Laws of motion

1) Explain the reasons for the following. (AS1)
a) Why dust comes out of a carpet when it is beaten with a stick?
b) Luggage kept on the roof of a bus is tied with a rope.
c) Why a pace bowler in cricket runs from a long distance before he bowls?

2) Illustrate an example of each of the three laws of motion.(AS1)

3) Explain the following (AS1)
a) Static Inertia b) Inertia of motion c) momentum
d) impulse e)impulsive force

4) Two objects have masses 8 kg and 25 kg. Which one has more inertia? Why?(AS1)

5) What is the momentum of a 6.0 kg ball bowling with a velocity of 2.2 m/s?
(Ans: 13.2 kg m/s2)(AS1)

6) Two people push a car for 3 s with a combined net force of 200 N. (AS1)
(a) Calculate the impulse provided to the car.
(b) If the car has a mass of 1200 kg, what will be its change in velocity?
(Ans: (a) 600 N.s (b) 0.5 m/s)

7) A force acts for 0.2 sec on an object having mass 1.4 kg initially at rest. The force stops to act but the object moves through 4m in the next 2 seconds find the magnitude of the force? (Ans: 14 N)(AS1)

8) An object of mass 5 kg is moving with a velocity of 10 ms-1. A force is applied so that in 20 s, it attains a velocity of 25 ms-1. What is the force applied on the object?
(Ans: 3.75 N)(AS1)

10) A hammer of mass 400 g, moving at 30 m s-1, strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer?
(AS1) (Ans: 1200 N)

11) A man of mass 30 kg uses a rope to climb which bears only 450 N. What is the maximum acceleration with which he can climb safely? (Ans: 15 m/s2) (AS7)

12) A vehicle has a mass of 1500 kg. What must be the force between the vehicle and the road if the vehicle is to be stopped with a negative acceleration of 1.7 ms-2?
(Ans:- -2550 N in a direction opposite to that of the motion of the vehicle) (AS7)

13) Two ice skaters initially at rest, push of each other. If one skater whose mass is 60 kg has a velocity of 2 m/s. What is the velocity of other skater whose mass is 40 kg? (Ans: 3 m/s in opposite direction) (AS7)

14) Three identical blocks, each of mass 10kg, are pulled as shown on the horizontal frictionless surface. If the tension (F) in the rope is 30N. What is the acceleration of each block? And what are the tensions in the other ropes? (Neglect the masses of the ropes) (AS1) (Ans: a = 1m/s2 , T1 =10N, T2 = 20N)

15) If a fly collides with the windshield of a fast-moving bus, (AS2)
(a) Is the impact force experienced, same for the fly and the bus? Why?
(b) Is the same acceleration experienced by the fly and the bus? Why?

1. The scientist who said that "an object in motion will remain in same motion as long as no external force is applied" is [ ]
a) Aristotle b) Galileo c) Newton d) Dalton

2. If the net force acting on an object is zero, then the body is said to be in the state of [ ]
a) Equilibrium b) Motion c) Inertia of motion d) Uniform motion

3. The inertia of a body depends on [ ]
a) Shape b) Volume c) Mass d) Area

4. Newton used the word 'mass in motion' to represent [ ]
a) Linear momentum b) Inertia of motion
c) Velocity d) Inertia at rest

5. The S.I unit of momentum is [ ]
a) m/sec b) Kg-m c) k.g.m/sec d) Kg. m/sec2