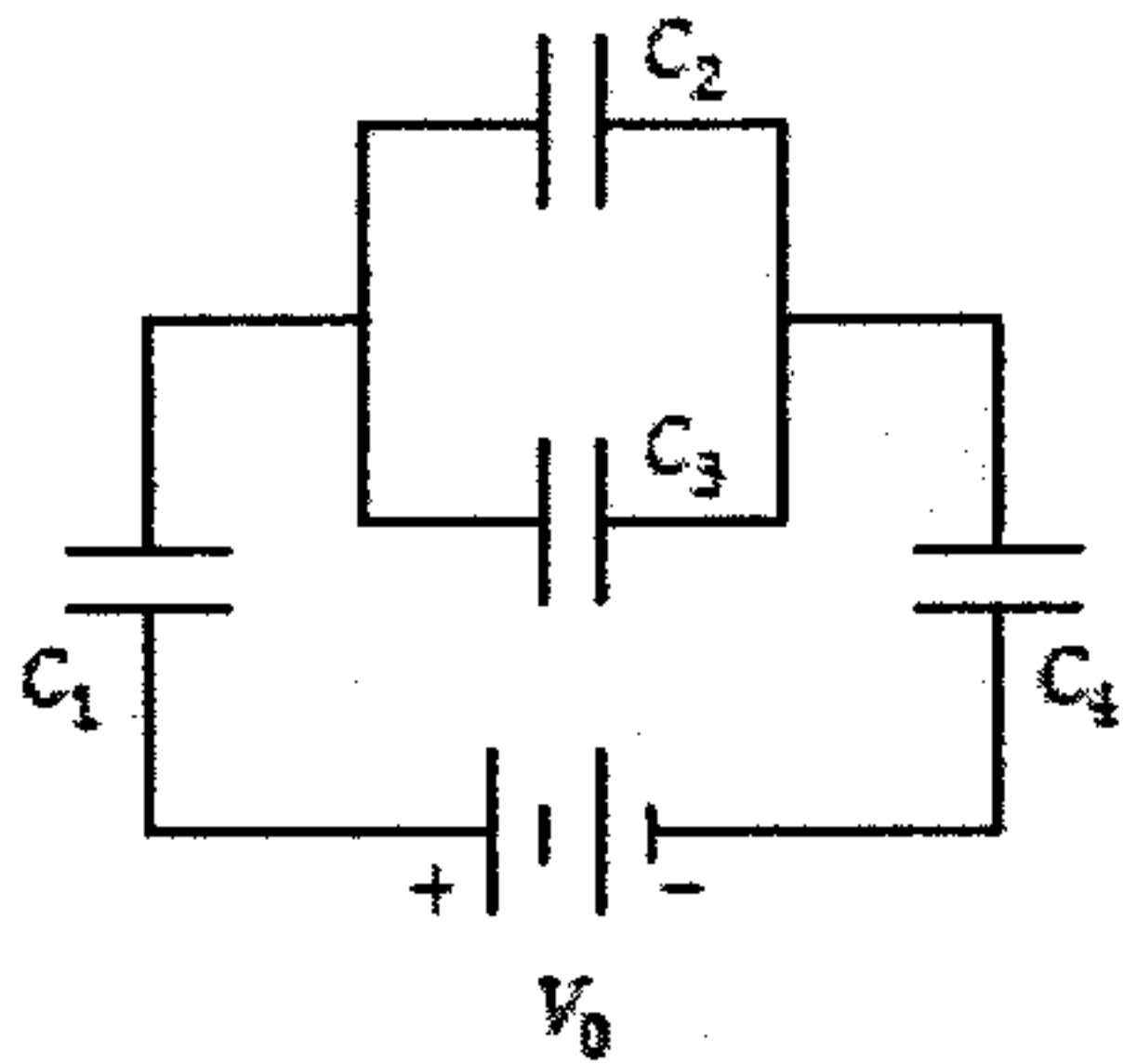


5. An uniform electric field of magnitude 15 V/m exists in a region of space. The energy in the electric field in a cubical volume with sides 2.8 m long is, in nJ,

- a) 22 b) 11 c) 1.5 d) 43 e) 3.0

$V = (2.8 \text{ m})^3 = 22 \text{ m}^3$
 $u = \frac{1}{2} \epsilon_0 (15 \frac{\text{V}}{\text{m}})^2 = 1.0 \times 10^{-9} \text{ J/m}^3$ $U = uV$

6. Determine the energy stored by C_4 when $C_1 = 20 \mu\text{F}$, $C_2 = 10 \mu\text{F}$, $C_3 = 14 \mu\text{F}$, $C_4 = 30 \mu\text{F}$, and $V_0 = 45 \text{ V}$.



Need Q on C_4 since $U_4 = \frac{Q_4^2}{2C_4}$
 $C_{eq} = (\frac{1}{C_1} + \frac{1}{C_2+C_3+C_4})^{-1} = 8.0 \mu\text{F}$
 so $Q_{bat} = C_{eq} V_{bat} = 360 \mu\text{C}$, $Q_4 = Q_{bat}$ (series)
 $U = \frac{Q_4^2}{2C_4} = 0.0022 \text{ J}$

- a. 3.8 mJ
 b. 2.7 mJ
 c. 3.2 mJ
 d) 2.2 mJ
 e. 8.1 mJ

7. Light bulb A is rated at 60 W and light bulb B is rated at 100 W. Both are designed to operate at 110 V. Which statement is correct?

- a. The 60 W bulb has a greater resistance and greater current than the 100 W bulb.
 b. The 60 W bulb has a greater resistance and smaller current than the 100 W bulb.
 c. The 60 W bulb has a smaller resistance and smaller current than the 100 W bulb.
 d. The 60 W bulb has a smaller resistance and greater current than the 100 W bulb.
 e. We need to know the resistivities of the filaments to answer this question.

$P = I^2 R = \frac{V^2}{R}$
 V same, lower
 $P \rightarrow$ higher R
 $V = IR$ $R \uparrow, I \downarrow$

8. A resistor is hooked up to a battery with a constant potential difference. If we cool the resistor using liquid nitrogen,

- a) the current increases b) the current decreases c) the current is unchanged

Ohmic
 $T \downarrow, \rho \downarrow, R \downarrow$
 $I = \frac{V}{R} \uparrow$

9. A small bulb is rated at 7.5 W when operated at 125 V. Its resistance (in ohms) is

- a. 0.45.
 b. 7.5.
 c. 17.
 d. 940.
 e. 2100.

$P = \frac{V^2}{R}$ so $R = \frac{V^2}{P} = 2100 \Omega$

10. An Ohmic material is one in which

- a) the drift velocity is proportional to the electric field
 b) the number of charge carriers is constant
 c) the drift velocity is independent of electric field
 d) a) and c)
 e) a) and b)