

# Coulomb's Law $r=1$

1.  $F = 0.080 \text{ N} \times 2$  bec  $F$  depends <sup>directly</sup> on  $q_1$  &  $q_2$

$F \propto q_1 q_2$   
Ans.  $0.160 \text{ N}$   
 $2F$

if  $q_1 = 1\text{C}$  &  $q_2 = 1\text{C}$   
then  $F \propto 1 \cdot 1 = 1$   
so if  $q_1 = 2\text{C}$  &  $q_2 = 1\text{C}$   
then  $F \propto 2 \cdot 1 = 2$   
it doubles

2.  $F = 0.080 \text{ N}$   $F \propto q_1 q_2$   $F \propto 1 \times 1 = 1$

Ans.  $0.32 \text{ N}$

$F \propto 2 \times 2 = 4 = \text{Ans.}$

3.  $F = 0.080 \text{ N}$   $F \propto \frac{1}{r^2}$  if  $r=1$   
then  $F \propto \frac{1}{1^2} = 1$

$0.25 \times 0.080 \text{ N} = 0.02 \text{ N}$   $\text{ANS}$  if  $r=2$   
then  $F \propto \frac{1}{2^2} = \frac{1}{4} \times$

4.  $F \propto \frac{1}{3^2} = \frac{1}{9} \times 0.080 \text{ N} = 0.0089 \text{ N}$  Ans

5.  $F \propto \frac{1}{4^2} = \frac{1}{16} \times 0.080 \text{ N} = 0.0050 \text{ N}$  Ans

6.  $F \propto \frac{1}{(\frac{1}{2})^2} \propto \frac{1}{\frac{1}{4}} = 1 \times \frac{4}{1} = 4 \times 0.080 \text{ N} = 0.32 \text{ N}$  Ans

7.  $F \propto \frac{(1)(2)}{(2)^2} = \frac{2}{4} = \frac{1}{2} \times 0.080 \text{ N} = 0.040 \text{ N} = F$

$$8. \quad F \propto \frac{(2)(2)}{(2)^2} = \frac{4}{4} = 1 \quad \text{same } F!$$

$$9. \quad F \propto \frac{(1)(4)}{(2)^2} = \frac{4}{4} = 1 \quad \text{same } F!$$

$$10. \quad F \propto \frac{(1)(3)}{(3)^2} = \frac{3}{9} = \frac{1}{3} \times 0.080 \text{ N} = 0.027 \text{ N}$$

$$11. \quad F = \frac{k q_1 q_2}{r^2} = \frac{9 \times 10^9 \frac{\text{N m}^2}{\text{C}^2} \cdot (4.0 \times 10^{-5} \text{ C})^2}{(0.10 \text{ m})^2}$$

$$F = 1440 \text{ N}$$

$$12. \quad F = \frac{k q_1 q_2}{r^2} = \frac{9 \times 10^9 \frac{\text{N m}^2}{\text{C}^2} \cdot (-2.6 \times 10^{-6} \text{ C})(+3.8 \times 10^{-6} \text{ C})}{(0.75 \text{ m})^2}$$

$$F = 0.158 \text{ N}$$

$$13. \quad F = -0.492 \text{ N} \quad \text{att } \therefore 1 \text{ is POS \& } 1 \text{ is NEG!}$$

$$\frac{r^2}{k} F = \frac{k q_1 q_2}{k r^2} \cdot r^2 \quad \text{equally charged } q_1 = q_2$$

$$\therefore q_1 q_2 = q^2$$

$$\frac{F r^2}{k} = \frac{q_1 q_2}{-1} \quad \sqrt{\frac{F r^2}{k}} = \sqrt{q^2} \quad \sqrt{\frac{F r^2}{k}} = q$$

$$29.1 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.291 \text{ m} \quad q = \sqrt{\frac{+0.492 \text{ N} (0.291 \text{ m})^2}{9 \times 10^9 \frac{\text{N m}^2}{\text{C}^2}}}$$

$$\text{Ans: } q = 2.15 \times 10^{-6} \text{ C}$$

$$14. \frac{r^2 \cdot F}{F} = k \frac{q_1 q_2}{r^2} \cdot \frac{r^2}{F}$$

$$\sqrt{r^2} = \sqrt{\frac{k q_1 q_2}{F}}$$

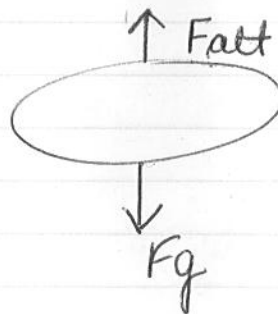
$$r = \sqrt{\frac{k q_1 q_2}{F}} = \frac{9 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} (5.0 \times 10^{-6} \text{C}) (7.6 \times 10^{-6} \text{C})}{0.72 \text{N}}$$

$$r = 0.61 \text{ m}$$

$$15. F = k \frac{q_1 q_2}{r^2} = \frac{9 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2} (-1.0 \times 10^{-6} \text{C}) (4.0 \times 10^{-6} \text{C})}{(0.50 \text{m})^2}$$

$$F = -0.144 \text{ N}$$

↑  
NEG = ATT



don't worry about this this year

FBD  
free body diagram

$$F_{eff} = F_{net} = \text{diff betw the 2 } F$$