NAME: .....

CATHODE RAYS

1. State one way of producing a beam of electrons and define the phenomenon.

[2m]

2. (ii) What are Cathode rays?

[1m]

(ii) Give three properties of these rays.

(a)
.....

(b)
.....

(c)
.....[3m]
[Total 4m]

3. A thin metal filament J and a metal plate K are sealed inside an evacuated

glass vessel. The electrical connections pass through the glass to external components as shown in Fig. 11.1.

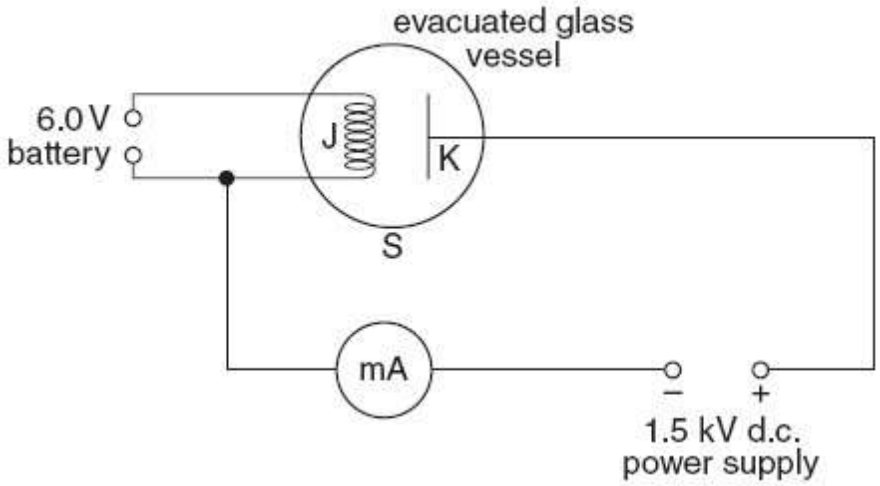

Fig. 11.1

(a) A 6.0 V battery is connected to J and the filament becomes white hot. The current from the battery is 1.6 A. Calculate the power supplied by the battery.

[2]

(b) A milliammeter and a 1.5 kV d.c. power supply are connected in series between K and J. The positive terminal of the power supply is connected to K.

(i) The milliammeter registers a small current. Explain the presence of a current in this circuit despite the gap between J and K.

(ii) State why the glass vessel must be evacuated.

[1]

(iii) One pole of a bar magnet is brought close to the side S of the glass vessel and the current registered by the milliammeter decreases. Explain why this happens.

[2]

(iv) The terminals of the 1.5 kV d.c. power supply are reversed. Explain how this affects the current in the milliammeter.

[2]

(c) Fig. 11.2 shows two terminals M and N of a potential divider

(potentiometer) connected to a 6.0 V battery. N is also connected to one of the two Y-input terminals of a cathode-ray oscilloscope. The other Y-input

terminal is connected to the sliding contact of the potential divider (potentiometer).

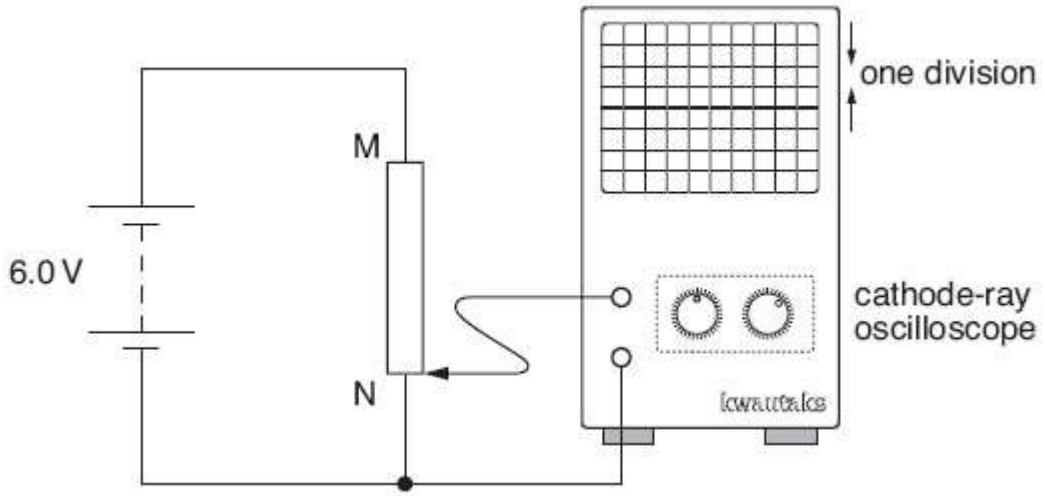

Fig. 11.2

The sliding contact is at N and the trace on the oscilloscope is a horizontal line passing through the centre of the screen.

(i) The timebase setting is 1.0 ms / div. Explain why the trace is a horizontal line.

[1]

(ii) The Y-gain setting is 2.0 V / div. The sliding contact is moved at a slow, uniform rate from N to M. Describe in detail what happens to the trace on the screen.

(iii) The Y-gain setting is now changed to 1.0 V / div and the trace disappears from the screen.
State why this happens.

[1]

4. Fig. 7.1 shows a simple version of an electron-beam tube.

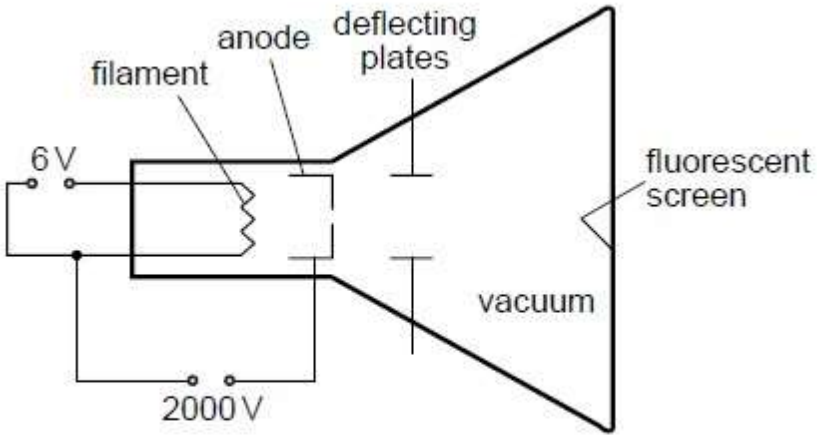

Fig. 7.1

The filament is connected to a 6 V power supply and there is a potential difference of 2000 V between the filament and the anode. As the electron beam hits the fluorescent screen, a spot of light appears on the screen.
(a) Explain why
(i) Electrons are emitted from the filament,

(iii) A vacuum is needed in the tube.

[3]

(b) An alternating potential difference of very low frequency is applied across the deflecting plates in Fig. 7.1. The spot of light on the screen is seen to move. Describe and explain the movement of the spot.

[2]

Total [5]