CHAPTER – 3 FORCE AND PRESSURE [EXERCISE SOLUTIONS]

A. Choose the correct option :

1. What causes the change in motion and change of state of motion?
(a) Pressure   (b) Force
(c) Atmospheric pressure   (d) Fulcrum
Answer : (b) Force

2. The unit of the force is
(a) newton   (b) pascal
(c) kilogram   (d) metre
Answer : (a) newton

3. Which of the following does not work on the existence of atmospheric pressure?
(a) rise of iodine solution in the glass tube of dropper
(b) rise of cold drink in a long plastic straw
(c) sticking of suction hook on the wall of a room
(d) rise of mercury in glass tube of thermometer
Answer : (d) rise of mercury in glass tube of thermometer

4. The pressure of water at the bottom of the lake is………………at the surface of lake.
(a) greater than   (b) equal to
(c) less than
(d) either greater or less than
Answer : (a) greater than

5. As we move to higher altitude the pressure exerted by air
(a) decreases   (b) increases
(c) remain same   (d) cannot say
Answer : (a) decreases

6. Pressure exerted by anybody can be increased by
(a) increasing force applied
(b) reducing area of contact
(c) both (a) & (b)
(d) none of these
Answer : (c) both (a) & (b)

7. The magnitude of atmospheric pressure is equal to the pressure exerted by a :
(a) 76 mm tall column of mercury
(b) 760 mm tall column of alcohol
(c) 76 cm tall column of mercury
(d) 760 cm tall column of mercury
Answer : (a) 76 mm tall column of mercury

B. Fill in the blanks :

1. To draw water from a well, we have to…………….at the rope.
Answer : pull

2. The symbol of……………….is kPa.
Answer : kilopascal

3. Force could be a…………..or a……………
Answer : push, pull.

4. Force has magnitude as well as………………
Answer : direction.

5. A force arises due to……………between two objects.
Answer : interaction or contact

6. Force acting on a unit area is called……………
Answer : pressure

7. The pressure exerted by a liquid…………… with depth.
Answer : increases

8. A drinking straw works on the existence of………………pressure.
Answer : atmospheric

9. Atmospheric pressure………………..with increasing height.
Answer : decreases

10. Torque is defined as the product of……………..and………………..
Answer : force (F), moment of arm (d).

C. Write T for True and F for False statements.

1. The pressure exerted by a liquid depends on the area of base of its container.
Answer : True

2. A drinking straw works on the pressure exerted by the liquid filled in a soft drink bottle in which it is placed.
Answer : False

3. Pressure is independent of the roughness of the surfaces in contact.
Answer : True

4. The force is applied at a point on the body from which axis is passing, for producing maximum torque.
Answer : True

5. If the turning effect on the body is anticlockwise, the moment of force is taken as positive.
Answer : False

D. Answer the following questions in short.

1. What is the push or pull on an object known as?
Answer : Force.

2. Why do the shape and size of a balloon change when filled with air or water?
Answer : The **shape and size** of the **balloon changes** when we add **water** or **air** because both them exerts pressure.

3. Name the quantity whose unit is 'newton' (N).
Answer : Force.

4. What name is given to the force acting on a unit area of an object?
Answer : Pressure.

5. Name the quantity whose one of the units is pascal (Pa)?
Answer : Pressure.

6. What conclusion do you get from the observation that a fountain of water is created at the leaking joint of pipes of the main water supply line?
Answer : It is due to the very high pressure exerted by water on the sides (or walls) of the pipes that such a fountain of water is formed.

7. What type of pressure is involved in the filling of a liquid in a syringe?
Answer : The syringe works on the existence of atmospheric pressure.

8. What substance present in our body balances the atmospheric pressure acting on us?
Answer : Blood pressure present in our body balances the atmospheric pressure acting on us.

9. Where will the atmospheric pressure be greater-at ground level or at the top of high mountain?
Answer : The depth (distance from **top** to bottom) of the **atmosphere** is greatest at sea **level** and decreases at higher altitudes. With **greater** depth of the **atmosphere**, more air is pressing down from above. Therefore, air **pressure** is greatest at sea **level** and falls with increasing **altitude**.

10. Name any two devices used in everyday life which work on the existence of atmospheric pressure.
Answer : Syringe, Dropper, Rubber suckers, Drinking straw, etc.

11. If a vacuum is created between two Magdeburg hemispheres joined together, they cannot be separated easily. What presses the hemispheres together?
Answer : The **two hemispheres** stick to each other because the air inside them is pumped out with a remarkable force **between** them so that **they** can stick **together**.

12. What makes a balloon get inflated when air is filled in it?
Answer : When **air is filled** in a **balloon** then the number of the molecules of **air** inside the **balloon** increases. As a result more collisions of molecules take place with the walls. This **gives** rise to high **air** pressure on the walls which **causes** the **balloon** to expand and **get inflated**.

13. Name the substance whose weight produces atmospheric pressure.
Answer : The **substance whose weight produces atmospheric pressure** is air.

14. Where is the pressure greater, 10 m below the surface of the sea or 20 m below the surface of sea?
Answer : Pressure is **greater 20m below the surface of sea** , the **pressure** increases as you go deeper in it. For every **10m** you go deeper pressures increases by 14 psi.

15. What force acting on an area of 0.5 m^2 will produce a pressure of 500 Pa?
Answer : We know, **pressure** is the ratio of **force** to **area**. Therefore 250 N **force acting on an area of 0.5** m² **will produce a pressure of 500 Pa.**
Pressure = Force/Area
500 Pa = F/0.5 m^2
Force = 500 Pa x 0.5 m^2
Force = 250 N

16. Can a liquid exert pressure upwards?
Answer : Yes water **can exerts pressure upwards** .
Yes water molecules being free to move in any direction **exert pressure** in all directions so they **exert pressure upward** also. If it is heated it gains sufficient Kinetic energy to move **upward** against force of gravity and thus water evaporates.

17. Can a liquid exert pressure sideways?
Answer : Yes, liquid exert sideways pressure as you can see in the example of water bottle of plastic.

18. What is moment of force?
Answer : The **moment of force**, often called torque, is the product of a **force** on an object and the distance from the reference point to the object.

19. In what units does torque calculated?
Answer : The SI unit for torque is the **Newton-meter**.

20. What is meant by saying that 'force is due to an interaction'? Give an example toillustrate your answer.
Answer : Interaction of **one** object with another object results in **force** between two objects.
Suppose a man is standing behind a stationary car. Since there is no interaction between the man and the car, no force acts on the car and hence the car does not move. When the man pushes the car, there is an interaction between the man and the car. During this interaction, a force arises which acts on the car and makes it move in the direction of applied force.

21. When does the turning effect of force occurs?
Answer : The **turning effect** of a **force is** known as the moment. It **is** the product of the **force** multiplied by the perpendicular distance from the line of action of the **force** to the pivot or point where the object **will turn**.

22. In a tug of war, when the two teams are pulling the rope, a stage comes when thr rope does not move to either side at all. What can you say abot the magnitudes and directions of the forces being applied to the rope by the two teams at this stage?
Answer : In **tug of war** when **two teams are pulling the rope** and if the **rope does not move** in eiher **side** then the net weight **is** zero and equal muscular **force is applied**.
Therefore the **magnitude** and the **direction** of the force are the same.
At this **stage**, **both** the **teams apply** equal muscular **force** in opposite **directions**.

23. What is foce? State the various effects of force.
Answer : Force : A push or a pull on an object is called force.
Various effects of Force : A **force** acting on an object may cause the object to change shape, to start moving, to stop moving, to accelerate or decelerate. When two objects interact with each other they exert a **force** on each other, the **forces** are equal in size but opposite in direction.

24. Give two examples from everyday life which show that air exerts pressure.
Answer : (i) When **air** is pumped inside a balloon, it expands in size. This **shows** that the **air** inside **exerts pressure** on the walls of the balloon.
(ii) A sealed packet of chips swells up in the mountains.

25. What is a rubber sucker? How does it work? State any one use of a rubber sucker.
Answer : A **rubber sucker** is also called a **suction** Cup because it sticks to a surface by **suction**. When we press the **rubber sucker** on a flat ,smooth, surface , its concave **rubber** cup gets flattened to a large extent, pushing out most of the air from beneath it.
Rubber suckers are used for making suction hooks which are fixed on walls, doors and almirah, etc., to hold various things.

26. Why do mountaineers usually suffer from nose-bleeding at high altitudes?
Answer : Nosebleeds can be caused by being up in a very **high altitude**. As you climb **higher**, the amount of oxygen in the air decreases. This makes the air thinner and dryer, which can in turn cause the inside of your **nose** to crack and **bleed.**

27. Describe one activity to show the existence of atmospheric pressure.
Answer : When a can filled with hot water is closed and is cooled down rapidly by pouring cold water on it, it will crush instantly. This experiment proves that there is a huge **atmospheric pressure** exerts on everything on the surface of the earth.

28. Explain why, water comes out more slowly from an upstairs tap than from a similar tap downstairs.
Answer : Water comes out more slowly from **upstairs tap than from a similar**. **tap downstairs**. It is because of the pressure exerted by **water**. As the depth of **water** increases, the pressure also increases.

29. Why does a sharp knife cut objects more effectively than a blunt knife?
Answer : A **sharp knife cuts objects** better because due to its very thin edge, the force of our hand falls over a **sharp** small area of the **object** producing a large pressure. And this large pressure **cuts** the **object** easily. A **blunt knife** has a thicker edge and **does** not **cut** the **object** easily.

30. Explain why, wooden (or concerete) sleepers are kept below the railway line.
Answer : Wooden or concrete sleepers are kept below the railway line so that there is less pressure of the train on the ground and **railway line** may not sink into the ground.

31. Explain why, a wide steel belt is provided over the wheels of an army tank.
Answer : The **army tank** is very heavy. It has **wide steel belt over the wheels**. The **wide belts** increase the area and reduce the pressure. This avoids sinking of the **tank** into the ground.

32. Explain why, the tip of a sewing needle is sharp.
Answer : The **tip of a sewing needle is sharp** because the area under the pointed end of the **sharp needle** is very small. Pressure exerted by a **sharp needle** is more on the cloth and can pierce easily through the cloth.

33. Explain why, snow shoes stop you from sinking into snow.
Answer : The area of **snow shoes** (which comes in contact with the **snow**) is much bigger than the area of sole of ordinary **shoes** worn by us in everyday life. So, the **snow shoes** exert less pressure (= force /area) on the soft **snow** and **stop** the wearer from **sinking into** it.

34. Explain why, when a person stands on a cushion, the depression is much more than when he lies down on it.
Answer : When a **person stands on a cushion**, the entire weight of his body gets focused on a smaller area, thereby producing a larger pressure. Thus, the **depression** in

the **cushion** is **more** when a **person stands** than when he lies.

P = 40 Pa

35. Explain why, porters place a thick, round piece of cloth on their heads when they have to carry heavy loads.
Answer : The **round piece of cloth on their heads** increases the area on which the force (weight of the **load**) will act. We know that, the pressure is inversely proportional to area. Therefore, increase in area reduces the pressure and this helps
the **porter** to **carry** the **heavy load** easily.

36. A bolt connecting the main and rear fram of a mountain bike requires a torque of 15 N m to tighten. If you are capable of applying 40 N of force to a wrench in any given direction, what is the minimum length of the wrench that will result in the required torque?
Answer : We know that
Torque = d x F
15 N m = d x 40 N
$$d = \frac{15 \, N \, m}{40 \, N}$$
$$d = \frac{3}{8} m$$
d = 0.375 m

37. A 40 N block exerts 20 Pa of pressure on a table. What is the area of the block that is touching the table?
Answer : We know that
$$Pressure = \frac{Force}{Area}$$
$$20 \, Pa = \frac{40 \, N}{Area}$$
$$Area = \frac{40}{20}$$
Area = 2 m^2

38. Calculate the pressure when a force of 200 N is exerted on an area of :
(i) 10 m^2 **(ii)** 5 m^2
Answer : We know that
$$Pressure = \frac{Force}{Area}$$
(i) P = ?, F = 200 N, A = 10 m^2
$$P = \frac{F}{A}$$
$$P = \frac{200}{10}$$
P = 20 Pa
(ii) P = ?, F = 200 N, A = 5 m^2
$$P = \frac{F}{A}$$
$$P = \frac{200}{5}$$