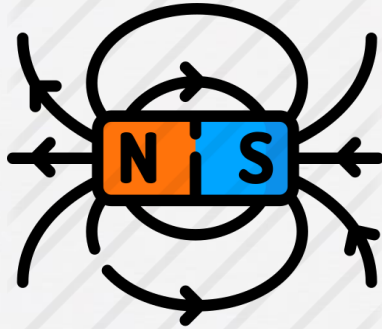
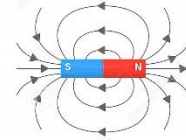


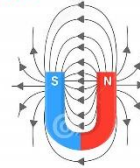
# Magnetic fields



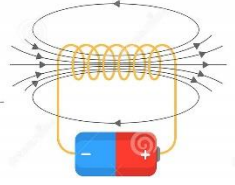
## MAGNETIC FIELD



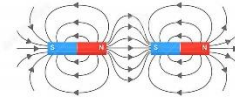
BAR MAGNET



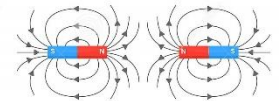
HORSESHOE MAGNET



ELECTROMAGNETIC FIELD



UNLIKE POLES ATTRACT



LIKE POLES ATTRACT

## Chapter 34





Section  
**4**

# Electricity and magnetism

## Chapters

Simple phenomena of magnetism

34 Magnetic fields

Electrical quantities and circuits

35 Static electricity

36 Electric current

37 Potential difference

38 Resistance

39 Capacitors

40 Electric power

41 Electronic systems

42 Digital electronics

Electromagnetic effects

43 Generators

44 Transformers

45 Electromagnets

46 Electric motors

47 Electric meters

48 Electrons

# Properties of magnets



## a) Magnetic materials

**Magnets** attract strongly only certain materials such as iron, steel, nickel and cobalt, which are called **ferro-magnetics**.



**iron**



**nickel**



**cobalt**

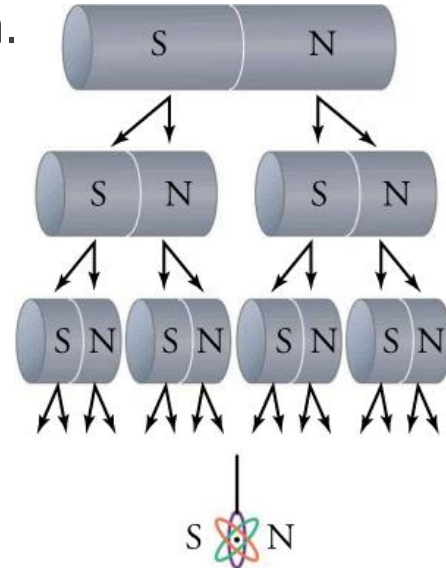


# Properties of magnets



## b) Magnetic poles

The **poles** are the places in a magnet to which magnetic materials, such as iron filings, are attracted. They are near the ends of a bar magnet and occur in pairs of equal strength.



# Properties of magnets

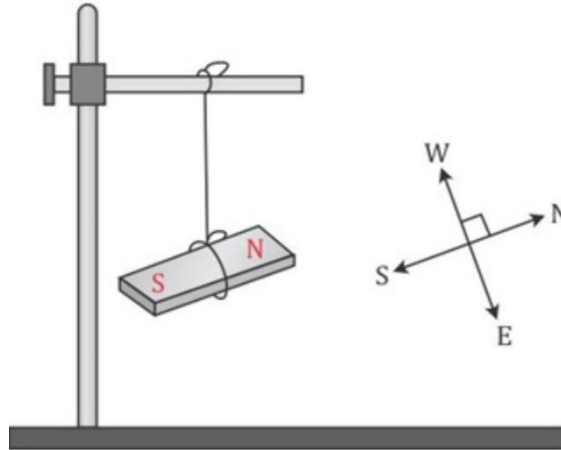


## c) North and south poles

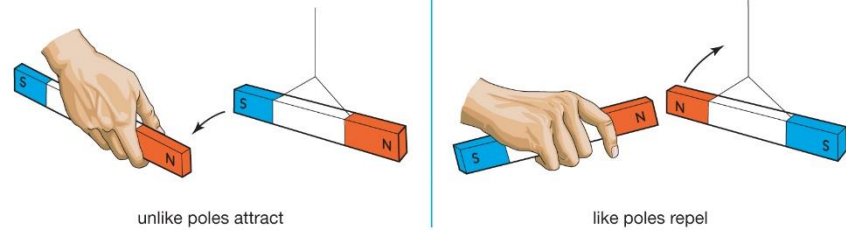
If a magnet is supported so that it can swing in a horizontal plane it comes to rest with one pole, the **north-seeking** or N pole, always pointing roughly towards the Earth's north pole. A magnet can therefore be used as a **compass**.



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# Properties of magnets



## d) Law of magnetic poles

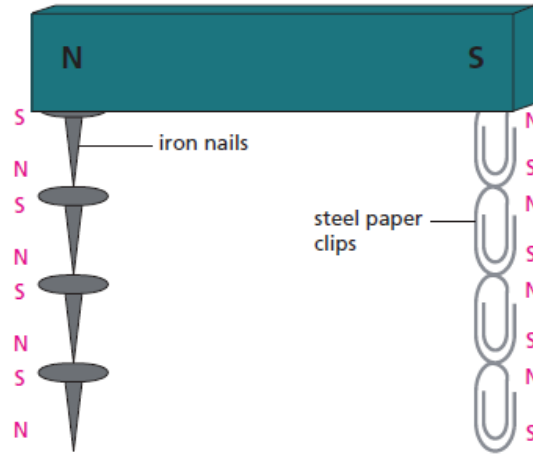
If the N pole of a magnet is brought near the N pole of another magnet, repulsion occurs. Two S (southseeking) poles also repel. By contrast, N and S poles always attract. The law of magnetic poles summarises these facts and states:

Like poles repel, unlike poles attract.

The force between magnetic poles decreases as their separation increases.

# Magnetisation of iron and steel

Chains of small iron nails and steel paper clips can be hung from a magnet (Figure 34.1). Each nail or clip magnetises the one below it and the unlike poles so formed attract.



If the iron chain is removed by pulling the top nail away from the magnet, the chain collapses, showing that **magnetism induced in iron is temporary**.

When the same is done with the steel chain, it does not collapse; **magnetism induced in steel is permanent**.



# Methods of Magnetisation and Demagnetisation



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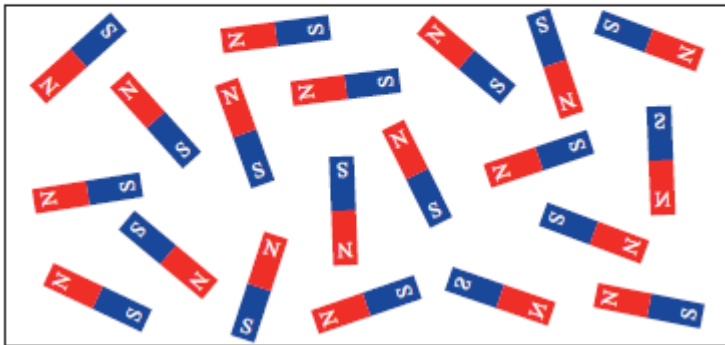
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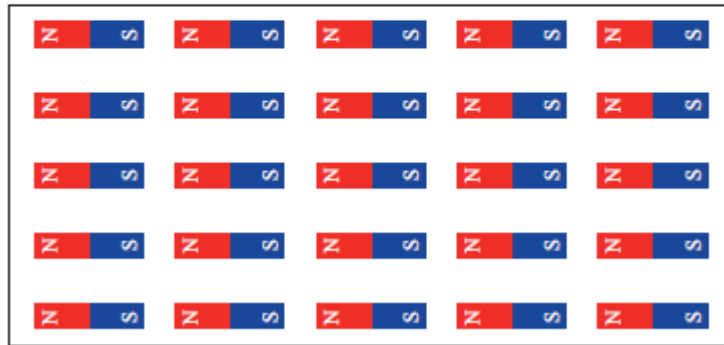


## Соронзон жижиглэж бутлаад байвал яах бол?

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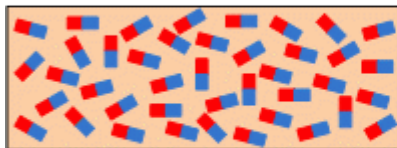
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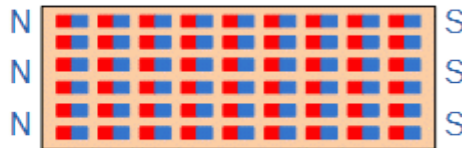
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Magnetic Materials



Loose and Random Magnetic Domains



Effect of Magnetization Domains Lined-up in Series

# Magnetisation- Соронзжуулах

‘Stroking’ a magnetic material several times in the same direction with one pole of a magnet will also cause it to become magnetised.

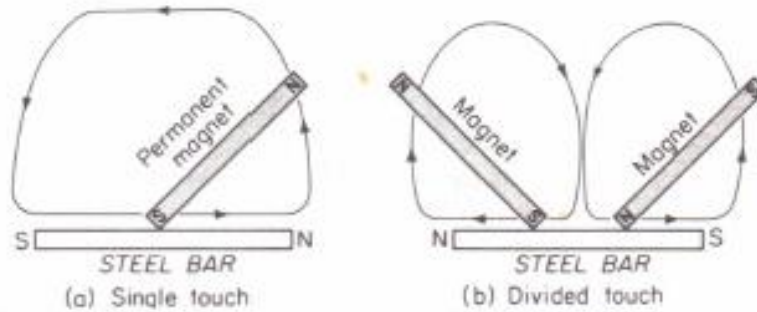
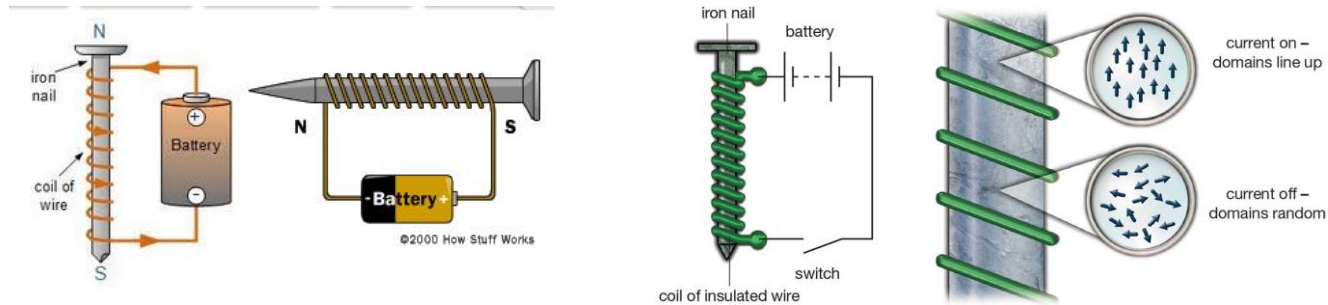
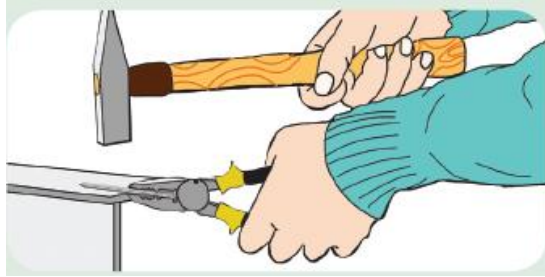


Fig. 30.6. Older methods of making magnets

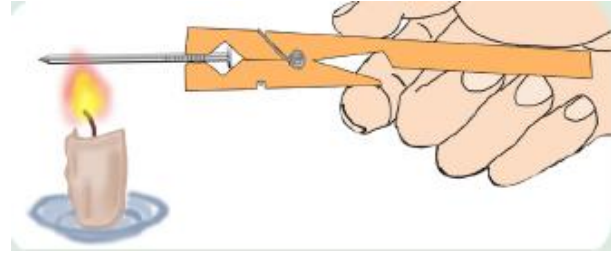


# Demagnetisation

1. By rough handling



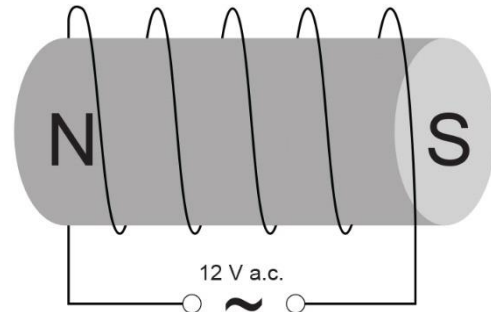
2. By heating



3. By Induction



4. By passing electricity



# Magnetic fields

The space surrounding a magnet where it produces a magnetic force is called a magnetic field.

A magnetic field is invisible

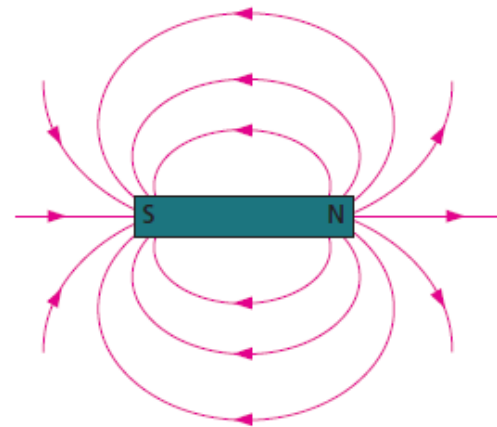
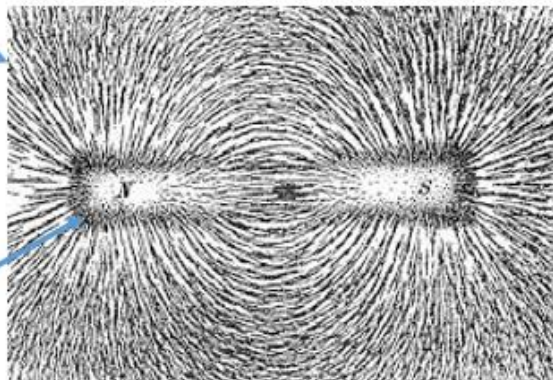
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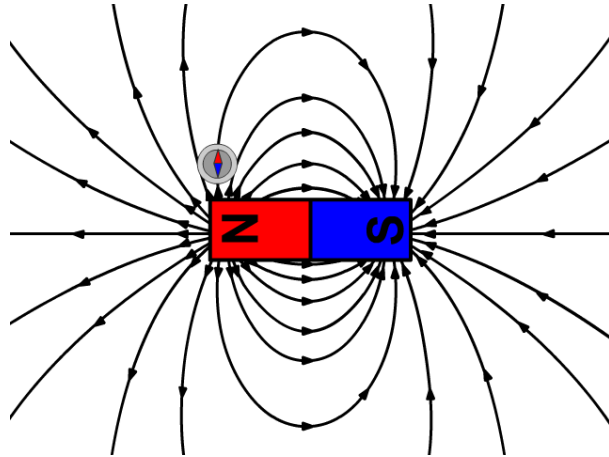
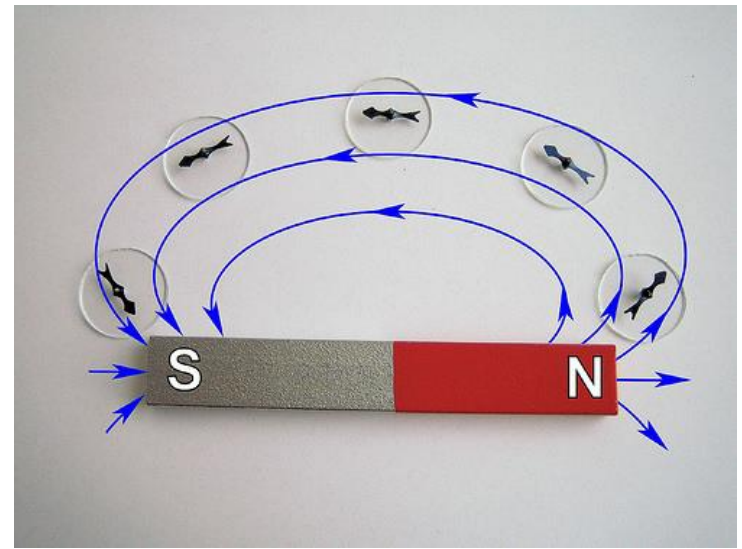
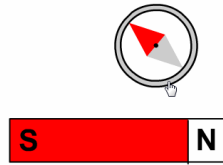
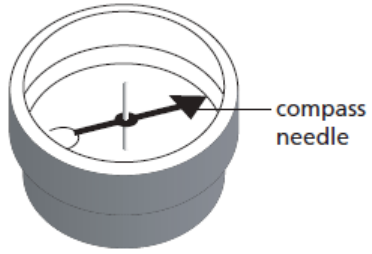
# Magnetic fields

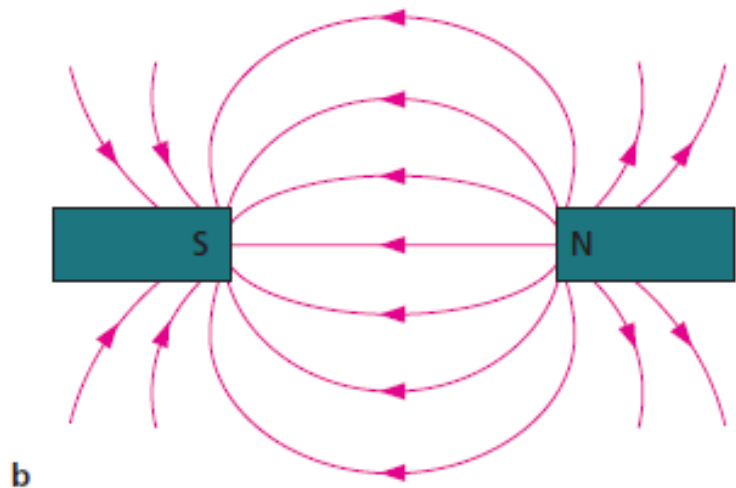
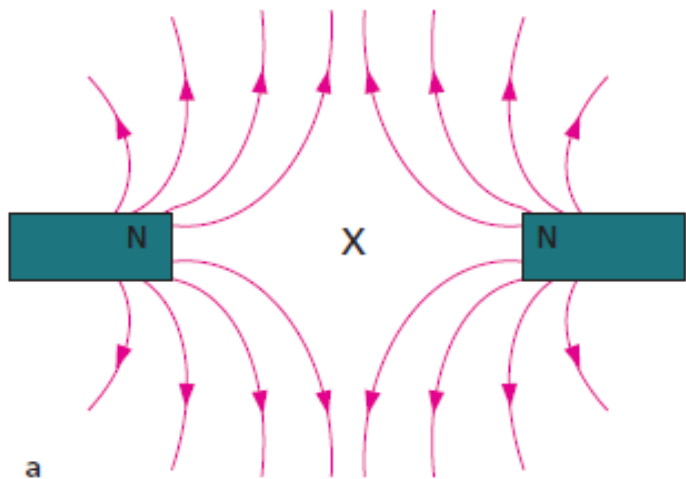
Төмрийн үртсүүд хоёр туйлын хооронд тодорхой дүрс үүсгэн байрлана.

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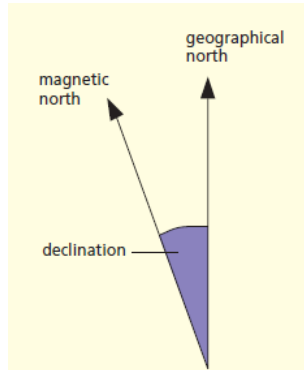
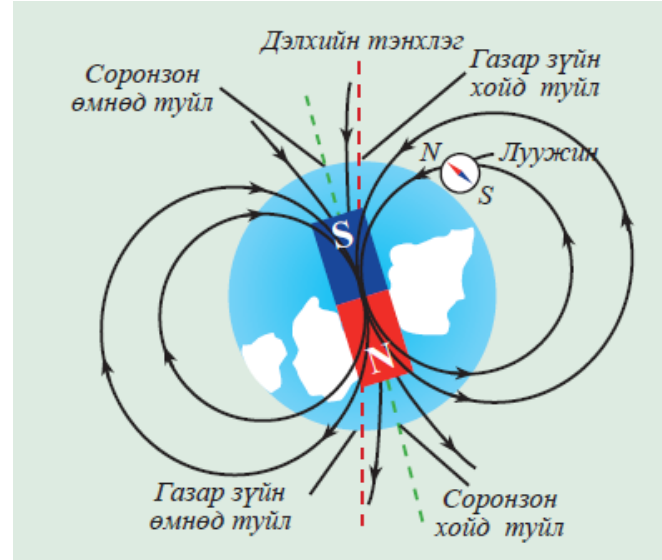
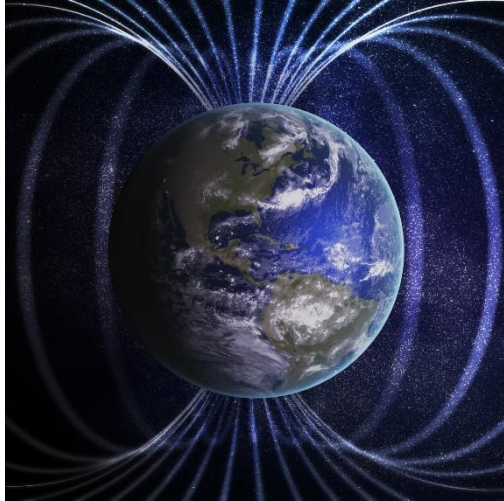
# Magnetic fields





The combined field due to two neighbouring magnets can also be plotted to give patterns like those in Figures 34.5a, b. In part a, where two like poles are facing each other, the point X is called a **neutral point**. At X the field due to one magnet cancels out that due to the other and there are no lines of force.

# Earth's magnetic field



Page 128 уншиж тэмдэглэх



# Example

A student suggests three methods for demagnetising a piece of steel.

- 1 placing it in an east-west direction and hammering it hard
- 2 placing it in an east-west direction and heating it until red hot
- 3 removing it slowly from a coil carrying alternating current

Which of the methods will demagnetise the piece of steel?

**A** 1 only

**B** 2 only

**C** 3 only

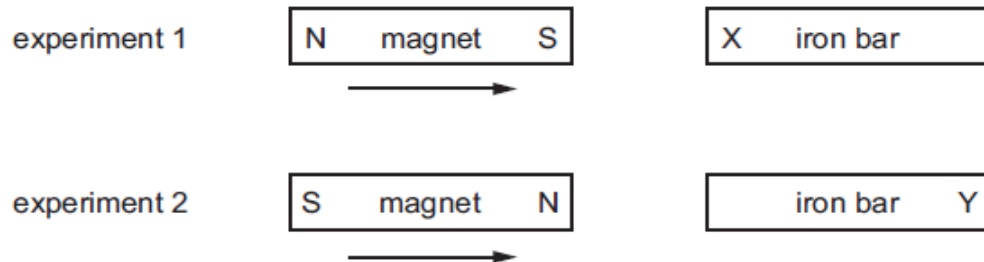


**D** 1, 2 and 3



# Example

In two separate experiments, a magnet is brought near to an unmagnetised iron bar. This causes the bar to become magnetised.



Which magnetic pole is induced at X and at Y?

|          | pole induced at X | pole induced at Y |
|----------|-------------------|-------------------|
| <b>A</b> | N                 | N                 |
| <b>B</b> | N                 | S                 |
| <b>C</b> | S                 | N                 |
| <b>D</b> | S                 | S                 |



- ❖ Page 149 Questions 1-2
- ❖ Paper 34

