

Beatty Secondary School
Secondary 4 Express
Pure Physics
Chapter 20: Magnetism

Name: _____ () Class: Sec _____ Date: _____

Learning Outcomes:

- (a) state the properties of magnets
- (b) describe induced magnetism
- (c) describe electrical methods of magnetisation and demagnetisation
- (d) draw the magnetic field pattern around a bar magnet and between the poles of two bar magnets
- (e) describe the plotting of magnetic field lines with a compass
- (f) distinguish between the properties and uses of temporary magnets (e.g. iron) and permanent magnets (e.g. steel)

A. Prior Knowledge

1. Are all metals magnets? Name the magnetic materials.

No, not all metals are magnets.
Magnetic materials are steel, iron, nickel and cobalt. (SIN C)

2. State as many uses of magnets as you can.

Compass, fridge doors, magnets, speakers, earphones, mobile phones, door bells, school vending machines (sort coins), bells, electromagnetic cranes, bullet trains

3. What are the characteristics of magnets that are used in the items you state in (2)?

a) Point north south – compass
b) Attract/repel – all the rest

B. Magnets

(a) state the properties of magnets

4. The 3 main properties of magnets are:

- a) **Two poles.**
- b) **Point in North – South direction when freely suspended.**
- c) **Like poles repel, unlike poles attract.**

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P
L**

5. a) On the drawing, write the north, south magnetic poles of the small compass on the surface of the Earth.



A attracts B on both ends.

A does not attract B at all.

7. From Question 6, state the key characteristic to identify a magnet.

Repel. One metal piece must repel the other.

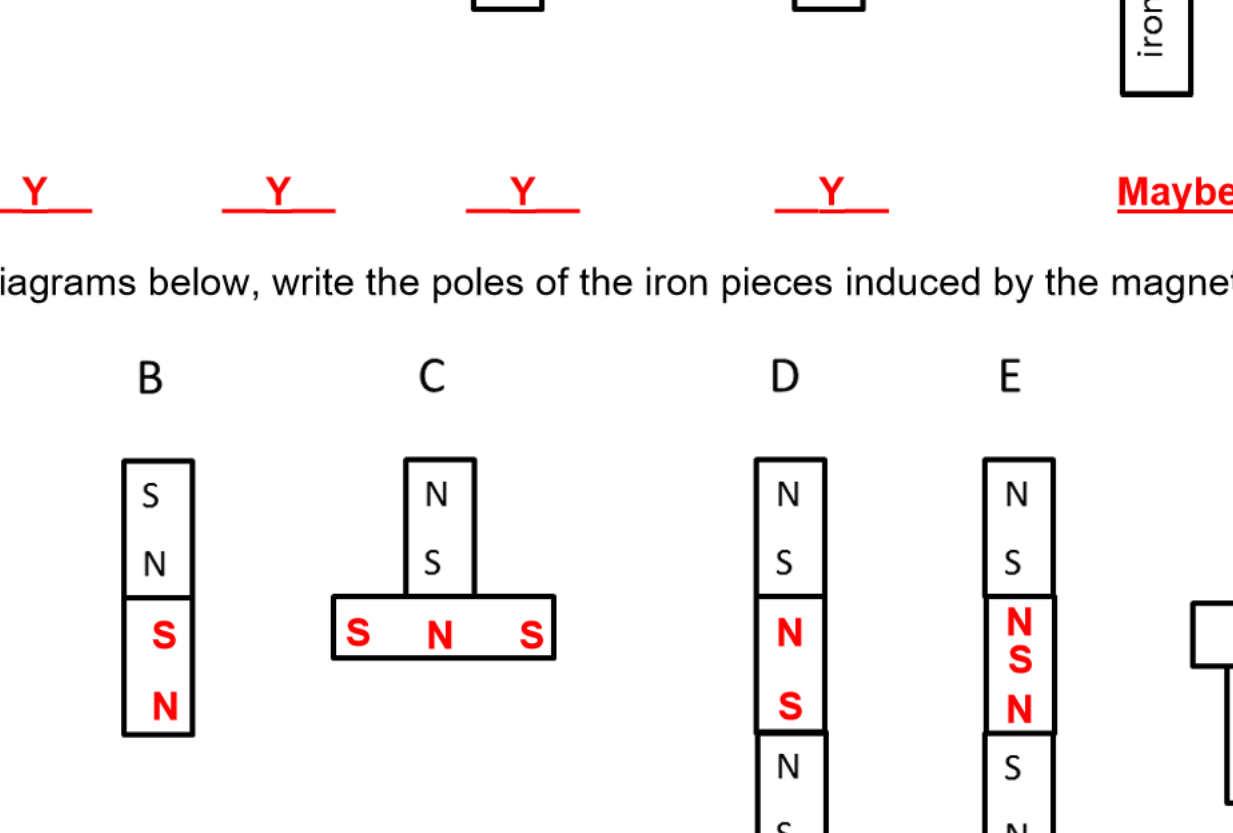
(b) describe induced magnetism

C. Magnetic Induction

8. State what is meant by magnetic induction.

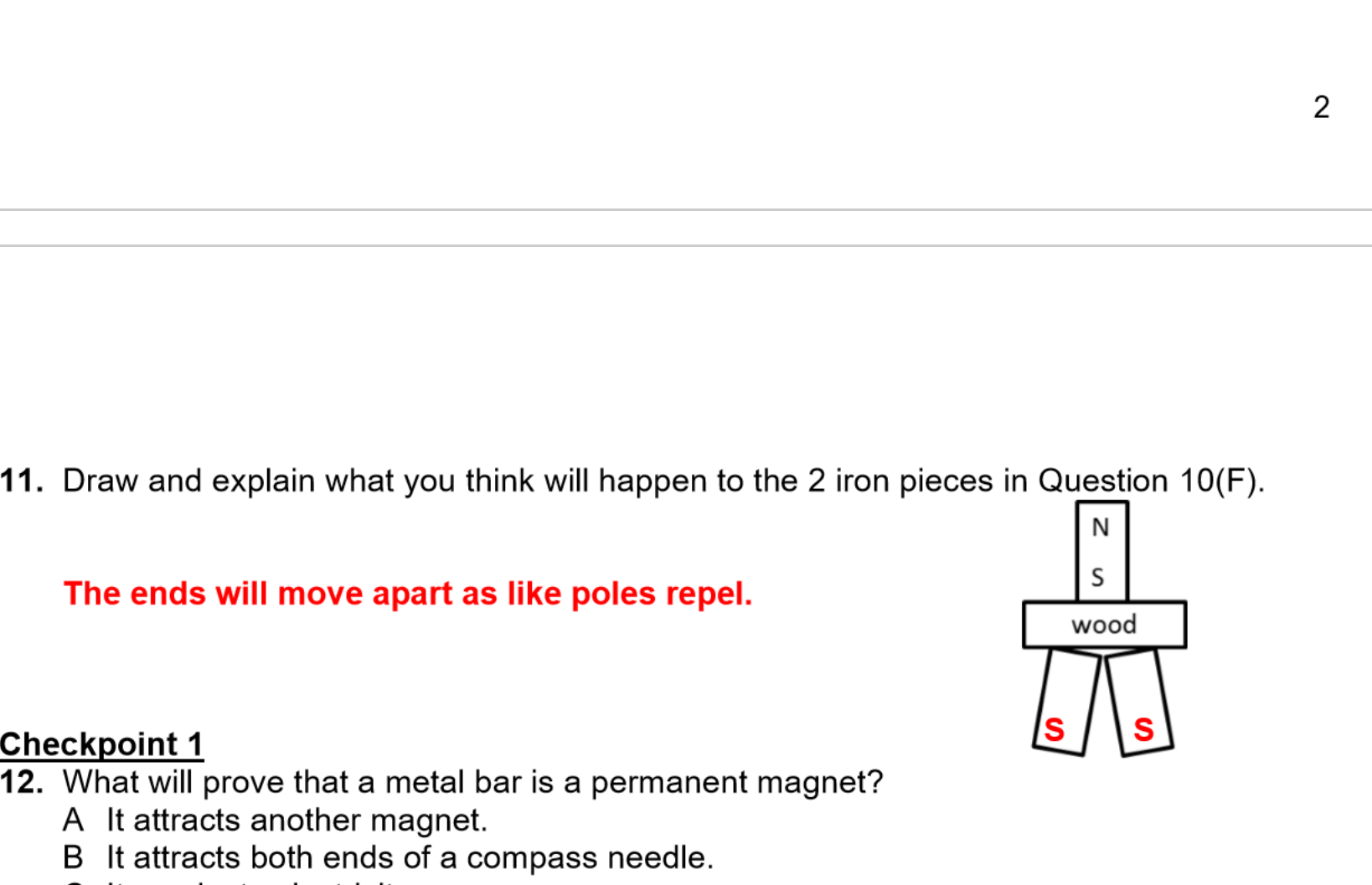
It is the process whereby an object made up of a magnetic material becomes a magnet when it is near or in contact with a magnet. (POM*)

9. State Y / N whether the iron becomes an induced magnet.



Y Y Y Y Maybe

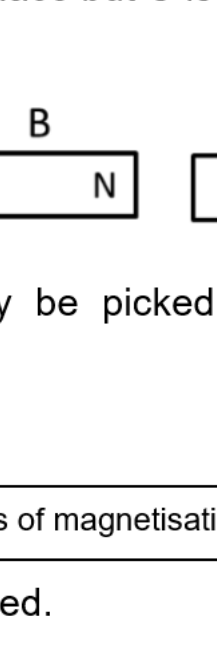
10. On the diagrams below, write the poles of the iron pieces induced by the magnet.



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11. Draw and explain what you think will happen to the 2 iron pieces in Question 10(F).

The ends will move apart as like poles repel.

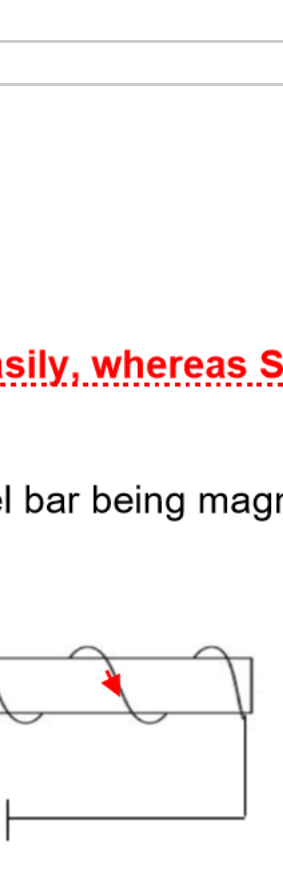


Checkpoint 1

12. What will prove that a metal bar is a permanent magnet?

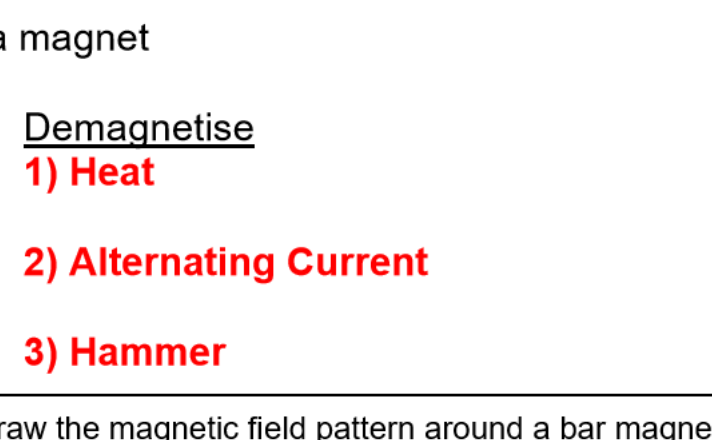
- A It attracts another magnet.
- B It attracts both ends of a compass needle.
- C It conducts electricity.
- D It repels another magnet.

13. The figure shows a strong magnet holding six paper clips. If a weaker magnet is brought close to the end of the last clip as shown, what will happen to the paper clips?



- A They will bend away from the magnet.
- B They will bend towards the magnet.
- C They will fall to the ground.
- D They will start swing into and out of paper.

14. The diagram shows 3 bars placed in a line. A and B are held in place but C is free to move. In which direction with C move?



C will move towards B.

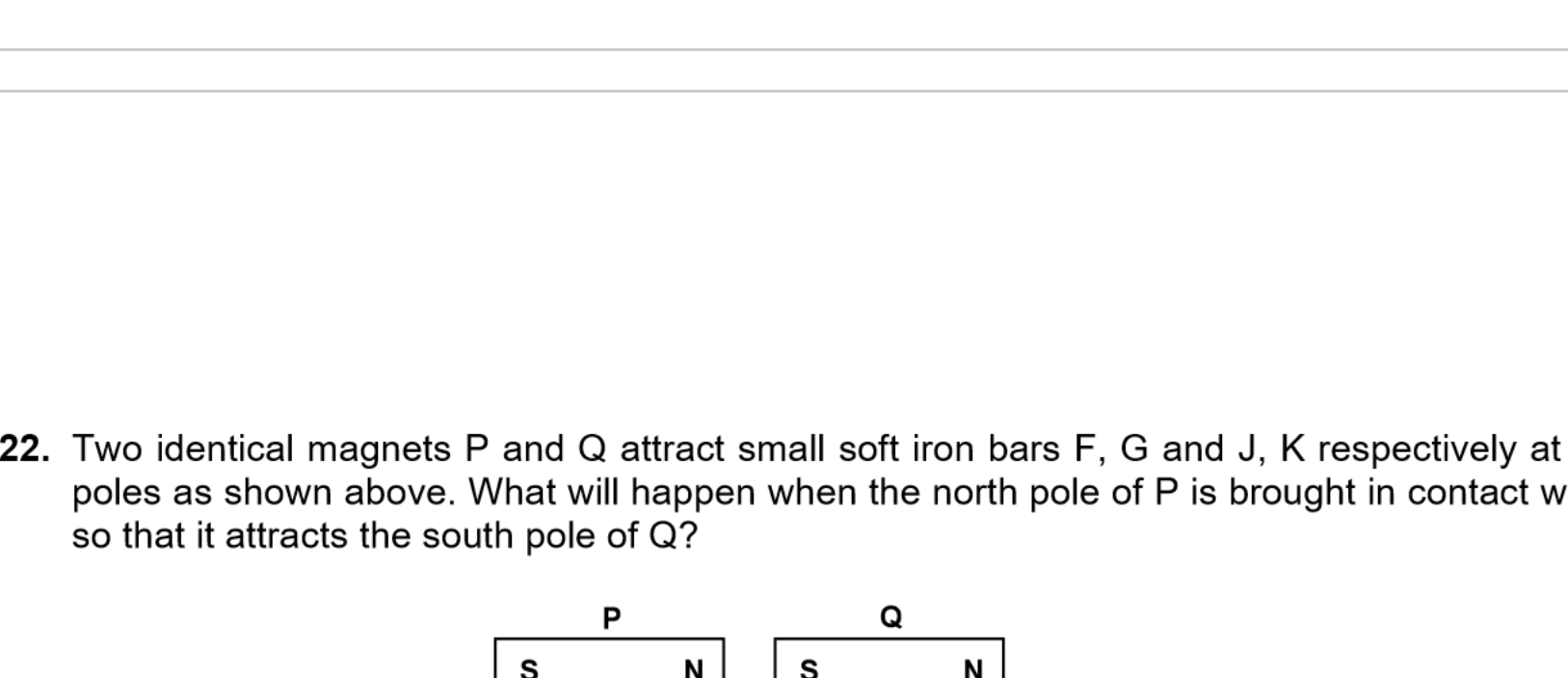
15. Can drinks are made of aluminium because they can easily be picked up by powerful electromagnets in recycling plants.

True False Aluminium is not a magnetic material.

D. Magnetisation & Demagnetisation

(c) describe electrical methods of magnetisation and demagnetisation

16. On the diagrams, write the poles on the steel bar being magnetised.



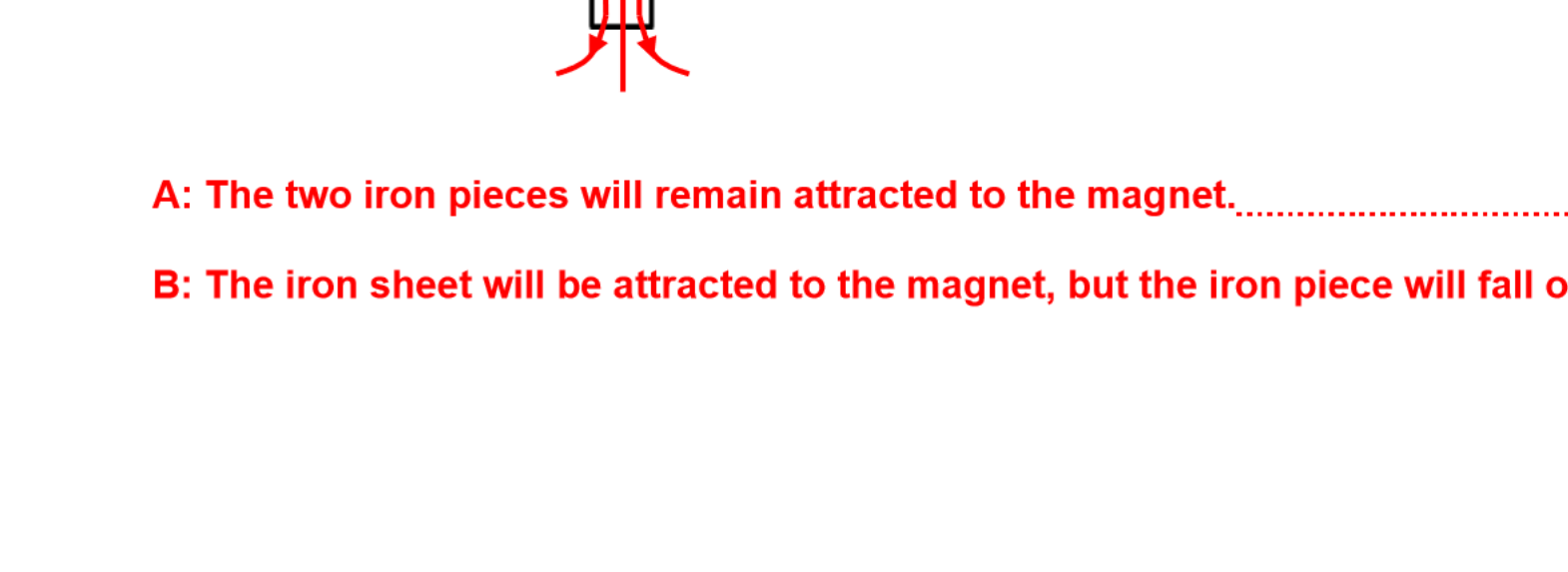
17. Is there any difference if you use an iron bar instead of a steel bar?

Iron will be magnetised faster, but it loses its magnetism faster too.

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Iron is a soft magnetic material which gets magnetized easily, whereas Steel is a hard magnetic material that gets magnetized more slowly.

18. Draw arrows indicating the current, and write the poles on the steel bar being magnetised.



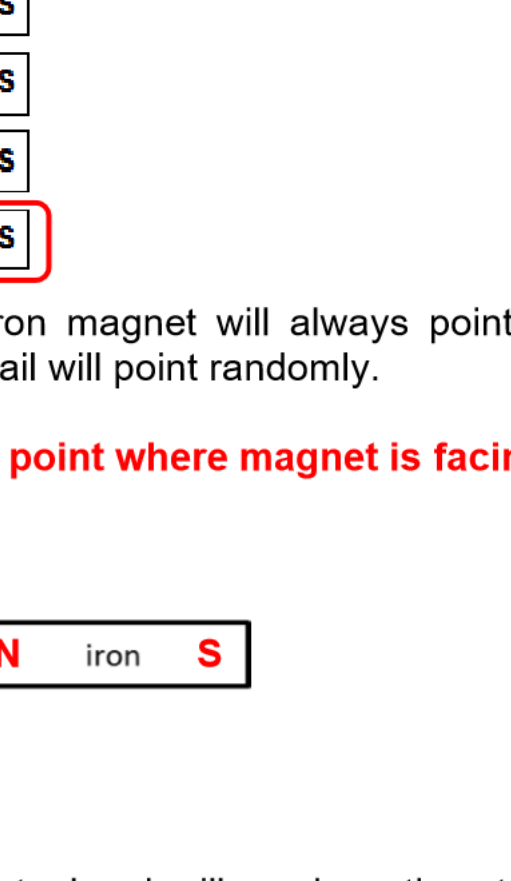
19. List the ways to magnetise and demagnetise a magnet

- Magnetise**
 - 1) Stroke
 - 2) Direct Current
- Demagnetise**
 - 1) Heat
 - 2) Alternating Current
 - 3) Hammer

E. Magnetic Field and Shielding

(d) draw the magnetic field pattern around a bar magnet and between the poles of two bar magnets

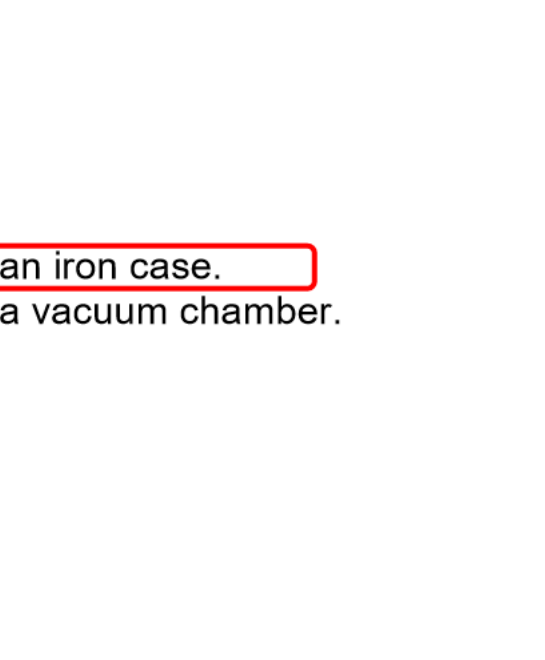
20. Draw the magnetic field pattern of Earth. Include arrows. Hint: first draw the imaginary magnet in Earth.



21. Draw the magnetic field patterns as per Section C Q1 in your workbook. Mark the neutral point, if any, with an X. What happens to the magnetic field at the neutral point?

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22. Two identical magnets P and Q attract small soft iron bars F, G and J, K respectively at their poles as shown above. What will happen when the north pole of P is brought in contact with Q so that it attracts the south pole of Q?

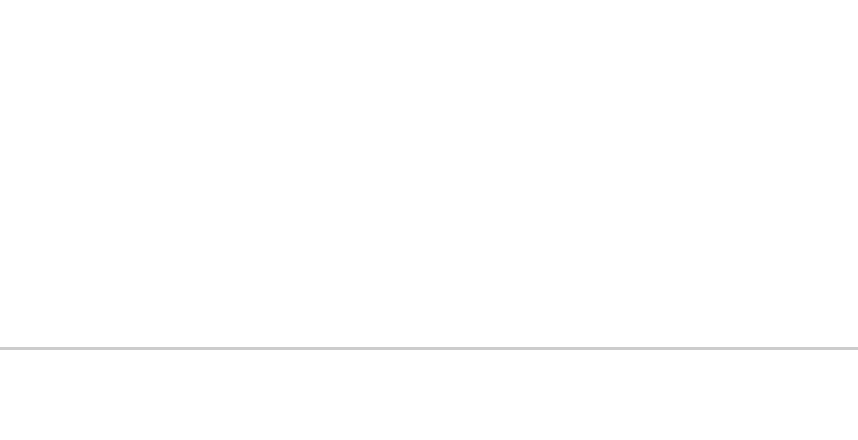


- A F and G will drop off.
- B J and K will drop off.
- C F and K will drop off.
- D G and J will drop off.

23. Draw the magnetic field patterns through these iron pieces. Do they correspond to the poles from Question 10?



24. State what happens to the iron pieces when these are hung from the magnet as shown below. Draw the magnetic pattern to confirm your answer.



A: The two iron pieces will remain attracted to the magnet.
B: The iron sheet will be attracted to the magnet, but the iron piece will fall off.

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Checkpoint 2

25. A bar magnet is broken into three parts X, Y and Z?

Which of the following diagrams shows the magnetic poles in X, Y and Z?

26. At the microscopic level, the magnetic domain of an iron magnet will always point in the north-south direction while that of an unmagnetised iron nail will point randomly.

True False The magnetic domain of the magnet will point where magnet is facing.

27. Write the poles on the induced iron piece.

28. Which one of the following methods of magnetizing a steel rod will produce the strongest magnet?

- A Bring a permanent magnet near to the rod.
- B Stroke the rod a number of times with a permanent magnet.
- C Pass an electric current through the rod.
- D Place the rod in a solenoid carrying a large alternating current.

29. A small bar magnet is placed in a region of a magnetic field as shown in the diagram. If it is free to move, the magnet will _____.

- A move to the left.
- B move to the right.
- C turn clockwise.
- D turn anticlockwise.

30. What is the best way to protect a piece of equipment from being magnetised by an external magnetic field?

- A Put the equipment in a thick wooden case.
- B Put the equipment in a thick walled lead box.

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- C Put the equipment in an iron case.
- D Put the equipment in a vacuum chamber.

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