

الشحنة q_c سالبة

$F_{A/C} = K \cdot \frac{|q_A| \cdot |q_C|}{x^2}$, $F_{B/C} = K \cdot \frac{|q_B| \cdot |q_C|}{(d-x)^2}$
 $\vec{F}_{A/C} + \vec{F}_{B/C} = \vec{0}$
 $F_{A/C} = F_{B/C}$
 $K \cdot \frac{|q_A| \cdot |q_C|}{x^2} = K \cdot \frac{|q_B| \cdot |q_C|}{(d-x)^2}$
 $\frac{(d-x)^2}{x^2} = \frac{|q_B|}{|q_A|} = \frac{10 \cdot 10^{-6}}{20 \cdot 10^{-6}} = \frac{1}{2}$
 $\left(\frac{d-x}{x}\right)^2 = \frac{1}{2}$
 $\frac{d-x}{x} = \frac{1}{\sqrt{2}}$
 $d-x = \frac{x}{\sqrt{2}} \rightarrow d = x + \frac{x}{\sqrt{2}} = x\left(1 + \frac{1}{\sqrt{2}}\right)$
 $x = \frac{d}{\left(1 + \frac{1}{\sqrt{2}}\right)}$
 $x = \frac{0,1}{\left(1 + \frac{1}{\sqrt{2}}\right)} = 0,059 \text{ m} = \underline{\underline{5,9 \text{ cm}}}$

وضوح: تبعد الشحنة "C" عن الشحنة "A" بحوالي 6 cm
 و "B" = "C" = 9 cm

تصحيح الفرض 2 / أفريل 2020

التمرين 1:

- 1- مرجع الدراسة: هيليوم كروي
- 2- جذب متبادل بين الشمس (S) والأرض (T)
- 3

$d = v \times t$
 $v = 3 \times 10^8 \text{ km/s} = 3 \times 10^8 \text{ m/s}$
 $t = 8 \text{ min } 20 \text{ s} = 500 \text{ s}$
 $d = 3 \times 10^8 \times 5 \cdot 10^2 = 15 \times 10^{10} \text{ m} = \underline{\underline{1,5 \times 10^{11} \text{ m}}}$

4- بتطبيق قانون الجذب العام لنيوتن:

$F_{T/S} = F_{S/T} = G \cdot \frac{M_S \times M_T}{d^2}$
 $= 6,7 \cdot 10^{-11} \times \frac{2,0 \times 10^{30} \times 6,0 \times 10^{24}}{(1,5 \times 10^{11})^2} = \underline{\underline{3,6 \times 10^{22} \text{ N}}}$

التمرين 2:

$d = 10 \text{ cm} = 0,1 \text{ m}$

- 1- تأثير متبادل
- 2

$F_{A/B} = F_{B/A} = K \cdot \frac{|q_A| \times |q_B|}{d^2}$
 $= 9 \times 10^9 \times \frac{20 \times 10^{-6} \times 10 \times 10^{-6}}{(0,1)^2} = \underline{\underline{180 \text{ N}}} \text{ (180N)}$

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القوى 4

$$M_T = 83 M_L$$

$$M_L = \frac{M_T}{83} = \frac{5,98 \times 10^{24}}{83} = 7,205 \times 10^{22} \text{ kg}$$

$$F_{S/L} = F_{L/S} = G \cdot \frac{M_S \times M_L}{(SL)^2}$$

$$SL = ST - TL = 150 \cdot 10^6 \times 10^3 - 3,8 \times 10^8$$

$$SL = 1,496 \times 10^{11} \text{ m}$$

$$F_{S/L} = F_{L/S} = 6,67 \cdot 10^{-11} \cdot \frac{5,98 \times 10^{24} \times 7,21 \times 10^{22}}{(1,496 \times 10^{11})^2}$$

$$= 4,23 \times 10^{20} \text{ N} \approx 4 \cdot 10^{20} \text{ N}$$

$$F_{T/L} = F_{L/T} = G \cdot \frac{M_L \times M_T}{(TL)^2}$$

$$= 6,67 \cdot 10^{-11} \cdot \frac{7,21 \times 10^{22} \times 5,98 \times 10^{24}}{(3,8 \times 10^8)^2}$$

$$= 1,99 \times 10^{20} \text{ N} \approx 2 \cdot 10^{20} \text{ N}$$

$$\frac{F_{S/L}}{F_{T/L}} = \frac{4 \cdot 10^{20}}{2 \cdot 10^{20}} = 2$$

$$F_{S/L} = 2 \cdot F_{T/L}$$

لذلك $F_{S/L}$ أكبر من $F_{T/L}$ $\times 2$

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القوى 3



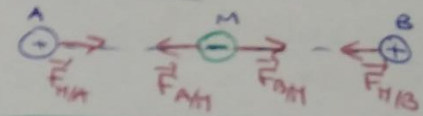
$$F_{A/B} = F_{B/A} = k \cdot \frac{q_A \cdot q_B}{AB^2}$$

$$AB = d = 3 \cdot 10^{-2} \text{ m}$$

$$q_A = 6 \cdot 10^{-7} \text{ C}$$

$$q_B = 4 \cdot 10^{-7} \text{ C}$$

$$F_{A/B} = F_{B/A} = 9 \cdot 10^9 \cdot \frac{6 \cdot 10^{-7} \times 4 \cdot 10^{-7}}{(3 \cdot 10^{-2})^2} = 2,4 \text{ N}$$



$$F_{A/M} = F_{M/A} = k \cdot \frac{q_A \cdot q_M}{(d/2)^2}$$

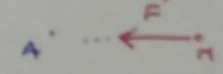
$$= 9 \cdot 10^9 \cdot \frac{6 \cdot 10^{-7} \cdot 5 \cdot 10^{-8}}{(1,5 \cdot 10^{-2})^2} = 1,2 \text{ N}$$

$$F_{A/M} = F_{M/B} = k \cdot \frac{q_A \cdot q_M}{(d/2)^2}$$

$$= 9 \cdot 10^9 \cdot \frac{4 \cdot 10^{-7} \cdot 5 \cdot 10^{-8}}{(1,5 \cdot 10^{-2})^2} = 0,8 \text{ N}$$

$$F_{A/M} > F_{M/B}$$

$$F_n = F_{A/M} - F_{M/B} = 1,2 - 0,8 = 0,4 \text{ N}$$



$$g = \frac{6,67 \times 10^{-11} \times 6 \cdot 10^8}{\left(\frac{650}{2}\right)^2} = \underline{\underline{3,8 \cdot 10^{-7} \text{ N/kg}}}$$

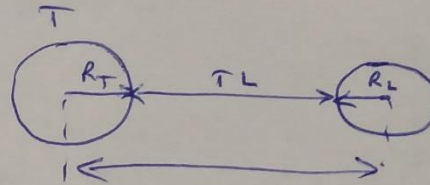
$$v = 30 \text{ km/s} = \frac{30 \text{ km}}{1 \text{ s}} = \frac{30 \text{ km}}{\frac{1}{3600} \text{ h}} \quad (1)$$

$$v = 30 \times 3600 \text{ km/h} = \underline{\underline{108000 \text{ km/h}}}$$

$$F_{T/A} = F_{A/T} = G \cdot \frac{M_T \times M_A}{d^2} \quad (2)$$

$$= 6,67 \cdot 10^{-11} \times \frac{5,97 \cdot 10^{24} \times 6 \cdot 10^8}{(1,8 \times 10^6 \times 10^3)^2}$$

$$= \underline{\underline{73740,5 \text{ N}}}$$



$$d = R_T + TL + R_L = 6370 + 384400 + 1738$$

$$d = 392508 \text{ km} = 392508 \times 10^3 \text{ m}$$

$$F_{T/L} = F_{L/T} = G \cdot \frac{M_T \times M_L}{d^2}$$

$$= 6,67 \cdot 10^{-11} \cdot \frac{5,97 \cdot 10^{24} \times 7,35 \cdot 10^{22}}{(392508 \times 10^3)^2}$$

$$= \underline{\underline{1,9 \cdot 10^{20} \text{ N}}}$$

$$g = \frac{G \times m}{R_A^2} \quad (4)$$