Unit 23

Answers: DC Circuits

Quick checks

1 b $\Delta Q = I\,\Delta t = 2.0 \times 10^{-3} \times (5.0 \times 60) = 0.60$

2 c $v = \dfrac{I}{nAq}$

3 d $W = EQ = 1.5 \times 20 = 30$

4 a

5 b

6 d $R = \dfrac{\rho l}{A}$

7 c $R = \dfrac{6 \times 3}{6 + 3} = 2$

8 b

9 c $V = E - Ir = 2.0 - 1.0 \times 0.50 = 1.5$

10 d

$I_0 = V + \dfrac{V}{9} = \dfrac{10V}{9}$ $I_1 = \dfrac{V}{9}$ $\dfrac{I_0}{I_1} = 10$

11 d

12 c

13 a $\dfrac{Q}{e} = \dfrac{It}{e}$

14 b

15 **d**

16 **d**

17 **d**

18 **a** $I = \dfrac{E}{R + r}$

19 **c**

20 **c** $R = \dfrac{V}{I} = \dfrac{2}{4} = 0.5 \qquad \rho = \dfrac{RA}{l} = \dfrac{0.5 \times 1 \times 10^{-6}}{1} = 5 \times 10^{-7}$

12. $A = 2.5^{\,2} = 2.5 \times 10^{-6}$

$$v = \frac{I}{nAe} = \frac{8.2}{8.49 \times 10^{28} \times 2.5 \times 10^{-6} \times 1.6 \times 10^{-19}} = 2.4 \times 10^{-4} \approx$$

$A = 100^{\,2} = 100 \times 10^{-4} = 1.0 \times 10^{-2}$

$$v = \frac{I}{nAq} = \frac{30 \times 10^{-3}}{6.02 \times 10^{26} \times 1.0 \times 10^{-2} \times 3.2 \times 10^{-19}} = 1.6 \times 10^{-8}$$

13. $A = \pi(2.3 \times 10^{-5})^2 = 1.66 \times 10^{-9}$

$$v = \frac{I}{nAe} = \frac{0.50}{1.26 \times 10^{29} \times 1.66 \times 10^{-9} \times 1.6 \times 10^{-19}} = 0.015 \; =$$

14. $A = \pi(3.25 \times 10^{-4})^2 = 3.32 \times 10^{-7}$

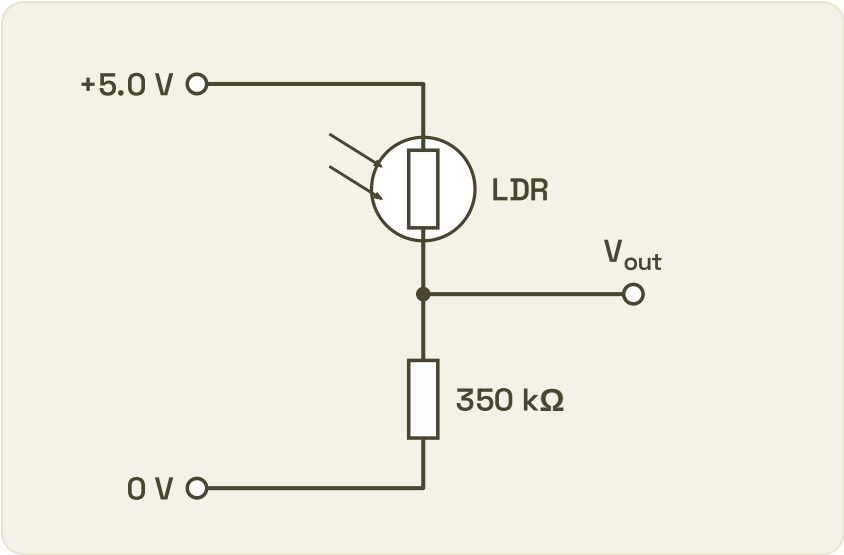
$$v = \frac{I}{nAq} = \frac{0.25}{8.5 \times 10^{28} \times 3.32 \times 10^{-7} \times 1.6 \times 10^{-19}} =$$

15.

$$A = 6.0 \times 10^{-3} \times 0.50 \times 10^{-3} = 3.0 \times 10^{-6}$$

$$v = \frac{I}{nAq} = \frac{10 \times 10^{-3}}{7.0 \times 10^{22} \times 3.0 \times 10^{-6} \times 1.6 \times 10^{-19}} = 0.30$$

16.



$$V = \frac{350}{350 + 120} \times 5.0 = 3.7$$

$$V = \frac{350}{350 + 590} \times 5.0 = 1.9$$

17.

$$R = \frac{16.5}{0.220} = 75\ \Omega$$

$$\frac{25 \times 50}{25 + 50} = 16.7$$

$$\frac{1}{R} = \frac{1}{53.8} - \frac{1}{195} = 0.01858 - 0.00513 = 0.01346\ \Omega^{-1} \quad \Rightarrow \quad R \approx$$

$$\frac{16.5}{216} = 0.076$$