

- 7 Fig. 7.1 shows what is observed when a parallel beam of electrons, accelerated by a potential difference  $V$ , is incident on a fluorescent screen.



Fig. 7.1

A carbon film is then placed perpendicularly to the path of the electron beam as shown in Fig. 7.2.

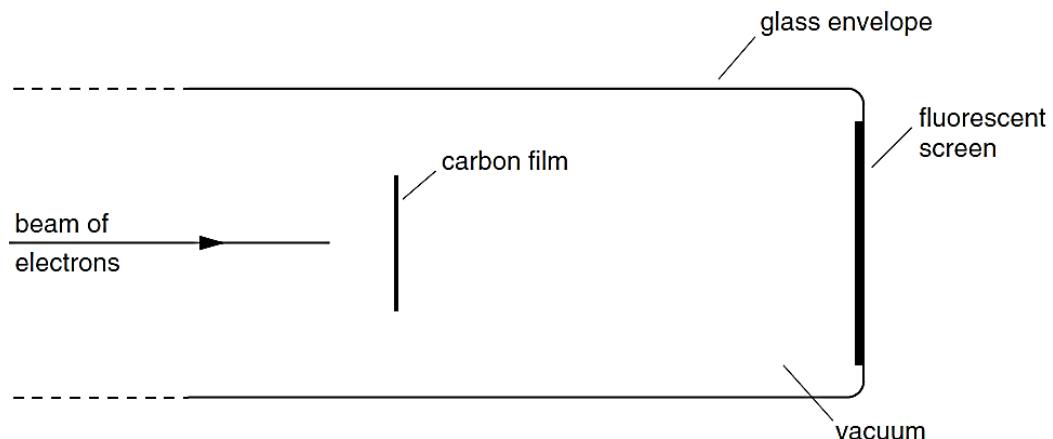
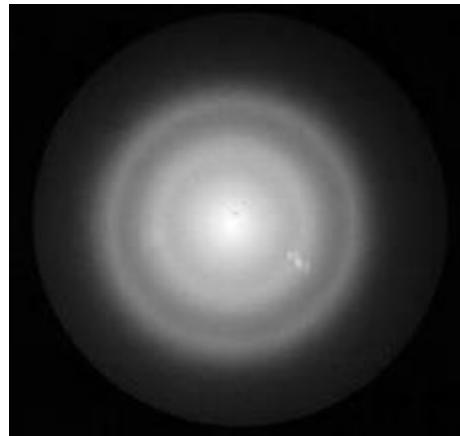


Fig. 7.2

The pattern observed on the screen is shown in Fig. 7.3.



**Fig. 7.3**

- (a) Identify and explain two key features in Fig. 7.3 that provide evidence for the wave nature of the electrons.

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[3]

- (b)** The electrons were accelerated through a potential difference of 2000 V.

**(i)** Calculate the momentum of an electron after being accelerated through a potential difference of 2000 V.

momentum = ..... N s [2]

- (ii) Hence, calculate the de Broglie wavelength of the electrons.

wavelength = ..... m [2]

**(c)** State and explain the changes, if any, that is observed in the pattern on the screen when the following changes are made separately.

**(i)** The potential difference used to accelerate the electrons is increased.

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[2]

**(ii)** The current of the electron beam is increased.

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[2]

[Total: 11]

### **Section B**

Answer **one** question from this section in the spaces provided.