Physics-Based Animation (SET09119)

Tutorial 04 - Motion Under Forces

1 Question

A particle has a mass of 100kg and has a 500N force applied to it.
(a) Find the acceleration.
(b) If the particle starts from rest, what is the speed after 4 seconds?

2 Question

A particle of mass 12 kg has an acceleration of $5ms^{-2}$. (a) Find the force F?
(b) If the particle is initially at rest, what distance is covered in the first 4 seconds?

3 Question

Pull of an engine is F and the resistance to the motion is 80N. Initially the body is at rest. Force F = 120N is applied for 10 seconds in the opposite direction and removed. How long before it is back to rest and what will be the total distance covered? (mass=20kg)

4 Question

A brick of mass 3kg falls through water with an acceleration of $2ms^{-2}$. Find the resistance force (gravity is $9.8ms^{-2}$).

5 Question

A 500 tonne train crashes into a buffer at 18 kmh^{-1} and depresses it 1.25 metres before coming to a rest. What is the force of impact from the train on the buffer? (Note, 1 tonne == 100,000kg).

6 Question

A balloon 'weighs' 600 kg is drifting horizontally. Some ballast is then thrown out, so the balloon begins to accelerate upwards at 0.2 ms^{-2}. How much ballast was thrown out (gravity is $9.8ms^{-2}$)?

7   Question

Two particles of mass 2m and 4m respectively are connected by a light inextensible string which passes over a smooth fixed pulley. The particles are released from rest with the parts of the string on each side of the pulley hanging vertically.

Find in terms of g and m as appropriate:

(a) the magnitude of the acceleration of the particles,

(b) the forces exerted by the string on the pulley.