General Physics 2 | 3rd Quarter

WW2: Electric Potential

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1. --
2. --
3. --
4. --
5. --
6. --
7. Two point charges $Q_1 = 3.5\mu C$ and $Q_2 = 7.5\mu C$ are initially very far apart. They are then brought together, with a final separation of $2.5\,m$. How much work does it take to bring them together?

$$PE_E = \frac{kq_1 q_2}{r} = \frac{(8.99\times10^{9})\cdot(3.5\times10^{-6})\cdot(7.5\times10^{-6})}{2.5} = \frac{2.36}{2.5}$$
$$PE_E = 9.44\times10^{-2}\,J$$

8. --
9. An electron and a proton are a distance $r = 7.5\times10^{-9}m$ apart. How much energy is required to increase their separation by a factor of two?

$$Q = 1.6\times10^{-19}$$
$$PE_E = \frac{(8.99\times10^{9})\cdot(1.6\times10^{-19})\cdot(-1.6\times10^{-19})}{7.5\times10^{-9}} = \frac{2.3\times10^{-28}}{7.5\times10^{-9}}$$
$$PE_E = -3.07\times10^{-20}\,J$$

10. --
11. --
12. --
13. --
14. A voltage of $12V$ is placed on a capacitor with $C = 100\,pF$ (picofarads).
    a. What is the charge on the capacitor?

$$Q = CV = (1\times10^{-12})\cdot(12)$$
$$Q = 1.2\times10^{-11}\,C$$

b. How much energy is stored in the capacitor?

$$PE=\frac{QV}{2}=\frac{(1.2\times10^{-11})\cdot(12)}{2}=\frac{1.44\times10^{-10}}{2}$$
$$PE=7.2\times10^{-11}$$

15. Three capacitors, all with capacitance C , are connected in parallel as shown in Figure B. What is the equivalent capacitance of this combination?

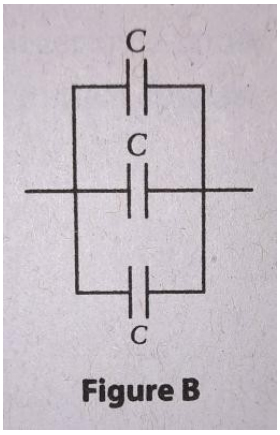

Figure B

$$C=C_1+C_2+C_3$$

16. --
17. Three capacitors are connected as showin in Figure D. What is the equivalent capacitance?

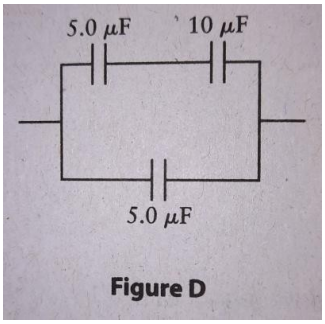

Figure D

$$C=(\frac{1}{5\times10^{-6}}+\frac{1}{10\times10^{-6}})+5\times10^{-6}=(3\times10^{5})+(5\times10^{5})$$
$$C=8\times10^{5}F$$