Chp 19

Q

3.) You would have to insulate your hand from the rod; otherwise, it will conduct electricity between the fur and you.

5) The moisture in the air tends to suck some of the balloons charge.

7) You acquire some charge after shuffling across the carpet.

15.) Since 1 + 2 repel they have ~~different~~ the same ~~charg~~ sign of net charge. 2 + 3 repel, so they also have charge of the same sign. Thus, 1 + 3 have the same sign of charge, so repel.

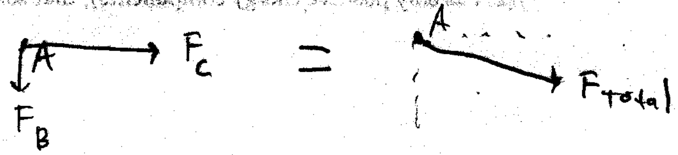
17.) In the 'modern view', stuff carries a positive or negative charge, and a lot of stuff means both more positive and less negative.

31.) When the scopes are connected, the charge is balanced between them. This means that each scope then measures the average of the two initial charges. Since the magnitude of "q_2" was less than "q_1", then q_2 must be less than the average; q_2 must increase in value. Since the magnitude of q_2 decreased, it must have had the opposite sign of the average; ~~and~~ therefore it had the opposite sign as q_1. q_2 was negative.

35.) The force ~~ct~~ reverses direction, but has the same magnitude.

37) The force is proportional to $1/(d)^2$, where d is the distance apart. If d changes to $\frac{1}{3}d$, then the force becomes proportional to ~~$\frac{9}{d^2}$~~ $\frac{9}{d^2}$.

41) Since the charges are identical, the forces push A away from B and C. Since B is twice the distance as C, the force from B is 1/4 the force from C. ~~Thy~~ So the vectors look like:



It looks like arrow 'C' is the answer.

E]

1.) Each apple occupies $1/50 = .02$ of the bushel.

3.) $Q = Q_{proton} + Q_{neutron} = (92)(1.6 \cdot 10^{-19} \frac{C}{proton}) + (143)(0)$

$= \underline{1.47 \cdot 10^{-19} C}$

7.) $Q_{nucleus} = 3\, Q_{proton} = (3) \cdot (1.6 \cdot 10^{-19})\, C$

$Q_{electron} = (1.6 \cdot 10^{-19})\, C$

$F = k \frac{Q_n Q_e}{r^2} = (k) \frac{3 \cdot (1.6 \cdot 10^{-19})^2 C^2}{(.018 \cdot 10^{-9} m)^2}$

$= (2.13 \cdot 10^{-6} N)$ attractive

9.) $\frac{F_e}{F_g} = \frac{k Q_1 Q_2}{G m_1 m_2} = \frac{(9 \cdot 10^9 \frac{N \cdot m^2}{C^2})(1.6 \cdot 10^{-19} C)^2}{(6.67 \cdot 10^{-11} \frac{N \cdot m^2}{kg})(1.67 \cdot 10^{-27} kg)^2}$

$= \boxed{1.23 \cdot 10^{36}}$ much, much stronger

13.) $E = \frac{kQ}{r^2} = \frac{k\, 8\,C}{(3\,m)^2} = 8 \cdot 10^9\ N/C$

17.) The field due to each charge points away from each charge, so the total at the center is the difference:

$E = \frac{k}{(1\,m)^2} \cdot (Q_1 - Q_2) = 4 \cdot k = 3.6 \cdot 10^{10} \frac{N}{C}$ towards the 2C Charge.

($Q_1 = 6$, $Q_2 = 2$)

21) Energy is conserved, so the change in potential cancels the change in kinetic. The object loses 20 J of potential nrg, so $P_{final} = P_{in} - 20\,J$
$= 30\,J$

25.) From the text, pg 490, "Dry air breaks down... when the electric field reaches about 30,000 volts per centimeter". So if the spark jumped through air, the field must have been about 30,000 volts (at least). ~~then~~, Next, the change in potential energy would equal the field times ~~the~~ the charge [giving the force] times the distance. $[\Delta P = -\text{Work} = F \cdot d]$. ~~This~~ is The change in potential is this divided by the charge, so is equal to the field times the distance:

$\Delta V = E\, d = (30{,}000\ \frac{V}{cm})(1.3\ cm)$
$= 39{,}000\ V$