$^{9}/_{12}$

B8 Work, Energy and Power

B8.1 A box of mass 5.0 kg is dropped from a height of 3.2 m.

a) How much gravitational potential energy (GPE) was stored by the box before it was released?

b) The box lands on a table that is 70 cm above the ground. How much work did gravity do on the box on its way down to the table?

B8.2 An object of mass 3.5 kg slips all the way down a slope inclined at 40° to the horizontal, with a base length of 4.8 m.

a) How much GPE does the object lose?

b) If the average frictional force is 4.0 N, work out how much work the object does against friction.

B8.3 50 J of work is done in stretching a spring to an extension of 3.5 cm. Work out the average force applied.

B8.4 A boy whirls a 30 g conker around his head in a circle at a speed of 2.2 m s^{-1}, using a taut inextensible string. How much work is done on the conker by the tension in the string?

B8.5 A weight lifter pulls a 2000 kg car forwards at an average speed of 1.5 m s^{-1} against a force of 1250 N.

a) What is his power output?

b) How long will it take the weight lifter to do $10\,000$ J of work?

B8.6 A 1300 kg car travels at a steady speed, covering 75 m in 5 seconds. Frictional forces are constant and are 450 N in total. Work out the power output of the engine, assuming 100% efficiency.

B8.7 A child of 40 kg rides a 35 kg bike at 9.0 m s^{-1}. The brakes are then applied and the bike is slowed to 3.8 m s^{-1}. How much work is done by frictional forces?

B8.8 A 55 kW motor is used to lift a 4800 kg mass vertically up a mine shaft. What is the maximum possible speed that the mass could move upwards?

B8.9 A 4.0 kg ball is thrown vertically up into the air with an initial velocity of 8.5 m s^{-1}. By the time it is height h metres above the starting point, it has a velocity of 3.0 m s^{-1} and has done 4.0 J of work against air resistance. Find h.