1.   (a)   Explain the principle which underlies the checking of the balance of equations using base quantities.

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                                                                     [1 mark]

   (b)   State ONE limitation of using base quantities to check the balance of equations.

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                                                                     [1 mark]

   (c)   A body moving through air at a high speed, v, experiences a force, F, given by $F = kA\rho v^2$, where A is the surface area of the body, ρ is the density of air and k is a unitless constant. If $A = 0.10 \pm 0.005$ m^2, $\rho = 1000 \pm 0.1$ kg m^{-3} and $v = 30.0 \pm 1$ m s^{-1}, find the fractional error in the force, F.

                                                                     [3 marks]

   (d)   The speed, v, of ocean waves is related to the wavelength, λ, and the acceleration due to gravity, g. Two relationships are proposed, $v = ag\lambda$ or $v = b\sqrt{g\lambda}$, where a and b are constants with no units. Determine which of these equations is possible.

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                                                                     [3 marks]

   (e)   Assuming that your result in (d) is correct, determine the full equation if an ocean wave has a speed of 16 m s^{-1} and a wavelength of 160 m.

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                                                                     [2 marks]

Total 10 marks