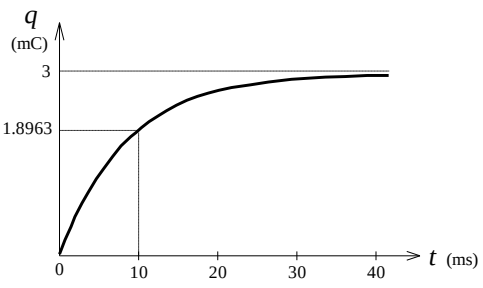
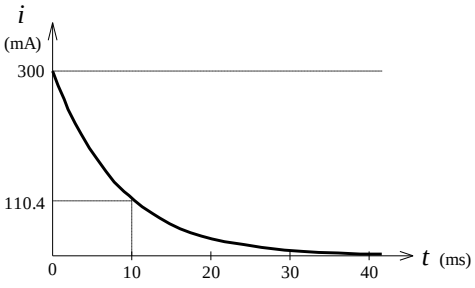
Answers

1.1

(a) To the left (b) $300e^{-100t}$ mA (c) 4.055 ms (d) $0.3820e^{-100t}$ A/mm^2

(e)





(f) 1.860×10^{16}

1.2

(a) 10 µC (b) 10 µC (c) 12.71 mA

1.3

(a) 975 C (b) 383 C

1.4

(a) 31.1 kC (b) 48 W (c) 373 kJ (d) 24.9 W

1.5

8.0 C

1.6

(a) $8\,\Omega$ (b) $3.7\,\Omega$

1.7

5.5 V, 3.975 A

A.2

2.1

8.0 C

2.2

(a) 120.8 V (b) 8.453 kW (c) 754.0 W/mm^2

2.3

(a) 10 V (b) 5 A (c) 50 W

2.4

(a) -3 A (b) 3 V (c) 15 W

2.5

(a) 2.5 A (b) 4 V

2.6

$$v_3 = \frac{R_1 R_3}{R_1 + R_2 + R_3} i_s \qquad i_1 = \frac{R_2 + R_3}{R_1 + R_2 + R_3} i_s$$

2.7

(a) 30 W (b) -2 A

3.1

(a) -33 (b) 17, -34, -11

A.4

4.1

6 A

5.1

80 W

5.2

(a) 150 V (b) 110 V

A.6

6.1

(a) 15 A, $2\,\Omega$ (b) $2\,\Omega$ (c) 112.5 W

6.2

381 mW

9.1

5.1 m

9.2

(a) 9×10^{-17} N, 9×10^{-8} Vm^{-1} (b) 9.61×10^{-8} Vm^{-1}, 8.61×10^{-17} N

9.3

1×10^{8} Vm^{-1} towards the negative charge

9.4

1.89×10^{6} Vm^{-1}

A.8

10.1

(a) $\mathbf{E} = \dfrac{q}{4\pi\varepsilon_0 r^2}\hat{\mathbf{r}}$, $\hat{\mathbf{r}}$ points along a spherical radius

(b) $\mathbf{E} = \mathbf{0}$

(c) $\mathbf{E} = \dfrac{\lambda}{2\pi\varepsilon_0 r}\hat{\mathbf{r}}$, $\hat{\mathbf{r}}$ points along a cylindrical radius

(d) $\mathbf{E} = \dfrac{\sigma}{2\varepsilon_0}\hat{\mathbf{r}}$, $\hat{\mathbf{r}}$ points perpendicularly to the plane

10.2

(e) No change.

(f) Between the plane and plate: $\mathbf{E} = \dfrac{\sigma}{\varepsilon_0}\hat{\mathbf{r}}$, $\hat{\mathbf{r}}$ points perpendicularly to the plane; elsewhere: $\mathbf{E} = \mathbf{0}$.

10.3

$\mathbf{E} = \mathbf{0}$

11.1

38.2 nV, 24.4 nV

11.2

1.2 MV

11.3

(a) $V = \dfrac{q}{4\pi\varepsilon_0 r}$

(b) $V = \dfrac{\lambda}{2\pi\varepsilon_0} \ln r$

(c) $V = \dfrac{\sigma}{2\varepsilon_0} r$

A.10

12.1

$$C = \frac{\varepsilon_0 A}{d}$$

12.2

(a) 10^6 Vm^{-1}, 8.85×10^{-6} Cm^{-2}, 14.8 pF

(b) 10^6 Vm^{-1}, 44.2×10^{-6} Cm^{-2}, 74.0 pF

(c) 3×10^6 Vm^{-1}, 0.6×10^6 Vm^{-1}, 26.6×10^{-6} Cm^{-2}, 44.2 pF, no

12.3

(a) $C/l = \dfrac{2\pi\varepsilon_r\varepsilon_0}{\ln(r_2/r_1)}$

(b) $1.01\,\mu$F, 44 kV, near inner conductor

12.10

(a) 9.6 V, 192 mW, 1.152 mJ (b) 16 V, 0 W, 3.20 mJ

12.11

(a) 2 nF (b) 2.4 nF

12.12

(b) $\frac{12}{7}\,\mu$F (b) $\frac{12}{11}\,\mu$F (c) $9\,\mu$F

14.1

(a) 20.6 ms (b) 177.7 ms

14.2

$2\sqrt{t-0.001}$ A, $0.01/\sqrt{t-0.001}$ V

14.3

(a) $60\cos 10t$ V (b) $5+2\sin 10t$ A

A.12

15.9

a) x b) x c) y d) $z(x+y)$ e) 0 f) $y(w+x)$

15.10

a) $\overline{A}\overline{B}+B(A+C)$ b) $A\overline{C}+BC$ c) $A+CD$ d) $A+\overline{B}CD$

15.11

a) 1 b) ??? c) 1 d) $(\overline{A}+B)(C+D)$

15.15

$T_1=\overline{A}(\overline{B}+\overline{C}),\ T_2=\overline{T_1}$