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PH-222-2A

## RECITATION #2

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Ans- The Chlorine ion has a negative charge  $-e$ .

The Oxygen ion has a negative charge  $-2e$ .

The ~~the~~ carbon ion has a positive charge  $+3e$ .

The distance between the Oxygen ions and the carbon ion is  $3.0 \times 10^{-11} \text{ m}$ .

$O^{-e}$

$O$   
 $-2e$

$O$   
 $3e$

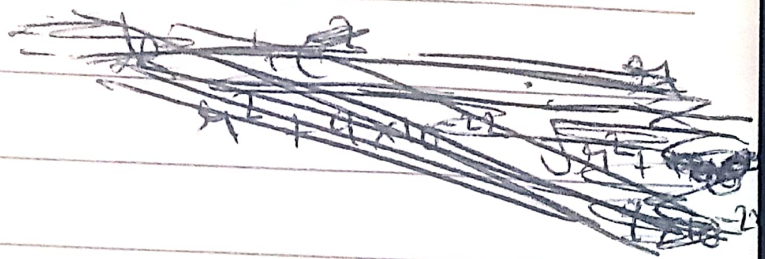
$O$   
 $-2e$

$\therefore$  The force due to  $-2e$  over  $-e$  is

directed upwards and the force due to  $3e$  is directed downwards.

$$F(-e, 3e) = k \frac{3e^2}{r^2}$$

$$F(-e, -2e)_y = 2 F(-e, -2e) \cos \theta$$



$$= k \frac{4e^2}{r^2 + 9 \times 10^{-22}} \cdot \frac{r}{\sqrt{r^2 + 9 \times 10^{-22}}}$$

Both forces would be equal, then:

$$k \frac{3e^2}{r^2} = k \frac{4e^2}{r^2 + 9 \times 10^{-22}} \cdot \frac{r}{\sqrt{r^2 + 9 \times 10^{-22}}}$$

$$= 3 (r^2 + 9 \times 10^{-22})^{3/2} = 4 r^3$$

Squaring both members we have:

$$9 (r^2 + 9 \times 10^{-22})^3 = 16 r^6$$

$$\Rightarrow 9(r^6 + 2.7 \times 10^{-22} r^4 + 81 \times 10^{-44} r^2 + 7.29 \times 10^{-63}) = 16 r^6$$

$$\Rightarrow -7r^6 + 2.43 \times 10^{-20} r^4 + 7.29 \times 10^{-42} r^2 + 6.96 \times 10^{-63} = 0$$

~~making~~ Making  $r^2 = z$ , we can write

$$-7z^3 + 2.43 \times 10^{-20} z^2 + 7.29 \times 10^{-42} z + 6.96 \times 10^{-63} = 0$$

Solving for  $z$ :-

$$z = 3.914 \times 10^{-22} \text{ m}^2$$

$\therefore$  The distance  $r$  is  $\sqrt{3.914 \times 10^{-22} \text{ m}^2}$

$$r = \underline{\underline{1.978 \times 10^{-11} \text{ m}}}$$