Force Numerical questions

Multiple choice questions

Question 1:
Why a goalkeeper in a game of football pulls his hands backwards after holding the ball shot at the goal?
a)Keep the ball in hands firmly
b)Reduce the force exerted by the ball
c)To exert larger force on the ball
d)None of these

Question 2:
A IITJEE text book of mass M rests flat on a horizontal table of mass m placed on the ground. Let $R_{x->y}$ be the constant force exerted by the body x on body Y. According to Newton third law, which of the following is an action-reaction pair of forces?

a. (M+m)g and $R_{table->book}$
b. $R_{ground->table}$ and mg+$R_{book->table}$
c. $R_{ground->table}$ and $R_{table->ground}$
d Mg and $R_{table->book}$

Question 3:
what options are true about momentum
a)Momentum is a vector quantity
b)The Unit of Momentum is kgm/s
c)Momentum is a scalar quantity
d)When two bodies acts on each other and no external force is acting on the system, then the momentum remains constant

Question 4:
What is not true of unbalanced forces?
a)It can change the velocity of the object
b)It can change the direction

c)Change the momentum
d)Change the shape of the body

Question 5:

An object of mass 100kg is accelerated uniformly from a velocity of 4m/s to 8m/s in 2seconds. Calculate the initial and final momentum of the object

a) 400 kgm/s,800 kgm./s
b) 100 kgm/s,400 kgm./s
c) 200 kgm/s,400 kgm./s
d)400 kgm/s,400 kgm./s

Question 6:

find the magnitude of the force exerted on the object?

a)250N
b)50N
c)100N
d) 200 N

Question 7

Which are laws of Newton's ?

a) Law stating action and reaction are equal and opposite
b) Product of mass and acceleration.
c) Tendency of a body to oppose any change in its state of rest or uniform motion
d) All the above

Question 8:

Which of the followings works on the principle of momentum?

a) A gun recoils after firing
b) Rocket
c) The case of hose pipe
d) All the above

Question 9:

A boy of mass 50 Kg running at 5 m/s jumps on to a 20Kg trolley travelling in the same direction at 1.5 m/s. What is the common velocity?

a) 4m/s
b) 3 m/s
c) 3.5 m/s

d) None of the above

Question 10:

which of these are vector quantities?

a) momentum

b) Force

c) Impulse

d) Inertia

Solution

1)b

2) c

3) a,b,d

4) d

5) a

Initial momentum =mv_0 =100X4=400 kgm/s

Final Momentum = mv_f=100X8=800 kg/s

6) d

Acceleration =change in velocity/time=(8-4)/2=2 m/s^2

Force=mass X acceleration=100X2=200 N

7) d

8) d

9) d

Since no external force, law of conservation of momentum can be applied

Initial momentum=50X5+20X1.5=280 kgm/s

Final momentum=70Xv=70v where v is the common velocity

Now we know that

Initial momentum=Final momentum

280=70v

V=4m/s

10) (a),(b) and (c)

Other Good questions

Question 1)

What is impulse? Prove that Impulse is equal to change in momentum?

Question 2)

State all the law Newton's law of Motion? And Give example for each law

Question 3)

What is the law of conservation of Momentum? A car of mass 200 kg moving with 3m/s collides with another car of mass 300 Kg moving in the same direction at 2 m/s .They collide and move together after that. What is the common velocity?

Question 4)

Explain these statements

a) when an cyclist moving stop pedaling ,Cycle get stops after some time. Which force is responsible for stopping

Answer : Force of friction opposes the motion and stops the cycle

b) Why people sitting in bus fall backward when bus suddenly starts?

Answer: This is because of inertia, the people tends to remain in a state of rest even when the bus start moving

c) A karate player can break a pile of tiles with a single blow of his hand?

Answer: This is because the karate player moves his hand very fast ,This way large momentum of fast moving hand reduces to zero in very short time and this result in very high force on the slab and they break

d) When a hanging carpet is beaten with stick ,the dust particle start coming out of it?

Answer: This is because force of stick moves the carpet but dust due to inertia remains at rest and start coming out

Question 5)

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 40000 N and the track offers a friction force of 5000 N, then calculate:

(a) The net accelerating force;

(b) The acceleration of the train; and

(c) The force of wagon 1 on wagon 2.

Solution:

Total mass, m = mass of engine + mass of wagons

Or, m = 8000 + 5 x 2000 = 18000 kg.

(a) The net accelerating force, F = Engine force - Frictional force

Or, F = 40000 - 5000 = 35000 N

(b) The acceleration of the train

$$a = \frac{F}{m} = \frac{35000}{18000} = 1.94 m/s^2$$

(c) The force of wagon 1 on wagon 2
= The net accelerating force - (mass of wagon x acceleration) -(mass of engine x acceleration)
= 35000 - (2000 x 1.94)-(8000X1.94) = 15591.2 N Ans.

Question 6)
A batsman hits a cricket ball which then rolls on a level ground. After covering a short distance, the ball comes to rest. The ball slows to a stop because
(a) the batsman did not hit the ball hard enough.
(b) velocity is proportional to the force exerted on the ball.
(c) there is a force on the ball opposing the motion.
(d) there is no unbalanced force on the ball, so the ball would want to come to rest.
Solution c

Question 7)
In the following example, try to identify the number of times the velocity of the ball changes:
"A football player kicks a football to another player of his team who kicks the football towards the goal. The goalkeeper of the opposite team collects the football and kicks it towards a player of his own team". Also identify the agent supplying the force in each case.
Solution:
The velocity of the ball changes four times.
When a football player kicks the football, its speed changes from zero to a certain value. In this case, force applied by player helps to change the velocity of the ball. This at first changes the velocity of the ball.
Another player kicks the ball towards the goal post. This changes the direction of the ball. Therefore, its velocity also changes. In this case, the player applied a force to change the velocity of the ball. The goalkeeper collects the ball. In other words, the ball comes to rest. Thus, its speed reduces to zero from a certain value. The velocity of the ball has changed 2nd time

the goalkeeper applied an opposite force to stop/change the velocity of the ball. Hence, its velocity changes third time.

The goalkeeper kicks the ball towards his team players. Hence, the speed of the ball increases from zero

to a certain value. Hence, its velocity changes once again. In this case, the goalkeeper applied a force to change the velocity of the ball.