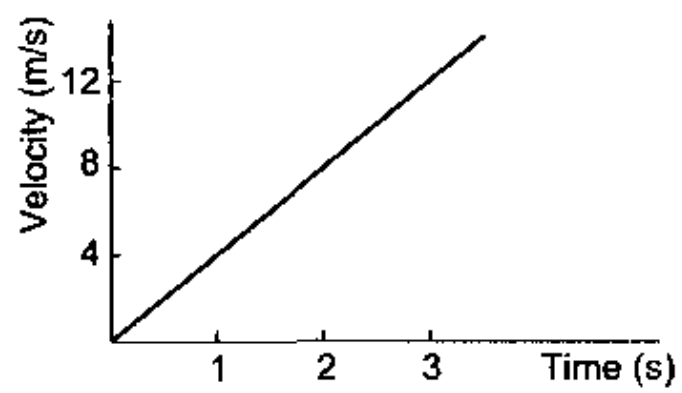## WORKSHEET No (1) - NUMERICALS FORCE AND LAWS OF MOTION

1. A bullet of mass 10 g moving with a velocity of 400 m/s gets embedded in a freely suspended wooden block of mass 900g. What is the velocity acquired by the block? (4.4 m/s)

2. A 60 g bullet fired from a 5 kg gun leaves with a speed of 500 m/s. find the speed (velocity) with which the gun recoils (jerks backwards.) (6 m/s)

3. A 10 g bullet travelling at 200 m/s strikes and remains embedded in a 2 kg target which is originally at rest but free to move. at what speed does the target move off? (.99 m/s)

4. A boy of mass 50 kg running at 5 m/s jumps on to a20 kg trolley travelling in the same direction at 1.5 m/s. what is their common velocity? (4 m/s)

5. A girl of mass 50 kg jumps out of a rowing boat of mass 3000 kg on the bank, with horizontal velocity of 3 m/s. with what velocity des the boat begin to move backwards? (0.5 m/s)

6. A truck of mass 500 kg moving at 4 m/s collides with another truck of mass 1500 kg moving in the same direction at 2 m/s. what is their common velocity just after the collision. If they move off together? (2.5 m/s)

7. A ball X of mass 1 kg c travelling at 2 m/s has a head – on collision with an identical ball Y at rest. X stops and Y moves off. Calculate the velocity of Y after the collision.(2 m/s)

8. A heavy car A of mass 2000 kg travelling at 10 m/s s has a head on collision with a sports car B of mass 500 kg. if both cars stop dead on colliding. What was the velocity of car B? (40 m/s)

9. A man wearing a bullet proof vest stands still on roller skates. The total mass is 80 kg. A bullet mass 20 grams is fired at 400 m/s. it is stopped by the vest and falls to the ground. What is then the velocity city of the man? (0.1 m/s)

10. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track, if the engine exerts a force of 401000 N and the track offer a friction force of 5000 N, calculate
   a) *The net accelerating force*   b) *The acceleration of the train and*   c)*The force of wagon 1 on wagon 2*

11. A cricket ball of mass 400 g travelling at 10 ms^{-1} is struck by a hockey stick so as to return it along its original path with a velocity at 5 ms^{-1} . Calculate the change of momentum occurred in the motion of the hockey ball by the force applied by the hockey stick. (-6 kg m/s)

12. Two objects each of mass 2.5 kg are moving in the same straight line but in opposite direction. The velocity of each object is 3.5 ms^{-1} before the collision during which they stick together, what will be the velocity of the combined object after collision? (0 m/s)

13. A car weighing 1500 kg moving with a velocity of 60 km / h retards uniformly to rest in 20 s. find the change in momentum that takes place in 1 s. (-1250.2 N)

14. An automobile vehicle has a mass of 2000 kg. what must be the force between the vehicle and road if the vehicle is to be stopped with a negative acceleration of 3 ms^{-2} . (6000 N)

15. A bullet of mass 12 g travelling horizontally with a velocity of 200 ms^{-1} strikes a stationary wooden block and comes to at rest in 0.02s. calculate the distance of penetration of the bullet in to the block. Also calculate the magnitude of the force exerted by the wooden block on the bullet. (2m, -240 N)

16. A ball of 20 g mass, moving at 150 ms^{-1} strike a wall. The wall stops the ball in a very short time equal to 0.05 s. what is the force of wall on the ball. (-60N)

17. How much momentum will a dumb bell of mass 10 kg transfer to the floor if it falls from a height of 80 cm? take its downwards acceleration to be 10 ms^{-2} . (40 kg m/s)

18. Which would require a greater force - accelerating a 20g mass at 5m/s^2 or a 10 g mass at 20 m/s^2.

19. Two persons manage to push a motorcar of mass 1200 kg at a uniform velocity along a level road. The same motorcar can be pushed by three persons to produce an acceleration of 0.2 ms^{-2}. With what force does each person push the motorcar? (240 N)

20. A motorcar mass 1200 kg is moving along a straight line with a uniform velocity of 90 km /h. its velocity is slowed down to 18 km/h in 4 s by an unbalanced external force. Calculate the acceleration and change in momentum. Also calculate the magnitude of force required.(-6000 N)

21. Two blocks made of different metals identical in shape and size are acted upon by equal forces which cause them to slide on a horizontal surface. The acceleration of the second block is found to be 5 times that of the first. What is the ratio of the mass of the second to the first.(1:5)

22. A force of 5 newton gives a mass m_1 an acceleration of 8 m/s^2 and a mass m_2 an acceleration of 24 m/s^2 . what acceleration would it give if both the masses are tied together.(6 m/s^2)

23. A car weighing 2400 kg and moving with a velocity of 20 m/s is stopped in 10 seconds on applying brakes. Calculate the retardation and retarding force. (2m/s^2, 4800 N)

24. A bullet of mass 10 g is fired on to a wall with a velocity of 50 m/s . it stops inside a wall at a depth of 10 cm. find the resistance offered by the wall.

25. A body moving with a velocity 10 m/s stops after 2 s. find the initial and final momentum of the body. The body weighs 5 kg. (-125N)

26. A wooden block of mass M1 kg accelerates at 10 ms^{-2} , when a force of 10 N acts on it. Another block of mass M2 accelerates at 20 ms^{-2} when the same force acts on it. Find the acceleration , if both the blocks are tied together and the same force acts on t his combination. (6.6 m/s^2)

27. A car weighing 3000 kg travelling ata speed of 108 km/h collides with a building and is stopped in 0.8 s. what is the impulse exerted on the car?(90000 N s)

28. A 1500 kg car moving with a speed of 50 m/s. when brakes are applied, it stops with uniform retardation at a distance of 150 m. calculate the force applied by the brakes of the car and the work done before stopping. (12500 N, 1875 kJ)

29. A bullet of mass 10 g is fired at a speed of 200 ms^{-1} from a gun of mass 2 kg. what is the recoil velocity of the gun? (-1 m/s)

30. An object of mass 1 kg travelling in a straight line with a velocity of 10 ms^{-1} collides with, and sticks to, a stationary wooden block of mass 5 kg . then they both move off together in the same straight line. Calculate the total momentum just before impact and just after impact. Also calculate the velocity of the combined object. (10 kg m/s, 10 kg m/s, 1.67 m/s)

31. Two particles A and B of mass 10 g and 20 g respectively fall vertically. At a given time, the speed of particle A is 12 m/s and that of B is 15 m/s. Find the total linear momentum of the system of the two particles. (0.42 kg m/s downwards 16.0.30 kg m/s)

32. A coin of mass 20 g is pushed on a table. The coin starts moving at a speed of 25 cm/s and stops in 5 seconds. Find the force of friction exerted by the table on the coin. (0.001 N)

33. How much force is needed to produce an acceleration of 16 cm/s2 in a body of mass 250 g? (0.04 N 4.25 m/s2 5.2 s 6.0,30 N)

34. A body of mass 1 kg is kept at rest. A constant force of 6.0 N starts acting on it. Find the time taken by the body to move through a distance of 12 m.

35. The velocity of a particle of mass 150 g changes from 8 m/s to 12 m/s in two seconds. Assuming that a constant force acts on it, find the magnitude of the force.

36. A force of 4.0 N acts on a body of mass 2.0 kg for 4.0 s. Assuming the body to be initially at rest, find: ((a) 8 m/s (b) 64 m)
    a. its velocity when the force stops acting,
    b. the distance covered in 10 s after the force starts acting.

37. A force produces an acceleration of 1.5 m/s2 in a disk. Three such disks are tied together and the same force is applied on the combination. What will be the acceleration? (0.5 m/s2 14.48 kg m/s).

38. Figure shows the velocity-time graph for a particle moving in a fixed direction, (a) Find the acceleration of the particle, (b) If the mass of the particle is 200 g, what is the force acting on it?