



# PHYSICS

## BOOKS - MTG IIT JEE FOUNDATION

### FORCE AND PRESSURE

#### Illustrations

1. Given diagram shows a moving ping pong ball, hit by a player. What effect of the force is

shown in the picture?



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2. The arrow in given diagram shows the direction of a sailing ship moves. What happens if a strong wind blows in the same direction?



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3. Mass of a body is 5 kg. What is its weight?

[Take  $g = 9.8ms^{-2}$ ]



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4. What is the mass of an object whose weight

is 49 newton? [Take  $g = 9.8ms^{-2}$ ]



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5. Calculate the pressure exerted by a brick, which applies a force of 2.5 N, when (a) it is placed upright on the soil, (b) when it is placed on its widest base. The dimensions of the brick are  $25\text{cm} \times 10\text{cm} \times 5\text{cm}$



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6. Why is it easier to swim in sea water than in the river water ?



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7. The dams of water reservoir are made thick near the bottom. Why?



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8. The blood pressure in human is greater at the feet than at the brain. Why?



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1. How much would a 70 kg man weigh on the moon? What will be his mass on the earth and on the moon? [ $g$  on moon =  $1.7ms^{-2}$ ]



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2. A student is pulling a load up an inclined plane. What are the forces the student has to overcome?



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3. Why carts with rubber tyres are easier to ply, than those with iron tyres?



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4. A person weighs 600 N. He is wearing shoes with a total area of  $0.02m^2$ . What pressure do they exert on the floor?



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5. Why are all the things attract towards the earth?



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6. What is the effect of force on the shape of an object?



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7. If several forces act in different direction on a body, in which direction will the body move?





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8. Why do the school bags have broad shoulder straps?



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9. What do you mean by state of motion of a body.



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10. What happens to the pressure when area on which it is applied increases?



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11. How do we feel force in our daily life?



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12. What are the effects of force?



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**13.** A force 20 N acts over an area of  $4\text{cm}^2$ . Find the value of pressure? [in  $\text{Nm}^{-2}$ ]



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**14.** Can you separate two hemispheres, if all the air is suck out from them?



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1. Give two examples of each situations in which you push or pull to change the state of motion of objects.



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2. Give two examples of situations in which applied force causes a change in the shape of an object.



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3. Fill in the blanks in the following statements.

To draw water from a well we have to \_\_\_\_\_ the rope.



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4. A charged body \_\_\_\_\_ an uncharged body towards it.



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5. To move a loaded trolley we have to \_\_\_\_\_ it.



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6. The north pole of a magnet \_\_\_\_\_ the north pole of another magnet.



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7. An archer stretches her bow while taking aim at the target. She then releases the arrow,

which begins to move towards the target.

Based on this information fill up the gaps in the following statements using the following terms.

muscular, contact, non-contact, gravity, friction, shape, attraction.

To stretch the bow, the archer applies a force that causes a change in its\_\_\_\_\_.



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8. The force applied by the archer to stretch the bow is an example of \_\_\_\_\_ force.



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9. The type of force responsible for a change in the state of motion of the arrow is an example of a \_\_\_\_\_ force.



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**10.** While the arrow moves towards its target, the forces acting on it are due to \_\_\_\_\_ and that due to of air.



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**11.** In the following situations identify the agent exerting the force and the object on which it acts. State the effect of the force in each case.

Squeezing a piece of lemon between the fingers to extract its juice.



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**12.** Taking out paste from a toothpaste tube.



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**13.** A load suspended from a spring while its other end is on a hook fixed to a wall.



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**14.** An athlete making a high jump to clear the bar at a certain height.



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**15.** A blacksmith hammers a hot piece of iron while making a tool. How does the force due to hammering affect the piece of iron?



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**16.** An inflated balloon was pressed against a wall after it has been rubbed with a piece of synthetic cloth. It was found that the balloon sticks to the wall. What force might be responsible for the attraction between the balloon and the wall?



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**17.** Name the forces acting on a plastic bucket containing water held above ground level in your hand. Discuss why the forces acting on

the bucket do not bring a change in its state of motion.



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**18.** A rocket has been fired upwards to launch a satellite in its orbit. Name the two forces acting on the rocket immediately after leaving the launching pad.



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**19.** When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to

- A. pressure of water.
- B. gravity of the earth.
- C. shape of rubber bulb.
- D. atmospheric pressure.

**Answer: d**



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## Exercise Multiple Choice Questions Level I

1. Which of the following is not a correct statement?

A. A force can change the state of rest or motion of a body

B. A force can change the direction of a body

C. A force can change the chemical properties of a body

D. A force can change the dimensions of a body.

**Answer: C**



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2. Which of the following forces is needed to pick up your school bag?

- A. Muscular force
- B. Gravitational force
- C. Magnetic force
- D. Electrostatic force

**Answer: A**



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3. You pick up your school bag by muscular force. The muscular force is also known as....

- A. frictional force
- B. magnetic force
- C. magnetic force
- D. all of these.

**Answer: C**



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4. When a ball is dropped from a certain height the speed of the ball goes on increasing due to

A. gravitational force

B. biological force

C. magnetic force

D. all of these.

**Answer: A**



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5. Force of friction is an example of

A. non-contact force

B. contact force

C. reactive force

D. none of these

**Answer: B**



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6. If no external force acts on a body, it will

A. move with more speed

B. change its shape

C. break into pieces

D. either remain in its state of rest or  
uniform motion.

**Answer: D**



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7. When the driver of a fast moving car suddenly applies brakes, the passengers in the car

A. fall backward

B. fall forward

C. are not affected

D. none of these

**Answer: B**



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8. The impact which a body can produce due to the combined effect of mass and velocity is called

A. momentum

B. force

C. moment of force

D. pressure

**Answer: A**



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9. \_\_\_\_\_ is a measure of the gravitational force acting on an object.

A. mass

B. weight

C. pressure

D. none of these.

**Answer: B**



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10. Mass differs from weight because

A. weight is a force whereas and mass is not a force.

B. the mass of an object is always more than its weight

C. mass can be expressed only in the metric system

D. there is no difference.

**Answer: A**



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11. Smooth surface has \_\_\_\_\_

A. less frictional force

B. more frictional force

C. sometimes less and sometime more  
force

D. no frictional force at all.

**Answer: A**



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12. If two equal forces act on the body in opposite direction, then the resultant force on the body will be

A. more

B. less

C. zero

D. none of these

**Answer: C**



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**13.** 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.

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 come to rest.

**Answer: C**



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**14.** An object rests on a horizontal frictionless surface. A horizontal force of magnitude  $F$  is applied. This force produces an acceleration

A. only if  $F$  is larger than the weight of the object

B. only while the object suddenly changes from rest to motion

C. always

D. only if the inertia of the object decreases.

**Answer: C**



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**15.** 1 tonne is equal to

A. 1000 mg

B. 1000 g

C. 1000 kg

D. 100 kg

**Answer: C**



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**16.** A spaceship continues moving in space with constant speed because

A. no force of friction due to air acts on it

B. no force of gravitation acts on it

C. its mass is zero in space



D. none of these

**Answer: B**



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**17.** What principle is used in a newton spring balance?

A. The mass of an object depends on its density.

B. The mass of an object depends on the gravity pulling it.

C. The weight of an object is directly proportional to its mass.

D. The extension of the spring is directly proportional to the weight pulling it, and weight depends upon mass.

**Answer: D**



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**18.** Which of these is a contact force ?

A. friction

B. magnetic force

C. gravitational force

D. electrostatic force

**Answer: A**



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**19.** The state of motion of a body is described by its \_\_\_\_\_ and direction of motion.

A. force

B. pressure

C. speed

D. none of these.

**Answer: C**



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20. There is one force which is exerted by all matter on all other matter. Which force is this?

A. Gravitational force

B. Magnetic force

C. Electrostatic force

D. Frictional force

**Answer: A**



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21. Which of the following is weakest force in nature?

A. Gravitational force

B. Electrostatic force

C. Magnetic force

D. All of these

**Answer: A**



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22. In CGS system, the unit of force is

A. newton

B. pascal

C. dyne

D. metre

**Answer: C**



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23. Equal forces  $F$  act on isolated bodies A and B as shown in figure. The mass of B is three times that of A. The magnitude of the acceleration of A is:

A. three times that of B

B.  $1/3$  that of B

C. nine times that of B

D.  $1/9$  that of B

**Answer: A**



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24. A coin flicked across a table will stop, because



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25. Which of the following substance can be attracted by magnet ?

A. Iron

B. Wood

C. Glass

D. All of these.

**Answer: A**



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**26.** The magnet is stronger near the

A. poles of the magnet

B. ends of the magnet

C. centre of the magnet

D. one quarter point from the poles of the magnet.

**Answer: A**



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**27.** The space or region around a magnet in which a force is experienced by magnetic material is called

A. electric field

B. magnetic force

C. magnetic field

D. magnetic axis.

**Answer: C**



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**28.** The pressure at the bottom of the sea is

A. greater than at sea level

B. lesser than at sea level

C. same

D. none of these

**Answer: A**



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**29.** When a body is thrown up, the force of gravity is:

A. in upward direction

B. in downward direction

C. zero

D. in the horizontal direction.

**Answer: B**



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**30.** Which of the following effects cannot be produced by a force?

A. changing the mass of an object

B. changing the shape of an object

C. changing the position of an object.

D. changing the direction of movement of  
an object

**Answer: A**



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## **Exercise Multiple Choice Questions Level 2**

**1. Pick the fundamental law of motion**

- A. Newton's first law of motion
- B. Newton's second law of motion
- C. Newton's third law of motion
- D. All laws of motion

**Answer: B**



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2. Equal and opposite forces acting on a body which do not change its state of rest or motion are called



A. null forces

B. unlike parallel forces

C. balanced forces

D. all of these

**Answer: C**



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3. If a body is allowed to fall down a height freely, its speed increases continuously. It is because

A. air does not exert frictional force

B. magnetic force of earth increases its  
speed

C. gravitational force of earth increases its  
speed

D. pressure of air forces it downward.

**Answer: C**



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4. A large truck and a car is moving with same velocity have a head on collision. Which of the following is an incorrect statement?

A. Both vehicles experience equal force of impact.

B. The car will experience greater force of impact.

C. The truck will experience lesser acceleration.

D. The car will experience greater acceleration

**Answer: B**



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5. A body is in the state of rest on the surface of earth. Which of the following is a correct statement?

A. Frictional force acts on the body

B. Only the weight of body acts on it

C. Only the reaction of the earth acts on it

D. The weight of body acting downward is equal and opposite to the reaction of the earth.

**Answer: D**



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6. A truck and a car are moving with velocity  $v$  towards each other. They collide head in and stops after some time. If the time of collision is 1 sec, which vehicle will have maximum change in momentum?

A. Car

B. Truck

C. Both will have same

D. None of the above

**Answer: C**



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7. The force of freely falling body is directly proportional to

- A. mass of body
- B. acceleration of body
- C. velocity of body
- D. both (a) and (b)

**Answer: D**



8. The acceleration due to gravity near the surface of moon is-

A.  $\frac{1}{6}$  of the acceleration due to gravity of

earth

B. almost equal to acceleration due to

gravity of earth

C. 6 times the acceleration due to gravity

of earth



D.  $\frac{1}{12}$  of the acceleration due to gravity of earth.

**Answer: A**



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9. Frictional force is important for motor racing. This is because, frictional force

A. can help a car slow down

B. can help a car move faster

C. can help a car move around the corners

without skidding

D. both (a) and (b)

**Answer: C**



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**10.** When a horse pulls a cart, the force which is responsible for the movement of cart is

A. the force of the horse on the cart

B. the force of the ground on the horse

C. the force of the ground on the cart

D. the force of the horse on the ground.

**Answer: B**



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**11.** At the centre of earth the acceleration due to gravity is

A. infinite

B. zero

C.  $9.8ms^{-2}$

D. all of these

**Answer: B**



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**12.** An object is weighed in the following places using a spring balance. In which place will it weigh the heaviest?

A. on the moon

B. at the equator

C. at the pole

D. at the centre of earth

**Answer: C**



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**13.** Why does an astronaut experience weightlessness in outer space?

- A. No gravitational force acts on him
- B. No frictional force acts on him
- C. There is no air resistance in outer space
- D. There is a vacuum in outer space

**Answer: A**



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**14.** Two forces act on the either side of the rigid body of negligible mass suspended by string as shown in figure. If  $R$  is the force to

balance then R will be:



A. 26 g wt

B. 41 g wt

C. 82 g wt

D. 16 g wt

**Answer: C**



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15. With the help of given figure, find which of the following options is correct?



A. The apple pulls with greater force than the earth pulls the apple.

B. The apple pulls with smaller force than the earth pulls the apple.

C. The apple pulls the earth with the same force that the earth pulls the apple.

D. All of these



**Answer: C**



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**16.** The mass of a body

A. is slightly different at different places on  
earth

B. is independent of the free-fall  
acceleration

C. is the same for all bodies of the same volume

D. can be measured most accurately on a spring scale.

**Answer: B**



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**17.** An object placed on a equal-arm balance requires 12 kg to balance it. When placed on a spring scale, the scale reads 12 kg. Everything

(balance, scale, set of weights and object) is now transported to the Moon where the free-fall acceleration is one-sixth that on Earth. The new readings of the balance and spring scale (respectively) are-

A. 12 kg, 12 kg

B. 2 kg, 2 kg

C. 12 kg, 2 kg

D. 2 kg, 12 kg

**Answer: C**



**18.** When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb , water gets filled in the dropper. The rise of water in the dropper is due to :

- A. Pressure of liquid
- B. Acceleration due to gravity of earth
- C. Shape of nozzle

D. Atmospheric pressure

**Answer: D**



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**19.** A car travels east with a certain constant velocity. The direction of the friction force on the car is

A. due east

B. due west

C. up

D. zero

**Answer: B**



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**20.** When pressure is applied through a piston at the top of a closed tube containing water, the pressure is transmitted to

A. Only the bottom of container

B. All directions

C. Only the side faces and the bottom of  
the container

D. None of these

**Answer: A**



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**21.** In this section each question has two matching lists. Choices for the correct combination of elements from List-I and List-II

are given as options (a), (b), (c) and {d) out of which one is correct.



A. P-3, Q-2, R-4, S-1

B. P-3, Q-4, R-2, S-1

C. P-1, Q-3, R-4, S-2

D. P-4, Q-3, R-1, S-2

**Answer: D**



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22. In this section each question has two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (a), (b), (c) and (d) out of which one is correct.



A. P-2, Q-1, R-4, S-3

B. P-3, Q-4, R-2, S-1

C. P-1, Q-3, R-4, S-2

D. P-4, Q-3, R-1, S-2

**Answer: A**



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## Exercise Match The Following

1. In this section each question has two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (a), (b), (c) and (d) out of which one is correct.



A. P-3, Q-2, R-4, S-1

B. P-3, Q-4, R-2, S-1

C. P-1, Q-2, R-4, S-3

D. P-4, Q-3, R-1, S-2

**Answer: C**



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**Exercise Assertion Reason Type**

1. Assertion : Force is defined as a push or a pull acting on a body.

Reason : CGS unit of force is newton

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: C**



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**2. Assertion :** The weight of an object changes from place to place but not mass.

**Reason :** The weight of the object is independent of the value of  $g$ .

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: C**



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**3. Assertion :** The forces acting on a body can be replaced by the resultant force only as regards the motion of the body as a whole.

**Reason :** The resultant force can not replace the several forces acting on a body in other respects.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: C**



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4. Assertion : The gravitational force makes the earth move around the sun and also makes the moon go around the earth.

Reason : Every objects in the universe exert a force on other objects.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: B**



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**5. Assertion :** When we bring a magnet close to a pin lying on a smooth table, the pin starts moving (sliding) towards the magnet.

**Reason :** Magnetic force is a contact force.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: C**



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**6. Assertion :** Friction always opposes the motion.

**Reason :** Whenever one surface moves or tries to move over another surface, the force of friction starts acting on the surfaces.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: D**



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7. Assertion : The pressure at the bottom of the sea is lesser than that near the surface.

Reason : The pressure exerted by a liquid depends upon the depth of the liquid and density of the liquid.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: D**



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**8. Assertion :**  $1 \text{ dyne} = 10^{-5} \text{ newton}$ .

**Reason :** Dyne is the CGS unit of pressure while newton is the SI unit of pressure.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: C**



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**9. Assertion :** We can live very happily if friction is not present in nature.

**Reason :** Aeroplane shape is streamlined to reduce the effort of frictional force.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: D**



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**10.** Assertion : The weight of the atmosphere exerts a pressure on the surface of earth.

Reason : When we go upwards, the magnitude of atmospheric pressure decrease gradually.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

**Answer: B**



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## Exercise Comprehension Type

1. PASSAGE-I: Ramu applied a force of 10 N on a body to move it from rest. He wants to express the applied force in terms of various system of units.

Express 10 N force in terms of dynes:

A.  $10^5$  dynes

B.  $10^6$  dynes

C.  $10^7$  dynes

D.  $10^8$  dynes

**Answer: B**



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2. **PASSAGE-I:** Ramu applied a force of 10 N on a body to move it from rest. He wants to express the applied force in terms of various system of units.

Express 10 N force in terms of kgf

A. 9.8 kgf

B. 56 kgf

C. 100 kgf

D. 84 kgf

**Answer: C**



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**3. PASSAGE-I:** Ramu applied a force of 10 N on a body to move it from rest. He wants to express the applied force in terms of various system of

units.

Express 10N force in terms of  $gcm s^{-2}$

A.  $10^5 gcm s^{-2}$

B.  $10^6 gcm s^{-2}$

C.  $10^3 gcm s^{-2}$

D.  $10^4 gcm s^{-2}$

**Answer: B**



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4. PASSAGE-II : Two bricks each of same dimensions are placed on level ground. Surface area of end of each brick is  $40\text{cm}^2$  and the surface area of base of each brick is  $150\text{cm}^2$ . Each brick weighs 40 N.

If both bricks are placed as shown then pressure exerted by both bricks on ground is:



A.  $100\text{Nm}^{-2}$

B.  $26\text{Nm}^{-2}$

C.  $150\text{Nm}^{-2}$



$$D. 126Nm^{-2}$$

**Answer: B**



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5. PASSAGE-II : Two bricks each of same dimensions are placed on level ground. Surface area of end of each brick is  $40cm^2$  and the surface area of base of each brick is  $150cm^2$ . Each brick weighs 40 N.

If both bricks are placed on standing position

then, the total pressure exerted by the bricks  
on ground is:

A.  $100Nm^{-2}$

B.  $200Nm^{-2}$

C.  $300Nm^{-2}$

D.  $400Nm^{-2}$

**Answer: B**



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# Exercise Subjective Problems Very Short Answer Type

1. What is the direction in which an object is pushed or pulled is called?



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2. Does a force acting on a body always cause a change in its state of motion?



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3. What measures the earth's gravitational pull on an object, its weight or mass?



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4. Which type of force is exerted by a static charge?



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5. Which force tends to slow down objects or keep them from moving?



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6. Name the force that acts on all bodies on the earth at all times.



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7. What is the force per unit area?



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**8.** Name the instrument used to measure liquid pressure.



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**9.** How is pressure related to force and area ?



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**10.** What do you call the force which can act from a distance?



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**11.** What is the unit of pressure?



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**12.** What is the requirement for a force to come into play?



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**13.** What is the resultant force when two forces act in same direction?



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**14.** What will be the resultant force when two forces act in opposite directions on an object?



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15. What happens in tug of war when two teams pull equally hard?



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## Exercise Subjective Problems Short Answer Type

1. What is a force? Explain with the help of some examples.



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2. Describe state of motion.



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3. What do you understand about the force of friction?



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4. What is electromagnetic force?



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5. We observe that the wheels of buses and trucks are heavier than the wheels of car or scooter. Why?



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6. What is atmospheric pressure?



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7. If the area of your head is  $15\text{ cm} \times 15\text{ cm}$ , how much air (in weight) would you carry on your head?



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8. Take a pencil sharpened at one end and press it between your fingers. Which end will hurt more and why?



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9. Why do deep-sea divers wear special suits?



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10. Why do some people suffer from nose bleeding at higher altitudes?



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**Exercise Subjective Problems Long Answer Type**

1. Prove that the pressure exerted by water at the bottom of the container depends on the height of its column.



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2. What are contact forces? State different contact forces. What are non-contact forces? Explain different types of non-contact forces.



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3. Show that air has pressure with the help of an experiment.



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4. Explain that a liquid exerts pressure on the walls.



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5. Explain that liquids exert equal pressure at the same depth.



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## Exercise Integer Numerical Value Type

1. The mass of an object whose weight is 50 N is  $x$  kg. Find  $x$ . (Take  $g = 10ms^{-2}$ )



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2. A force of 16 N is distributed uniformly on one surface of a cube of edge 4 cm. The pressure on this surface is  $x \times 10^4$  Pa. Find the value of x.



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3. A horizontal force of 4 N is applied to a block of mass 2 kg resting on a frictionless table. What is the acceleration of the block in  $m.s^{-2}$  ?



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4. The mass of the body is 60 kg, if value of acceleration due to gravity is  $10ms^{-2}$  and weight of the body is  $x \times 10^2$  N. Find x.



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5. If two horizontal forces  $F_1$  and  $F_2$  act on a body of certain mass in opposite directions

such that they are odd consecutive force then find the net force acting on the body.



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## Olympiad Hots Corner

1. A block of mass 4 kg and dimensions  $10\text{cm} \times 20\text{cm} \times 30\text{cm}$  rests on the floor. If  $g = 10\text{ms}^{-2}$ , then the maximum pressure the block can exert on the floor is:

A.  $2000Nm^{-2}$

B.  $1000Nm^{-2}$

C.  $4000Nm^{-2}$

D.  $1333Nm^{-2}$

**Answer: A**



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2. A body of volume  $V$  and density  $d$  is completely immersed in a liquid of density  $p$ .

Then the apparent weight of the body will be:

A.  $Vdg$

B.  $V\rho g$

C.  $V(\rho - d)g$

D.  $V(d - \rho)g$

**Answer: D**



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**3.** In a container (cross-sectional area  $A$ ) a homogeneous solid cylinder of length  $L$  ( $L < H/2$ ) as shown in the figure), cross-

sectional area  $A/5$  is immersed such that it floats with its axis vertical at the liquid-liquid surface with length  $L/4$  in the denser liquid as shown in the figure. The lower density liquid is open to the atmosphere. Then the density  $D$  of solid is given by:



A.  $\frac{4}{5}d$

B.  $4d$

C.  $\frac{d}{5}$

D.  $\frac{5}{4}d$

**Answer: D**



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4. A piece of wood is floating in water kept in a bottle. The bottle is connected to an air pump. Neglect the compressibility of water. When more air is pushed into the bottle from the pump, the piece of wood will float with:

A. larger part in the water

B. lesser part in the water

C. same part in the water

D. will sink to the bottom

**Answer: A**



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5. Kerosene of mass 100 g is mixed with 100 g of water. One of the under given options that well describes the reason for kerosene to float on water is



A. mass of displaced water is less than the mass of kerosene of equal volume

B. mass of kerosene is more than the mass of equal volume of water

C. mass of kerosene is less than the mass of displaced water

D. mass of kerosene is equal to mass of displaced water

**Answer: D**



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6. A body floats with one-third of its volume outside water and  $\frac{3}{4}$  of its volume outside another liquid. The density of another liquid is :

A.  $\frac{9}{4} \frac{g}{cc}$ ,  $\frac{8}{3} \frac{g}{cc}$

B.  $4 \text{ g/cc}$

C.  $\frac{3}{8} \text{ g/cc}$

D. 1

**Answer: B**



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7. The displacement- time graph of a lift climbing from the ground floor to the top of the building is given here. Which of the following statements are true about the graph?



- (i) At point A, the lift is stationary.
- (ii) Velocity of lift is decreasing from point B to C.

(iii) At point C, the lift is at zero velocity.

(iv) Velocity of lift is minimum at B.

A. (i) and (iii) only

B. (ii) and (iv) only

C. (i), (ii) and (iii) only

D. (ii), (iii) and (iv) only

**Answer: C**



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8. A force of 16 N is distributed uniformly on one surface of a cube of edge 8 cm. The pressure on this surface is:

A. 3500 Pa

B. 2500 Pa

C. 4500 Pa

D. 5500 Pa

**Answer: B**



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9. A football has lesser inertia than a stone of the same size because:

A. football has more air inside than the stone

B. football has less air inside than the stone

C. football has less mass than the stone

D. football has more mass than the stone

**Answer: C**



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10. A machine gun of mass 10 kg fires 20 g bullets with speed of 500 m/s at the rate of 10 bullets per second. To hold the gun steady in its position how much force is necessary?

A. 200 N

B. 500 N

C. 100 N

D. 250 N

**Answer: C**



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**11.** 20 Pa pressure is applied on the head of a nail placed perpendicular to the surface of a wall. If the area of cross section of the tip of the nail is  $\frac{1}{10}$  the area of cross section of the head, the pressure exerted at the wall is \_\_\_\_ Pa.

A. 10 Pa



B. 20 Pa

C. 200 Pa

D. None of these

**Answer: C**



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**12.** An aluminium sphere is dipped into water.

If  $B_I$  and  $B_{II}$  are the buoyancies in water at

$0^\circ\text{C}$  and  $40^\circ\text{C}$  respectively, then:

A.  $B_1 < B_2$

B.  $B_1 > B_2$

C.  $B_1 = B_2$

D.  $B_1 >$  or  $< B_{II}$  depending upon the  
radius of the sphere.

**Answer: B**



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**13.** A force acting on an object of mass 500 g changes its speed from 200 cm/s to 0.2 m/s.

The change in momentum is

- A. increase by 0.90 N s
- B. decrease by 0.90 N s
- C. increase by 90 g cm/s
- D. decrease by 90 g cm/s

**Answer: B**



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14. A block of ice is floating in a liquid of specific gravity 1.2 contained in a beaker. What will happen to the liquid level when ice completely melts?

- A. Liquid level will increase
- B. Liquid level will decrease
- C. Liquid level will remain unchanged
- D. Depends on the size of ice block

**Answer: A**



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15. The weight of an empty balloon on a spring balance is  $W_1$ . The weight becomes  $W_2$  when the balloon is filled with air. Let the weight of air itself be  $W$ . Neglect the thickness of balloon when it is filled with air. Also neglect the difference the density of air inside and outside the balloon.

A.  $W_2 < W_1 + W$

B.  $W_2 = W_1 + W$

C.  $W_2 > W_1 + W$

D.  $W_2 < W_1$

**Answer: A**



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