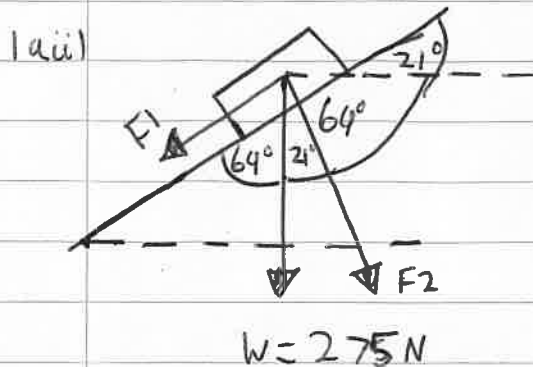


Science Coursework

1ai) magnitude of friction = $275 \cos(69) = 98.55 \text{ N}$



The angle between the direction of the force of friction and the vertical = 111°

1d iii) Normal reaction between the box and plane = $275 \sin(69) = 256.73 \text{ N}$

1b ii) momentum = kg m/s

2ci) $275 \div 9.81 = 28.03 \text{ kg} = \text{mass}$

Resultant = mass $\times$ acceleration
force

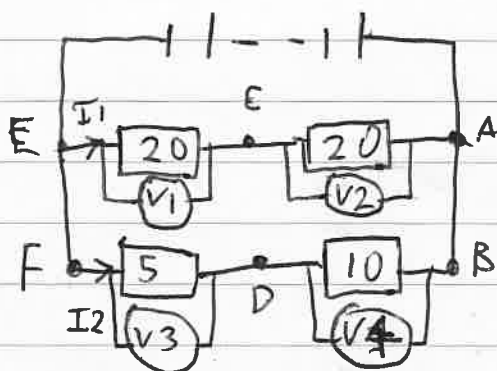
2cii) $28.03 \times 7.5 = 210.225 \text{ ms}^{-1}$

$70.075 = 28.03 \times 2.5$

2ciii) $5 \times 12.5 = 62.5 \div 3.2 = 19.53 \text{ N}$

3ai) $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ $\frac{1}{40000} + \frac{1}{15000} = \frac{11}{120000}$ $\frac{120000}{11} = 10909.09$

3aii) $V = IR$ $I = \frac{V}{R} = \frac{12}{10909.09} = 1.1 \times 10^{-3}$



3aiii) Power = current $\times$ Voltage
 $P_1 = 3 \times 10^{-4} \times 6 = 1.8 \times 10^{-3} \text{ W}$
 $P_2 = 1.8 \times 10^{-3} \text{ W}$
 $P_3 = 8 \times 10^{-4} \times 4 = 3.2 \times 10^{-3} \text{ W}$
 $P_4 = 8 \times 10^{-4} \times 8 = 6.4 \times 10^{-3} \text{ W}$

$$\begin{aligned}
 3a) \quad V &= IR \\
 I &= \frac{V}{R} \\
 I &= 12 \div 10.91 \times 10^3 \\
 I &= 1.1 \times 10^{-3} A
 \end{aligned}$$

$$\begin{aligned}
 I_1 &= V \div R & I_2 &= V \div R \\
 I_1 &= 12 \div 40 \times 10^3 & I_2 &= 12 \div 15 \times 10^3 \\
 I_1 &= 3 \times 10^{-4} A & I_2 &= 8 \times 10^{-4} A
 \end{aligned}$$

$$\begin{aligned}
 3bi) \quad &\underline{\text{PD between A-C}} \\
 V_1 &= IR \\
 V_1 &= 3 \times 10^{-4} \times 20 \times 10^3 \\
 V_1 &= 6V \\
 V_1 &= 6V
 \end{aligned}$$

$$\begin{aligned}
 &\underline{\text{PD between D-E}} \\
 V_3 &= IR \\
 V_3 &= 8 \times 10^{-4} \times 5 \times 10^3 \\
 V_3 &= 4V
 \end{aligned}$$

$$\begin{aligned}
 &\underline{\text{PD between C-D}} \\
 V_4 &= IR \\
 &8 \times 10^{-4} \times 10 \times 10^3 \\
 V_4 &= 8V
 \end{aligned}$$

The potential difference between C-D is 0 because the circuit is parallel

4a) the moment of : The product of the distance from the a force of a point to the point of application of the force and the component of the force perpendicular to the line of the distance.

$$\begin{aligned}
 5a) \quad M &= FA \\
 12 \text{ Nm} &= 250 \times 0.048
 \end{aligned}$$

$$\begin{aligned}
 5aii) \quad F &= \frac{M}{D} = \frac{12}{2.7 \times 10^{-3}} = 444.4 \text{ N}
 \end{aligned}$$

$$\begin{aligned}
 5aiv) \quad F &= kx \\
 k &= \frac{F}{x} = \frac{444.4}{0.015} = 29626.6 \text{ N/m}
 \end{aligned}$$