

Solutions

2.1 A Resistance times capacitance has units of time.

Compare the rejected options: volts; amperes. Use the stated model and conditions.

2.2 A Free charges rearrange until the internal electrostatic field vanishes.

Compare the rejected options: always positive; infinite. Use the stated model and conditions.

2.3 2. Multiply $1000 \times 0.002 = 2$.

2.4 False. The field depends on the gradient, which is zero for constant potential.

3.1 Let $k = 1/(4\pi\epsilon_0)$ and positive field mean radially outward. For $r < R$, $E = 0$ and $V = kQ/R - kQ/(2R) = kQ/(2R)$. For $R < r < 2R$, $E = kQ/r^2$ and $V = kQ/r - kQ/(2R)$. For $r > 2R$, both E and V are zero. At R the two potentials give $kQ/(2R)$; at $2R$ they give zero. Normal E jumps at the surface charges. Award each region's pair one mark, each continuity check one, and field-jump interpretation one.