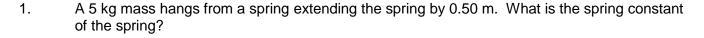
Mechanics Level 2 Equation Test Answers

The formulae listed in the explanatory notes to the achievement standard will be provided, plus any other required formulae $(g = 9.8 \text{ ms}^{-2} (\text{Nkg}^{-1}))$.



$$F = ma$$

$$F = -kx$$
98 Nm⁻¹

2. If a rifle of mass 7 kg fires a bullet of mass 8 g at a speed 210 m s⁻¹, what is the rifle's initial recoil velocity?

$$p = mV$$
 0.24 ms⁻¹

3. A train of mass 5000 kg moves at a speed of 30 ms⁻¹ on a horizontal surface. Calculate the kinetic energy of the train.

$$E_k = \frac{1}{2} m v^2$$
 2.25 x 10⁶

4. A resultant force of 4 N is applied to a body of mass 2 kg for 1 second. What is the acceleration of the body?

$$F = ma$$
 2 ms⁻²

5. An airplane has a maximum acceleration on the ground of 3.4 ms⁻². What is the minimum length of runway needed if it is to reach its take-off speed of 110 ms⁻¹?

$$v_f^2 = v_i^2 + 2ad$$
 1779 m

6. A 4 kg mass travels at 5 ms⁻¹ to the right. It collides with a 3 kg mass travelling at 6 ms⁻¹ to the left. After the collision, the 3 kg mass moves off to the right at 2 ms⁻¹. Use the law of conservation of momentum to work out the final speed of the 4 kg mass.

$$p = mv$$
 1 ms⁻¹ to the left

7. A student whirls a stone around on the end of a string in a horizontal circle. The stone rotates round at 10 times each second. What is the time period of the stone's rotation?

$$f = \frac{1}{T}$$
 0.1 s

8. An arrow, in being fired from a bow, is accelerated over a distance of 0.40 m and leaves the bow with a velocity of 40 ms⁻¹. What is the acceleration of the arrow while being fired?

$$v_f^2 = v_i^2 + 2ad$$
 2000 ms⁻²

