

$$1. w = mg \quad m = \frac{w}{g} = \frac{-245\text{N}}{-10\text{m/s}^2} = \boxed{24.5\text{kg}}$$

$$2. F = ma = m \left(\frac{v_2 - v_1}{t} \right) = 1500\text{kg} \left(\frac{30 - 10\text{m/s}}{10\text{s}} \right) = \boxed{3000\text{N}}$$

$$3. F + w = ma \quad F + mg = ma \quad F = ma - mg \quad m = \frac{F}{a - g} = \frac{109\text{N}}{12 - (-10)} \\ \boxed{m = 4.95\text{kg}}$$

$$4. \mu = \frac{f}{N} = \frac{30\text{N}}{(12\text{kg})(10\text{m/s}^2)} = 0.25$$

$$5. \begin{array}{c} \text{B} \quad \text{G} \\ \text{---} \end{array} \quad F_B = F_G \quad m_B a_B = m_G a_G \quad 60\text{kg} a_B = -(40\text{kg})(-3\text{m/s}^2) \\ \boxed{a_B = 2\text{m/s}^2}$$

$$6. N = \text{SCALE READING}$$

$$\sum F = w + N = ma; \quad -30\text{N} + N = (70\text{kg})(7\text{m/s}^2) \quad \boxed{N = 520\text{N}}$$

$$7. \begin{array}{c} T_1, T_2 \\ \text{---} \end{array} \quad w_5 \quad w_5 = mg = (5\text{kg})(10\text{m/s}^2) = 50\text{N} \\ \sum F = T_1 + T_2 + w_5 = ma \\ 0 + 50\text{N} = 15\text{kg} a \quad \boxed{a = 3.3\text{m/s}^2}$$

$$8. \begin{array}{c} \uparrow T \\ \text{---} \\ \downarrow w \end{array} \quad \sum F = w + T = ma; \quad -(2 \times 10^{-4}\text{kg})(9.8\text{m/s}^2) + (2 \times 10^{-3}\text{N}) = (2 \times 10^{-4}\text{kg}) a \\ \boxed{a = 0.2\text{m/s}^2}$$

$$9. f = \mu N = ma \\ \mu mg = ma \\ \mu = \frac{a}{g} \quad a = \frac{v_2^2 - v_1^2}{2d} \quad v_2 = 0 \quad a = \frac{-v_1^2}{2d} \quad \mu = \frac{-v_1^2}{2dg} = \frac{-14\text{m/s}}{2(25\text{m})(-10\text{m/s}^2)} \\ \boxed{\mu = .392}$$

$$10. \sum F = w_1 + T_1 + T_2 + w_3 = ma \quad \textcircled{A} \\ -(1\text{kg})(10\text{m/s}^2) + 0 + (3\text{kg})(10\text{m/s}^2) = 4\text{kg} a \quad \boxed{a = 5\text{m/s}^2} \\ \sum F = w_1 + T_1 = ma \quad \textcircled{B} \\ -(1\text{kg})(10\text{m/s}^2) + T = (1\text{kg})(5\text{m/s}^2) \quad \boxed{T = 15\text{N}}$$

$$11. -F_A = F_E \\ -m_A a_A = m_E a_E \\ -(6.40\text{kg})(-9.8\text{m/s}^2) = (5.98 \times 10^{-2}\text{kg}) a_E \\ \boxed{a_E = 6.6 \times 10^{-2}\text{m/s}^2}$$