Force Numerical -2

Question 1)
How much net force is required to accelerate a 1000 kg car at 4.00 m/s²?
Solution)
F=ma
Given a=4.00 m/s²
M=1000kg
 F= 4000 N

Question 2)
 If you apply a net force of 3 N on .1 kg-box, what is the acceleration of the box
(a) 2 m/s²
(b) 30 m/s²
(c) 10 m/s²
(d) None of these.
Solution: b

Question 3)
A body of mass 1 kg undergoes a change of velocity of 4m/s in 4s what is the force acting on it?

Solution)
Acceleration is given by

$$a = \frac{\Delta v}{\Delta t}$$

So a=1 m/s²
Now force is given by
F=ma
F=1 N

4) A particle of 10 kg is moving in a constant acceleration 2m/s² starting from rest. What is its momentum and velocity per the table given below

S.No	time	Momentum	Velocity
1	1sec		
2	1.5 sec		
3	2 sec		
4	2.5 sec		

Solution)
Velocity can find using
V=u+at

u=0
v=at

Momentum
P=mV

S.No	time	Momentum	Velocity
1	1sec	20 Kg m/s	2 m/
2	1.5 sec	30 kg m/s	3 m/s
3	2 sec	40 kg m/s	4 m/s
4	2.5 sec	50 kg m/s	5 m/s

Question 5)
If a net force of 7 N was constantly applied on 400 g object at rest, how long will it take to raise its velocity to 80 m/s?
a) 0 s
b) 2.23 s
c) 3.47 s
d) 4.57 s

Question 6
 A sedan car of mass 200kg is moving with a certain velocity . It is brought to rest by the application of brakes, within a distance o f 20m when the average resistance being offered to it is 500N.What was the velocity of the motor car?
Solution:
Average acceleration= 500/200=-2.5 m/s^2
Now
$v^2=u^2$ +2as
Now v=0
So u=10 m/s

Question 7)
 A driver accelerates his car first at the rate of 4 m/s^2 and then at the rate of 8 m/s^2 calculate the ration of the forces exerted by the engines?
Solution ratio of force exerted= Ratio of acceleration= 1:2

Question 8)
An object of mass 10 g is sliding with a constant velocity of 2 m/ s on a frictionless horizontal table. The force required to keep the object moving with the same velocity is
(a) 0 N
(b) 5 N
(c) 10 N
(d)20 N

Solution (a)

Question 9)
A cricket ball of mass 0.20 kg is moving with a velocity of 1.2m/s . Find the impulse on the ball and average force applied by the player if he is able to stop the ball in 0.10s??
Solution
Impulse= Change in momentum= .20 X1.2=.12 Kgm/s
Fxt=.12
F=.12/.10=1.2 N

Question 10)
A car start from rest and acquire a velocity of 54 km/h in 2 sec. Find (i) the acceleration (ii) distance travelled by car assume motion of car is uniform iii) If the mass of the car is 1000 Kg,what is the force acting on it?
Solution
a) Acceleration is given by

$$a = \frac{\Delta v}{\Delta t}$$

So a=7.5 m/s²
b) Distance is given by

$$S = ut + \frac{1}{2}at^2$$

c) F=ma=1000X7.5=7500 N

Question 11
A hockey ball of mass .2 Kg travelling at 10 ms^{-1} is struck by a hockey stick so as to return it along its original path with a velocity at 2 m/s . Calculate the change of momentum occurred in the motion of the hockey ball by the force applied by the hockey stick.
 Solution:
ΔP= m (v - u) = 0.2 (-2 - 10) = –2.4 kg ms^{-1}
(The negative sign indicates a change in direction of hockey ball after it is struck by hockey stick.)

Question 12)
 Two objects of masses of 100 gm and 200 gm are moving in along the same line and direction with velocities of 2 ms^{-1} and 1 ms^{-1} respectively. They collide and after collision, the first object moves at a velocity of 1.67 ms^{-1}. Determine the velocity of the second object.
Solution
M$_1$ = 100 gm = 0.1 kg, M$_2$ = 200 gm = 0.2 kg,
u$_1$ = 2 ms^{-1}, u$_2$ = 1 ms^{-1}, v$_1$ = 1.67 ms^{-1}, v$_2$ = ?
By the law of conservation of momentum,
M$_1$u$_1$+M$_2$u$_2$=M$_1$v$_1$+M$_2$v$_2$
 0.1 x 2+ 0.23 x 1=0.1 x 1.67 + 0.2 v$_2$
v$_2$ = 1.165 ms^{-1}
It will move in the same direction after collision

Question 13)
Anand leaves his house at 8.30 a.m. for his school. The school is 2 km away and classes start at 9.00 a.m. If he walks at a speed of 3 km/h for the first kilometer, at what speed should he walk the second kilometer to reach just in time?

Question 14)
An object of mass 1kg acquires a speed of 10 m/s when pushed forward. What is the impulse given to the object?
Solution
Impluse=Change in Momentum= 10 Kgm/s
Question 15)
A bullet of mass 10 gm is fired with an initial velocity of 20 m/s from a rifle of mass 4 kg. Calculate the initial recoil velocity of the rifle..
Solution
From law of conservation of Momentum
0=.01X20+4v
Or v=.05 m/s