

# Force Conceptual Questions

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## Multiple choice Questions

**Question 1:** A massive Truck collides head on with the small Nano car. Which of the following are correct?

- (A) Both the car and truck experience the same force of impact.
- (B) Car experiences the greater acceleration
- (C) Truck experience the greater acceleration
- (D) Car experience the more force of impact
- (E) None of these.

**Solution -1** (a) (b)

### **Explanation**

As per Newton's third law of Motion, Both the vehicle will experience the same force of impact. Now since car mass is smaller than truck, the acceleration would be higher

**Question 2:** Which law explains how rockets are launched into space?

- (A) Newton's first law
- (B) Newton's second law
- (C) Newton's third law
- (D) None of these.

**Solution-2** (c)

### **Explanation**

As Rocket pushes the gas out with some force, the reaction force pulls the rocket up This is as per Newton's third law

## True or False statement

- 3) Weight and normal force are action reaction pair
- 4) The upward Normal force on the person standing in the elevator accelerating downward is more than weight of the body
- 5) An object is falling through the atmosphere. It has not yet reached its terminal velocity. The net force on the object has magnitude less than its weight and is directed downward.
- 6) A rocket moves forward by pushing the surrounding air backward
- 7) When a person moves on a rough surface, the frictional force exerted by the surface on the person is in the direction of its motion

**Solution-3** (False).

**Explanation**

Action –reaction pair acts on the different body, so weight and normal force are not action reaction pair

**Solution 4** (False)

**Explanation**

From a person standing on ground, following forces are present

W-> Weight of the body acting downward

N-> Normal reaction of the elevator floor acting upward

Since the person is accelerating downward

$$W-N=ma$$

$$\text{Or } N=W-ma$$

**Solution 5** (True)

**Explanation**

W-> weight of the body acting downward

R-> Air Friction acting upward

Since the object has not reached terminal velocity, it will be still accelerating

$$W-R=ma$$

$\Sigma F > 0$  and it is less than weight and acting downward

**Solution 6** (False)

**Explanation**

A gas jet is expelled in backward direction

**Solution 7** (True)

**Explanation**

When the person moves, it pushes the ground backward and in reaction ground pushes him forward.

### **Link Type comprehension**

A rear-wheel drive car accelerates from rest such that all the wheels roll without slipping.

8) What is the direction of frictional force on the front wheel?

- a) Forward direction in the direction of car. And friction is static
- b) Backward direction. And friction is static
- c) Forward direction in the direction of car. And friction is kinetic
- d) Backward direction. And friction is kinetic

9) What is the direction of frictional force on the rear wheel?

- a) Forward direction in the direction of car. And friction is static
- b) Backward direction. And friction is static
- c) Forward direction in the direction of car. And friction is kinetic
- d) Backward direction. And friction is kinetic

10) If the car is placed on the friction less surface, what will happens when the driver pushes the accelerator?

- a) Car will not go anywhere and rear wheel will just rotate about its axis
- b) Car will move forward but front wheel will skid
- c) Car will move backward
- d) None of these

11) If we have friction present on rear wheel only, which of these will be true?

- a) Car will not go anywhere and front wheel will just rotate about its axis
- b) Car will move forward but front wheel will skid
- c) Car will move backward
- d) None of these

### **Solution**

#### **Explanation:**

When rear wheel of the car is rotated by the engine in the clockwise direction, the frictional force between wheel and surface will oppose the motion and it will drive the car forward. Since it is a pure rolling case with not skidding, the friction will be static

The front's wheel is pushed forward as the car moves, the friction force between wheel and surface will oppose the motion and friction force will act in backward direction and front wheel will also start rotating in clockwise direction. Since pure rolling case, the friction will be static

If the friction is not present at all, when the rear wheel is rotated by the engine, nothing happens and car stands at the same position only.

If the friction is present at rear wheel only, when the rear wheel is rotated by the engine, the car will move forward. But as no friction is there on front wheel, it will skid without any rotation

- 8) (b)
- 9) (a)
- 10) (a)
- 11) (b)

### **Multiple choice Questions**

**Question 12** A reference frame attached to the earth

- a) cannot be an inertial frame because the earth is rotating about its own axis
- b) is an inertial frame because Newton Law's are applicable in this frame
- c) cannot be inertial frame because earth is revolving around the sun
- d) is an inertial frame by definition?

**Solution -12** (a) and (c)

#### **Explanation**

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It cannot be inertial frame as this has centripetal acceleration due to motion around the sun and revolving motion around its axis

**Question 13** A block of mass  $M$  is given a push so that it can slide up on the ramp. After the block reaches at some point on the ramp, the block moves downward. Let  $a_1$  be the acceleration on the upward journey And  $a_2$  be the acceleration on downward journey. Which of these is true for these two values?

- a)  $a_1 > a_2$
- b)  $a_1 = a_2$
- c)  $a_1 < a_2$
- d) Not sufficient information

**Solution -13** (a)

**Question 14** A karate kids delivers a force of 1000 N to a set of tiles that breaks. The force that the tiles exerts on the hand during this event is

- a)  $> 1000\text{N}$
- b)  $< 1000\text{N}$
- c)  $1000\text{N}$
- d) Not sufficient information

**Solution -14** ©

**Explanation:**

Newton's third law

**Question 15** As per Newton's third law, Action-reaction pair of force

- a) may acts on the same body
- b) always acts on different bodies
- c) are in same direction
- d) are in opposite direction
- e) always acts on same body

**Solution -15** (b) and (d)