Complete solutions to Exercise 1(a)

1. Very similar to **EXAMPLE 1**, thus

$$c = \sqrt{24^2 + 7^2} = \sqrt{625} = 25$$

2. Substituting $R = 1000$ and $V = 15$ into $V = IR$ gives

$$15 = 1000I$$

$$I = \frac{15}{1000} = 15 \times 10^{-3} \text{ amp } = 15 \text{ mA}$$

3. Substituting the given values into $P_1V_1 = P_2V_2$ yields

$$\left(5 \times 10^6\right) \times \left(2 \times 10^{-4}\right) = \left(2 \times 10^7\right) \times V_2$$

$$V_2 = \frac{\left(5 \times 10^6\right) \times \left(2 \times 10^{-4}\right)}{2 \times 10^7} = 0.5 \times 10^{-4} m^3$$

4. Substituting the given values into $PV = nmRT$ yields

$$\left(5.6 \times 10^5\right) \times 0.015 = m(8.31 \times 34.6 \times 312)$$

$$m = \frac{\left(5.6 \times 10^5\right) \times 0.015}{8.31 \times 34.6 \times 312} = 0.094 \text{ kg } (2 \text{ s.f.})$$

5. Substituting $s = 30$, $u = 2$ and $t = 5$ into $s = ut + \frac{1}{2}at^2$ gives

$$(2 \times 5) + \left(\frac{1}{2} a \times 5^2\right) = 30$$

$$10 + 12.5a = 30$$

$$12.5a = 20$$

$$a = \frac{20}{12.5}$$

$$a = 1.6 m/s^2$$

6. Substituting $R_0 = 33$, $R = 35$ and $t = 89$ into $R_0(1 + \alpha t) = R$ gives

$$33(1 + 89\alpha) = 35$$

$$1 + 89\alpha = \frac{35}{33} = 1.06$$

$$89\alpha = 1.06 - 1 = 0.060000$$

$$\alpha = \frac{0.06}{89} = 6.7 \times 10^{-4} / {}^\circ\text{C} \ (2 \text{ s.f.})$$

7. Substituting $R = 20$, $E = 12$ and $r = 1$ into $E = \frac{V(R + r)}{R}$ gives

$$12 = \frac{V(20 + 1)}{20}$$

$$V = \frac{12 \times 20}{21} = 11.4 \text{ volt}$$

Questions 8-10 involve transposition of formulae similar to **EXAMPLES 4** and **5**.

8.(i) $u = v - at$ (ii) $a = \frac{v - u}{t}$

9. $R = \frac{V}{I}$

10. $T = \frac{PV}{mR}$

11. Divide both sides by 100 to give

$$\frac{S}{100} = 1 - \frac{r\omega}{v}$$

We have

$$\frac{r\omega}{v} = 1 - \frac{S}{100}$$

$$r\omega = v\left(1 - \frac{S}{100}\right)$$

$$\omega = \frac{v}{r}\left(1 - \frac{S}{100}\right)$$