Solutions to Period 10 Exercises

E.1 **Suppose that the Styrofoam ring you levitated in class has a mass of 0.005 grams and floated 5 cm above the rod. How large was the electrical force that supported the ring? (Hint: what forces act on the floating ring? How do the amounts of these forces compare?)**

a) 4.9×10^{-2} newtons

b) 5.0×10^{-3} newtons

c) 4.9×10^{-5} newtons

d) 2.5×10^{-6} newtons

e) 2.5×10^{-7} newtons

$$F_{electrical} = F_{gravity} = M\ g =$$

$$0.005\ g \times \frac{1\ kg}{1000\ g} \times 9.8\ m/s^2 = 0.000049\ N$$

$$= 4.9 \times 10^{-5}\ N$$

E.1 = c

E.2 **How much electrical potential energy is stored if 0.5 coul of charge is raised to a voltage of 10 volts?**

a) 5 joules

b) 10 joules

c) 20 joules

d) 10 volts

e) 25 volts

$E_{pot} = Q\,V = 0.5 \text{ coul} \times 10 \text{ V} = 5 \text{ J}$

E.2 = a

E.3 **You wish to store 5 coulombs of charge on a capacitor, using a battery as the energy source. If the final voltage on the capacitor is 6 volts, what is the total energy stored on the capacitor?**

a) 5 joules

b) 6 joules

c) 15 joules

d) 30 joules

e) 180 joules

$E_{cap} = \frac{1}{2}\,Q\,V_{final} = \frac{1}{2}(5 \text{ coul}) \times 6 \text{ volts} = 15 \text{ J}$

E.3 = c

E.4 **A 1.0 farad capacitor stores 5 joules of electrical potential energy. How many such charged capacitors would it take to equal the 0.7 million joules of chemical energy stored in a bottle of gasoline the size of one of these capacitors?**

$$\frac{1 \text{ capacitor}}{5 \cancel{\text{ J}}} \times \frac{700{,}000 \cancel{\text{ J}}}{1 \text{ bottle}} = \frac{140{,}000 \text{ cap}}{\text{bottle}}$$

Solutions to Period 10 Exercises

E.1 = c

E.2 = a

E.3 = c

E.4 = 140,000 capacitors/bottle