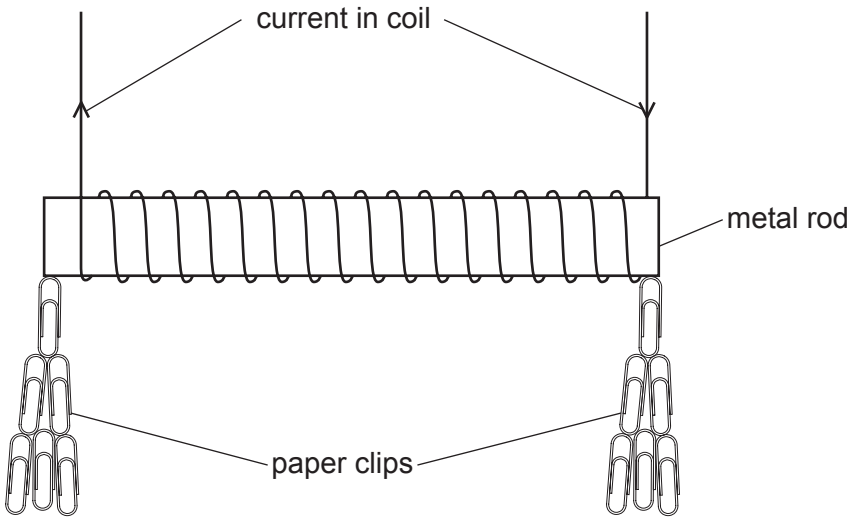
A Only the brass rod is magnetised.

B Only the iron rod is magnetised.

C The two rods attract each other.

D The two rods repel each other.

28 Four metal rods are placed, in turn, inside a coil of copper wire.



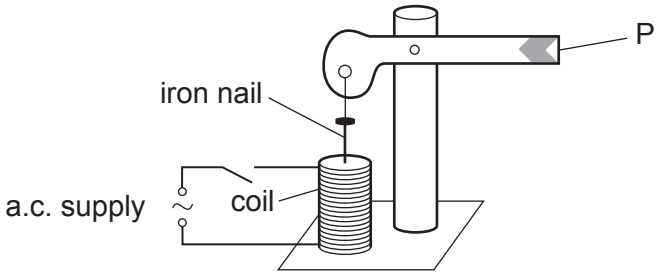
Each rod is used to pick up as many paper clips as possible. The current is then switched off.

The table gives the results of the experiment.

Which rod is the most suitable core for a coil in a circuit breaker?

	number of paper clips picked up when there is a current in the coil	number of paper clips still attached after the current is switched off
A	1	0
B	20	2
C	35	0
D	35	30

29 The diagram shows a model railway signal.



What does the end P do when the switch is closed?

A It goes down and stays down.

B It goes up and stays up.

C It goes down and then returns to its original position.

D It goes up and then returns to its original position.

30 Which part of a video tape recording system does **not** rely on magnetic material for its operation?

A the drive motor

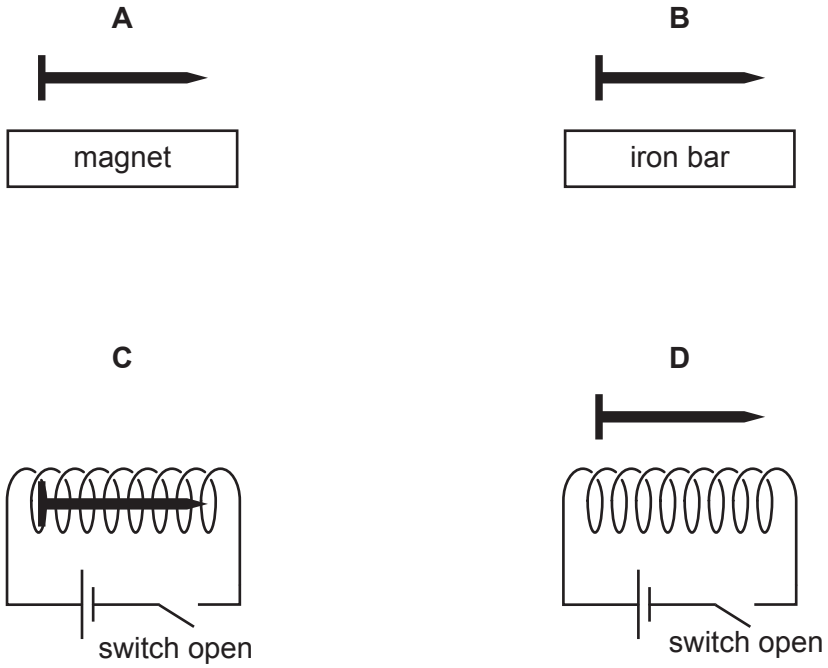
B the power lead

C the transformer

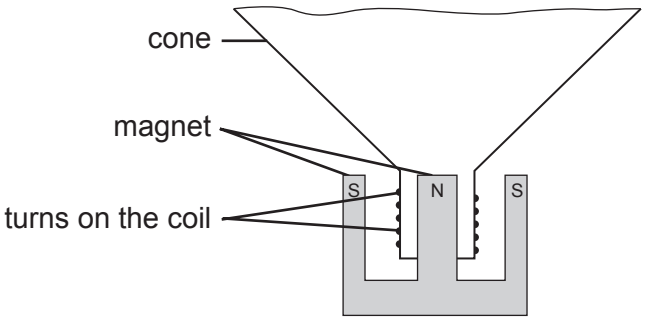
D the video tape

31 The diagrams show an iron nail in four different situations.

In which diagram will the nail become an induced magnet?



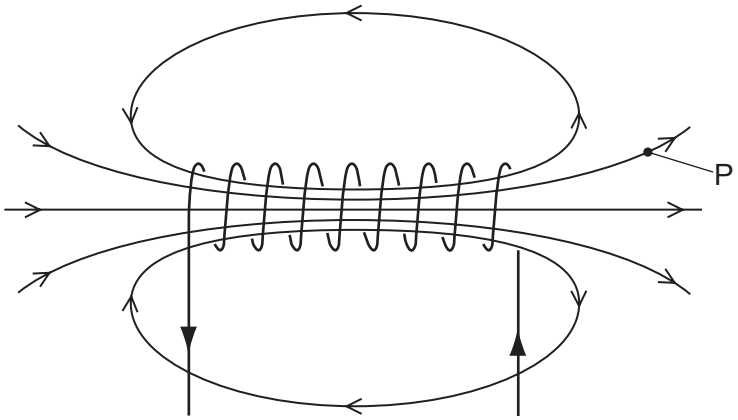
32 The diagram shows parts of a loudspeaker.



Which type of current is passed through the coil and why?

	current passed through coil	reason why
A	alternating	to keep the magnetic field constant
B	alternating	to make the coil vibrate
C	direct	to keep the magnetic field constant
D	direct	to make the coil vibrate

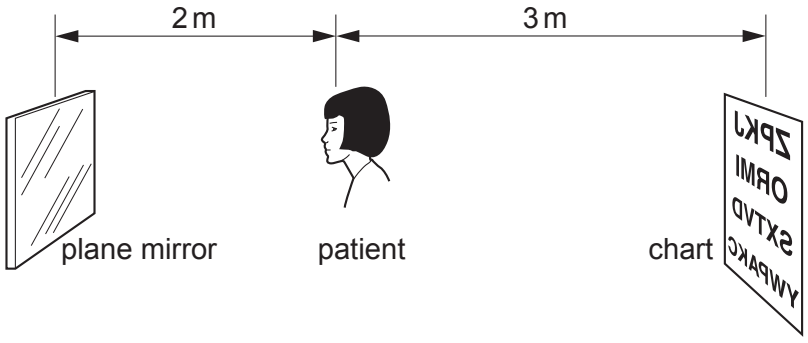
33 A current in a solenoid creates a magnetic field.



What is the effect on the magnetic field at the point P of using a larger current in the opposite direction?

	field strength	field direction
A	decreases	reverses
B	decreases	unchanged
C	increases	reverses
D	increases	unchanged

34 The diagram shows a patient having her eyes tested. A chart with letters on it is placed behind her and she sees the chart reflected in a plane mirror.

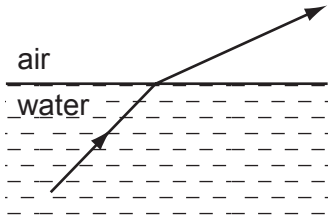


How far away from the patient is the image of the chart?

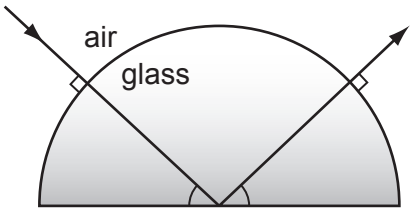
A 2 m **B** 4 m **C** 5 m **D** 7 m

35 In which diagram is the path of the light ray **not** correct?

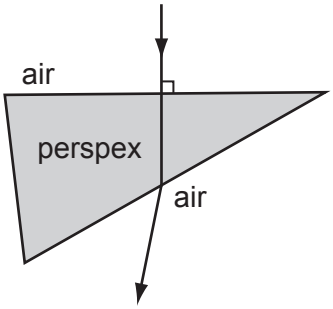
A



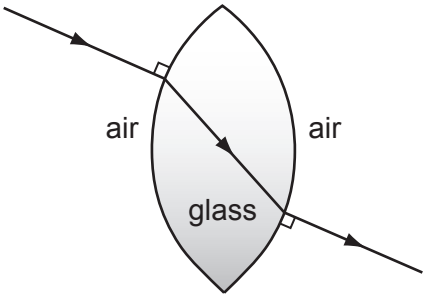
B



C



D



36 A student tries to magnetise a short steel rod.

Which of these tests will show that he has been successful?

A both ends of a permanent magnet attract the rod

B one end of a permanent magnet repels the rod

C the rod picks up a small piece of paper

D when freely suspended, the rod points in any direction

37 End X of a metal rod attracts the N-pole of a compass needle.

What does this show about the rod?

A It could be made of copper but is not permanently magnetised.

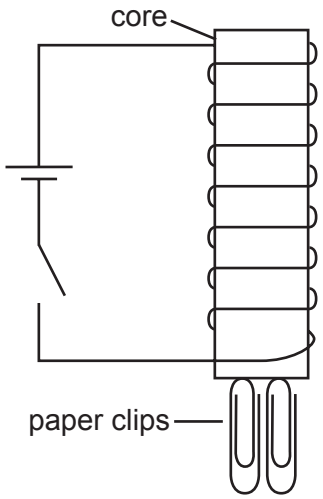
B It could be made of copper with a S-pole at X.

C It could be made of steel but is not permanently magnetised.

D It could be made of steel with a N-pole at X.

38 Four different substances are tested by using each as the core of an electromagnet.

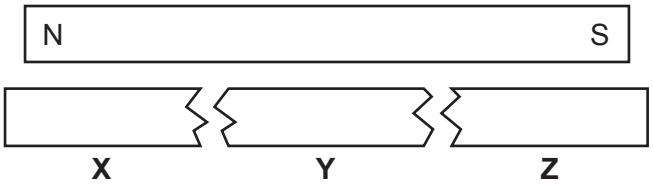
The number of paper clips each holds is recorded when there is a current in the electromagnet and when the current is switched off.



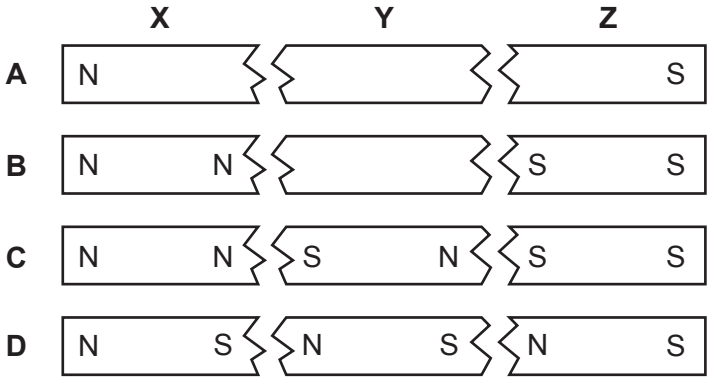
Which substance is the best for making the core of a transformer?

	number of paper clips held when there is a current in the electromagnet	number of paper clips held when current is switched off
A	8	4
B	6	0
C	5	1
D	4	0

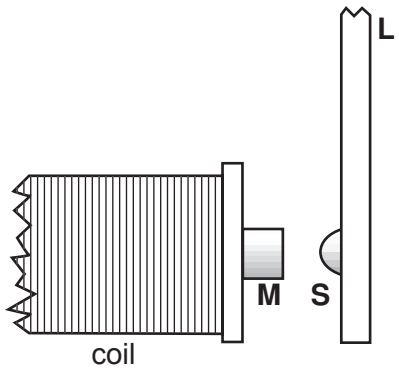
39 A bar magnet is broken into three parts **X**, **Y** and **Z**.



Which diagram shows the poles in **X**, **Y** and **Z**?



40 The diagram shows part of a magnetic relay. **M** is part of the core of the magnet. **L** is part of the armature which is attracted to the core when a current flows through the coil. **S** is a stud which stops the armature being attracted too strongly.



Which line of the table gives the best materials for **M**, **L** and **S**?

	M	L	S
A	iron	iron	iron
B	iron	iron	copper
C	iron	copper	copper
D	copper	copper	copper

41 Which of the following will prove that a metal bar is a permanent magnet?

A it attracts another magnet

B it attracts both ends of a compass needle

C it conducts electricity

D it repels another magnet