1. Capacitance is the charge stored per unit:

   ☐ time

   ☐ current

   ☐ potential difference

   ☐ resistance

2. The energy stored in a capacitor is:

   ☐ $\frac{1}{2}CV$

   ☐ $\frac{1}{2}CV^2$

   ☐ CV^2

   ☐ $\frac{1}{2}QV^2$

3. During discharge through a resistor, the charge on a capacitor:

   ☐ decays exponentially

   ☐ rises steadily

   ☐ stays constant

   ☐ falls in a straight line

4. A capacitor holds 0.012 C at 4.0 V. What is its capacitance, in mF?

   _____ mF

5. A 2.0 μF capacitor is charged to 1000 V. How much energy does it store?

   _____ J

6. Why is a capacitor's discharge exponential?

   ☐ the capacitance falls with time

   ☐ the resistance increases as the capacitor empties

   ☐ the rate of loss of charge is proportional to the charge remaining

   ☐ the current is constant

7. A charged capacitor holds +Q on one plate and -Q on the other, so the capacitor as a whole is neutral.

   ☐ True ☐ False

8. Why is there a factor of ½ in the stored-energy formula?

   ☐ the average p.d. during charging is only V/2

   ☐ the capacitor is only half full

   ☐ energy is always halved

9. A capacitor of 500 μF discharges through a 2000 Ω resistor. What is the time constant?

   _____ s

10. Doubling the charge on a capacitor doubles the voltage, so its capacitance stays the same.

    ☐ True ☐ False

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1. **potential difference**

   $C = \dfrac{Q}{V}$ – charge per volt, in farads.

2. $\frac{1}{2}CV^2$

   Equivalent forms: $W = \frac{1}{2}QV = \frac{1}{2}CV^2 = \dfrac{Q^2}{2C}$.

3. **decays exponentially**

   The bigger the charge, the bigger the current – giving an exponential decay.

4. **3 mF**

   $C = \dfrac{Q}{V} = \dfrac{0.012}{4.0} = 0.0030 \text{ F} = 3.0 \text{ mF}$.

5. **1 J**

   $W = \frac{1}{2}CV^2 = \frac{1}{2} \times 2.0 \times 10^{-6} \times (1000)^2 = 1.0 \text{ J}$.

6. **the rate of loss of charge is proportional to the charge remaining**

   Q/C = -R dQ/dt says exactly that. Every quantity with this property, radioactive decay included, gives the same curve.

7. **True**

   Electrons move from one plate to the other through the battery, so the charges are always equal and opposite. The stored charge Q means the charge on one plate.

8. **the average p.d. during charging is only V/2**

   The p.d. rises from 0 to V as it charges, so the average is V/2 – hence the triangle area $\frac{1}{2}QV$.

9. **1 s**

   $\tau = RC = 2000 \times 500 \times 10^{-6} = 1.0 \text{ s}$.

10. **True**

    $C = \dfrac{Q}{V}$ is fixed by the capacitor's size and dielectric – Q and V rise together.

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