

## Electron Diffraction

### Apparatus Required :

- (i) Electron diffraction tube with stand
- (ii) High voltage power supply (up to 10KV)
- (iii) Connecting wires
- (iv) Plastic measuring scale

### Objective :

To calculate the interplanar spacing in graphite from the diffraction pattern.

### Basic Information :

In this experiment electrons get transmitted through a very thin polycrystalline graphite sheet.

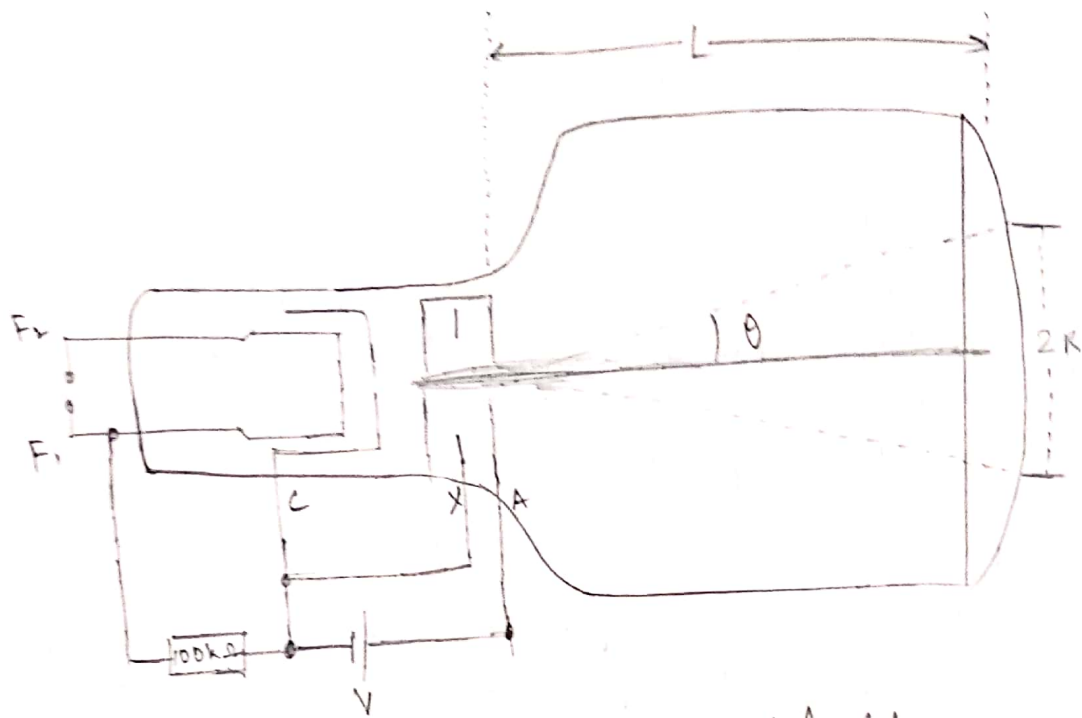
Applying diffraction formula for first order,

$$\lambda = d \sin \theta$$

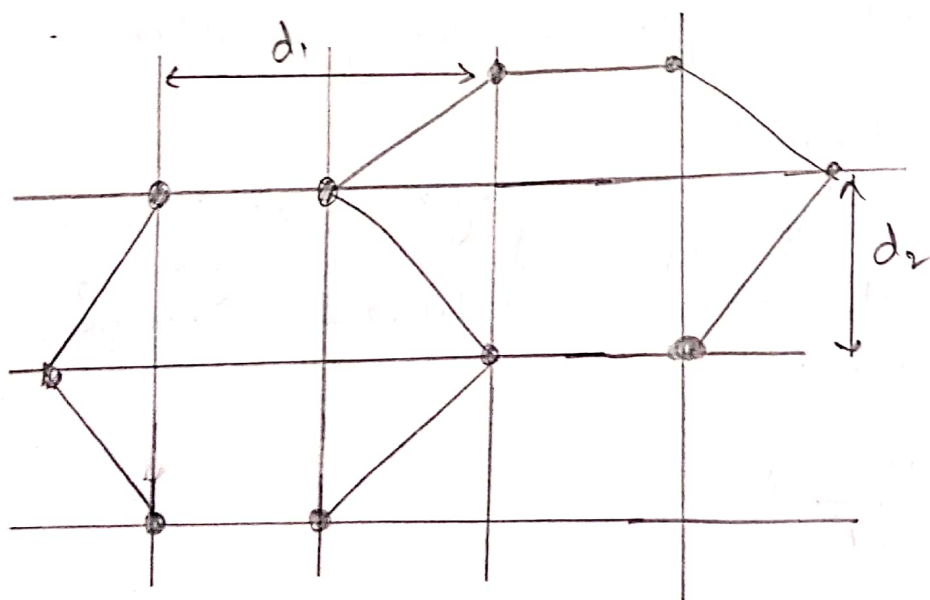
where  $\lambda$  is de Broglie wavelength of electron,  $d$  is interplanar spacing and  $\theta$  is angle of diffraction. Electrons are accelerated through a p.d of 'V' volts.

$$\lambda = \frac{12.3}{\sqrt{V}} \text{ \AA}$$

Teacher's Signature : .....



Sketch of Experimental Setup.



Independent types of lattice planes in graphite

Expt. No.

From

Line

La

(i) N

(ii) O

(iii) O

(iv) O

(v) O

(vi) O

(vii) O

(viii) O

(ix) O

(x) O

(xi) O

(xii) O

(xiii) O

(xiv) O

(xv) O

(xvi) O

(xvii) O

(xviii) O

(xix) O

(xx) O

(xxi) O

(xxii) O

(xxiii) O

(xxiv) O

(xxv) O

(xxvi) O

(xxvii) O

(xxviii) O

(xxix) O

(xxx) O

From geometry,

$$\sin \theta = \frac{R}{\sqrt{R^2 + L^2}} - ? \quad \text{length of tube} = 13.5 \text{ cm}$$

simplifying :

$$\sin \theta = \frac{1}{\left(1 + \left(\frac{13.5}{R}\right)^2\right)^{0.5}}$$

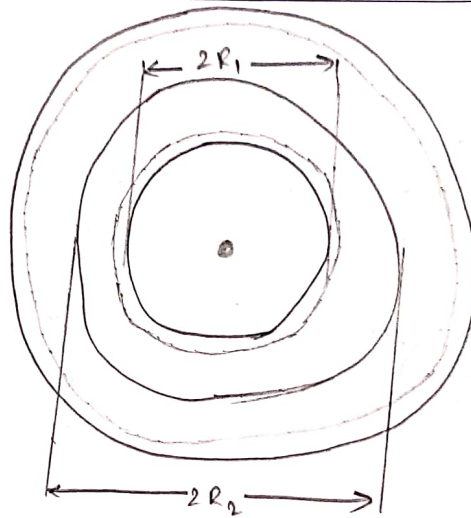
Safety guidelines :

- (i) Never accelerate beyond 5 kV
- (ii) Only use the "one-off" knob and varying voltage knob.

Expt. No.....

Date.....

Page No.....



Lattice rings produced and diameters ( $2R_1$  &  $2R_2$ )

Expt. No.

Tab

RING

Inn

Out

A

A

Re

Y



Expt. No.....

Date.....

Page No. 2

Tabular Column :

RING	V (kV)	$2R_1$ (or) $2R_2$ (cm)	$R_1$ (or) $R_2$ (cm)	$\lambda$ (Å)	$\sin \theta$	$d$ (Å)
Inner	4.0	2.5	1.25	0.194	0.092	2.108
	4.5	2.4	1.2	0.183	0.088	2.079
	5.0	2.2	1.1	0.173	0.081	2.135
Outer	4.0	4.5	2.25	0.194	0.164	1.182
	4.5	4.1	2.05	0.183	0.150	1.220
	5.0	4	2	0.173	0.146	1.184

Average 'd' for inner ring =  $2.107 \text{ Å}$ Average 'd' for outer ring =  $1.195 \text{ Å}$ 

Result :

The interplanar spacing in graphite were measured as  $d_1 = 2.107 \text{ nm}$  and  $d_2 = 1.195 \text{ nm}$

Teacher's Signature : .....