

**Physics****Revision Worksheet for Mid-Term Test****Class - IX****Instructions:**

- ✓ Read the chapter in your book - quickly and thoroughly, preferably more than once.
- ✓ Watch the uploaded video classes from School's Website/YouTube channel.
- ✓ For becoming more clear about the basics, watch more than once, if needed.
- ✓ For any difficulty in understanding, contact with me.

**(Questions given in this worksheet are important questions for all exams)**

**CHAPTER 4 : WORK, POWER AND ENERGY****Cognitive Questions (Mark - 1)****1. What is called work done?**

Ans.: The product of applied force on a body and its displacement along the direction of the force applied is called work done.

**2. What is 1 joule?**

Ans.: If an object has one meter displacement towards force from applying one Newton force on it then the amount of work done is called one joule.

**3. What is power?**

Ans.: Power is the rate of doing work or transformation of energy.

**4. What is watt?**

Ans.: If one joule work is done in one second then it is called watt Or one watt.

**5. Write down the principle of conservation of energy.**

Ans.: "Energy cannot be created, neither be destroyed, it can be transformed from one form to another or multiple forms. The total amount of energy of the universe is constant and unchangeable."

**6. What is kinetic energy?**

Ans.: The energy to work that an object receives due to being in motion is called kinetic energy.

### 7. What is called potential energy?

Ans.: When an object is brought to another state or position from its natural state or position then the ability of work that the object gains is called the potential energy of that object.

### 8. What is efficiency?

Ans.: The ratio of effective energy and the total given energy is called efficiency.

### 9. What is mechanical energy?

Ans.: Energy that is attained due to position, shape and motion of an object is mechanical energy.

## Analytical Questions (Marks - 2)

### 1. What do you mean by the work 50j?

Ans.: The work 50j means-

- i. If a force of 50N is applied on a body and the body gets displacement of 1m along the direction of force, then the work done is said to be 50j.
- ii. If 1N force is used to move a body 50m along the direction of force, then the work done is said to be 50j.

### 2. Write down the differences between energy and power.

Ans.: The differences between energy and power are given below -

<b><i>Energy</i></b>	<b><i>Power</i></b>
i. The ability to work is energy.	i. The rate of work done is called power.
ii. Energy is determined by the total amount of work done.	ii. Total amount of work done is not needed to determine power. In doing the same work, the fastest has the more power.
iii. Energy has different forms. It can be transformed from one form to another.	iii. It has no different forms. So, there is no question of transforming.
iv. The unit of energy is joule (j).	iv. The unit of power is watt (w)

### 3. Explain why the unit of energy and work is same.

Ans.: Ability to do work is energy. Doing work means transforming energy from one state to another state.

In this case, the amount of work done is equal to the amount of energy transformed. This means that total amount of work done by body is energy. Since energy of a body is measured from the amount of work done. So, unit of work and energy is same and it is joule (j).

### 4. In all respect, equal work cannot be done by applying force. Explain.

Ans.: We know, work = force x displacement

If the displacement of the body is zero on the application of a force, then work done will be zero. Again, if the displacement is opposite to the direction of force then work is negative and work is positive when the displacement is in the same direction of force. Thus, in all respect work done cannot be equal.

### 5. What do you mean by potential energy? Explain.

Ans.: The energy that an object gains for changing its position or state is potential energy inside it. If a piece of stone or brick is thrown from roof on any object it can break or bend. When the stone or brick was kept on the roof, energy was stored in it. When the stone falls, that energy is used. The energy was hidden within the stone as it was above the ground. Again, if the two ends of a spring is attached to two object and then released then they will strike each other. Though the spring was stretched, energy was conserved in it. When it is released, work is done. Energy was hidden when the spring was stretched, because it was strained. Now, for the both cases, as there was a change in the position from normal state on the ground, an energy was stored within them due to strain of them and this is called potential energy.

### 6. What factors does potential energy depend on? Explain.

Ans.: Potential energy = weight of the body x vertical height

$$\therefore E_p = mgh.$$

i. e. potential energy = mass of the body x acceleration due to gravity x vertical height

Potential energy depends on the vertical height of the object from the surface of the earth. The more is the height, the higher will be the potential energy.

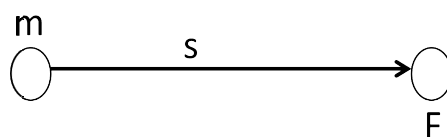
Potential energy also depends on the mass of the object. The more the mass the more will be the potential energy of the object.

### 7. What is meant by the work done against the force?

Ans.: If the displacement of a body takes place opposite to the direction of force then the work done is called work done against force. If a duster is lifted on the top of a table from the floor then the work is done against force. If a duster is lifted on the top of a table from the floor then the work is done against the force of gravity. This is because, the displacement taken place opposite to the direction of force of gravity.

### 8. How the kinetic energy of a moving body is related with the velocity? Explain.

Ans.: Let a body at rest with mass  $m$  accelerated at a velocity ' $v$ ' when ' $F$ ' force was applied on it. In this time, the body travelled ' $s$ ' distance towards the direction of force. So the work to give this velocity to the body is its kinetic energy.



$\therefore$  kinetic energy = work done

$$\Rightarrow E_k = \text{Force} \times \text{displacement}$$

$$\Rightarrow E_k = F \times s$$

$$\Rightarrow E_k = mas \text{ [} F = ma \text{]} \text{-----(1)}$$

$$\text{But, } v^2 = u^2 + 2as$$

$$\Rightarrow v^2 = 2as \text{ [} u = 0 \text{]}$$

$$\Rightarrow as = v^2/2$$

Putting the value of ' $as$ ' into equation (1) and we get,

$$E_k = m \cdot v^2/2$$

$$\Rightarrow E_k = \frac{1}{2} mv^2$$

$$\therefore E_k = v^2 \text{ [mass, } m = \text{constant]}$$

Therefore, kinetic energy is proportional to the square of velocity.

### 9. Can kinetic energy of Rahim be negative?

Ans.: Rahim's kinetic energy can never be negative. Because if any moving object's mass is ' $m$ ' and velocity is ' $v$ ' then kinetic energy is  $\frac{1}{2}mv^2$ . Object's mass  $m$  can never be negative. Object's velocity can be positive or negative but its square is always positive. So, kinetic energy can never be negative.

**10. Why the nuclear reaction is not environmentally friendly? Explain.**

Ans.: There is no emission of carbon-dioxide in a nuclear power plant. But nuclear wastages are very radioactive and these have to be preserved for millions of years for their radioactivity to reach a safe level which is not hazardous for the environment. Though nuclear power plant is very safe due to modern technology, sometimes owing to people's mistakes or natural calamities major accidents happen to create a fatal disaster. These are why, nuclear reaction is not environmentally friendly.

**11. Why effective energy depends on efficiency? Explain.**

Ans.: The ratio of the amount of work done by a machine and total given energy is called the efficiency of that machine.

$$\text{Efficiency} = \frac{\text{Amount of work}}{\text{Energy given}}$$

or, Amount of work = Efficiency x Energy given

So, amount of work will increase with the efficiency of a machine. So, less energy will be wasted. So, amount of work depends on the efficiency.

**12. How can geothermal energy be used? Explain.**

Ans.: The heat below the earth surface can be used as an energy source. The heat below the surface is so high that sometimes due to

geological changes, this magma comes upwards which accumulates slightly below the earth surface. These places are known as hot spots. Water beneath the surface vaporizes in contact with hotspots. Pipes can be inserted into these hot spots to extract this vapor using high pressure which can produce electricity by rotating turbines.

**13. When we throw an arrow by stretching the string of a bow, how does the energy transformation take place?**

Ans.: While pulling the string of a bow, potential energy accumulates in the string due to the position change of the string. Then, while shooting the arrow, the potential energy in the string accumulates kinetic energy in the bow. This potential energy changes to kinetic energy while shooting an arrow by pulling the string of the bow.

**14. Explain why biomass can be considered as a multiple source of energy.**

Ans.: Biomass refers to those organic matters that can be changed to energy. A lot of organisms including humans consume biomass as food and then turn it into energy to keep daily activities in motion. The organic matters that can be used

as the source of biomass energy are trees, fuel wood, waste of wood, crops, rice husks, leaves, faeces of animals and birds, municipal waste etc. This is why biomass is considered as a multiple source of energy.

**15. Write the difference between potential energy and kinetic energy.**

Ans.: Difference between kinetic energy and potential energy is as follows:

<b><i>Kinetic energy</i></b>	<b><i>Potential energy</i></b>
i. The ability of work that a moving object gains from its motion state is called kinetic energy.	i. The energy that an object gains from its position change with respect to the surroundings is called potential energy.
ii. Kinetic energy of a falling object gradually increases.	ii. Potential energy of a falling object gradually decreases.
iii. If an object is not in motion then its kinetic energy is zero.	iii. The potential energy of an object on the ground is zero.

**16. How mechanical energy transforms into another type of energy?**

Ans.: Mechanical energy can be transformed into heat-energy. If palms are rubbed, heat is produced. If we blow at the open side of pen it generates sound energy. When water is stored in the top of the mountain it stays as potential energy and it transforms into kinetic energy while falling down. Electricity can be produced by rotating a wheel using this water flow. In this way, mechanical energy transforms into electric energy.

**17. What is meant by kinetic energy of 500j of a body?**

Ans.: Kinetic energy of 500j of a body means -

- i. If the body moves at a certain velocity, because of motion it can do 500j of work.
- ii. If force is applied to stop the body, the body will work an amount of 500j against the applied force until the body stops.

**18. "The efficiency of an engine is 90%" - what is meant by this?**

Ans.: The efficiency of an engine is 90% means, if 100 unit of energy is given to that engine, the amount of work done will be 90 unit.

**19. "All moving objects are in possession of kinetic energy" - explain.**

Ans.: Creating velocity in a body in rest increasing the velocity of moving object means to produce acceleration in it. For this, force has to be applied. as a result, work will be done on the body. For this, the body will obtain the ability to work and this work will be stored in the object as kinetic energy. This is why all moving objects are in possession of kinetic energy.

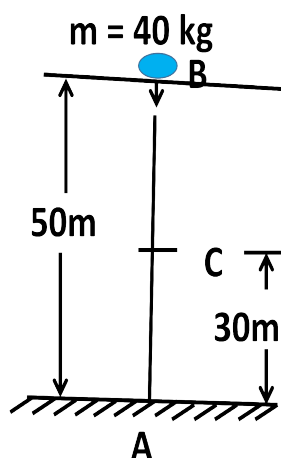
## 20. Differentiate between work and power.

Ans.: The differences between work and power are -

<b>Work</b>	<b>Power</b>
i. If force can displace a body from its original position then it is called work	i. Power is the rate of work or transformation of energy.
ii. The unit of work is joule (j).	ii. The unit of power is watt (w).
iii. The dimension of work is $[M L^2 T^{-2}]$ .	iii. The dimension of power is $[M L^2 T^{-3}]$ .
iv. Time is not needed to measure work.	iv. Time is essential to measure power.

### Creative Questions (Mark - 3 or 4)

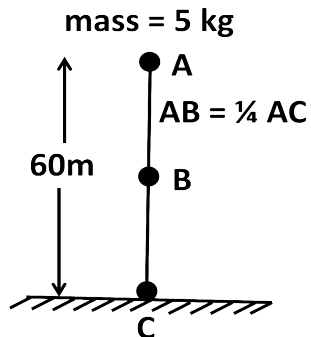
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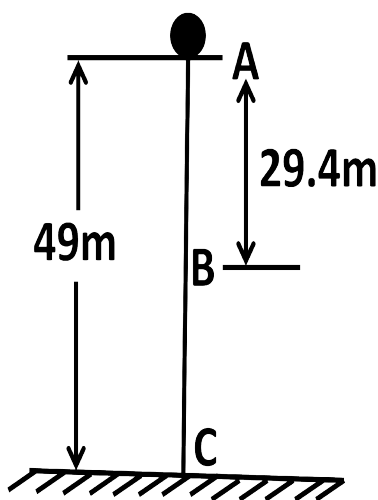
Observe the above figure carefully and answer the following questions

- Determine at which velocity the object will hit the ground.
- If the object is dropped freely from point B, the object follows the law of conservation of energy. Explain mathematically.

2. Observe the following figure carefully and answer the following questions



- a) If the time to lift the body at position A from the ground be 2 minutes, what power is used?
- b) Does the law of conservation of energy follow at position B and C in above stem? Evaluate mathematically.
3. A body of mass 100g is static at a point A. The body is released from that point.



- a) Determine the maximum Kinetic Energy of the body.
- b) The total energy of the body at point A and B remains the same - explain with mathematical logic.
4. An electric motor of power 15kw can lift 1000kg water on a roof of height 300m in 0.5 minutes.
- a) Calculate the efficiency of the motor.
- b) Analyze mathematically the amount of energy used by the motor within that time if the efficiency is 75%.



- 5.** A pump is used to raise 1500 litres of water per minute from a 100m deep well. The efficiency of the pump is 70%.
- Determine the power of the pump.
  - Mathematically represent the amount of extra time required to raise 1500 litres of water if the efficiency of the pump is 60%.
- 6.** A motor of 15kw can lift 2 quintal water in 1 minute at a height of 300m.
- What is the effective power of the motor?
  - What will be the change in energy spent by the motor if the efficiency is increased by 5%? Analyze mathematically.
- 7.** Mass of Jony and Rony are respectively 40kg and 50kg. Jony and Rony can stair up 20 steps of 20cm height each in 10s and 18s respectively. [Acceleration due to gravity is  $9.8\text{ms}^{-2}$ ]
- Calculate work done by Rony.
  - Though Rony's work is more but Jony is ahead in power - evaluate the statement.
- 8.** Karim carries a load of 30kg through a distance of 500m in 5 minutes while Rahim carries the same load through the same distance in 10 minutes. [Take  $g=10\text{m/s}^2$ ]
- Calculate the force applied on the load.
  - Explain with mathematical logic whether the power will be double or not in comparison with one another.
- 9.** A toy car of mass 250gm is generated by an engine of 5J energy, at 1st trail it continues with 4m/s uniform velocity and in the 2nd trail it starts from rest with uniform acceleration  $1\text{m/s}^2$  and travels 8m distance.
- Determine the required time to travel the distance in the 2nd trail mentioned in the above stem.
  - Is there any change of efficiency of the toy car in both trails? Explain with mathematical logic.
- 10.** An engine of power 1kw and efficiency 70% is used for lifting up water for a house of height 30m in 4 minutes. Another engine of power 2kw can lift up 1000kg of water at height of 10m in 2 minutes.
- Find out what amount of water the first engine can lift up in minutes.
  - Which engine will you select for the purpose of lifting water? Establish your selection.

## MCOs

### (Solve Yourself)

<p><b>1.</b> Which one of the following is renewable energy?</p> <p>a) petrol b) gas c) coal d) water</p> <p><b>2.</b> What is the dimension of energy?</p> <p>a) <math>MLT^{-2}</math> b) <math>MLT^2</math> c) <math>ML^{-2}T^2</math> d) <math>ML^2T^{-3}</math></p> <p><b>3.</b> Which one is the dimension of power?</p> <p>a) <math>ML^2T^2</math> b) <math>MLT^{-1}</math> c) <math>ML^2T^{-2}</math> d) <math>ML^2T^{-3}</math></p> <p><b>4.</b> An electric motor lifts a body of mass 2kg by 5m and consumed 107j of energy. What amount of energy is wasted by the motor?</p> <p>a) 6j b) 9j c) 10j d) 49j</p> <p><b>5.</b> <math>ML^2T^{-3}</math> is the dimension of -</p> <p>i. work done per unit ii. power iii. energy used per unit of time</p> <p>Which of the following is correct?</p> <p>a) i and ii b) ii and iii c) i and iii d) i, ii and iii</p>	<p><b>6.</b> If a runner of 60kg passes 100m distance within 12.5 sec, how much will be the kinetic energy in joule?</p> <p>a) 240 b) 480 c) 1920 d) 3840</p> <p><b>7.</b> What is the power (in watt) of a boy of mass 40kg if he steps up 6m high stair in 12s?</p> <p>a) 20 b) 32.66 c) 196 d) 786</p> <p><b>8.</b> A body of mass 5kg was dropped from the roof of a building. What will be the kinetic energy just before it touches the ground?</p> <p>a) 245j b) 845j c) 1225j d) 2450j</p> <p><b>9.</b> A boy of mass 50kg runs with a velocity <math>7ms^{-1}</math>. What is his kinetic energy?</p> <p>a) 350j b) 490j c) 1225j d) 3430j</p> <p><b>10.</b> Which one is the main fuel of thermal power station?</p> <p>a) coal b) mineral oil c) wind d) solar energy</p>

**11.** A machine is able to lift 200kg of object vertically up to a height of 30m above the ground in 50s. What is the power of the machine?

- a) 0.12 kw
- b) 1.2 kw
- c) 6.0 kw
- d) 300 kw

**12.** A car of 1000 kg mass is moving with  $10\text{ms}^{-1}$  velocity. What is the kinetic energy in joule?

- a)  $5 \times 10^4$
- b)  $5 \times 10^3$
- c)  $5 \times 10^2$
- d)  $5 \times 10$

**13.** Which one is a part of mechanical energy?

- a) chemical energy
- b) kinetic energy
- c) electrical energy
- d) magnetic energy

**14.** What is the unit of potential energy?

- a) pascal
- b) newton
- c) watt
- d) joule

**15.** Before releasing an arrow which type of energy is stored in arrow and bow?

- a) kinetic energy
- b) potential energy
- c) chemical energy
- d) heat energy

**16.** If a boy crosses 6m high stair in 12s and if the mass of the boy is 40kg, then what is the power of the body?

- a) 20w
- b) 32.67w
- c) 196w
- d) 2352w

**17.** Which is the correct relation between kinetic energy and momentum?

- a)  $E_k = P/2m$
- b)  $E_k = P^2/2m$
- c)  $E_k = 2P/m$
- d)  $E_k = 2P^2/m$

**18.** What will be the potential energy of a body of mass 7kg if it is raised to a height of 2000 cm above the surface of the earth?

- a) 1372j,
- b) 32.67j
- c) 1176j
- d) 1376j

**19.** If we through stone at mango it may fall down for which energy?

- a) used energy
- b) potential energy
- c) kinetic energy
- d) solar energy

**20.** Efficiency -

- i. will not be above 100%
- ii. a quantity without unit
- iii. the ratio between energy output and energy input

Which of the following is correct?

- a) i and ii
- b) i and iii
- c) ii and iii
- d) i, ii and iii

<p><b>21.</b> In the equation <math>E = mc^2</math>, <math>m</math> is -</p> <ol style="list-style-type: none"> <li>mass of nucleus</li> <li>lost mass of nucleus</li> <li>atomic mass</li> <li>mass of uranium</li> </ol> <p>Which of the following is correct?</p> <ol style="list-style-type: none"> <li>i and ii</li> <li>i and iii</li> <li>ii and iii</li> <li>i, ii and iii</li> </ol>	<p><b>22.</b> At what condition the kinetic energy of a boy will be 16 times</p> <ol style="list-style-type: none"> <li>mass twice, velocity twice</li> <li>mass eight times, velocity half</li> <li>mass four times, velocity unchanged</li> <li>mass unchanged, velocity four times</li> </ol>
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**23.** Which one is correct for the energy conversion of a car engine?

- mechanical energy → chemical energy
- chemical energy → mechanical energy
- thermal energy → chemical energy
- chemical energy → electrical energy

**24.** Which one is the correct transformation of energy of a running fan?

- electric energy → magnetic energy → mechanical energy → heat energy
- electric energy → mechanical energy → sound energy → heat energy
- electric energy → heat energy → magnetic energy → mechanical energy
- electric energy → mechanical energy → magnetic energy → heat energy

**25.** Which one is correct for freely falling body?

- The potential energy is increased
- The kinetic energy is increased
- Potential energy and kinetic energy are equal
- The kinetic energy is increased

**26.** The potential energy of an object will be higher if -

- the magnitude of the force is higher
- the mass of the object is increased
- displacement of the object is increased

Which of the following is correct?

- i and ii
- i and iii
- ii and iii
- i, ii and iii

**27.** Read the following words regarding petroleum.

- i. Petroleum is a Greek word.
- ii. Petroleum products are used mainly to produce electric and mechanical energy.
- iii. There is nothing like petrol to be used as fuel of vehicle.

Which one is correct?

- a) i and ii
- b) ii and iii
- c) i and iii
- d) i, ii and iii

**28.** A body falls under the action of gravity, the changes of energy are -

- i. the potential energy is decreased
- ii. the kinetic energy is increased
- iii. total energy is unchanged

Which one is correct?

- a) i and ii
- b) ii and iii
- c) i and iii
- d) i, ii and iii

*Read the stem carefully and answer the questions no. 29 and 30.*

A carpenter is being made to enter a nail into a wood by a hammer.

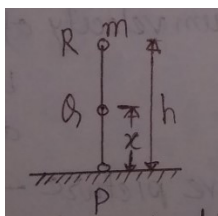
**29.** What type of energy transformation takes place when the hammer falls down?

- a) potential energy → kinetic energy → sound energy
- b) chemical energy → sound energy → kinetic energy
- c) mechanical energy → kinetic energy → sound energy
- d) potential energy → sound energy → heat energy

**30.** What type of energy transformation takes place when the carpenter lifts the hammer up?

- a) heat energy → potential energy
- b) chemical energy → potential energy
- c) mechanical energy → potential energy
- d) potential energy → mechanical energy

From the figure below, answer the questions no. 31 and 32



**31.** What will be the kinetic energy of the freely falling body at points Q if it falls from R?

- 0
- max
- $mgh$
- $mg(h-x)$

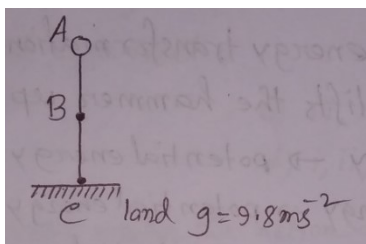
**32.** In case of a freely falling body from point R -

- the body will gain velocity
- the kinetic energy will be transformed into potential energy
- velocity will increase as distance increases

Which one is correct?

- i and ii
- i and iii
- ii and iii
- i, ii and iii

According to the picture below answer the questions no. 33 and 34.



An object of weight 50kg is allowed to drop down from the point A [ $AC = 100\text{m}$  and  $AB = \frac{AC}{2}$ ]

**33.** What will be the maximum velocity of the object?

- $100\text{ms}^{-1}$
- $44.72\text{ms}^{-1}$
- $44.27\text{ms}^{-1}$
- $31.61\text{ms}^{-1}$

- 34.** According to the above picture -
- i. the highest potential energy will be in point 'A'
  - ii. potential energy and kinetic energy will be equal in point B
  - iii. potential energy of point A is 100j

Which one is correct?

- a) i and ii
- b) i and iii
- c) ii and iii
- d) i, ii and iii

## CHAPTER 5 : STATE OF MATTER AND PRESSURE

### Cognitive Questions (Mark - 1)

**1. What is buoyancy?**

Ans.: Buoyancy is an upward force exerted by a fluid that opposes the weight of an immersed object.

**2. What is pressure?**

Ans.: The force exerted perpendicularly on an unit area of a body is known as pressure.

**3. State Archimedes's law.**

Ans.: "If a body is immersed in a liquid, the weight of the body is reduced by an amount equal to the displaced liquid."

**4. What is density?**

Ans.: The mass per unit volume of a substance is called density.

**5. What is pascal?**

Ans.: If 1N force is applied perpendicularly to an area of  $1\text{m}^2$  then the pressure is called pascal.

**6. What is atmospheric pressure?**

Ans.: The pressure exerted vertically by the weight of the atmosphere on per unit area of earth is called the atmospheric pressure of that area.

**7. Write down Pascal's law.**

Ans.: " if pressure is applied on a liquid or gas enclosed in a container from outside then this pressure is transmitted equally and acts perpendicularly on the surface of the container in contact with the liquid or gas."

**8. What is called stress?**

Ans.: The force per unit area that develops within a substance due to deformation is called stress.

**9. Write down Hooke's law.**

Ans.: " Within elastic limit stress is directly proportional to strain."

**10. What is strain?**

Ans.: The relative change in length or shape which is made by applying a force from outside is called strain.

**Analytical Questions (Marks - 2)****1. Write down the condition of floatation and immersion of a body.**

Ans.: The conditions of floatation and immersion of an object are -

- i) If  $W_1 > W_2$ , or if the weight of the body is greater than the weight of the displaced liquid by the body, then the body will sink in the liquid.
- ii) If  $W_1 = W_2$  or if the weight of the body is equal to the weight of the displaced liquid by the body, then the body floats being fully immersed in the liquid.
- iii) If  $W_1 < W_2$  or if the weight of the body is less than the weight of the displaced liquid by the body, then the body doesn't sink. It floats being partly immersed in liquid.

**2. Which one is more difficult - when you walk by bare foot on plain brick road or brickbat road? Explain.**

Ans.: In a brickbat road, the edge of the brickbat is sharp. So while walking barefooted on this, force is applied on a small area. On the other hand, in plain brick road, same force is applied on a large area. In this time, the pressure is small. So while walking on brickbat road, pain is felt because of the high pressure. For this reason, walking on brickbat road becomes difficult.

**3. Why is a heavy weight easy to lift in water? Explain.**

Ans.: In water an upward force or buoyancy acts on any heavy object. For this reason a heavy object appears lighter when immersed in water and it becomes easy to lift it.



#### 4. What is Torricelli's vacuum? Explain.

Ans.: If a one-meter long glass tube opened at one end filled with mercury is put into a mercury filled container inverted and perpendicularly, due to air pressure the mercury comes down, but at a certain level, it becomes steady. Which means a portion of tubes upper area becomes vacuum. This vacuum is known as Torricelli's vacuum.

#### 5. Why atmospheric pressure reduces with the increase of altitude? Explain.

Ans.: Air is a fluid. So atmospheric pressure depends on the height of atmosphere and the density of air. The pressure at any level in the atmosphere may be interpreted as the total weight of the air above a unit area at any elevation. At higher elevation, there are fewer air molecules above a given surface than a similar surface at lower levels. So, with the increasing altitude, the atmospheric pressure decreases.

#### 6. Why does not the shape of a human body change in atmospheric pressure?

Ans.: On earth surface atmospheric pressure is  $10^5\text{N}$  per square meter. If we assume, body area of an adult human is  $1.5\text{m}^2$ , the atmospheric pressure on his body will be  $1.5 \times 10^5\text{N}$ . But the blood pressure inside the human body is slightly above this pressure, so human does not feel this pressure. As a result, the human body does not deform at atmospheric pressure.

#### 7. Why do we not feel the atmospheric pressure? Explain.

Ans.: The blood pressure inside our body is slightly greater than atmospheric pressure and this blood pressure acts along every direction in the body equally. That's why we don't feel the atmospheric pressure.

#### 8. What is the reason of variation of the pressure at a point in specific liquid at a fixed depth?

Ans.: We know, pressure,  $P = h\rho g$ . Here,  $h$  = depth of liquid,  $\rho$  = density of liquid and  $g$  = gravitational acceleration. Density of a certain liquid is fixed, fixed depth is fixed. But gravitational acceleration ( $g$ ) is different in different places of earth. So, we can say that, the reason of pressure variation at a point in a specific liquid at a fixed depth is because of the value of different gravitational acceleration in different places.

#### 9. Why do we feel that an object lost its weight when it is drowned in liquid?

Ans.: If an object is drowned in liquid an upward force or buoyancy acts on it. So it seems like that the object lost some of its weight. The upward force or buoyancy acting on the object is equal to the amount of liquid that the object removes. If

this buoyancy is subtracted from object's weight, we get object's net force which is less than object's weight. That is why we feel that the object lost some of its weight.

**10. Why an embankment dam's lower part is kept wider than the upper part?**

Ans.: While making any dam, a slope needs to be created. If not, the dam may break-down because of its own weight.

Therefore, the lower part is usually wider than the upper part. Also, embankment dams are normally made to stop water flow. The pressure applied by water increases as the height increases. So lower part of dam must tolerate more pressure. To control this pressure, lower part of dam is made wide so that the pressure due to water height decreases.

**11. Why ice is floating in water? Explain**

Ans.: If the density of a body is less than water, it will float on water otherwise it will sink. Ice is a state of water. When water transforms into ice, its volume increases but mass remains same. As a result, density decreases. Hence ice floats on water.

**12. Why does rotten egg floats on water? Explain.**

Ans.: Rotten egg floats on water because its density is less than water. Pure egg immerses in water because its density is more than that of water. When egg becomes rotten, gas comes out through porous shell of egg and for this reason in a same volume, the density of egg becomes less and it floats on water.

**13. The density of matter depends on the temperature - explain.**

Ans.: When heat is applied on a body, its atoms move away from each other. So its volume increases. Mass will be same and density is the ratio of mass and volume. So with increase of temperature, the density increases. But exception can be found in some cases (such as water).

**14. Why it is easier to swim in the sea than in the river?**

Ans.: The density of sea water is more than that of river water. As a result, buoyancy of sea water is more than river water. It is easier to swim in the sea than in the river because of this buoyancy.

**15. Why is it easier to penetrate paper by a sharp pin than by a dull one? Explain.**

Ans.: If the area of the force applied is less, then the pressure increases. The area of sharp edge of a pin is small compared to that of a dull one. So, when it is placed on a paper it penetrate the paper more easily than pin with dull edge.

We know,  $P = F/A$

When 'A' decreases, 'P' increases.

As a result, a sharp pin can penetrate more easily.

**16 . A needle gets sunk in water but a ship made of iron floats in water - Explain.**

Ans.: A needle has a very little volume. The weight of displaced water by the needle is less than its weight. So a needle gets sunk in water. On the other hand, a ship has a very large volume. The weight of displaced water by the ship is more than the ships weight. So a ship made of iron floats in water.

**17. Why does the iron sink in water but float on mercury? - Explain.**

Ans.: The density of iron is more than water but less than mercury. That is why the weight of iron is more than water of same volume but less than weight of mercury of same volume. So, when the iron piece is immersed in water, its resultant force is downward, so it sinks. When the iron is immersed in mercury the resultant force is upward, so floats being partially immersed.

**18. Why are elasticity of all matters not same?**

Ans.: Elasticity evolves due to the force of attraction and repulsion between the internal molecules of a body. This force depends on the average distance between the molecules. In liquids, they are comparatively distant from one another, but the force of attraction prevails between them. The distance between the molecules in gas are the most. For this reason, solids are the most elastic, liquids are less elastic than solids and gases almost have no elasticity.

**19. Steel is more elastic than rubber - Explain.**

Ans.: Elasticity is defined as the attributed property by which a body is able to resist deformation and recovers its original shape and size when the deforming force is removed. Elasticity is measured by the value of modulus of elasticity and is the ratio of stress and strain. In a steel object, the stress developed for a very small strain under an external force is greater than rubber. Because the intermolecular forces in steel is very strong, its modulus of elasticity is greater than that of rubber. So steel is more elastic than rubber.

## 20. The unit and dimension of elastic constant and stress is same - explain.

Ans.:

$$\begin{aligned} \text{Elastic Constant} &= \frac{\text{Stress}}{\text{Strain}} \\ &= \frac{\frac{\text{Force}}{\text{Area}}}{\frac{\text{Change of length}}{\text{Length}}} \end{aligned}$$

$$\text{The unit of elastic constant} = \frac{\frac{\text{N}}{\text{m}^2}}{\frac{\text{m}}{\text{m}}} = \text{Nm}^{-2}$$

$$\begin{aligned} \text{The dimension of elastic constant} &= [\text{MLT}^{-2} \times \text{L}^{-2}] \\ &= [\text{ML}^{-1}\text{T}^{-2}] \end{aligned}$$

Again, stress is defined as the amount of force per unit area.

$$\text{Stress} = \frac{\text{Force}}{\text{Area}}$$

$$\text{The unit of stress} = \frac{\text{N}}{\text{m}^2} = \text{Nm}^{-2}$$

$$\begin{aligned} \text{Dimension of stress} &= [\text{MLT}^{-2} \times \text{L}^{-2}] \\ &= [\text{ML}^{-1}\text{T}^{-2}] \end{aligned}$$

So the unit and dimension of elastic constant and stress is same.

### Creative Questions

1. The weight of a body of volume  $400\text{cm}^3$  in the air is  $19.6\text{N}$ . If it is immersed in water, its weight becomes  $15.68\text{N}$ . At experimental place acceleration due to gravity  $g = 9.8 \text{ m/s}^2$ .
  - a) Find out the density of the body of the stem.
  - b) Does the above stem support Archimedes' Principle? Give opinion through mathematical analysis.
  
2. A rectangular object with a mass of  $200\text{g}$  has an area and height of  $24 \text{ cm}^2$  and  $3 \text{ cm}$  respectively. The weight of the object in kerosene is  $1.4\text{N}$ . It is to be mentioned that, density of kerosene is  $800\text{kgm}^{-3}$ .
  - a) How much is the density of the element of the object?
  - b) Mathematically analyze if the given stem follows the Archimedes Law.
  
3. Mina sat with her little brother beside the pond. Her brother hold a ball of mass of  $200\text{g}$  and of volume  $250\text{cm}^3$ . Suddenly the ball fell into the pond. The depth of the pond was  $3\text{m}$ . (Density of water is  $1000\text{kg/m}^3$  and  $g = 9.8 \text{ ms}^{-2}$ ).
  - a) Determine the pressure of water at the bottom of the pond.
  - b) Will the ball sink into the water? - Explain your opinion mathematically.
  
4. A body of mass  $2.5 \text{ kg}$  having length, breadth and height  $25\text{cm}$ ,  $15\text{cm}$  and  $5\text{cm}$  respectively.
  - a) Object of the above stem when placed on the floor, calculate the highest and lowest magnitude of pressure that will exert on the floor.
  - b) The object of the stem is placed in water of  $4^\circ\text{C}$ , whether it will float or immerse in the water? Explain with mathematical analysis.