LECTURE 32 Magnetic Fields 2

By the end of this lecture:

- Know the formula for the magnetic field strength due to a solenoid and be able to perform calculations using that formula

- Have an understanding of the form of the Earth's magnetic field and understand that this field resolves into two components

- Understand the principles behind the *mass spectrometer* and be able to perform calculations which demonstrate that understanding

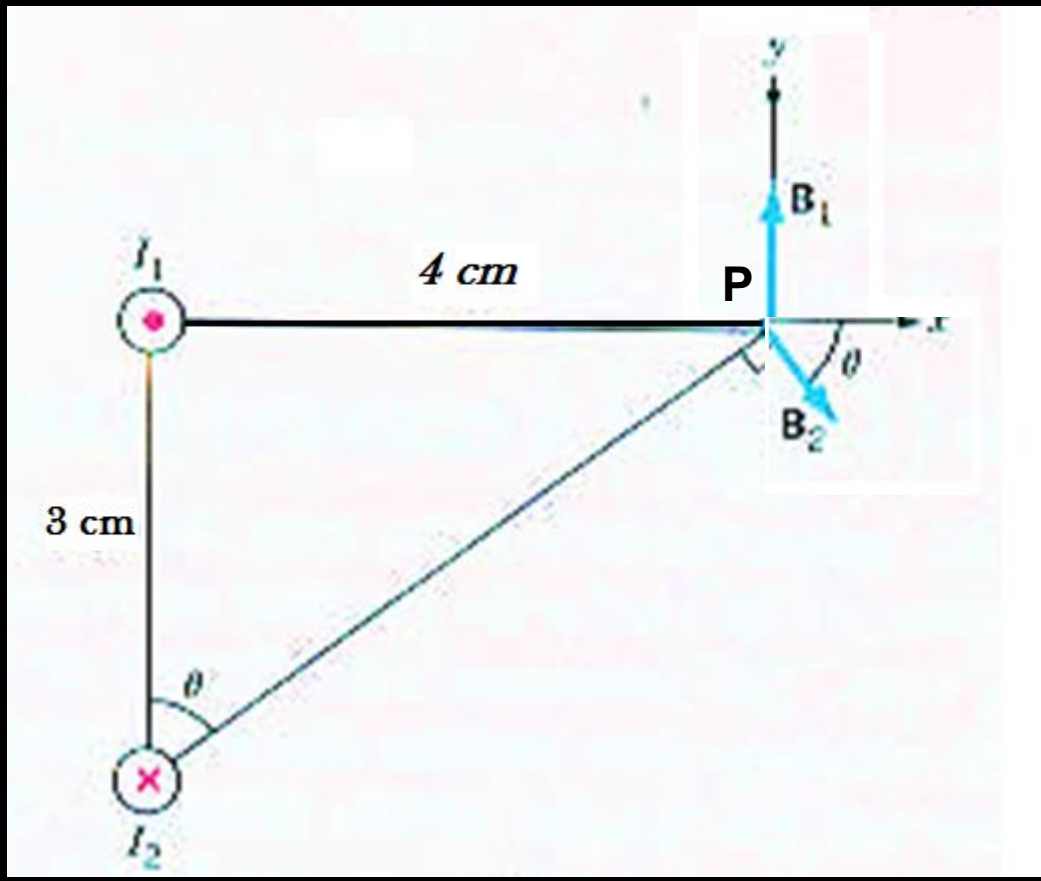
- Understand the workings of the *Cathode Ray Oscilloscope (CRO)*
- Appreciate that a television works on the same principles as a CRO

Example 4

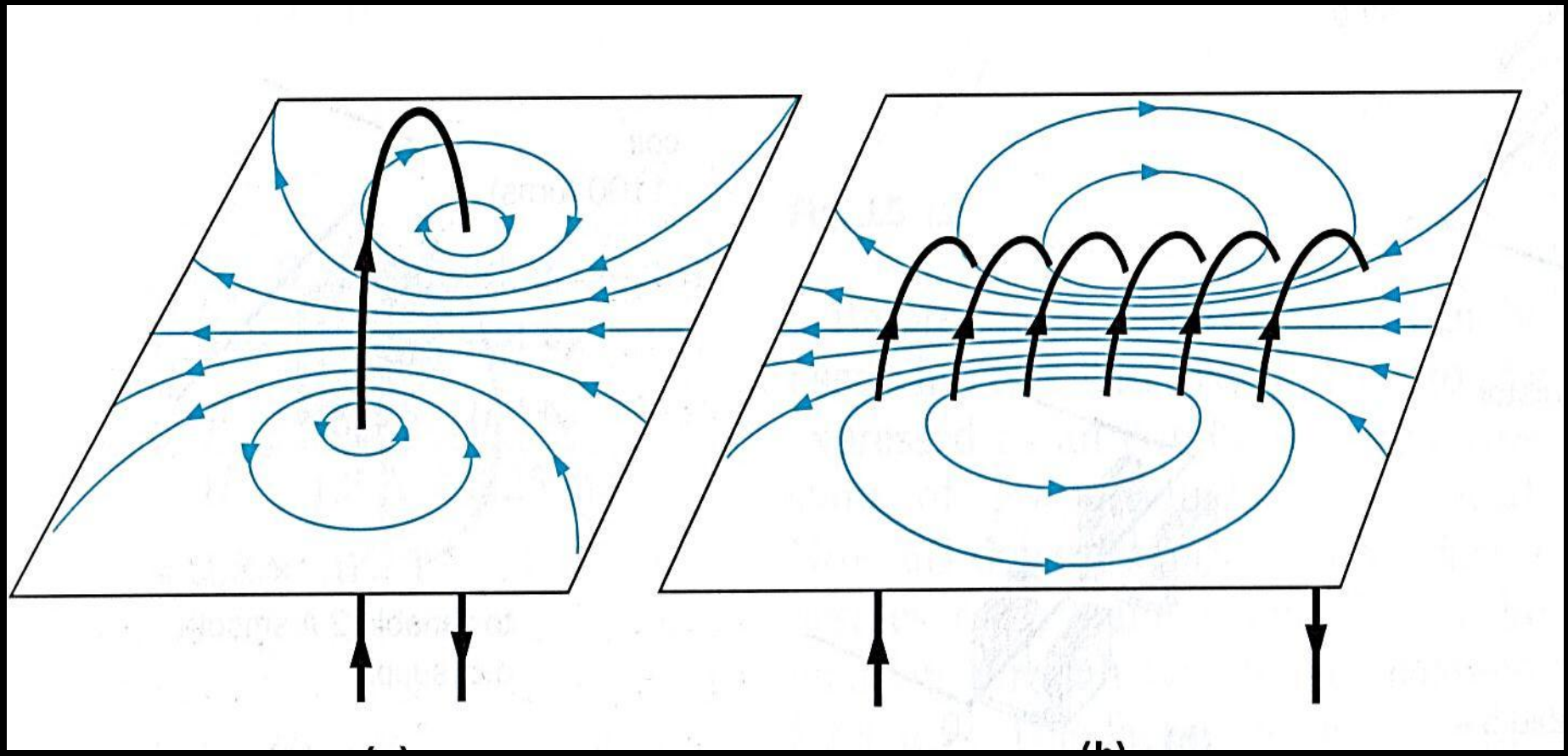
Two long, straight, parallel wires are 3.00 cm apart. I_1 = 3.00 A and I_2 = 5.00 A in opposite directions.

(a) Find B field strength at point P

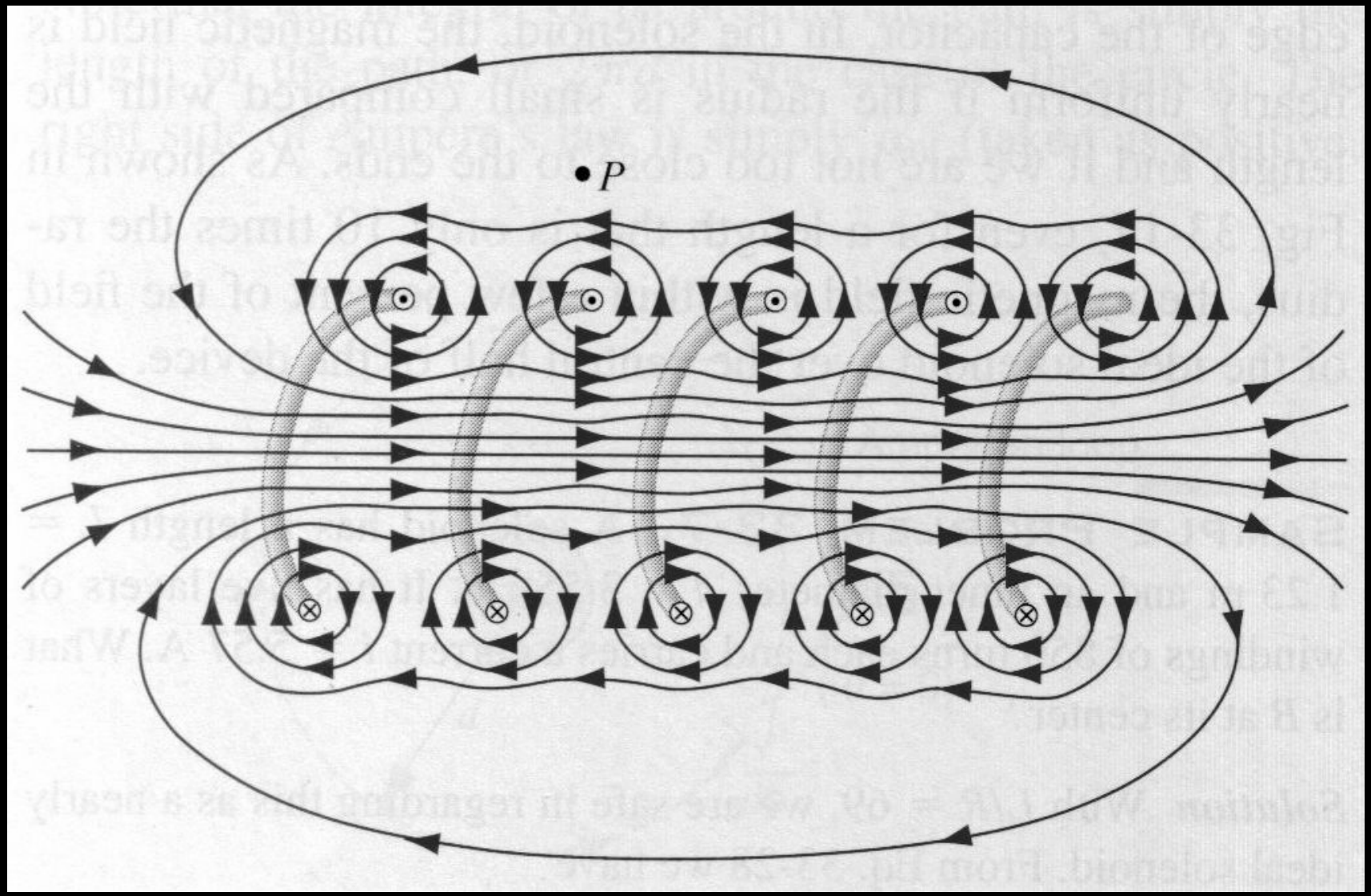
(b) At what point, besides infinity, is the B field strength zero?



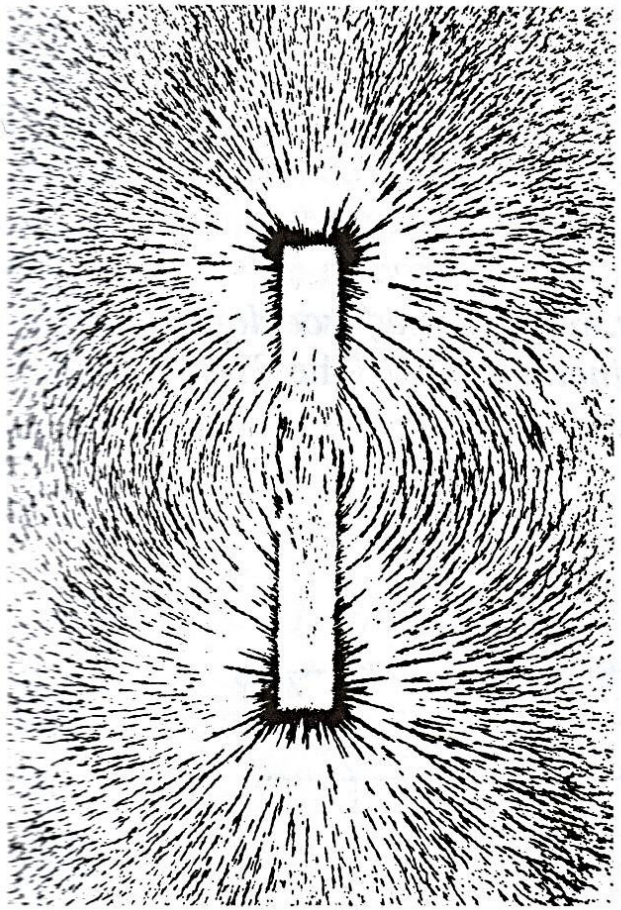
Fields due to coil and solenoid



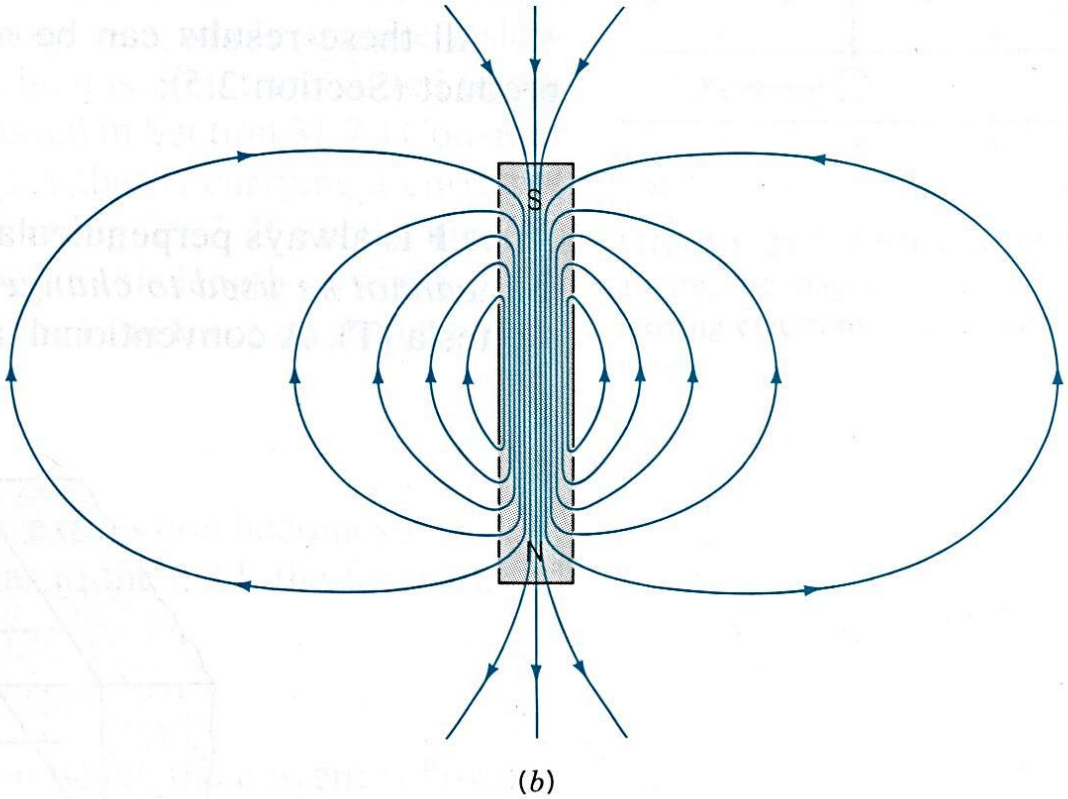
Field due to wires in solenoid



Magnetic fields due to permanent magnet

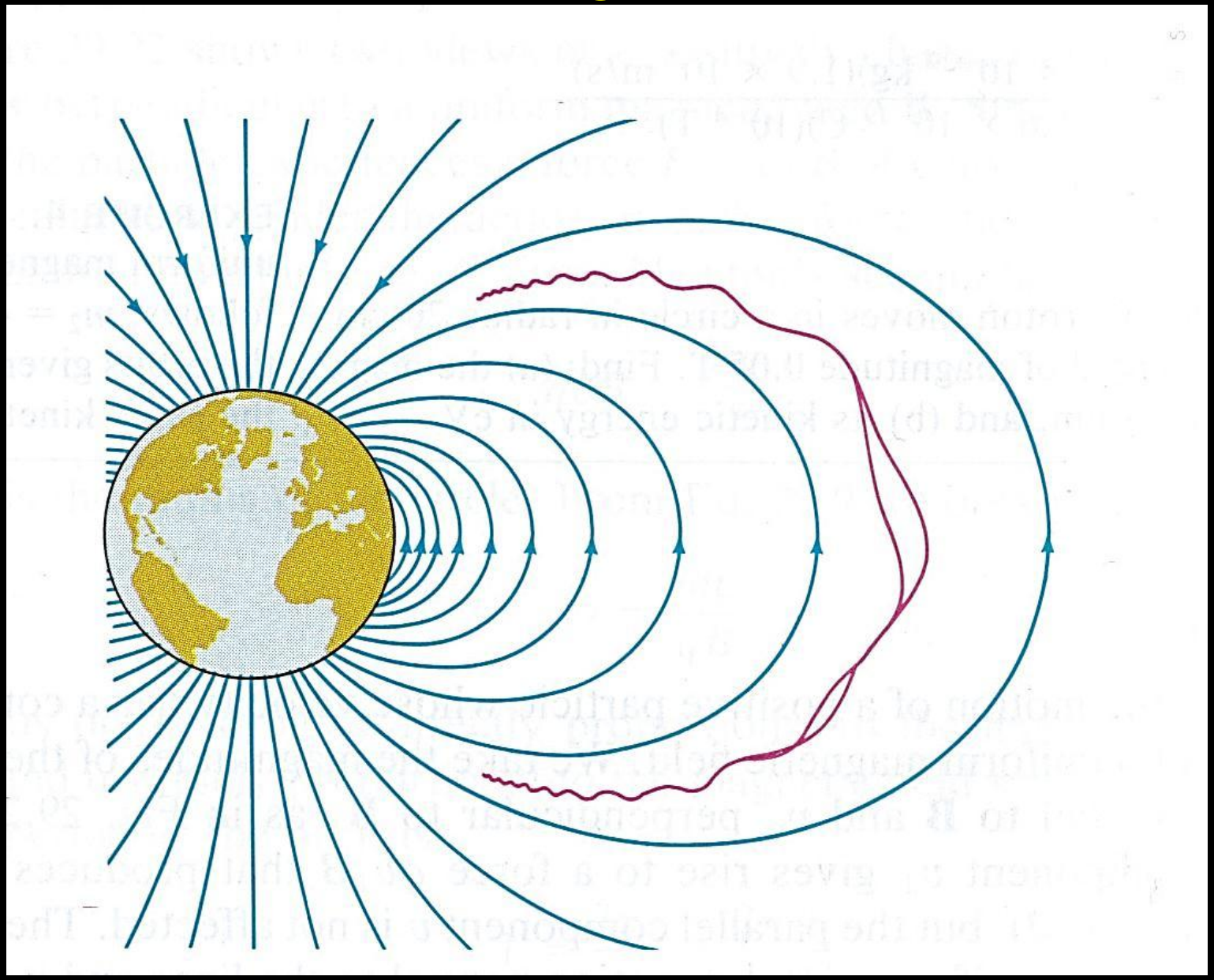


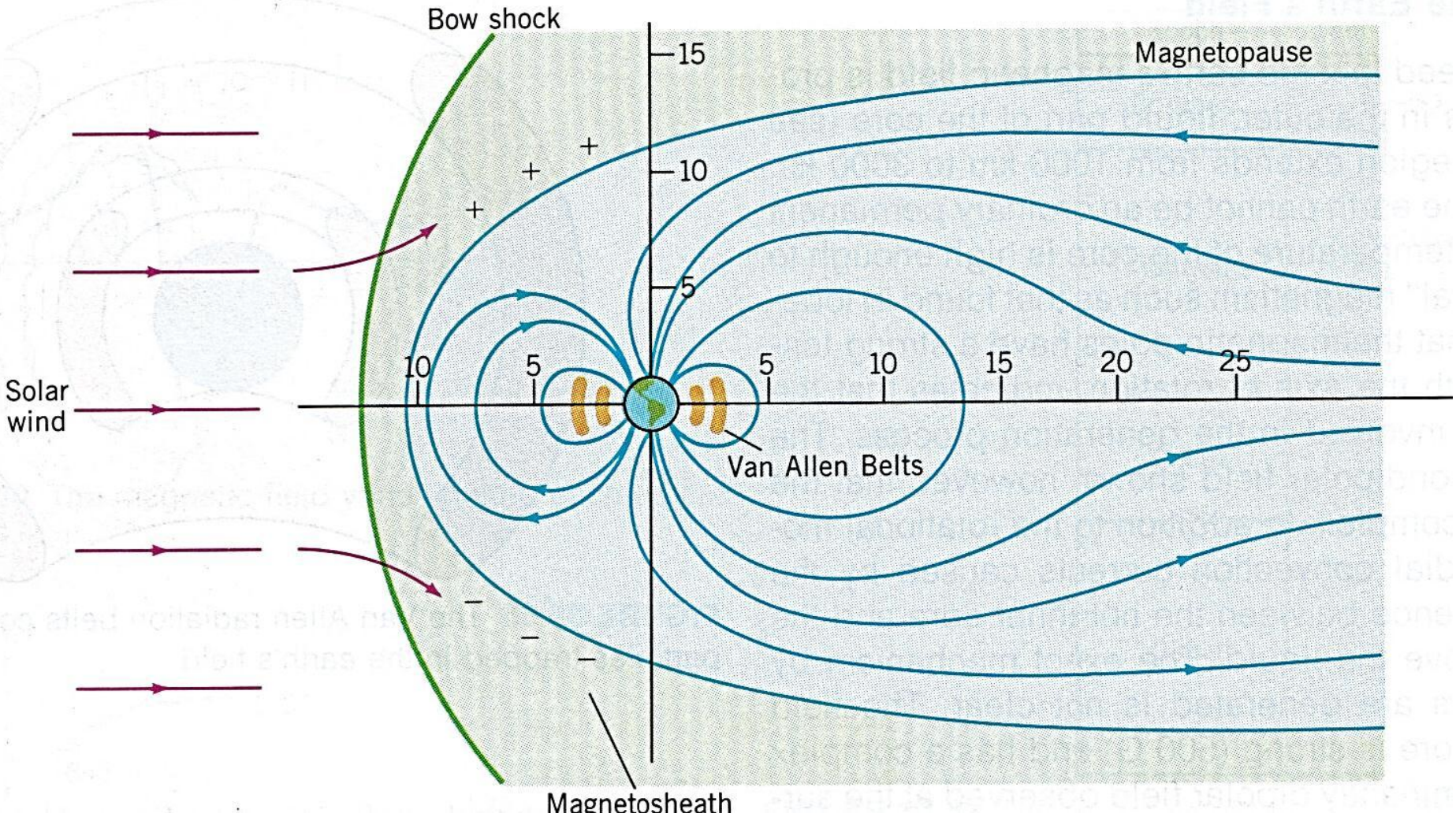
Iron filings scattered near short bar magnet



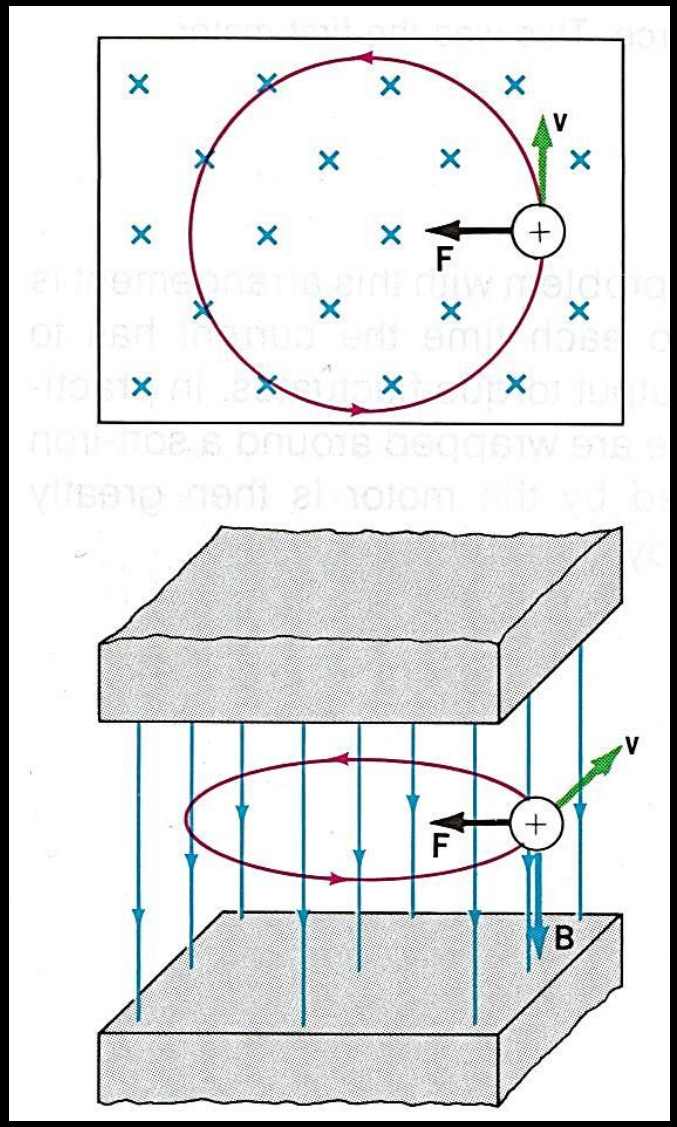
Field lines due to solenoid (long coil of wire carrying current)

Earth's magnetic field



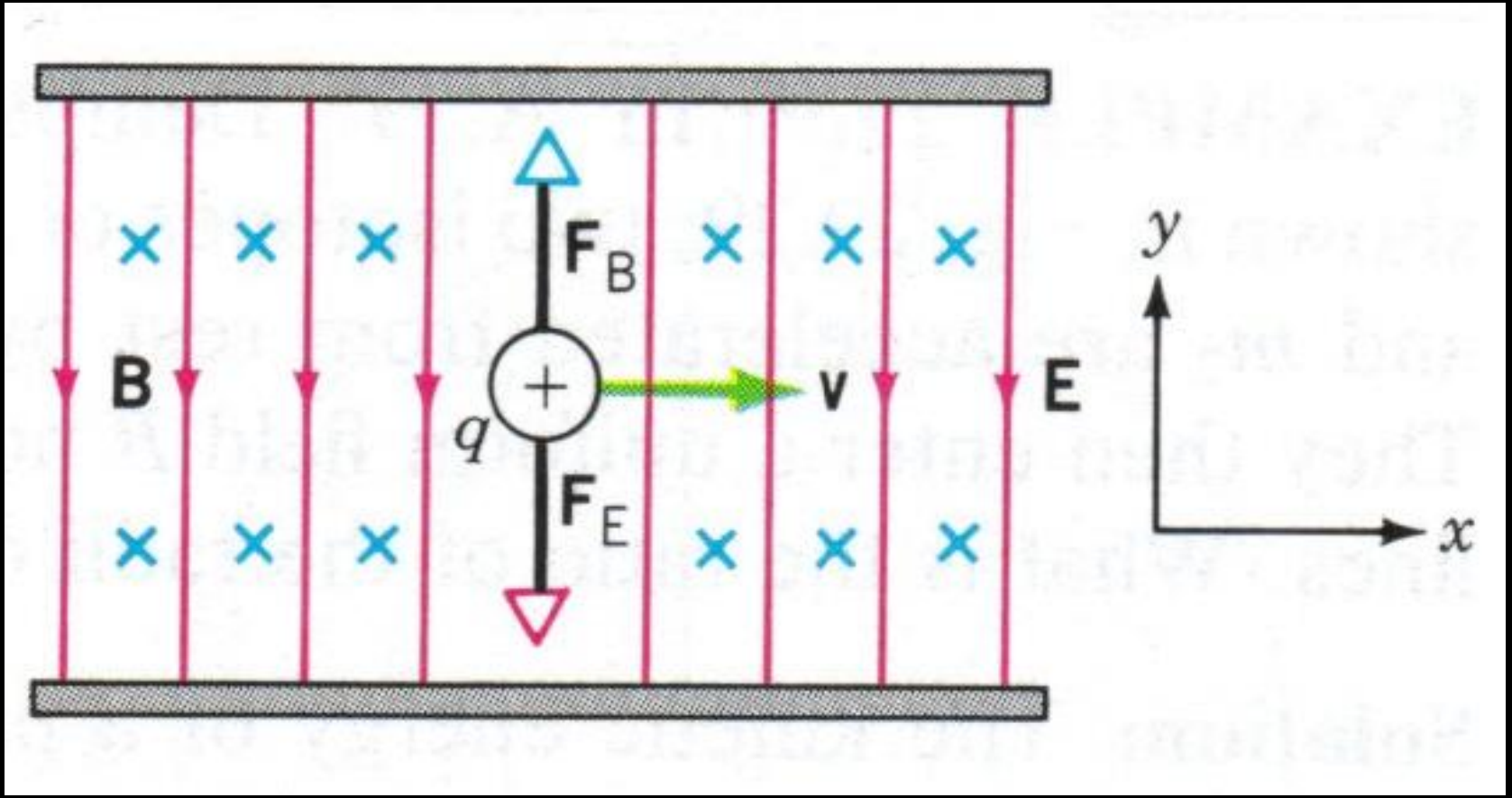

Bow shock
Magnetopause
15
10
5
10
5
5
10
15
20
25
Solar wind
Van Allen Belts
Magnetosheath

Circular Path of charge moving perpendicularly to B field

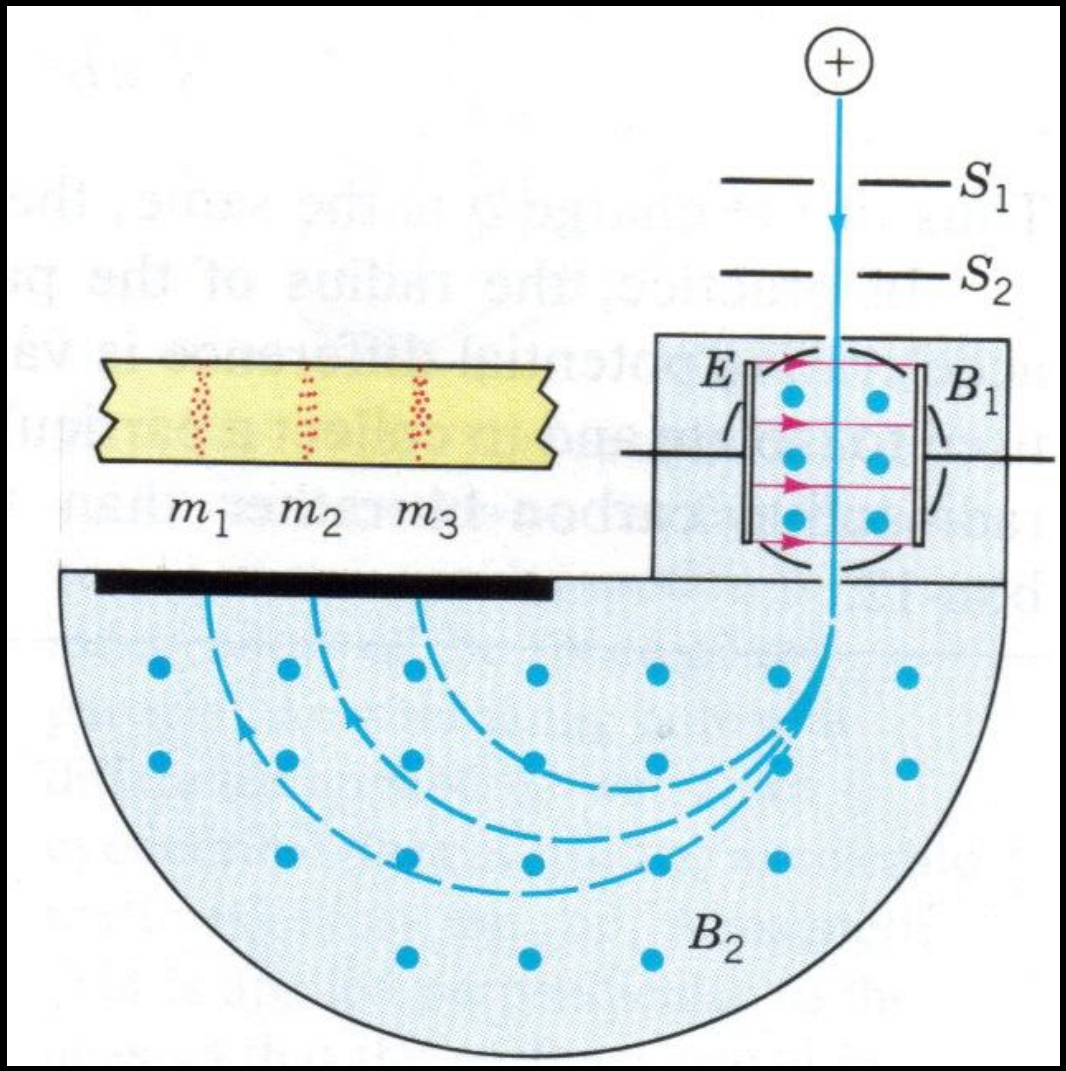


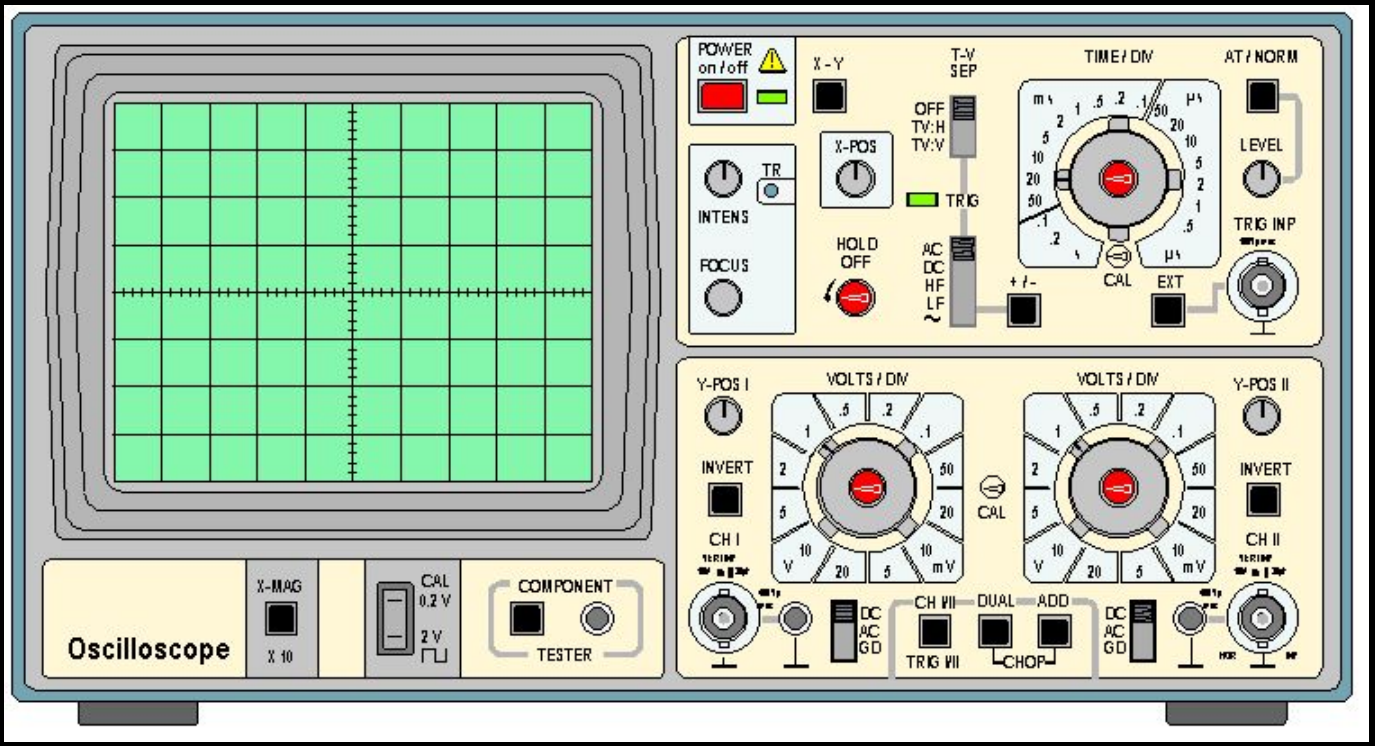
Therefore:

Velocity selector

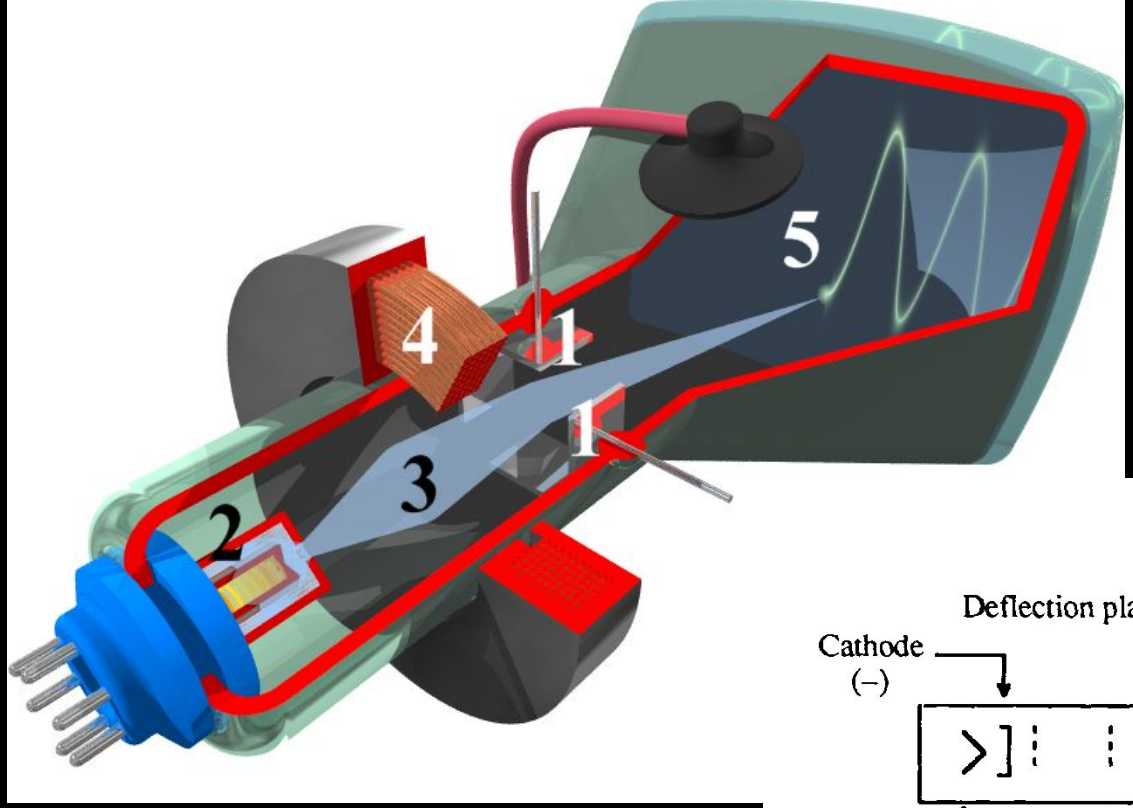


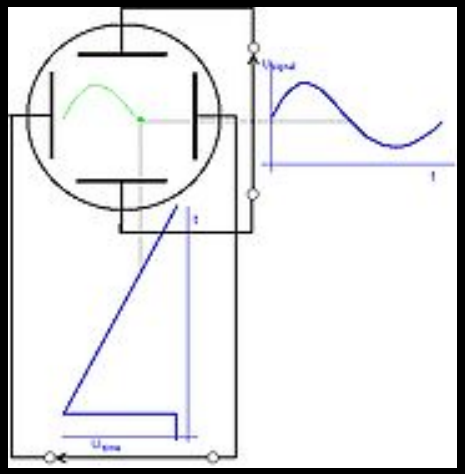
Mass spectrometer





Cathode Ray Oscilloscope





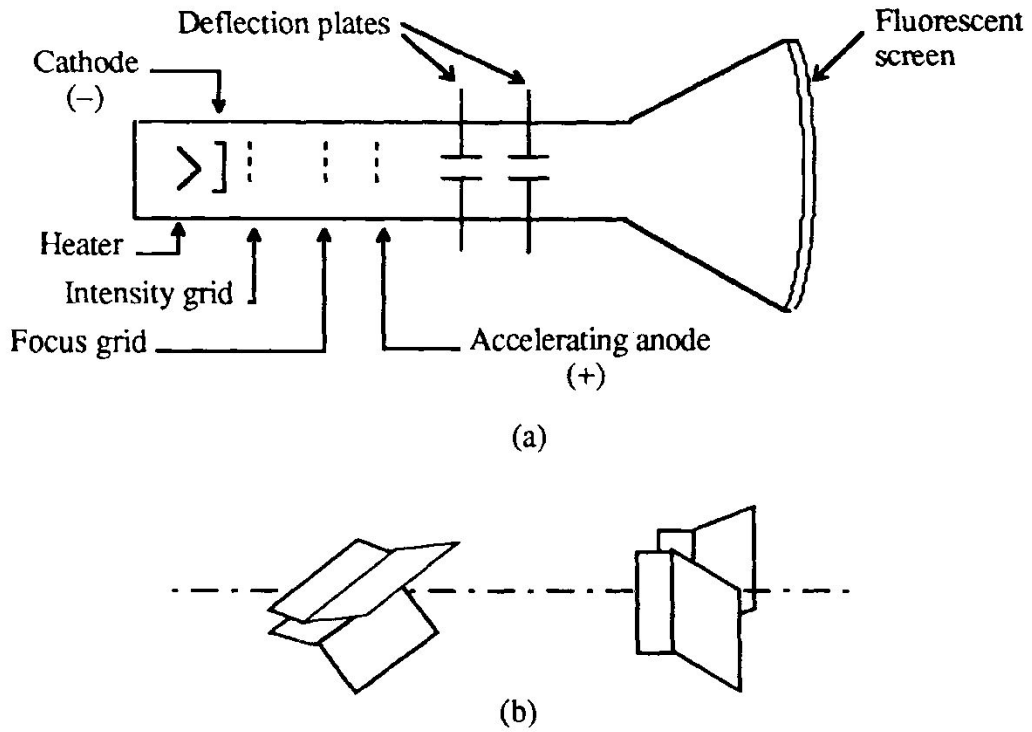
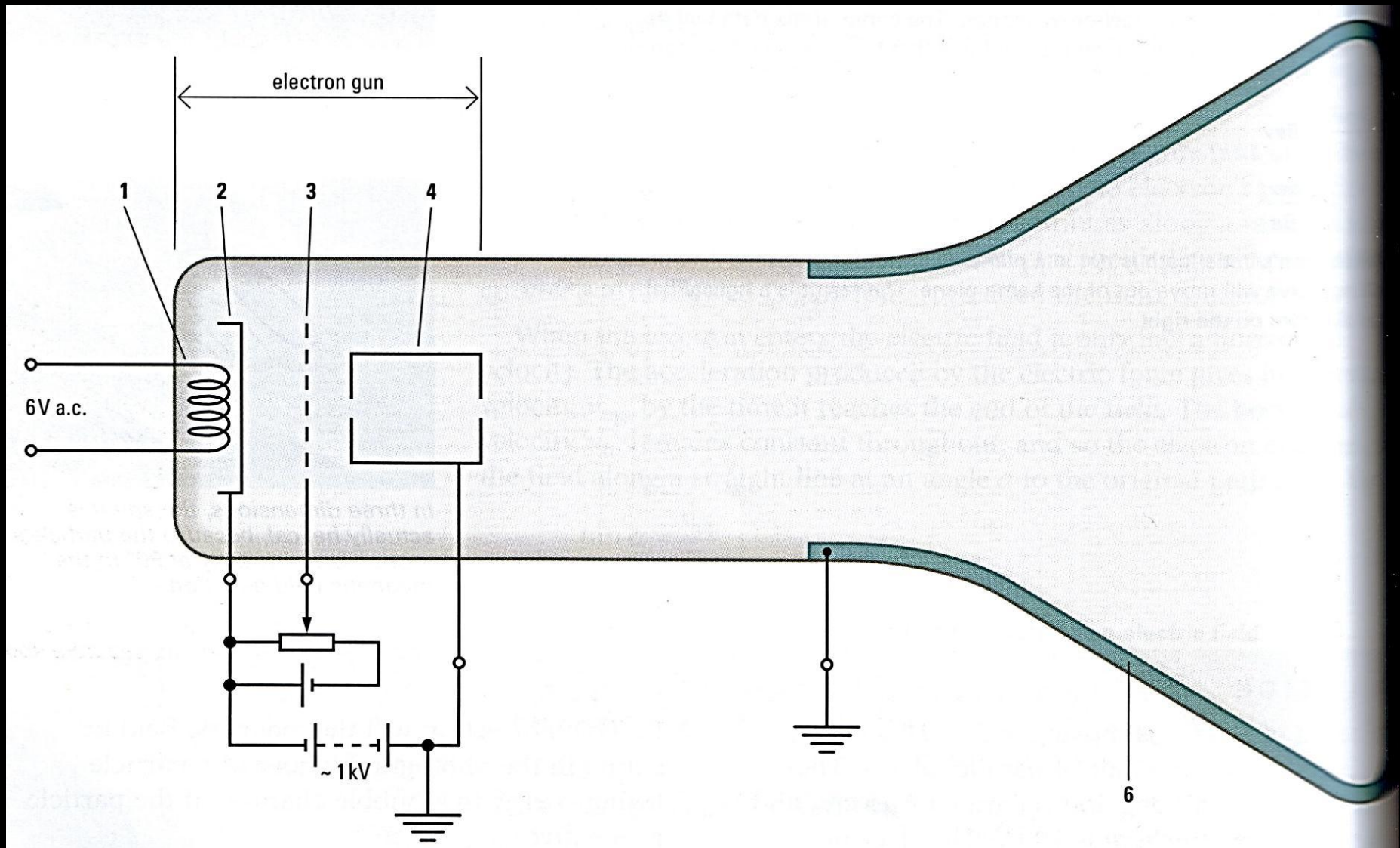


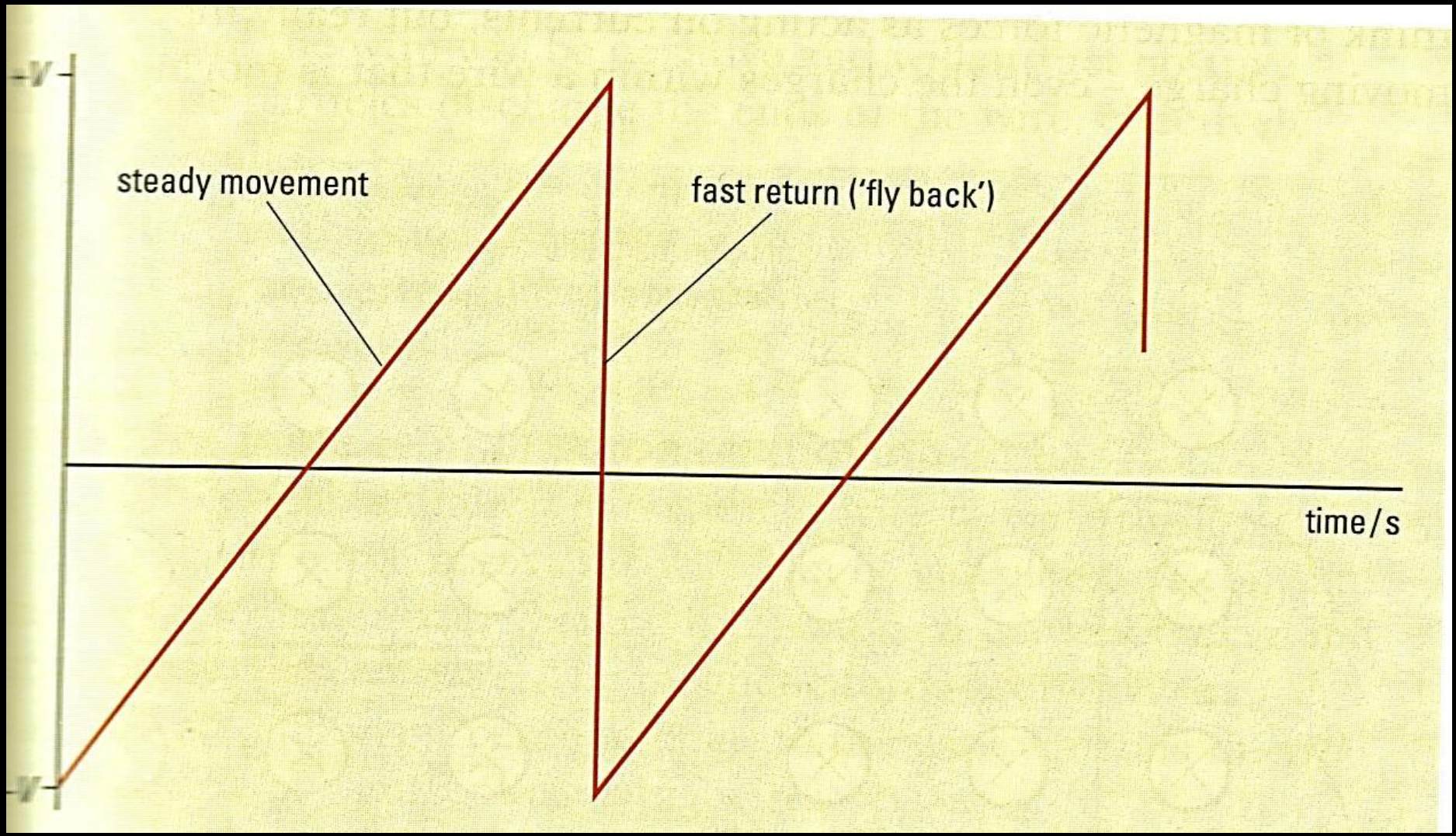
Figure 1. Cathode-ray tube: (a) schematic, (b) detail of the deflection plates.

Cathode Ray Oscilloscope



A cross-sectional diagram of a typical cathode-ray tube.

Time-base voltage



LECTURE CHECK LIST

LECTURE 32 Magnetic Fields

READING Adams and Allday: 5.14, 5.15, 5.16, 5.19, 5.20, 8.3, 10.16

Serway: 19.5 – 19.8

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