

## **1. MOTION AND TIME**

### **Synopsis :-**

- An object is said to be in motion if it changes its position with respect to its surroundings in a given time.
- An object is said to be in rest if there is no change in its position with respect to its surroundings in a given time.
- A body may be at rest with respect to one set of surroundings and at the same time be in motion with respect to another set of surroundings.
- If a body covers equal distance in equal intervals of time, it is said to be in uniform motion.
- If a body covers unequal distances in equal intervals of time, it is said to be in non-uniform motion.
- Motion of hands of a clock is uniform motion.
- Motion of kite in the air is non-uniform motion
- He classify the motion of bodies as
  1. Translatory motion
  2. Rotatory motion
  3. Oscillatory motion
- If all parts of a moving body moves in the direction of motion, then the motion is said to be translatory motion
- If a body in translatory motion moves along a straight line, then it is rectilinear motion
- Motion of a mango falling from tree is rectilinear motion.
- If a body in translatory motion moves along a curved path, then it is curvilinear motion.
- Movement of a needle in a speedometer of a car is curvilinear motion.
- Motion of all particles of moving body follow a circular path with respect to a fixed centre or axis of rotation is called rotatory motion.
- Motion of blades of ceiling fan is rotatory motion.
- Back and forth of the motion (or) to and fro motion (or) backwards and forwards (or) upwards and down wards on the either side of a fixed point of a line is called oscillatory motion.
- Units of time is second
- 1 Hour = 3600 seconds
- 1 day = 86400 seconds
- 1 decade = 10 years
- 1 year = 31,536,000 sec
- 1 century = 10 decades = 100 years
- 1 Millinium = 10 centuries = 10 X 10 decades  
= 10 X 100 years  
= 1000 y

- Units of distance and displacement in MKS system is metre.
- Units of distance and displacement in S.I. system is metre.
- 10 mm = 1 cm
- 10 cm = 1 decimetre
- 10 decim = 1 metre
- 10 m = 1 decametre
- 10 decametre = 1 hectameter
- 10 Hm = 1 km
- A quantity having only magnitude is scalar.
- A quantity having both magnitude and direction is called vector.
- The shortest distance between two points is called displacement
- Distance (s) is a sealar quantity and Displacement (s) is a vector quantity.
- Distance travelled by a body pen lenit time is called speed.

$$Speed = \frac{Disance}{time}$$

- Displacement in a specified direction per unit time is velocity

$$Velocity = \frac{Displacement}{time}$$

- Speed is a scalar qauntity.
- Velocity is a vector quantity.
- Odometer in a vehicle shows the distanced travelled in kilometres.
- Speedometer is the speed of the journey in kilometers per hour.
- SI unit of speed is m/sec
- SI unit of velocity is m/Sec

$$Average\ speed = \frac{Total\ distance\ travelled}{Total\ time\ taken}$$

$$1\ Km/H = 1000m/3600sec = \frac{5}{18} m/sec$$

$$1\ m/Sec = \frac{18}{5} Km/H$$

$$Average\ velocity = \frac{Displacement}{time\ taken}$$

#### Worked out examples

1. At a certain moment of time a particle moving along a straight line is located at a distance 5 m from a point and at a subsequent moment it is at a distance of 10 m from the same point.

The minimum and maximum distances the particle could have moved are ...

Sol : Direction is not Mensioned. Let the point be A and particle be P

Same direction :  $P \xleftarrow{5m} A$   $P \xleftarrow{10m} A$ , Opposite direction :  $P \xleftarrow{10m} A$   $A \xrightarrow{5m} P$

Minimum distance =  $10 - 5 = 5\text{m}$

Maximum distance =  $10 + 5 = 15\text{m}$

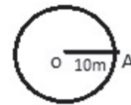
2. A boy standing at a point A. He walked to a distance 10 m and reaches the same point A. Find the displacement travelled by the boy ?

Sol : Distance travelled = 10 m

Displacement = 0 m

3. A player completes a circular path of radius 10 m in 40 sec. His displacement for complete revolution is .

Ans : Displacement = 0 m



4. A player completes a circular path of radius 7 m in 20 sec Find the displacement and distance travelled by the player for  $2\frac{1}{2}$  revolutions.

Sol : Perimeter =  $2\pi r$

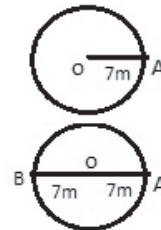
$$= 2 \times \frac{22}{7} \times 7$$

$$= 44 \text{ m}$$

The distance travelled in  $2\frac{1}{2}$  revolutions

$$= 44 \times 2 + 22 = 88 + 22 = 110 \text{ m}$$

Displacement =  $7 + 7 = 14 \text{ m}$



5. A man is 3m to the north of a certain point. And 4 m to the east what is displacement of the man ? what's distance of the man ?

- A. Displacement :  $\triangle ABC$  is Right angled triagle. From pythagorouss theorenm

$$AC^2 = AB^2 + BC^2$$

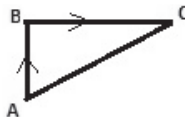
$$= 3^2 + 4^2$$

$$= 9 + 16 = 25$$

$$Ac = \sqrt{25} = 5\text{m}$$

Displacement = 5m

Distance =  $3 + 4 = 7 \text{ m}$

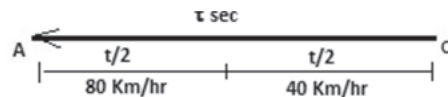


6. A train moves at a speed of 80 km/H during the 1st half of its time and 40 km/H during the other half. Find the average speed of the train ?

A. Average speed =  $\frac{V_1 + V_2}{2}$

$$= \frac{80 + 40}{2} = \frac{120}{2}$$

$$= 60 \text{ Km/H}$$

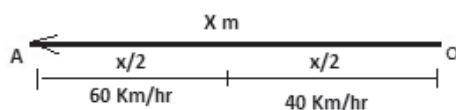


7. A car covers half of the distance at a speed of 60 Km/H and other half at a speed of 40 Km/H. Find the average speed of the car ?

A. Average speed =  $\frac{2V_1V_2}{V_1+V_2}$

$$= \frac{2 \times 60 \times 40}{60 + 40}$$

$$\frac{4800}{160} = 48 \text{ Km/H}$$



8. What is the average speed of a dog that travels 100 m in 4 sec ?

A. Distance = 100 m

Time = 4 sec

$$\text{Average speed} = \frac{\text{Total distance}}{\text{time}} = \frac{100}{4} = 25 \text{ m/Sec}$$

9. A train of length 50 m is moving with a constant speed of 10m/sec. Calculate the time taken by the train to cross an electric pole and a bridge of length 250 m?

Sol : Distance = Speed X time

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Time to cross the pole} = \frac{50}{10} = 5 \text{ sec}$$

$$\text{Time to cross a bridge} = \frac{\text{length of train} + \text{length of bridge}}{\text{speed}}$$

$$= \frac{50 + 250}{10} = \frac{300}{10}$$

$$= 30 \text{ Sec}$$

10. The time of ascent of a stone is 10 sec. Find the time of descent of the stone and time of flight ?

A. Time of ascent  $t_1 = 10 \text{ sec}$

Time of Descent  $t_2 = 10 \text{ sec}$

Time of flight =  $t_1 + t_2 = 20 \text{ sec}$

11. A player moving on circular path of radius r in 30 sec the displacement of the palyer in 2 minutes 44 sec is....

Sol : Time in seconds

$$= 2 \times 60 + 44 = 164 \text{ sec}$$

Time for each revolution = 30 sec

Time for 3 complete revolutions =  $30 \times 3 = 90 \text{ sec}$

Time for  $\frac{1}{2}$  revolution = 15 sec

Displacement =  $2r$



12. Displacement between A and B is

Sol  $AB^2 = 3^2 + 3^2$

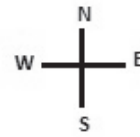
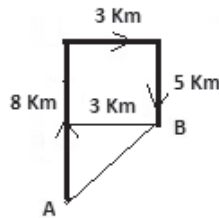
$= 9 + 9$

$= 18$

$AB = \sqrt{18}$

$= \sqrt{9 \times 2}$

$= 3\sqrt{2} \text{ km}$



13. An athlete running in circular track having radius 14 m with a constant speed of 20 Km/H and he completed one complete revolution. Find the average velocity ?

Ans : Displacement = 0

Average velocity = 0

14. A car travels 1st two hours with a constant speed of 50 km/H and next two hours with a constant speed of 37.5 km/H. The total distance traveled in 4 hours ...  
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A. Distance travelled first 2 hours = 100 km

Distance travelled in next 2 hours = 75 km

Total Distance travelled in 4 hours = 175 km

= 175000 m

**EXERCISE**

1. Find the displacement of the second's hand in a minute ( )

- A. 60m                      B. 360 m                      C. 1 m                      D. on

2. Find the displacement of minutes hand in an hour ( )

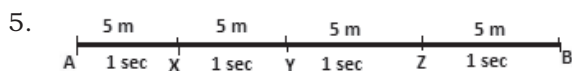
- A. 60 m                      B. 3600 m                      C. 86400 m                      D. 0 m

3. Find the displacement of hours hand in a day ( )

- A. 0 m                      B. 60 m                      C. 3600 m                      D. 86400 m

4. Rama covers 1st 2 meter distance in 5 sec, and next 2 meters also in 5 sec. He covers 2 meter distance for every 5 sec. The type of motion is ( )

- A. Uniform Motion                      B. Non uniform motion  
C. Rotatory motion                      D. None



In the above diagram the speed of the car is .. ( )

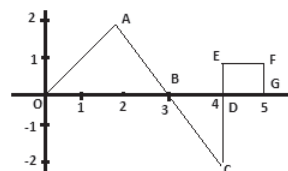
- A. 20 m/sec                      B. 5 m                      C. 5m/sec                      D. None

6. A body is in rectilinear motion, then it moves ... ( )

- A. along a straight line                      B. along a curved path  
C. in a rotatory motion                      D. to and for motion

7. A particle covers  $\frac{1}{4}$ th of the circle of radius  $r$ . Then the distance and the displacement of the particle respectively ( )  
 A.  $\frac{1}{2}\pi r, r$       B.  $\frac{1}{2}\pi r, \sqrt{2}r$       C.  $\frac{1}{2}\pi r, 2r$       D.  $\frac{1}{2}\pi r, \text{zero}$
8. A body moves east by a distance of 6 m and turns towards north the by a distance of 8m. What is the displacement of the body ( )  
 A. 5 km      B. 7 km      C. 10 Km      D. None of these
9. A train of length 100 meters is crossing a bridge 200 mts with a speed of 72 Km/H. The time taken by the train is ... ( )  
 A. 24 sec      B. 15 sec      C. 14 minutes      D. 10 Sec
10. 54 Km/H convert into m/sec ( )  
 A. 10 m/sec      B. 15 m/sec      C. 20 m/sec      D. 25 m/sec
11. 100 years .. Millianions ( )  
 A. 0.1 millionion      B. 1      C. 10      D. 100
12. Number of seconds in 2 days... ( )  
 A. 86400 sec      B. 1,72,800 sec      C. 3600 sec      D. 120 sec
13. An ant covers 30 m in rotatory motion and reaches the same point the distance and displacement are ( )  
 A. 0, 30 m      B. 30 m, 30 m      C. 30 m, Om      D. Om, Om
14. A cyclist moves in a circular path of radius 14 m in 20 sec. He covers  $1\frac{1}{2}$  revolution. Then the distance covered by the cyclist ( )  
 A. 88 m      B. 44 m      C. 132 m      D. 14 m
15. A cyclist moves in a circular path of radius 14 m in 20 sec. He covers  $1\frac{1}{2}$  revolutions. Then the diplacement covered by the cyclist ( )  
 A. 132 m      B. 14 m      C. 20 m      D. 28 m
16. A cyclist moving on circular track of radius 100 m completes half a revolution in one minute what is the average velocity . ( )  
 A. O      B. 200 m/min      C.  $\pi \times 100$  m/min      D. NOne
17. A person travels along a straight road for the 1st halftime with  $x$  velocity and 2nd half time with  $y$  velocity, then the average velocity is . ( )  
 A.  $\frac{2xy}{x+y}$       B.  $x+y/2$       C.  $\sqrt{xy}$       D.  $\frac{y}{x}$
18. The velocity time graph of a body moving in a straight line is as follwos ( )

- A. 3 m      B. 4 m  
 C. 5 m      D. 2 m



19. A body moves along a circular track of radius  $r$ . It starts from one end of the diameter, moves along the circular track and reaches the other end of the diameter. What is the ratio of the distance travelled by the body to its displacement?
- A.  $\frac{\pi}{2}$                       B.  $\frac{2}{\pi}$                       C.  $2\pi$                       D.  $\frac{1}{2\pi}$                       ( )
20. The numerical ratio of displacement to distance is ( )
- A. Always  $< 1$               B. Always  $= 1$               C. Always  $> 1$               D. may be  $< 1$
21. A car travels from X to Y with a velocity 30 Km/H and returns with velocity 40 Km/H. Average velocity is .. ( )
- A. 70 Km/H                      B.  $\frac{240}{7}$  Km/H                      C. 10 km/H                      D. Zero
22. A man travels 3m along the N-direction, 4m along the E-direction and then 8 m along the W - direction. The displacement of the man is ... ( )
- A. zero                      B. 3m                      C. 4m                      D. 5 m
23. A passenger in a train moving with a speed of 72 Km/H sees another train moving with a speed of 32.4 Km/H in opposite direction for 10 seconds through a window. The length of the second train is ... ( )
- A. 300 m                      B. 240 m                      C. 270 m                      D. 290 m
24. 0.1 ml is equal to ( )
- A.  $10^{-6} \text{ m}^3$                       B.  $10^{-7} \text{ m}^3$                       C.  $10^{-4} \text{ m}^3$                       D.  $10^{-5} \text{ m}^3$
25. A man in car travels from a town P to town Q with an average speed of 40 Km/H and town Q to P with an average speed of 50 Km/H. The average speed of the entire Journey is... ( )
- A. 45 Km/H                      B. 44 Km/H                      C. 46.2 Km/H                      D. 44.4 Km/H
26. Trains A and B are travelling with speeds of 80 Km/H and 75 Km/H respectively from Delhi to Chennai. which is true .. ( )
- A. Trains A and B have same velocity and they are travelling in the same direction  
 B. Trains A and B have the same velocity but different speeds  
 C. Trains A and B have the same speed but different velocities  
 D. Trains A and B have the same speed
27. If a car moves with the speed of 72 Km/H. Then the speed of car in m/sec is .. ( )
- A. 15 m/sec                      B. 20 m/sec                      C. 720 m/sec                      D. 7.2 m/Sec
28. A particle travels along a circular path of radius 12 m. Find the distance and displacement travelled in half revolution ( )
- A.  $12\pi, 12$                       B.  $12\pi, 24$                       C.  $6\pi, 24$                       D.  $24\pi, 24$ .
29. A train of length 1.2 km travels at a speed of 5 km/H. How long does it take to travel a bridge of 3.8 km ( )
- A. 1 h                      B.  $\frac{1}{2}$  hr                      C. 2 hr                      D.  $2\frac{1}{2}$  hr

30. A Train of length 200 m travels at a speed 72 Km/H find the time taken by it to cross a bridge of length 600 m ( )  
 A.  $\frac{1}{50}h$                       B.  $\frac{2}{50}h$                       C.  $\frac{4}{50}h$                       D.  $\frac{3}{50}h$
31. The basic unit of speed is ( )  
 A. Km/min                      B. m/min                      C. Km/H                      D. m/Sec
32. Motion of a mango falling from a tree is .. ( )  
 A. Oscillation motion                      B. Translatory motion  
 C. At rest                      D. Rotatory motion
33. 1 Km/H = .. m/sec ( )  
 A. 18/5                      B. 15/8                      C. 5/18                      D. 15/18
34. A simple pendulum takes 36 sec to complete 20 oscillations what is its time period? ( )  
 A. 316 Sec                      B. 1.8 Sec                      C. 18 sec                      D. 7.2 Sec
35. Time period of a simple pendulum depends upon... ( )  
 A. Length of the pendulum                      B. Weight of bob  
 C. Both 1 & 2                      D. None of these
36. One millionth part of a second is called ... ( )  
 A. Micro second                      B. Nano second                      C. Pico second                      D. Femto second
37. A train runs from New Delhi to Hyderabad. It covers first distance of 420 km in 7 hours and next distance of 360 km in 6 hr Find speed of train ( )  
 A. 60 Km/H                      B. 70 Km/H                      C. 80 Km/H                      D. 50 Km/h

### **KEY FOR MOTION AND TIME**

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1) D  | 2) D  | 3) A  | 4) A  | 5) C  |
| 6) A  | 7) B  | 8) C  | 9) B  | 10) B |
| 11) A | 12) B | 13) C | 14) C | 15) A |
| 16) B | 17) A | 18) A | 19) A | 20) D |
| 21) D | 22) D | 23) B | 24) B | 25) D |
| 26) A | 27) B | 28) B | 29) A | 30) A |



31) D

32) B

33) C

34) B

35) A

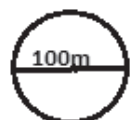
36) A

37) A

14.



16.



18. Hint : displacement  $S_1$   $\triangle DAB$

$$S_1 = \frac{1}{2} \times bh = \frac{1}{2} \times 3 \times 2 = 3\text{m}$$

Displacement  $S_2$   $\triangle BCD$

$$S_2 = \frac{1}{2} \times (4-3) \times 2 = -1\text{ m}$$

Displacement DEFG

$$S_3 = 1 \times 1 = 1\text{ m}$$

$$\text{Total Displacement} = 3 - 1 + 1 = 3\text{m}$$

25. Hint :  $V = \frac{2V_1V_2}{V_1 + V_2}$

## **2. WEATHER AND CLIMATE**

### **Synopsis :-**

- Farmers listen to radio or watch T.V. for weather forecast
  - Amaravathi is the capital of A.P.
  - The weather is the complex phenomenon that it can vary over short periods of time.
  - We have different types of measuring instruments to measure different weather compounds.
  - The weather of a place can change every day.
  - Six invented the maximum - minimum thermometer.
  - Wind speed and direction is measured with anemometer
  - Rain gauge is also called udometer
  - We know equatorial region is very hot and polar region is very cold
  - Indian meteorological department (IMD) studies climate of our country
  - Weather affects our life.
  - Tsunami in Andaman and Nicobar islands in 2004.
  - Magnitude is 9.1 to 9.3
  - Depth is 30,000
  - Location Banda Aceh Indonesia
  - The tribals who observed the occur moving back and birds making sounds moved away from danger
  - MMT - Maximum minimum thermometer
  - In MMT, A, B filled with alcohol.
  - In MMT, tube contains mercury
  - In MMT, the liquid expands is alcohol
  - Farmer estimate the rainfall based on the heatness of the soil after the rain
  - Udometer or Pulvinometer or ombrometer are different names for rain gauge.
  - Rainfall is expressed in cms or millimetres.
  - We can measure the direction of the wind with an anemometer.
  - The quantity of moisture in the air is humidity.
  - If humidity is high where it is hot, we feel sweaty.
  - If the same weather recur periodically at a place, it is considered as climate of that place.
  - Climate of a place can be defined after 25 years of weather observations.
- UNOCHO → UNITED NATIONS OFFICE COORDINATION OF HUMANITATION OFFICE

### **EXERCISE**

1. Weather changes... ( )
  - a. Week after week
  - b. Day after day
  - c. With in a short period
  - d. In any of above from period
2. The quantity of water vapour in air is... ( )
  - a. Temperature
  - b. Humidity
  - c. Climate
  - d. Weather
3. Minimum temperature of the day occurs generally... ( )
  - a. The morning
  - b. eveining
  - c. Noon
  - d. Afternoon
4. Maximum Temp. of the day occurs generally ( )
  - a. The morning
  - b. eveining
  - c. Noon
  - d. Afternoon
5. Humidity is measured by ( )
  - a. Raingauge
  - b. Aremometer
  - c. Wind gauge
  - d. Hydrometer
6. The max. and min. temp. at a place is measured by ... ( )
  - a. Lab thermometer
  - b. Six's thermometer
  - c. Clinical thermometer
  - d. Gas thermometer
7. Raingauge is also called ( )
  - a. Hydrometer
  - b. Anemometer
  - c. Udometer
  - D. None
8. Wind speed is measured by ( )
  - a. Anemometa
  - b. Hydrometa
  - c. Speedometa
  - D. udometa
9. Tsumani in Andaman Nicobar occured in.. ( )
  - a. 2000
  - b. 2002
  - c. 2004
  - d 2006.
10. Rainfall is measured in ( )
  - a. mm
  - b. feet
  - c. yards
  - d. meter
11. Which of the following is the climate found in kerala ( )
  - a. Hot and dry
  - b. Wet
  - c. Moderately hot and moderately dry
  - d. Very hot and wet
12. All the changes of weather are caused by ( )
  - a. stars
  - b. moon
  - C. earth
  - d. sun
13. The average weather pattern taken over a long time is called the climate change of the place. Here long time means ... ( )
  - a. 50 Y
  - b. 25 y
  - c. 10 y
  - d. 5 y
14. Which of the following part of India has hot and dry climate ( )
  - a. Kerala
  - b. Kasmir
  - c. Rajasthan
  - d. A.P.
15. Choose the correct matching ( )
  1. MMT
  2. Tsunami
  3. Ombrometer
  4. Aremometer
  5. Humidity
  - a. 2004
  - b. Mobture
  - c. wurd
  - d. Rainfall
  - e. Six

A. a,e,c,d,b      B. b,d,e,a,c,      C. c,a,d,c,b      D. a,c,b,d,e



### 3. ELECTRICITY

1. We use electric current in many ways like fans, collers, T.V., Radio and music systems.

2. Source of Electric Current :-

(i) Small sources of electric current:-

A cell is a small source of electric current. Cells are used to operate small electrical devices such as torches, calculators, and tape recorders. Button cells (very small cells) are used in wrist watches.


The storage cells can **Store Electric Energy** in them in the form of **Chemical Energy**. They are used in motor bikes, cars, trucks.

(ii) Bigger sources of electric current.

Ex.: Power stations.

3. A device which converts chemical energy into electric energy is called cell.

4. Torch light cell also converts chemical energy into electrical energy.

5. Symbol for a cell is 

The long line represents the positive terminal of the cell and the small line represents the negative terminal of the cell.

#### Simple Voltaic Cell

1. A **copper plate** acts as a positive terminal of the cell.

2. A **zinc plate** acts as a negative terminal of the cell.

3. Dilute sulphuric acid is used as a Electrolyte.

The zinc metal reacts with sulphuric acid to form positively charged hydrogen ions which migrate towards the copper plate. Thus the copper plate gets positively charged and zinc plate negatively charged. The electric current flows from copper to zinc in the external circuit.

4. The electromotive force of voltaic cell is 1 volt.

5. There are two main defects in simple voltaic cell, 1. Local action  
2. Polarisation.

6. In any kind of electricity source, it is the positive charge which flows towards negative charge.

The flow of electricity is due to the flow of electrons in a conductor. As electrons are negatively charged, therefore no positive charge flows through the conductor. It is the electrons at high potential which flow through the conductor and hence give rise to electric current.

#### Closed circuit or complete circuit:-

- When the path of current which starts from one terminal of the cell and ends at the other terminal of the cell without any break, then such a circuit is called closed circuit or complete circuit.
- When the circuit is closed then any electric appliance in that circuit starts working.

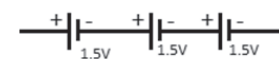
### **Open Circuit :-**

When the path of current, starting from one terminal of the cell to another terminal of the cell is broken, then such a circuit is called an open circuit.

### **Cells are in series combination :-**

Cells are said to be connected in series when the number of cells are connected end to end in such a way that the positive terminal of one cell connects to the negative terminal of the next cell.

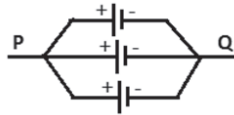
For two cells:  Effective emf is  $1.5 + 1.5 = 3\text{v}$

For three cells :  Effective emf is  $1.5 + 1.5 + 1.5 = 4.5\text{v}$

- \* The bulb glows brightly due to driving force of electricity increases in series combination of cells.
- \* The cells are connected in series the potential difference increases, but the current remains same.

### **Cells are in parallel combination :-**

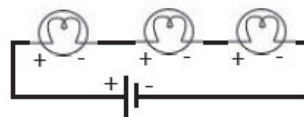
The cells are said to be connected in parallel, if all of them have been connected to a common positive wire and common negative wire as shown below diagram.



- \* No change in the brightness of the bulb in parallel combination of cells when compared with single cell.
- \* When the cells are connected in parallel, the potential difference remains same, but the current increases.

### **The properties of SERIES circuit with the help of bulbs :-**

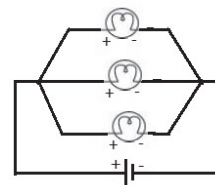
1. In series circuit all the appliances work simultaneously when the switch is closed. Conversely all appliances stop working when the switch is open.



2. In series circuit, if any of the appliances goes out of order, the other appliances stop working.
3. As the bulbs were not glowing very brightly, it can be concluded that in series the appliances do not work to their full capacity.

### **The properties of parallel circuit with the help of bulbs :-**

1. In parallel circuit all the appliances work independently.
2. In parallel circuit if one appliance goes out of order, the others continue working. It means that each appliance in parallel circuit can be operated independently by a switch.
3. As the bulbs glow brightly, it means each appliance gets enough electric energy and hence works to its full capacity.



### **Heating Effect of Electric current :-**

Electric current is basically the drifting of a very large number of electrons through the conducting material. As these electrons drift through the conducting material, they experience resistance or friction, due to which mechanical energy possessed by electrons changes into heat energy.

### **Applications :-**

The common household appliances which are based on heating effects of current,

- |                       |                           |                      |
|-----------------------|---------------------------|----------------------|
| (i) Common heater     | (ii) Hot plate            | (iii) Electric Iron  |
| (iv) Electric toaster | (v) Immersion heater      | (vi) Electric Geyser |
| (vii) Electric kettle | (viii) electric oven etc. |                      |

- \* The element of an electric heater is made from an alloy, **NICHROME** which offers large resistance and hence gets red hot.

### **Magnetic Effect of Electric Current :-**

An electric current flows through any conductor such as an insulated copper wire is wound in the form of a helix (coil), the conductor behaves like a magnet.

A coil with a core of iron nail or an iron bar which acts like a magnet, when electric current flows through it is called electromagnet. It loses its magnetism when current is switched off.

Steel or ALNICO (Al,Ni,Co) are used for making permanent magnet.

### **Uses of Electromagnet :-**

1. They are used in electrical appliances such as electric bell, electric fan, electric motor.
2. They are used in electric generators where very strong magnetic field is required.
3. They are used in television for deflecting electron beam of the picture tube.
4. They are used in magnetic separation of iron ores from earthly substances.
5. They are used for preparing strong permanent magnets.
6. They are used by doctors to cure certain diseases.
7. Electromagnets are used for lifting heavy iron loads.
8. Electromagnets are used for removing iron objects from scrap.

### **Chemical Effects of Electric Current :-**

The process of bringing about a chemical reaction by passing electric current through the salt solution of a particular salt is called electrolysis.

### **Applications of Electrolysis :-**

1. Electroplating :- The process of depositing a superior metal over an inferior metal with the help of electric current is called electroplating.

#### **Electroplating is done :**

- (i) On iron articles, such as rims of bicycles, wheels of automobiles, etc to prevent them from rusting.
- (ii) On objects of inferior metals to give them a better appearance.
2. Purification of metals.
3. Electrotyping.

### **Electric Fuse :-**

- (i) A metallic conducting wire with low melting point and high resistance.
- (ii) Fuse is placed in series with the appliance
- (iii) When the current in the circuit exceeds the specified value, the fuse is damaged by melting and breaks the circuit and the device is saved.
- (iv) The current capacity of a fuse independent of its length and varies with the radius.

### **Electrical energy in house :-**

- In household purposes, Electrical energy is measured in units.

$$\text{Units(KWH)} = \frac{\text{NO. of appliances} \times \text{No. of watts} \times \text{No. of hours}}{1000}$$

**Problem :** A room has two tube lights, a fan and a TV. Each tube light draws 40W, the fan draws 80W and the TV draws 60W. On the average, the tube lights are kept on for five hours, the fan for twelve hours and TV for eight hours every day. The rate for electrical energy is Rs. 3.10 per KWH. Calculate the cost of electricity used in this room in a 30 day month.

Sol. For tube lights,  $\text{Units} = \frac{2 \times 40 \times 5}{1000}$

For a fan,  $\text{Units} = \frac{1 \times 80 \times 12}{1000}$

For a TV,  $\text{Units} = \frac{1 \times 60 \times 8}{1000}$





$$\text{Total units in a month (30 days)} = 30 \left( \frac{2 \times 40 \times 5}{1000} + \frac{8 \times 12}{1000} + \frac{60 \times 8}{1000} \right)$$

$$\text{Cost} = 30 \left( \frac{2 \times 40 \times 5}{1000} + \frac{8 \times 12}{1000} + \frac{60 \times 8}{1000} \right) \times 3.10$$

$$\therefore = \text{Rs. } 171.12$$



### **BITS**

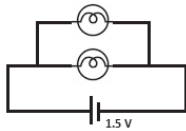
1. In a house there are four bulbs each of 50W and 5 fans each of 60W. If they are used at the rate of 6 hours a day, the electrical energy consumed in a month of 30 days is ( )  
1. 9000 units            2. 90 units            3. 0.9 units            4. 900 units.
2. Five bulbs each rated at 40 W are used for 5 hours daily. How many units of electric energy is consumed in a month of 30 days ( )  
1. 1 unit            2. 15 units            3. 25 units            4. 30 units
3. The rate of electricity in a town is Rs. 3.00 per unit. Calculate the cost of running an 80-Watt fan for ten hours a day for the whole month of June ( )  
1. Rs. 70            2. Rs. 72            3. Rs. 74            4. Rs. 68
4. Calculate the energy consumed in kilowatt hours by a 60-W fan in 2 hours ( )  
1. 0.10 KWH            2. 0.11 KWH            3. 0.12 KWH            4. 0.13 KWH
5. Which appliance does not use an electromagnet ? ( )  
1. TV            2. Electric Bell            3. Radio            4. Electric Heater
6. Identify the element that is used for making the filament in bulbs ( )  
1. Tungsten            2. Copper            3. Aluminium            4. Silver
7. Which of the following does NOT contain a heating element ? ( )  
1. Electric Iron            2. Electric Heater            3. Electric oven            4. Electric bell
8. How are bulbs in our houses connected ? ( )  
1. In Parallel            2. In series            3. Both in series and in parallel  
4. Some times in series and some times in parallel
9. Which of the following effects of current in an electric bulb gives us light?( )  
1. Heating            2. Magnetic            3. Chemical            4. All the above
10. Which of the following does NOT produce electrical energy ? ( )  
1. Generator            2. Motor            3. Battery            4. Cell
11. Which of these is the symbol for a series combination of cells ? ( )  
1.             2.             3.             4. 
12. Which of the following does not help us save electricity ? ( )  
(i) Switch off the air conditioner and open the refrigerator door to cool the house  
(ii) Use the electric iron to iron just one or two clothes at a time  
(iii) Connect more than one electric appliance to one power point  
1. only (i) and (ii)            2. Only (ii) and (iii)  
3. only (i) and (iii)            4. (i), (ii) and (iii)
13. A fuse wire is made up of alloy ( )  
1. Nichrome            2. Tin-Lead            3. Manganin            4. Constantan

14. Copper wires are used as connecting wires because ( )

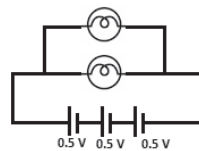
1. Copper has very high melting point
2. Copper wires are very thick wires
3. Copper wire offers a lower resistance
4. None of these

15. In which circuit the bulbs will glow brightly ? ( )

(P)

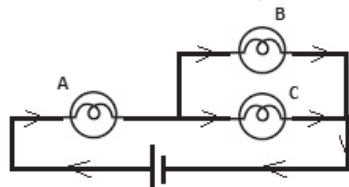


(Q)



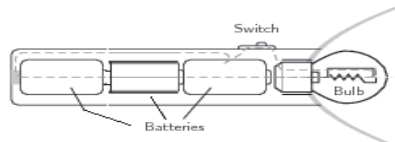
1. In circuit P only
2. In circuit Q only
3. In both circuits P and Q, the bulbs will glow with equal brightness
4. Data is insufficient.

16. Three bulbs A, B and C are connected as shown in figure. The bulbs B and C are identical. If the bulb C is fused, then ( )



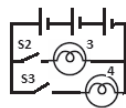
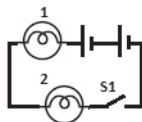
1. Brightness of both bulbs A and B will increase
2. Brightness of both bulbs A and B will decrease
3. Brightness of the bulb A decreases and that of bulb B increases
4. None of the bulbs will glow.

17. Which of the following circuit diagram represents the given (3 cell) torch ? ( )



- 1.
- 2.
- 3.
- 4.

18. Observe the given circuit diagram (x and y) and identify the correct statement ( )



1. Circuit Y is a series circuit
2. Bulb 2 in circuit X will glow, even when the bulb 1 is fused and switch S1 is closed
3. In circuit Y, bulb 3 will glow if only switch S2 is closed.
4. Both circuits X and Y are parallel circuits.

19. marking in a bulb is 60W, 220 V. what does it signify ? ( )
1. The bulb is connected across 220 volts, 60 joules of energy is consumed for every second.
  2. The bulb is connected across 220 volts, 60 joules of energy is released in every minute.
  3. 60 A of current will flow in the bulb.
20. Match the two columns and select the correct option from codes given below.
- | Column 1   | Column II    |
|--|--------------|
| a. A bad conductor of electricity but good conductor of heat                       | i. CFL       |
| b. A wire twisted many times in the form of circle                                 | ii. Nichrome |
| c. Smart Eco-friendly bulb   | iii. Mica    |
| d. An alloy whose temperature<br>Can rise up to 9000c and used as heating element. | iv. Coil     |
1. A-iv, b - iii, c-ii, d-i
  2. a-i, b-ii, c-iii, d-iv
  3. a-iii, b - iv, c- i, d- ii
  4. a-ii, b-iv, c-i, d-iii

### **KEY FOR ELECTRICITY**

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1) 2  | 2) 4  | 3) 2  | 4) 3  | 5) 4  |
| 6) 1  | 7) 4  | 8) 1  | 9) 1  | 10) 2 |
| 11) 1 | 12) 4 | 13) 2 | 14) 3 | 15) 3 |
| 16) 3 | 17) 4 | 18) 3 | 19) 1 | 20) 3 |

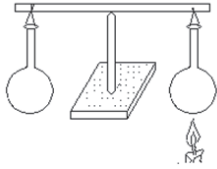
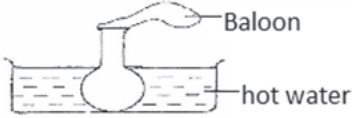
Symbol of the elements of Electric Circuit.

#### **4. AIR, WINDS AND CYCLONES**

- \* Air is every where.
- \* Wind : The moving air is called wind.
- \* Air exerts pressure.
- \* Air expands on heating and contracts on cooling.
- \* Warm air rises up whereas comparatively cooler air tends to sink towards the earth's surface.
- \* As warm air rises air pressure at the place is reduced and the cooler air moves into that place.
- \* Uneven heating on the earth causes wind movements.
- \* Cyclones may be caused due to wind travelling at high speed due to difference in air pressure.
- \* It has become easier to study cyclones with the help of advanced technology like satellites and radars.
- \* The land heats up faster than the sea, so warm air rises over the land during the day as it is warmed by the sun.
- \* At night, the land cools faster than the sea, reversing the air flow. This creates a land breeze that blows out to sea.
- \* The region close to the equator gets more heat from the sun. This is because of the direction of the sun's rays closer to the equator.
- \* Monsoon winds : The air over the land gets heated and rises. This causes the winds to flow from the oceans towards the land. These are monsoon winds. This is usual during the months of June to September.
- \* Tropical cyclones are like giant engines that use warm moist air as fuel.
- \* Factors like wind speed, wind direction, temperature and humidity contribute to the development of cyclones.
- \* In India cyclones usually occur in the month of May - June and October - November.
- \* More cyclones tend to occur on the eastern side i.e. towards Bay of Bengal.
- \* Information about cyclones will be given by the Indian meteorological department (IMD).

#### **BITS**

1. Air ..... pressure ( )  
1. Upward            2. Downward        3. Sideward        4. All
2. Hot air is .. than cooler air ( )  
1. Heavier            2. Lighter            3. Denser            4. All
3. .... is used to measure the wind speed ( )  
1. Odometer            2. Barometer        3. Anemometer      4. Speedometer
4. .... are useful to predict the occurrence of cyclones ( )  
1. a and b            2. b and d            3. a and c            4. All the above

5. Tropical cyclones are like ( )  
 1. gaint engines 2. Destructive arms  
 3. Enemies 4. Friends
6. Air ... on heating ( )  
 1. Contracts 2. Liquifies 3. Candenses 4. Expands
7. Which plays an important role in the formalation of strams ? ( )  
 1. Wind speed 2. Heat 3. Clouds 4. Rain
8. In India cyclones usually occur in the month of ... ( )  
 1. May-June 2. Oct-Nov 3. Jan-March 4. May-June and Oct-Nov
9. Information about cyclones will be given by the ... ( )  
 1. IBC 2. IMD 3. MCB 4. IBP
10. The picture explains that ( )  
 1. Cool air is lighter  
 2. Hot air is lighter  
 3. Hot and cool air are equal in weights  
 4. Hot air is heavier
- 
11. This part of the globe gets more heat from the sun ( )  
 1. Polar region 2. near the polar region  
 3. Regian close to equator 4. All type above
12. The other names of cyclones are ( )  
 1. Typhoons 2. Hurricanes 3. Tornadoes 4. All the above
13. Air expands on... ( )  
 1. Cooling 2. Applying pressure  
 3. By its own 4. on heating
14. The picture explains the experiment ( )  
 1. Expansion of air  
 2. contraction of air  
 3. Air pressure 4. weight
- 
15. One of the following doesn't depend an air pressure ( )  
 1. Syringe 2. air pump 3. steering 4. Kalloon
16. Air moves from a region of .. pressure to a region of .. pressure ( )  
 1. High, low 2. High, high 3. Low, Low 4. Low, high

### **KEY FOR AIR, WINDS AND CYCLENES**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1) 4  | 2) 2  | 3) 3  | 4) 3  | 5) 1  |       |
| 6) 4  | 7) 1  | 8) 4  | 9) 2  | 10) 2 |       |
| 11) 3 | 12) 4 | 13) 4 | 14) 1 | 15) 3 | 16) 1 |

## 5. REFLECTION OF LIGHT

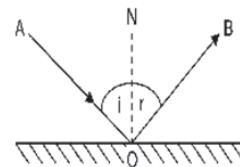
### Synopsis

1. Light is a form of energy which causes sensation of vision.
2. Light not only makes things visible but also rises temperature and exerts pressure on them.
3. Light travels with a speed of  $3 \times 10^8$  m/s in vacuum. The speed of light is a scalar.
4. Properties of light :-
  1. Rectilinear propagation of light
  2. Reflection of light
  3. Refraction of light
  4. Dispersion of light
  5. Scattering of light
  6. Interference of light
  7. Diffraction of light
  8. Polarization
  9. Photoelectric effect
  10. Compton effect.
5. Waves are two types. They are (1) Mechanical waves which requires medium for propagation. Example is **Sound Waves**.
  2. Electromagnetic waves which does not require medium for propagation. Example is light waves. Electromagnetic waves are generated by accelerated charge. Electromagnetic waves contains both electric field and magnetic field.

\* Light is propagated in the form of electromagnetic waves.
6. Shadows are formed due to Rectilinear propagation of light.
7. Objects are seen due to reflected light from objects reach our eye.
8. The colour of light is determined by its wavelength or frequency.
9. The angle made by incident ray with normal is called angle of incidence (i)
10. The angle made by reflected ray with normal is called angle of reflection (r)
11. The angle made by incident ray with surface is called angle of glancing
12. The angle made by reflected ray with original path of incident ray is called angle of deviation.

### **Reflection of Light :**

- Light falls on mirror is called incident ray.
- Light goes away from mirror into same medium is called reflected ray.
- The phenomenon of returning of incident light in the same medium is known as reflection.



### **Laws of reflection :-**

1. Incident ray, reflected ray and normal drawn to the surface lie in the same plane.
2. Angle of incidence (i) = Angle of reflection (r)  
Angle of deviation (d) =  $180^\circ - 2i$   
 $= 2\pi - 2i$   
 $= 2(\pi - i)$
3. For normal incidence, deviation is  $180^\circ$ .
4. When a light ray is incident normally on a surface, it retraces its path with angle of deviation being  $180^\circ$ .
5. When the mirror is rotated through an angle  $\theta$  from its position, for the same incident ray the reflected ray rotates through an angle  $2\theta$ .
6. Mirrors work on the principle of reflection.
7. The image formed by a plane mirror is unmagnified, virtual and erect.
8. The image is laterally inverted, i.e., The left side of the image appears to be the right side and right side as left side.
9. The minimum height of the plane mirror to observe full height of a person is half the height of that person.
10. The minimum height of the plane mirror hung on a wall of a room to observe the full height of the opposite wall by a person standing at the centre of a room is one third of the height of the rear wall.
11. If the object moves with a velocity "u" towards or away from the mirror, the image appears to move with a velocity  $2u$  towards or away from the mirror.
12. If the two plane mirrors are arranged in inclined at certain angle " $\theta$ ". The number of images formed is.

$$n = \frac{360}{\theta} \text{ (if } \frac{360}{\theta} \text{ is odd)}$$

$$n = \frac{360}{\theta} - 1 \text{ (if } \frac{360}{\theta} \text{ is even).}$$

13. For all types of mirrors the linear magnification is given by

$$\therefore m = \frac{\text{Size of image}}{\text{Size of Object}}$$

$$\therefore m = \frac{(\text{image distance})}{(\text{object distance})} = \frac{-v}{u}$$

### **Characteristics of the image formed in plane mirror**

1. Image is virtual
2. Image is erect
3. Image is of the same size as the object.
4. Image is formed as far behind the mirror, as the object is in front of it.
5. Image is laterally inverted.

### **Type of Images :-**

1. When the rays after reflection if actually converge to the image, it is called real image and if they appear to diverge from the image it is called virtual image.
2. Real image can be received on a screen but not the virtual image.
3. The region between the extreme reflected rays from the mirror is called its field of view. It depends on the location of the object in front of the mirror. If our eyes lies in the field of view then only we can see the full image of the object otherwise not.

### **Difference between the virtual image and the Real image :-**

Virtual Image	Real Image
1. The rays of light after reflection or refraction appear to meet at some other point.	1. The rays of light after reflection or refraction actually meet at some other Point.
2. It cannot be taken on screen	2. It can always be taken on screen.
3. It is always erect.	3. It is always inverted.

### **Lateral Inversion :-**

The phenomenon due to which the image of an object turns through an angle of  $180^\circ$  through vertical axis rather than horizontal axis, such that right side of image appears as left or vice versa is called lateral inversion.

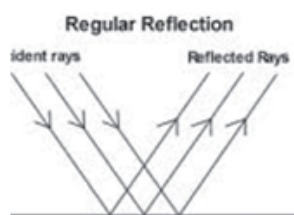
### **Type of Reflections :-**

There are two types of reflections.

#### **1. Regular Reflection :-**

The phenomenon due to which a parallel beam of light travelling through a certain medium, on striking some smooth polished surface, bounces off from it, as parallel beam, in some other direction is called regular reflection.

Regular reflection takes place from the objects like looking glass, still water, oil highly polished metals, etc.

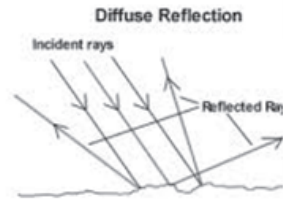


Regular reflection is useful in the formation of images. We can see our face in a mirror only on account of regular reflection.

#### **2. Irregular Reflection or Diffused Reflection:-**

The phenomenon due to which a parallel beam of light, traveling through some medium, gets reflected in various possible directions, on striking some rough surface is called irregular reflection or diffused reflection.





The reflection which takes place from ground, walls, trees, suspended particles in air and a variety of other objects, which are not very smooth is irregular reflection.

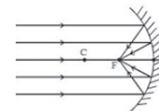
Irregular reflection helps in spreading light energy over a vast region and also decreases its intensity. Thus, it helps in the general illumination of places and helps us to see things around us.

**Spherical Mirrors :-**

**1. Spherical Mirror :-** A mirror which is made from a part of a hollow sphere is called spherical sphere.

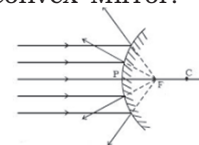
**2. Concave Mirror :-** A mirror which is polished from the bulging side of a hollow sphere, such that the reflecting side is towards its hollow side is called concave mirror.

(i) concave mirror forms both real and virtual images



**3. Convex Mirror :-** A mirror which is polished from the hollow side of sphere, such that reflecting surface is towards its bulging side is called convex Mirror.

(i) Convex lens always forms virtual image.



**Uses of concave Mirror :-**

**1. As a Reflector :-** We know that when a source of light is placed at the principle focus of a concave Mirror, it produces a strong parallel beam of light. Thus it is used as a reflector in the automobiles headlights and in searchlights.

**2. As a Shaving Glass:-** We know that when an object is placed between P and F of a concave mirror, it forms a virtual and enlarged image. Thus, by using this mirror we can have a proper shave, as the tiny hairs are clearly visible.

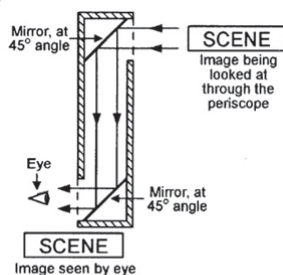
**3. For Doctors :-** Dentists use a concave mirror to see the back of tooth. E.N.T. doctors use it to focus light on the internal parts of ear, nose and eye for proper examination.

**Uses of convex Mirror :-**

1. It is used as a rear view mirror in automobile because it can cover a very wide field behind the driver and hence enables to see him the traffic behind without turning his head. Plane mirror is not useful as a rear view mirror as its field of view is very small.

2. It is used as a reflector for street light bulbs, because it diverges rays of light over large area.

## Reflecting Periscope



(a) 'View-above' type of periscope

It consists of a cardboard or wooden tube, bent twice at right angles and is provided with two openings as shown in Fig. Two plane mirrors are fixed at the bends of the tube at an angle  $45^\circ$  to the framework, such that the mirrors face each other. The tube is completely blackened from inside to avoid any reflection from its sides.

The parallel rays coming from an object at a higher plane, strike the plane mirror at an angle of  $45^\circ$ , and hence, are reflected through an angle of  $45^\circ$ .

These reflected rays, strike the second mirror at angle of  $45^\circ$ , and hence, are further reflected through an angle of  $45^\circ$ . These reflected rays on reaching the eye from the image on retina.

### Use of Reflecting periscope

1. It is used to see above the head of crowds.
2. It is used by soldiers in trench warfare.

### Disadvantages of Reflecting Periscope

1. The final image is not brightly illuminated as light energy is absorbed due to two successive reflections.
2. Any deposition of moisture or dust on the mirror reduces the reflection almost to nil, and hence, the periscope cannot be used in places where there is a lot of dust or moisture.

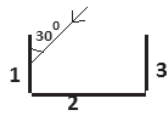
### LEVEL - I

1. When a light ray incidents normally on the surface, the reflected ray deviates through as angle ( )
  1. Zero
  2.  $\pi/2$
  3.  $\pi$
  4.  $2\pi$
2. The angle of deviation for a ray with an angle of incidence 'i' on surface is( )
  1.  $2i$
  2.  $180^\circ - 2i$
  3.  $90 - i$
  4.  $90 + i$
3. The field of view is more for .. mirror ( )
  1. convex
  2. concave
  3. plane
  4. paraboloid
4. The reflectors used in head lights in automobiles are ( )
  1. convex mirror
  2. concave mirror
  3. Plane mirror
  4. cylindrical mirror

5. A dentist uses a .. mirror for examination ( )  
 1. Convex                    2. Concave                    3. Plane                    4. Cylindrical
6. The reflectors used for street lights are ( )  
 1. convex mirror                    2. concave mirror  
 3. Plane mirror                    4. Paraboloid Mirror
7. The mirrors used as rear view ( )  
 1. Convexmirror                    2. concave mirror  
 3. Plane mirror                    4. Paraboloid Mirror
8. The mirror which forms always a diminish image ( )  
 1. convex                    2. concave                    3. Plane                    4. Cylindrical
9. A mirror produces magnified erect image of an object. The nature of the mirror is ( )  
 1. Convex                    2. Concave  
 3. Plane                    4. Neither convex or concave
10. A real image of an object is ( )  
 1. Inverted                    2. enlarged/diminished/same size  
 3. Can be taken on screen                    4. All the above
11. A virtual image may be ( )  
 1. Magnified/same size/ diminished                    2. erect  
 3. Cannot be taken on screen                    4. All the above
12. Which statement is correct, when an image is formed in a plane mirror? ( )  
 1. Image is real                    2. Image is laterally invert  
 3. Image is inverted                    4. Image is formed in front of plane mirror
13. When you stand in front of mirror, your image is always erect, of the same size and laterally inverted. The mirror is ... ( )  
 1. Plane                    2. Convex                    3. Concave                    4. Both (1) & (2)
14. Which of the following can produce a virtual image ? ( )  
 1. convex                    2. Concave                    3. Plane                    4. All the above
15. A ray of light strikes the surface of a plane mirror at angle of  $30^\circ$  with the surface the angle of reflection is .. ( )  
 1.  $30^\circ$                     2.  $60^\circ$                     3.  $120^\circ$                     4. None of the above
16. An object is moving towards a plane mirror at a speed of  $1\text{ms}^{-1}$ . To an independent observer, the speed of the image in the mirror is ( )  
 1.  $2\text{ms}^{-1}$                     2.  $1\text{ms}^{-1}$                     3.  $4\text{ms}^{-1}$                     4. None
17. A ray of the light makes an angle of incidence of  $25^\circ$  with the plane mirror. If the plane mirror is turned through an angle of  $5^\circ$ , the angle of reflection can be ( )  
 1.  $35^\circ$                     2.  $15^\circ$   
 3. both  $35^\circ$  and  $15^\circ$  depends on the direction of turn of mirror  
 4. None

18. The mirror used in car head lights is ( )  
 1. Concave            2. Convex            3. Plane            4. None
19. A ray of light incident perpendicularly on glass slab, then the reflected light is  
 1. bends toward the normal            2. bends away from the normal ( )  
 3. moves along the normal            4. None
20. A man runs towards mirror at a speed 15 m what is the speed of his image for him ( )  
 1. 7.5 m/s            2. 15 m/s            3. 30 m/s            4. 45 m/s
21. If two mirrors are kept at  $60^\circ$  to each other, then the number of images formed by them is ( )  
 1. 5            2. 6            3. 7            4. 8
22. To get three images of a single object, one should have two plane mirrors at an angle ( )  
 1.  $30^\circ$             2.  $60^\circ$             3.  $90^\circ$             4.  $120^\circ$
23. If two mirrors are kept at  $36^\circ$  to each other, then the number of images formed by them ( )  
 1. 11            2. 8            3. 10            4. 9
24. If two mirrors are kept at  $72^\circ$  to each other, then the number of images formed ( )  
 1. 4            2. 5            3. 6            4. 7
25. If two mirrors are kept at  $40^\circ$  to each other, then the number of images formed ( )  
 1. 9            2. 10            3. 11            4. 8
26. To get 17 images of a single object, one should have two plane mirrors at an angle is ( )  
 1.  $10^\circ$             2.  $20^\circ$             3.  $30^\circ$             4.  $40^\circ$
27. Two plane mirrors are at  $45^\circ$  each other, If an object is placed between them, then the number of images will be ( )  
 1. 5            2. 9            3. 7            4. 8
28. To get five images of a single object, one should have two plane mirrors at an angle of ( )  
 1.  $30^\circ$             2.  $72^\circ$             3.  $90^\circ$             4.  $150^\circ$
29. A watch shows time as 3:25 when seen through a mirror, time appeared will be ( )  
 1. 8:35            2. 9:35            3. 7:35            4. 8:25
30. A man of length  $h$  requires a mirror, to see his own complete of length at least equal to ( )  
 1.  $h/4$             2.  $h/3$             3.  $h/2$             4.  $h$



40. A bus driver is reversing his bus at a speed  $8 \text{ ms}^{-1}$ . The rear view mirror of a bus is a plane mirror. The driver sees in his rear view mirror the image of a car parked behind his bus. The speed at which the image of the car appears to approach the driver will be ( )
1.  $2 \text{ ms}^{-1}$                       2.  $4 \text{ ms}^{-1}$                       3.  $8 \text{ ms}^{-1}$                       4.  $16 \text{ ms}^{-1}$
41. Statement 1 : It is not possible to photograph a virtual image  
Statement 2 : An image is said to be virtual if the reflected rays are diverging in nature.
1. Both statements 1 and statement 2 are true and the statement 2 is the correct explanation of statement 1.  
2. Both statement 1 and statement 2 are true but statement 2 is not the correct explanation of statement 1  
3. Statement 1 is true but statement 1 is false.  
4. Statement 1 is false but statement 2 is true.
42. If you keep red coloured marbles in a blue coloured vase made of glass then the colour of red coloured marbles will appear ( )
1. Blue                      2. Red                      3. Black                      4. White
43. Mirrors 1,2 and 3 are placed at right angles as shown in a figure and a beam of light is made incident on mirror 1.  
Which will be the angle of reflection from mirror "3"?
1.  $30^\circ$                       2.  $45^\circ$   
3.  $60^\circ$
- 
4. The reflected ray from mirror "2" will be parallel to the surface of mirror "3".
44. Which of the following letters will be seen without any change in a plane Mirror?  
1. S                      2. T                      3. L                      4. P ( )
45. How many Letters in the English alphabets have the image formed in a plane mirror appear exactly like the letter itself ? ( )
1. 4                      2. 8                      3. 9                      4. 11
46. An object placed 3 m from a plane mirror is shifted by 0.4 m away from the mirror. What is the new distance between the object and its image ? ( )
1. 6.4 m                      2. 6.8 m                      3. 6 m                      4. 5.2 m
47. A ray of light is incident on plane mirror at an angle of incidence is  $30^\circ$ . What is the angle of reflection ? ( )
1.  $30^\circ$                       2.  $60^\circ$                       3.  $90^\circ$                       4.  $120^\circ$
48. If the angle of incidence is  $80^\circ$ , what will be the angle of reflection with respect to the normal drawn perpendicular at the point of reflection ? ( )
1.  $80^\circ$                       2.  $100^\circ$                       3.  $160^\circ$                       4.  $20^\circ$
49. If the angle of incidence is  $50^\circ$ , what is the angle between the incident ray and the reflected ray ? ( )
1.  $50^\circ$                       2.  $100^\circ$                       3.  $130^\circ$                       4.  $80^\circ$

50. What enables us to see objects ? ( )  
 1. Light absorbed by an object  
 2. Light that enters our eyes after it is reflected by an object  
 3. Light dispersed by an object 4. Light refracted through the object.
51. Which of the following is used by an E.N.T. doctor ? ( )  
 1. convex mirror 2. convex lens 3. Plane Mirror 4. Concave mirror
52. Which of the following are used as reflectors in torchlights? ( )  
 1. Concave mirrors 2. Plane mirrors 3. Convex mirrors 4. Concave lens.
53. Identify the nature of light emitted from a torchlight ( )  
 1. convergent 2. Divergent 3. Parallel 4. Irregular
54. What is rectilinear propagation of light? ( )  
 1. Travelling in curved lines 2. Travelling in straight lines  
 3. The ability to bend around obstacles.  
 4. The display of the phenomenon of diffraction
55. What causes the formation of shadows ? ( )  
 1. Rectilinear propagation of light 2. Curvilinear propagation of light  
 3. Total internal reflection 4. Refraction
56. How many colours in white light made up of ? ( )  
 1. A single colour 2. Primary colours 3. Five colours 4. Seven colours

### **KEY FOR REFLECTING OF LIGHT**

- |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|
| 1) 3  | 2) 2  | 3) 1  | 4) 2  | 5) 2  |       |
| 6) 1  | 7) 1  | 8) 1  | 9) 2  | 10) 4 |       |
| 11) 4 | 12) 2 | 13) 1 | 14) 4 | 15) 2 |       |
| 16) 2 | 17) 3 | 18) 1 | 19) 3 | 20) 3 |       |
| 21) 1 | 22) 3 | 23) 4 | 24) 2 | 25) 1 |       |
| 26) 2 | 27) 3 | 28) 2 | 29) 1 | 30) 3 |       |
| 31) 3 | 32) 2 | 33) 1 | 34) 4 | 35) 1 |       |
| 36) 4 | 37) 3 | 38) 2 | 39) 3 | 40) 4 |       |
| 41) 4 | 42) 3 | 43) 3 | 44) 2 | 45) 4 |       |
| 46) 2 | 47) 1 | 48) 1 | 49) 2 | 50) 2 |       |
| 51) 4 | 52) 1 | 53) 2 | 54) 2 | 55) 1 | 56) 4 |

## **6. FORCE**

1. Rest is the natural state of an object or the matter.
2. Force may be defined as an external cause that changes or tends to change the state of rest or uniform motion of a body in a straight line or changes the direction of a body or deforms a body.
  - 2.1) Force has magnitude as well as direction.
  - 2.2) It is a vector quantity.
  - 2.3) S.I. Unit of force is "Newton" (or) N
  - 2.4) Formula for force  $F = ma$                        $m = \text{Mass}$                        $a = \text{Acceleration}$ .
3. Force generally denotes push or pull or the action which deforms an object.

### **4. Examples of pull :-**

- (i) A bullock applies a force of pull in moving a cart.
- (ii) Two teams pulling a rope in the tug of war are applying force of pull.
- (iii) Fruits falling from trees due to gravitational pull.
- (iv) Sucking Juice with a straw
- (v) A magnet attracting nails.

### **5. Examples of Push:-**

- (i) Pushing a pin in a paper
- (ii) A car moves in the forward direction by a force of push.

### **6. Examples of deforming by a force :-**

- (i) Squeezing a lemon so as to extract lemon juice.
- (ii) Squeezing out tooth paste from a tube.
- (iii) Stretching of spring of a chest expander.

### **7. Effect of force :-**

#### **(i) To set a stationary body into motion :**

- (a) A horse can make a carriage move by applying force in the forward direction.
- (b) A player can set a ball in motion by hitting it with some suitable material.
- (c) The railway engine can move a stationary train by applying a force of pull or push.
- (d) A magnet can move an iron nail.

#### **(ii) To stop a moving body :**

- (a) A speeding car is stopped by the force of friction of brakes.
- (b) A rolling football stops because of friction from the ground.
- (c) A stone thrown vertically upward slows down and finally stops because of the force of gravity of the earth.
- (d) A freely oscillating pendulum stops because of the friction of air.

#### **(iii) To change the speed or direction of a moving body :**

- (a) A stone projected vertically upward changes its speed as well as direction because of the force due to gravity.



- (b) A moving car changes its direction, when a force is applied on its steering wheel.
- (c) A moving bicycle starts running faster, when more force is applied on its paddles.
- (d) The direction and speed of a football changes, when a player heads it.
- (e) Satellites move around the earth at a constant speed, but continuously change their direction due to the force of gravity.

**(iv) To bring about change in dimensions (shape)**

- (a) Length of a rubber band increases, when a stretching force is applied.
- (b) A spring shortens in length on the application of a compressive force.
- (c) Gold on hammering flattens to form a thin leaf.
- (d) Wet clay can be moulded in any shape by applying a force with hands.
- (e) A rubber ballon expands when the molecules of the air exert force on its walls.

**Conclusions :-**

- (i) A force can change the speed of a body. It means that a force can make a stationary body move, or a moving body move faster or it can slow down a moving body or stop the moving body altogether
- (ii) A force can change the direction of a moving body.
- (iii) A force can change the shape of a body. i.e, it can deform a body.

**Type of Forces :-**

Types of forces (Two types)

1. Contact forces (i) Muscular Force, 2. Force of friction, 3. Normal force, 4. Tension.
3. Forces at a distance (field force) : 1. Magnetic force, 2. Electrostatic force, 3. Gravitational force.

**1. Muscular Force :-**

- The force which we exert by using our body muscles is known as muscular force.
- Animals use the muscular force to carry out their regular physical activities.
- Blood circulation, expansion and contraction of lungs during breathing, heart beating are also muscular forces.
- In our daily life works, mostly we use the muscular force.

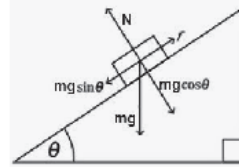
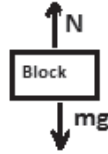
**2. Force of Friction :-**

- The force which opposes the relative motion of surfaces in contact is called force of friction.
- Friction is the resistance to the movement of a body over the surface of another body



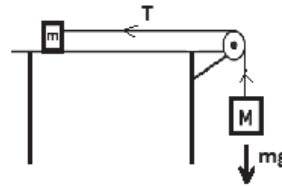
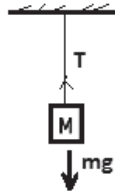
### **3. Normal force :-**

The force by a solid surface exerts on any object in the normal direction is called the normal force.



### **4. Tension :-**

The force developed in a thread or, string when a weight is suspended is called tension.



### **Field Force (or) Force at a distance :-**

1. Magnetic force :- The force of attraction and repulsion between two poles of a magnet is called magnetic force.

- The action of pull or push arises due to a magnetic force.
- Like poles repel each other
- Unlike poles attract each other
- Monopole does not exist in magnetism.
- A magnet can attract or repel another magnet without contact.

### **Electrostatic Force :-**

The force between any two charged objects is called Electrostatic force.

The force exerted by a charged body on other charged body is known as electrostatic force.

### **Gravitational Force :-**

The force between any two massive objects is called gravitational force.

- The force between small objects is very small, that is not observable.
- The gravitational force by the earth is observed.
- Every object on the earth or close to earth will experience a gravitational pull.

### **Net Force :-**

When the forces on a body in a straight line are in opposite directions, the net force is equal to the difference between the two forces. The object at rest moves in the direction of the net force acting on it.

$$\vec{F}_1 \quad \vec{F}_2$$

The algebraic sum of all the forces acting on a body is known as net force.

$$F_{\text{net}} = F_1 + (-F_2) = F_1 - F_2$$

The diagram showing all the forces acting on an object at a particular instant is called free body diagram.

**Pressure :-**

The force acting perpendicularly on unit area of a surface is called pressure.

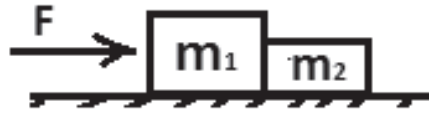
$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

The unit of pressure in S.I. System is N/M<sup>2</sup>

**MOTION OF BODIES IN CONTACT**

If two bodies with masses m<sub>1</sub> and m<sub>2</sub> are put in contact and if a force F is applied on the mass m<sub>1</sub> then equal acceleration is produced in both the bodies.

Case (i) :



Acceleration produced in both bodies is,

$$a = \frac{F}{m_1 + m_2} = \frac{\text{Force}}{\text{total mass}}$$

Here F = Force acting on the body with mass m<sub>1</sub>.

If the force exerted by m<sub>2</sub> on m<sub>1</sub> is F<sup>1</sup>, then

$$\therefore F - F^1 = m_1 a$$

$$F^1 = F - m_1 a$$

$$F^1 = F - m_1 \frac{F}{m_1 + m_2} = F \left[ 1 - \frac{m_1}{m_1 + m_2} \right]$$

$$\therefore F^1 = \frac{m_2 F}{m_1 + m_2}$$

Case (ii)

When the force F acts on the body with mass m<sub>2</sub>

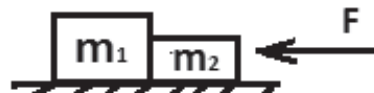
$$a = \frac{F}{m_1 + m_2}$$

If the force exerted by m<sub>1</sub> on m<sub>2</sub> is F<sup>1</sup>, then

$$F - F^1 = m_2 a$$

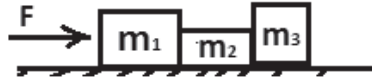
$$F^1 = F - m_2 a = F - m_2 \frac{F}{m_1 + m_2} = F \left[ 1 - \frac{m_2}{m_1 + m_2} \right]$$

$$\therefore F^1 = \frac{m_1 F}{m_1 + m_2}$$



Case (iii)

When three bodies are lying in contact on a horizontal smooth table.



Representation of action and reaction forces.

The contact force between  $m_1$  and  $m_2$  is  $T_1$  and that between  $m_2$  and  $m_3$  is  $T_2$ .

For the first body,  $F - T_1 = m_1 a$

For the second body,  $T_1 - T_2 = m_2 a$

For the third body,  $T_2 = m_3 a$

Here,  $F = (m_1 + m_2 + m_3) a$  -  $a = a = \frac{F}{m_1 + m_2 + m_3}$

Solving these equations we get

$$\therefore T_1 = \frac{(m_2 + m_3)F}{m_1 + m_2 + m_3}; \quad T_2 = \frac{m_3 F}{m_1 + m_2 + m_3}$$

**Motion of bodies connected by string passing over a smooth pulley (At woods machine) :**

Let two bodies of masses  $m_1$  and  $m_2$  respectively are connected by a light inextensible string passing over a massless smooth pulley. If  $m_1 > m_2$ ; then  $m_1$  moves downwards and mass  $m_2$  moves upwards.

For body a,  $m_1 g - T = m_1 a$

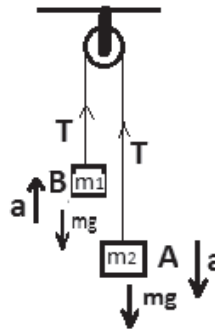
For body B,  $T - m_2 g = m_2 a$

Solving we get,  $a = \frac{m_1 - m_2}{m_1 + m_2} g$

$$T = \frac{2m_1 m_2}{m_1 + m_2} g$$

The reaction at the pulley,

$$R = 2T = \frac{4m_1 m_2}{m_1 + m_2} g$$



Suppose a body B with mass  $m_2$  rests on a smooth table. Mass  $m_1$  is connected to  $m_2$  by a light string and it hangs freely. If  $m_1 > m_2$ , then equation of motion is.

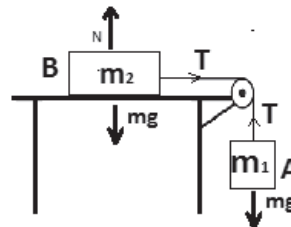
For body A,  $m_1 g - T = m_1 a$

For body B,  $T = m_2 a$

For body B,  $T = m_2 a$

Solving we get  $a = \frac{m_1 g}{m_1 + m_2}$

$$T = \frac{m_1 m_2 g}{m_1 + m_2}$$



Suppose a mass  $M$  rests on a frictionless horizontal table. Let the mass  $M$  be connected to two masses  $m_1$  and  $m_2$  by two light strings passing over two light pulleys. If  $m_1 > m_2$  and  $m_1$  is moving downwards with acceleration “ $a$ ” then equations of motions.

For body A,  $m_1g - T_1 = m_1a$

For body B,  $T_2 - m_2g = m_2a$

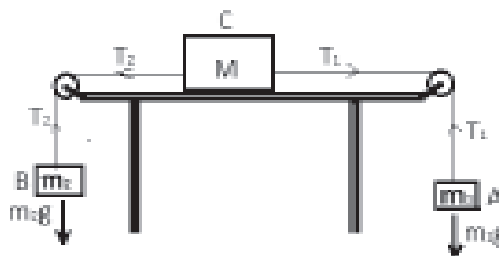
For body C,  $T_1 - T_2 = Ma$

Solving we get,

$$a = \frac{(m_1 - m_2)g}{(m_1 + m_2 + M)}$$

$$T_1 = \frac{m_1(2m_2 + M)g}{(m_1 + m_2 + M)}$$

$$T_2 = \frac{m_2(2m_1 + M)g}{(m_1 + m_2 + M)}$$



A block of mass  $M$  is pulled along horizontal frictionless surface by a rope of mass  $m$ . Force  $P$  is applied at one end of the rope. Find the force exerted by the rope on the block ?

Sol : -  $a = \frac{P}{M + m}$

Force on  $M = Ma = M \frac{P}{M + m}$

$\therefore F = \frac{MP}{M + m}$

$M \xrightarrow{m} P$

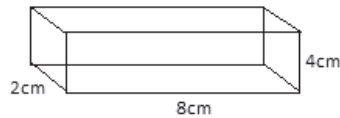
**SUBJECT BASED BITS**

1. An external cause that changes the state of rest or uniform motion of a body in straight line is called ( )
  1. Momentum
  2. Acceleration
  3. Force
  4. Displacement
2. All forces are associated with the action of ( )
  1. pull only
  2. Push only
  3. both push and pull
  4. None of the above
3. Which of the following action is not associated with the term pull ( )
  1. Drawing water from a well
  2. Flicking a coin on the carrom board
  3. Lifting a bar of iron
  4. A horse drawing a crat
4. Which of the following action is not associated with the term push? ( )
  1. Driving a nail in the wall
  2. Kicking a football
  3. Pounding rice
  4. Straightening hair

5. Which is the correct statement ? ( )
1. A force is produced in the living beings because of food
  2. A force is produced by the motion in a body
  3. A force is produced by the interaction of one object with another object.
  4. None of the above.
6. Which of the following statements is incorrect. When a boy pushes a stationary cart ( )
1. The cart may not move
  2. The cart may move in the direction of force
  3. The cart may move opposite to the direction of force
  4. None of the above
7. A football player angles his foot in the path of a rolling foot ball. This action may
1. Change the direction of foot ball
  2. Increase the speed of foot ball ( )
  3. May not increase the speed of football
  4. None of the above.
8. Which is the most appropriate statement, when a group of boys push the wall of their class room ( )
1. Force moves the wall
  2. Force tries to move the wall
  3. Force has no effect on the wall
  4. None of the above
9. A ball of dough is rolled into a chapli (roti). The applied force ( )
1. increases the volume of dough
  2. Decreases the volume of dough
  3. Changes the shape of the ball of dough
  4. None of the above.
10. Which one is not a contact force ? ( )
1. Muscular force
  2. Frictional force
  3. Mechanical force
  4. Gravitational force
11. Which one is not a force at a distance ? ( )
1. Frictional force
  2. Electrostatic force
  3. Gravitational force
  4. Magnetic force
12. Which one is not an example of contact force ( )
1. A ball projected vertically upward
  2. A bullock ploughing a field
  3. A body pulling a chest expander
  4. Applying breaks to moving bicycle.
13. Which one is the example of contact force ( )
1. A rolling football stops
  2. A freely falling stone
  3. A magnet pulling iron nails
  4. A charged ballon sticking to a wait
14. The force acting on a body is directly proportional to ( )
1. Momentum of body
  2. Rate of change of momentum of a body
  3. Rate of change of inertia of a body
  4. None of the above

15. The SI unit of force is ( )  
 1. Newton                    2. Pascal                    3. dyne                    4. Kilogram force
16. One newton is equal to ( )  
 1.  $1 \text{ Kg} \times 1 \text{ ms}^{-1}$     2.  $1 \text{ kg} \times 1 \text{ ms}^{-2}$     3.  $9.8 \text{ kg} \times 1 \text{ ms}^{-1}$     4.  $10 \text{ kg} \times 1 \text{ ms}^{-2}$
17. One kilogram force (kgt) is equal to ( )  
 1. 9.8 N                    2. 1.6 N                    3. 10.0N                    4. 5 N
18. In CGS system, 1 N is equal to ( )  
 1.  $10^5$  dynes                    2.  $10^1$  dynes                    3.  $10^4$  dynes                    4.  $10^3$  dynes.
19. A speeding car stops due to the force of ... of the brakes ( )  
 1. Viscosity                    2. Friction                    3. Elasticity                    4. All the above
20. Satellites move around the earth at a constant speed, but continuously change their direction due to the force of ... ( )  
 1. Electricity                    2. Magnet                    3. Gravity                    4. All the above
21. When unbalanced forces act on a body, the body ( )  
 1. Must move with uniform velocity    2. Must remain at rest  
 3. Must experience acceleration    4. Must move in a curved path
22. Identify the application of low pressure in every day life ( )  
 1. Cutting of an apple with a sharp knife    2. Wide tyres of a heavy vehicle  
 3. hammering of a nail into wood    4. All the above
23. The speed of a falling body increases continuously why ? ( )  
 1. No force acts on the falling body    2. The falling body is very light  
 3. Air exerts a frictional force on the falling body  
 4. The force acting on the body is in the direction of the fall
24. Why is the atmospheric pressure not felt by us ? ( )  
 1. It is small in magnitude  
 2. It acts only on atmosphere and not on us  
 3. Our internal body pressure is equal to that of the atmosphere pressure  
 4. It does not act at sea level
25. Arrange the given below in ascending order according to the air pressure at the highest point in each case ( )  
 A. A mountain top    B. A high building                    C. A sea beach  
 1. A,B,C                    2. B,C,A                    3. B,A,C                    4. C,B,A
26. How is the weight of an astronaut in the outer space in relation with his actual weight ? ( )  
 1. It is less than his actual weight    2. It is more than his actual weight  
 3. It is the same as his actual weight    4. It is zero
27. What is thrust equal to ? ( )  
 1. Force  $\times$  area    2. Force / area    3. Pressure    4. Pressure  $\times$  area

28. Look at the block placed on the table given below. ( )



Which of the following physical quantities is not the same when this block is kept over a table with its different faces touching the table.

1. Pressure                      2. Volume                      3. weight                      4. Mass
29. A spirit level is used to determine the surface level as shown in the figure below



Why does the air bubble at the centre of the tube move to the right when the surface is inclined ? ( )

1. The forces acting on the air bubble are in equilibrium  
 2. Unbalanced forces act on the air bubble  
 3. Air bubble always rise                      4. Frictional force act on the air bubble
30. A book remains at rest on a table why ? ( )
1. No force acts on it  
 2. There is friction between the book and the surface of the table.  
 3. Force exerted by the book on the table is the same as the force exerted by the table on the book.  
 4. All of the above
31. A deep sea diver's ears get hurt when he is inside the water. What is the cause for it ? ( )
1. Lack of Oxygen                      2. Decrease in atmospheric pressure  
 3. Increase in water pressure                      4. All of the above
32. In which of the following cases the net force is NOT equal to Zero ? ( )
1. A kite held stationary in the sky    2. A ball falling freely from a height  
 3. A helicopter hovering above the ground  
 4. A cork floating on the surface of water
33. Why do deep sea divers use a special suit for diving ? ( )
1. To maintain their body temperature in cold sea water  
 2. To protect against sea animals  
 3. To counter balance the pressure in the sea  
 4. To keep them dry
34. In cities, water from an overhead tank is supplied to houses using the principle of  
 (i) Difference in pressure                      (ii) Gravitational force                      ( )  
 (iii) Decreases of of friction in pipes
1. only (i)                      2. only (i) and (ii) 3. only (ii) & (iii) 4. (i), (ii), and (iii)



35. Four forces are acting on a body. If the body does not change its position or shape, then what does it mean ? ( )

1. Forces are similar acting in the same direction
2. Forces are parallel and opposite
3. Forces add up to zero when taken as vectors
4. Forces are different acting in the same direction

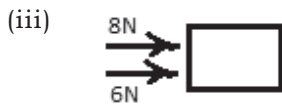
36. Find the net forces in the following diagrams ( )



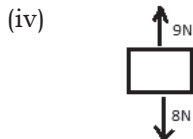
1. 10N
2. 14N
3. 12 N
4. 8N



1. 8 N
2. 16 N
3. 0 N
4. 64 N



1. 14 N
2. 8 N
3. 6 N
4. 2N



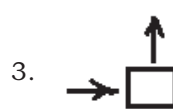
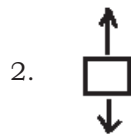
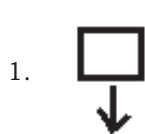
1. 8 N
2. 9 N
3. 2 N
4. 1N

**PREVIOUS BITS**

37. Which of the following have more net force ? ( )



38. A pen is falling from a table. Neglect air resistance. The free body diagram for this situation ? ( )

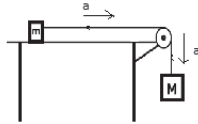


39. Three forces are acting as shown in above figure. The net force is zero then  $x$  is. ( )



1. 17 N                      2. 34 N                      3. 8.5 N                      4. Zero

40.



A system is exist as shown in above figure. What is the FBD with respect to  $M$  kg body ( )

1.                      2.                      3.                      4.

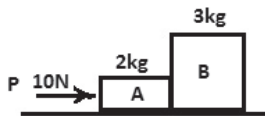
41. Which is not is field force ( )

1. Gravitational force                      2. Spring force  
3. Electrostatic force                      4. magnetic force

42. Which of the following is non contact force ? ( )

1. Muscular force    2. Magnetic force    3. Normal force    4. Force of friction

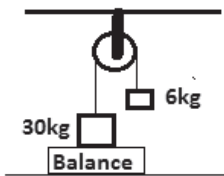
43.



Block A and B have masses of 2 kg and 3 kg respectively. The ground is smooth.  $P$  is an external force of 10 N. Then the force exerted by B on A is ... ( )

1. 6 N                      2. 4 N                      3. 8 N                      4. 10 N

44.



As shown in the figure, a mass of 30 kg is applying a force to lift a block of mass 6 Kg with an acceleration of  $2 \text{ m/s}^2$ . Find the reading of the machine.. (consider  $g = 10 \text{ m/s}^2$ ) ? ( )

1. 22.8N                      2. 22.8 Kg                      3. 228 Kg                      4. 72 N

45.



As shown in above system, what is the speed of the block when free end of the string is pulled with  $V=2 \text{ cm/s}$  in horizontally... ( )

1. 3 cm/s                      2. 2. cm/s                      3. 1 cm/s                      4. 4 cm/s

46. A particle is simultaneously acted by two forces equal to 4N and 3N. The net force on the particle is ( )

1. 7 N                      2. 5 N                      3. 1 N                      4. Between 1 N and 7 N

47. A block of mass  $M$  is pulled along a horizontal frictionless surface by a rope of mass  $m$ . Force  $P$  is applied at one end of the rope. The force which the rope exerts on the block is .. ( )

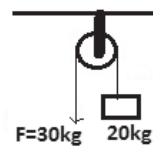
1.  $\frac{P}{M-m}$       2.  $\frac{PM}{M+m}$       3.  $\frac{Pm}{M-m}$       4.  $Pm (M+Mm)$

48. Two bodies of masses 6 kg and 3 kg are tied to the ends of a string, which passes over a fixed pulley of the Atwood' machine then the accelerations in the downward direction of the body of mass 6 kg is ... ( )

1.  $g$       2.  $3g$       3.  $g/3$       3.  $2g$

49. Figure shows a weight of 20 kg suspended at one end of cord and a force of 30 kg applied at other end of the cord passing over a pulley. Neglecting weight of rope and pulley tension in the cord will be ( )

1. 300 N      2. 240 N  
3. 400 N      4. 420 N



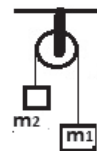
50. Two masses  $m_1 = 5\text{kg}$  and  $m_2 = 4.8\text{kg}$  tied to a string are hanging over a light frictionless pulley. What is the acceleration of the masses... ( )

1.  $9.8\text{ m/s}^2$       2.  $0.2\text{ m/s}^2$   
3.  $4.8\text{ m/s}^2$       4.  $5\text{ m/s}^2$



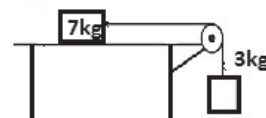
51. Two masses  $m_1$  and  $m_2$  are attached to a string which passes over a frictionless pulley, when  $m_1 = 10\text{ kg}$ ,  $m_2 = 6\text{ kg}$ , the acceleration of masses is ( $g = 9.8\text{ m/s}^2$ ) ( )

1.  $20\text{ m/s}^2$       2.  $5\text{ m/s}^2$   
3.  $2.5\text{ m/s}^2$       4.  $10\text{ m/s}^2$



52. A block A of mass 7 kg is placed on a frictionless table. A thread tied to it passes over a frictionless pulley and carries a body B of mass 3 kg at the other end. The acceleration of the system is ..... ( )

1.  $100\text{ m/s}^2$       2.  $3\text{ m/s}^2$       3.  $10\text{ m/s}^2$       4.  $30\text{ m/s}^2$



53. A rain drop of mass 0.2 gm is falling with a uniform velocity of 20 cm per sec. Then its weight is ( $g = 10\text{ m/s}^2$ ) ( )

1.  $2 \times 10^{-3}\text{ N}$       2. Zero      3.  $10^{-3}\text{ N}$       4.  $4 \times 10^{-4}\text{ N}$

54. A rain drop of mass 0.2 gm is falling with a uniform velocity of 20 cm per sec. Then the net force on rain drop is ... ( $g = 10\text{ m/s}^2$ ) ( )

1.  $2 \times 10^{-3}\text{ N}$       2. Zero      3.  $10^{-3}$       4.  $4 \times 10^{-4}\text{ N}$

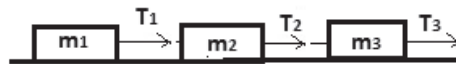
55. Three blocks A, B and C weighing 1, 8 and 27 kg respectively are connected as shown below with an inextensible string and are moving on a smooth surface  $T_3$  is equal to 36 N then  $T_2$  is .. ( )



1. 18 N                      2. 9 N                      3. 3.375 N                      4. 1.25 N
56. Three blocks of masses 2kg, 3 kg and 5 kg are connected to each other with light string and are then placed on a frictionless surface as shown in below. The system is pulled by a force  $F = 10$  N, then tension  $T_1 = \dots$  ( )



1. 1 N                      2. 5 N                      3. 8 N                      4. 10 N
57. Three blocks of masses  $m_1$ ,  $m_2$  and  $m_3$  are connected by massless strings as shown on a frictionless table. They are pulled with a force  $T_3 = 40$  N. If  $m_1 = 10$  kg,  $m_2 = 6$  kg and  $m_3 = 4$  kg then tension  $T_2$  will be ( )



1. 20 N                      2. 40 N                      3. 10 N                      3. 32 N
58. Two identical particles P and Q are at rest suspended by an inextensible string over a smooth pulley above a perfectly elastic table. particle P is given a velocity  $V$  vertically downwards. Immediately after P strikes the table. ( )
1. Both P and Q are at rest  
 2. P moves up and Q moves down with equal speeds  
 3. Q moves up and P remains at rest  
 4. P and Q both move up with the same speed



**KEY FOR FORCE**

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1) 3  | 2) 3  | 3) 2  | 4) 4  | 5) 3  |
| 6) 3  | 7) 1  | 8) 2  | 9) 3  | 10) 4 |
| 11) 1 | 12) 1 | 13) 1 | 14) 2 | 15) 1 |
| 16) 2 | 17) 1 | 18) 1 | 19) 2 | 20) 3 |
| 21) 3 | 22) 2 | 23) 4 | 24) 3 | 25) 1 |

26) 4	27) 4	28) 1	29) 2	30) 3
31) 3	32) 2	33) 3	34) 2	35) 3
36) 4,3,1,4	37) 2	38) 1	39) 3	40) 1
41) 2	42) 2	43) 1	44)	45) 2
46) 4	47) 2	48) 3	49) 2	50) 2
51) 3	52) 2	53) 1	54) 2	55) 2
56) 3	57) 4	58) 4		

## **8. SOUND**

### **Symopsis :**

- \* Sound plays an important role in our lives.
- \* It helps us to easily communicate with each other.
- \* Vibrating bodies produce sound.
- \* We may able to observe the vibrations of the plate, hack-saw blade etc.
- \* Sound has energy.
- \* “Tabala” the vibrating part is Mombrane, air inside hollow body.
- \* Bismillah Khar is the most outstanding SHEHNAI player.
- \* Born in BIHAR Childhood in VARANASI.
- \* Official Shahna Player in famous Kasi Viswandh temple.
- \* CHITTI BABU is a famous Veena player in the Karnatik Music
- \* Larynx has two muscular ligaments called Vocal Cards.
- \* They are stretched across voice box, it leads to a narrow slit between them, to allow Passage of air, to Produce sounds
- \* Vocal Cards slightly open during breathing to allow air into lungs
- \* Length of Vocal Cards in men is nearly 20 mm
- \* Length of Vocal Cards in Women is about 5mm
- \* The air surrounding us act as a medium which allow the sound to pass through it.
- \* Ventriloquists make sounds or talk with hardly any movement of lips.
- \* Gomatham Srinivas is a Ventriloquist.
- \* He belongs to Telangana State, Warangal District
- \* Nerella Venu Madhav is a World famous mimicry artist.
- \* N. Venumadhav got Padma Sree in 2001.
- \* Sound travel in solid medium, liquid and gas
- \* Sound travels more speed through solids and then in liquids, then gases

Medium	Speed of Sound
Diamond	12000 m/sec
Pyrex glass	5640 m/sec
Iron	5130 m/sec
Aluminium	5100 m/sec
Brass	4700 m/sec
Copper	3560 m/sec
Gold	3240 m/sec
Rubber	1600 m/sec
Glycerol	1904 m/sec
Sea water at 25°	1533 m/sec

Mercury	1493 m/sec
Methyl alcohol	1143 m/sec
Carbon tetra ahloride	926 m/sec
Hydrogen 0°C	1286 m/sec
Helicum 0°C	972 m/sec
Air 20°C	343 m/sec
Air 0°C	331 m/sec

- \* Sound does not propagate through Vaccum
- \* Vaccum purmps are used to create Vaccum
- \* Our ear consists of 3 sections
  - 1) Outer ear
  - 2) The Middle
  - 3) Inner ear
- \* Pinna of external ear Collects the sound Vibrations
- \* They enter in to ear canal
- \* Sound Waves strikes the tympanum and make it vibrate
- \* The Vibrations from the tymparic membrane reach the middle ear (ear ossicles)
- \* Middle ear consists 3 small bones
- \* 1st one is Malleus (hammer shaped)
- 2nd is Stapes (Stirrup shaped)
- 3rd is Incus (Anvil shaped)
- \* The bones of middle ear magnify the sound Vibrations
- \* Stapes transmit Vibrations to Oval Window
- \* Oval window has the surface area 1/20 th of the eardrum
- \* Because of this Vibrations increase 30 to 60 times.
- \* The Vibrations from the oval window transmit to the Cochlea which is the inner Part of the ear
- \* The initial position of the scale at rest along the surface of the table is called mean position.
- \* The to and fro motion of a body from its mean position is known as one Vibration.
- \* Sound level of a noice (loudness) is proportional to intersity of the source.
- \* Decibel is the unit for measuring the intensity of sound.
- \* Symbol for decibal is dB
- \* The name decidel is from Alexander Graham bell.
- \* Smallest audible sound is '0' dB (Total silence)
- \* A sound 10 times more powerful than this is 10 d B
- \* A sound 100 times more powerful than that of total silence is 20 dB

- \* A sound 1000 times more powerful than sound nearer to total silence is 30 dB
- \* Near Total sound - 0 dB
  - A whisper - 15 dB
  - Normal Conversation - 60 dB
  - A Lower mover - 90 dB
  - A car horn - 110 dB
  - A Jet engine - 120 dB
- \* The shrillness of sound is known as pitch
- \* The number vibrations per second is called frequency
- \* The pitch of the sound depends upon its frequency
- \* Frequency is inversely proportional to length of blade.
- \* Pitch of the voices in the ascending order Lion < Adultman < Adult woman < Child < infant < insect
- \* Bird makes high pitch sound and a lion makes low pitch sound
- \* Frequency is directly proportional to pitch
- \* The parts of the speech organ which we are involved in producing sounds are
  - \* Vocal cords
  - \* Lips
  - \* Teeth & tongue
  - \* Nose & throat
- \* The sounds which are not pleasant to hear are called noise.
- \* Noise is an irregular combination of sounds which are unpleasant to hear
- \* Music is a combination of sounds that are produced in an order and pleasant to hear
- \* The sounds that a normal human being can hear are called audible sounds
- \* Frequency of the audible sound ranges from 20vib /sec to 20,000 v/s
- \* Infrasonic range is less than 20 v/s
- \* Ultrasonic range is greater than 20,000 v/sec
  - Ex. Rhinoceroses - 5 Hz                  Dogs - 50 K Hz
  - Fishes 1 to 25 Hz                  Bats - 100K Hz
- \* If the loudness exceeds 80dB, the sound becomes painful.
- \* Loudness and feebleness of a sound are determined by amplitude of Vibration.
- \* Great philosopher Pythagoras explained that sound travels in air due to the to and fro motion of the air Particles.
- \* A tuning fork is an acoustic resonator invented by John Shore (1711)
- \* Wave length is denoted by  $\lambda$  (Lambda)
- \* The distance between two points which are in the same phase is called wave length



- \* The maximum disturbance of particles in the medium on either side of mean position is called amplitude of wave.
- \* Density SI units Kg/m<sup>3</sup>
- \* Pressure - Pascal
- \* Displacement - Metre
- \* The time taken to complete one Oscillation of the density of the medium is time period (T)
- \*  $T = \frac{1}{f}$  or  $\frac{1}{\nu}$
- \* SI unit of Frequency is Hertz
- \* Kilo Hz - 10<sup>3</sup> Hz
- \* Mega Hz - 10<sup>6</sup> Hz
- \* Giga Hz - 10<sup>9</sup> Hz
- \* Tera Hz - 10<sup>12</sup> Hz
- \*  $V = \nu\lambda$  or  $\lambda = VT$
- \* When a body moves with a speed which is greater than the speed of sound in air is supersonic speed.
- \* Supersonic sounds produce shock waves.
- \* The shock waves carry large amount of energy.
- \* They Produce a very sharp and loud sound called sonic boom
- \* The degree of the sensation produced on the ear
- \* The quality of a note depends on its wave form

\*  $\text{Speed} = \frac{\text{Total distance travelled}}{\text{echo time}}$

$$V = \frac{2d}{t}$$

- \* SONAR - SOUND NAVIGATION AND RANGING
- \* RADAR - RADIO DETECTION AND RANGING
- \* LASER - LIGHT amplification by stimulated emission of radiation
- \* The method of finding distance of sea is called echo ranging.

$$S = Vt/2$$

### **WORKED OUT EXAMPLES**

- 1) The distance covered by an oscillating particle in 10 sec is 1000 cm and its amplitude is 1 cm. The frequency of it is ..... oscillations /sec
- A. 25 V/sec
- \* For one oscillation 4 cm distance covered
  - The distance covered in 10 sec is 1000 cm

2. A sound  $10^5$  times more power ful than total silience is ..... dB
- A. 10 times is 10 dB  
 $10^2$  times is 20 dB  
 $10^3$  times is 30 dB  
 $10^4$  times is 40 dB  
 $10^5$  times is 50 dB
3. The intensity of sound is 60 dB. How many times it is more powerful than total silience ?
- a.  $10^6$  times  
 10 dB - 10 times  
 20 dB -  $10^2$  times  
 30 dB -  $10^3$  times  
 40 dB -  $10^4$  times  
 50 dB -  $10^5$  times  
 60 dB -  $10^6$  times
4. The frequency of the sound 20 Her. The time period is .....
- $$f = 20 \text{ Hz}$$
- $$T = ?$$
- A.  $T = \frac{1}{f} = \frac{1}{20} = 0.05 \text{ sec}$
5. The number of Vibrations per second 40 vib/sec. Find the frequency of sound ?
- A. No. of Vibrations per second is called forequency. Frenquency = 40 Vib/sec
6. Find the time period of the wave whose frequency is 500 Hz ?
- A.  $f = 500 \text{ Hz}$
- $$T = \frac{1}{f} = \frac{1}{500} = 0.002 \text{ sec}$$
7. The frequency of source of sound is 10 Hz. How many times does it vibrate in 1 minute ?
- A. The number of vibrations per Xend = 10 Vib  
 number of Vibrations per minute =  $10 \times 60 = 600 \text{ vib}$
8. Two sources A and B Vibrate with same ampltude. They produce sounds of frequencies 1 Hz and 30 KHz respectively which of the two waves will have larger power ?
- A. Frequency of A= 1 KHz  
 Frequency of B = 30 KHz  
 As the speed of wave increases with frequency and both the waves have same anlplitude, the sound produced from B has larger power

9. A sound wave travels at speed of 340 m/sec its wave length is 2 cm. What is the frequency of the wave ?

$$V = 340 \text{ m/sec} = 34000 \text{ cm/sec}$$

A.  $\lambda = 2 \text{ cm}$

$$V = n\lambda$$

$$n = \frac{V}{\lambda} = 17000 \text{ Hz}$$

10. A sound of wave length 100 cm has 300 m/sec velocity in air. Velocity of sound in water is 1200 m/sec. What is the wave length in water ?

A.  $\frac{V_1}{V_2} = \frac{\lambda_1}{\lambda_2}$

$$\frac{300}{1200} = \frac{100}{x}$$

$$x = 400 \text{ cm}$$

11. Velocity of sound in air at 27°C is 340 m/sec. What is the Velocity of sound at 327°C ?

$$T_1 = 27^\circ \text{C} + 273 = 300 \text{ K}$$

$$T_2 = 327 + 273 = 600 \text{ K}$$

$$V_1 = 340 \text{ m/sec}$$

$$V_2 = ?$$

$$\frac{V_1}{V_2} = \sqrt{\frac{T_1}{T_2}}$$

A.  $\frac{340}{x} = \sqrt{\frac{300}{600}}$

$$\frac{340}{x} = \frac{1}{\sqrt{2}}$$

$$x = 340 \times 1.414 = 480.76 \text{ m/sec.}$$

12. What is the ratio of Velocities of sound in hydrogen and Oxygen whose are at some temperature. The ratio of densities is 1 : 16

$$\frac{V_H}{V_O} = \sqrt{\frac{d_O}{d_H}}$$

A.  $= \sqrt{\frac{16}{1}} = \frac{4}{1}$

$$V_H : V_O = 4 : 1$$

13. The length of a simple Pendulum is 25 cm. Find the frequency, if the value of

$$\frac{\sqrt{l}}{T} = 5$$

$$l = 25$$

$$\frac{\sqrt{25}}{T} = 5$$

$$5T = \sqrt{25}$$

$$5T = 5$$

$$T = 1 \text{ Sec}$$

14. A research team sends a signal to confirm the depth of a sea. They heard an echo after 6 sec. Find the depth of the sea. If the speed of sound in sea water is 1500 m/sec.

A.  $S = \frac{Vt}{2}$

$$S = \frac{1500 \times 6}{2} = 4500 \text{ m}$$

$$= 4.5 \text{ km}$$

15. An echo is heard after 0.8 sec when a boy fires a cracker, 132 m away from a tall buildings Calculate the speed of sound.

A.  $t = 0.8 \text{ sec}$                        $d = 132 \text{ m}$

$$v = \frac{2d}{t} = \frac{2 \times 132}{0.8} = 330 \text{ m/sec}$$

16. A research team sends a somar signal to confirm the depth of a sea. They heard an echo after 6 sec. Find the depth of the sea, if the speed of sound in sea water is 1500 m/sec.

A.  $d = \frac{Vt}{2} = \frac{1500 \times 6}{2}$

$$= 1500 \text{ m/sec}$$

### EXERCISE :

- Loudness of a sound will be determined by its ..... ( )  
A) Amplitude            B) Frequency    C) Velocity            D) Pitch
- Hertz is a unit of ..... ( )  
A) Wave length        B) Frequency    C) Speed of light D) Intensity of sound
- A timing fork of frequency 256 cycles / sec and produces a wave 10 cm in length in air. The speed of sound in air is ..... ( )  
A)  $256 \times 10$             B)  $\frac{256}{10}$             C)  $256 \times 10^2$         D)  $\frac{10}{256}$

4. The speed of a wave in air is  $V$  Frequency is  $f$  wave length is ..... ( )  
 A)  $Vf$                       B)  $\frac{f}{V}$                       C)  $\frac{V}{f}$                       D)  $Vf^2$
5. A body Vibrating with a certain frequency sends waves 15 cm long through a medium A and 20 cm long through a medium B. The Velocity of waves in A is 120 cm/sec. The velocity in B is .... ( )  
 A) 160 m/sec              B) 320 m/sec      C) 480 m/sec      D) 640 m/sec
6. The frequency of sound wave is 100 vib/sec. Find time period ( )  
 A) 10 sec                      B) 0.1 sec              C) 0.01 sec              D) 0.001 sec
7. The flash of lightning and sound of thunder, in these which is observed 1st... ( )  
 A) Sound of thunder B) Lighting      C) Both              D) Can't say
8. Velocity of sound at  $0^\circ\text{C}$  ..... ( )  
 A) 341 m/sec              B) 1200 m/sec      C) 3200 m/sec      D) 375 m/sec
9. Velocity of sound in Vaccum ( )  
 A) 341 m/sec              B) 350 m/sec      C)  $3 \times 10^8$  m/sec D) Zero
10. Velocity of light in Vaccum - ( )  
 A) 341 m/sec              B) 350 m/sec      C)  $3 \times 10^8$  m/sec D) 0
11. .... is the important organic human body to produce sound ( )  
 A) Larynx                      B) Vocal Card      C) Ear drum              D) Cochlea
12. Length of Vocal Cards in men ( )  
 A) More than 20mm                      B) Less than 20 mm  
 C) nearly 20 mm                      D) Less than 5 mm
13. Sound travels faster in ( )  
 A) Iron                      B) Diamond              C) brass                      D) copper
14. Sound travels faster in ..... ( )  
 A) Iron                      B) Hydrogen              C) Water                      D) Sea water
15. Sound pollution does not cause loss of ..... ( )  
 A) Hearing                      B) Hypertension C) Blindness              D) Sleeplessness
16. The maximum displacement of vibrating body from into near position is 5 cm then the amplitude is ..... ( )  
 A) 5 cm                      B) 10 cm                      C) 15 cm                      D) 20 cm
17. The pitch of the sound depends up on ..... ( )  
 A) Wave length              B) Time period      C) forequency              D) Amplitude
18. The frequency of a sound wave is 10 vib /sec. Its time period is ..... ( )  
 A) 0.1 sec                      B) 0.01 sec              C) 0.001 sec              D) 1 sec

19. The intensity of sound is measured in ..... ( )  
 A) Decibel                      B) Meter                      C) Kg                      D) Newton
20. The shrilling of a sound is called ( )  
 A) Pitch                      B) Velocity                      C) Wave length                      D) None
21. A pendulum oscillates 40 times in 4 sec. Find its time period ..... ( )  
 A) 0.01 sec                      B) 0.001 sec                      C) 0.02 sec                      D) 0.1 sec
22. Velocity of sound at 20°C ( )  
 A) 430 m/sec                      B) 33 m/ sec                      C) 340 m/sec                      D) 320 m/sec
23. Velocity of sound at 0°C ( )  
 A) 430 m/sec                      B) 343 m/sec                      C) 340 m/sec                      D) 320 m/sec
24. Match the following : ( )
- |                                |     |           |
|--------------------------------|-----|-----------|
| i) Vibrating body produces     | ( ) | A) Vacuum |
| ii) Sound is a form of         | ( ) | B) Sound  |
| iii) External ear              | ( ) | C) Energy |
| iv) Sound can't travel through | ( ) | D) Pinna  |
- A) A, B, C, D                      B) A, C, B, D                      C) B, C, D, A                      D) B, C, A, D
25. Symbol of decibel is ..... ( )  
 A) dB                      B) Db                      C) bd                      D) bD
26. Two blades of length 20 cm, 10 cm, when they are vibrating, which produces more frequency ( )  
 A) 20 cm                      B) 10 cm                      C) 20 cm and 10 cm                      D) None
27. Among these which has high pitch sound ( )  
 A) Insect                      B) Lion                      C) Child                      D) Infant
28. Frequency of audible sound range ( )  
 A) 20 Vib/sec to 2000 vib/sec                      B) 20 vib /sec to 200 vib /sec  
 C) 20 vib/sec to 20000 vib/sec                      D) more 20000 vib/sec
29. Frequency of dogs is ( )  
 A) 50 KHz                      B) 20 KHz                      C) 100 KHz                      D) 20 Hz
30. The sound produced by dogs and bats is ( )  
 A) Audible range                      B) Infrasonics                      C) Ultrasonics                      D) None
31. Frequency range of fishes ( )  
 A) 1 to 25 Hz                      B) 1 to 50 Hz                      C) 20000 Hz                      D) 100 KHz
32. Frequency range less than 20 Hz is called ( )  
 A) Audible range                      B) Infrasonics                      C) Ultrasonics                      D) None
33. If the loudness exceeds .....the sound becomes painful ( )  
 A) 20 dB                      B) 40 dB                      C) 60 dB                      D) 80 dB

34. S.I units of frequency ( )  
 A) Hertz B) Vib/sec C) A & B D) None
35. Mega Hertz = ..... ( )  
 A)  $10^5$  Hz B)  $10^6$  Hz C)  $10^9$  Hz D)  $10^{12}$  Hz
36. Micro Hertz ..... ( )  
 A)  $10^5$  Hz B)  $10^6$  Hz C)  $10^{-6}$  Hz D)  $10^{-9}$  Hz
37. Giga ( $10^9$ )Hz = ..... Mega ( $10^6$ )Hz ( )  
 A) 1000 B) 100 C) 10 D) 10000
38. Tera Hz = ..... ( )  
 A)  $10^{12}$  Hz B)  $10^{-12}$  Hz C)  $10^8$  Hz D)  $10^9$  Hz



- In these, which has higher pitch ( )  
 A) A B) B C) Both same D) None
40. The loudness or softness depends ..... ( )  
 A) Amplitude B) frequency C) Wave length D) Time period
41. A sound  $10^4$  times more powerful than total silence is ..... dB ( )  
 A) 30 dB B) 10,000 C) 10000 dB D) 40 dB
42. Find the time period of the wave whose frequency is 50 Hz ( )  
 A) 0.2 sec B) 0.02 sec C) 0.002 sec D) 2 sec
43. The frequency of source of sound is 30 Hz. How many times does it vibrate in 3 minutes . ( )  
 A) 5000 B) 5400 C) 90 D) 100
44. The rates of densities of Oxygen and nitrogen is 16 : 14. At what temperature is the speed of the sound in  $O_2$  will be same as in nitrogen at  $14^{\circ}c$  ( )  
 A)  $55^{\circ}c$  B) 328 K C) Both A & B D) 273 K
45. At what temp the velocity of sound in air is doubled to the value at  $0^{\circ}c$  ( )  
 A)  $819^{\circ}c$  B)  $809^{\circ}c$  C)  $0^{\circ}c$  D)  $900^{\circ}c$
46. A sound of frequency 400 Hz has the wave length 200 cm. What is its velocity ? ( )  
 A) 800 m/sec B) 800 cm/sec C) 8000 cm/sec D) 80 m/sec
47. .... decides the loudness of sound ( )  
 A) Amplitude B) Frequency C) Velocity D) Pitch
48. Gopi made a raingauge using a beaker of 10 cm diameter. Ramu make using a tube of 1 cm ( )  
 A) Gopi's Raingauge is correct B) Ramu's Raingauge is correct  
 C) Both give same measurement D) Both give different measurement

49. In summer at afternoon, the direction of wind is ( )  
A) Earth to sea      B) Sea to earth    C) Earth to hills    D) Hills to earth

**KEY FOR SOUND**

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1) A  | 2) B  | 3) A  | 4) C  | 5) A  |
| 6) C  | 7) B  | 8) A  | 9) D  | 10) C |
| 11) A | 12) C | 13) B | 14) A | 15) C |
| 16) A | 17) C | 18) A | 19) A | 20) A |
| 21) D | 22) B | 23) B | 24) C | 25) A |
| 26) B | 27)A  | 28) C | 29) A | 30) C |
| 31) A | 32) B | 33) D | 34) A | 35) B |
| 36) C | 37) A | 38) A | 39) B | 40) A |
| 41) D | 42) B | 43) B | 44) A | 45) A |
| 46) A | 47) A | 48) C | 49) B |       |



## **10. SOME NATURAL PHENOMENA**

- \* Winds, storms, cyclones, lightning, Earthquakes and tsunami are some of the Natural Phenomena.
- \* Benjamin Franklin, An American Scientist showed that lightning and spark from our clothes are essentially the same phenomena.
- \* Some objects can be charged by rubbing with other objects charges are of two types, positive and Negative charges.
- \* The object which loses electrons by rubbing gets positive.
- \* Charge, which gains electrons gets negative charge.
- \* Charges produced by rubbing are static charges.
- \* Static charges constitute static electricity. Moving charges constitute an electric current.
- \* Electroscope is the device that is used to detect whether the body is charged or not
- \* Like charges repel and unlike charges attract.
- \* Attraction is not a suretest to know the presence of charge on a body.
- \* When an uncharged body is touched by charged body it acquires a similar charge. This is called charging by conduction.
- \* When an uncharged body is touched by charged body it acquires a similar charge. This is called charging by conduction.
- \* A body can be charged by bringing a charged body near to it but not touching it. This is called charging by induction.
- \* The process of transfer of charge from a charged object to the earth is called earthing.
- \* The process of electric discharge between clouds and the earth or between different clouds causes lightning.
- \* Lightning conductors are used to protect the buildings from the effects of lightning.
- \* Earth quake is a sudden shaking or trembling of earth.
- \* It is caused due to the disturbance deepinside the earth's crust.
- \* The magnitude of earthquake is measured on Richter scale.
- \* Seismograph is an instrument that measures seismic waves cause by an earthquake.
- \* Earthquakes tend to occur at the boundaries of earth's plates. These boundaries are known as fault zones.
- \* The huge wave caused as a result of earthquake under sea is known as Tsunami.

### **Multiple choice questions :**

1. Which of the following can not be charged easily by friction. ( )  
A) Plastic scale      B) Copper rod      C) Woollen cloth      D) Piece of wood

2. Electric charge can only flow through ( )  
 A) Insulators          B) Rubber          C) Conductors    D) ebonite
3. The goldleaf electroscope can be used to ( )  
 A) Detect charge only  
 B) Detect, measure and find the nature of charge  
 C) detect and measure charge only    D) to detect electricity
4. Thunder and lightning occur ( )  
 A) in any order          B) with thunder first    C) with lightning first  
 D) Both simultaneously
5. A body can be charged by ( )  
 A) Rubbing it against another body    B) Touching it to a charged body  
 C) Bringing a charged body near it    D) All the above
6. Main cause of earthquakes are ( )  
 A) Colliding of tectonic plates          B) Volcanic activity  
 C) Both (a) and (b)                      D) only (a)
7. Choose the incorrect statement ( )  
 A) When amber is rubbed with fur it attracts light objects such as hair  
 B) When we take off wollen or polyester clothes in a dryseason the hair on your skin stands on end.  
 C) An inflated balloon which is rubbed against clothes is observed to be attracting small pieces of paper closer to it  
 D) When we rub piece of wood with silk cloth it attracts small pieces of paper closer to it.
8. The person who proved that lightning and the from your clothes are essentially the same phenomena ( )  
 A) Gilbert                                      B) Sir Humphry day  
 C) Benjamin Franklin                      D) Micheal Faraday
9. The charges produced on same type of objects rubbed by some material are ( )  
 A) Similar (or) like charges              B) Unlike or dissimilar charges  
 C) Neutral                                      D) None of these
10. Choose the correct convention. The glass rod rubbed with silk cloth ( )  
 A) acquires positive charge              B) acquires negative charge  
 C) acquires neither positive nor negative    D) acquires both the changes
11. When a charged glass rod is brought near to plastic straw which is charged by rubbing with polythene sheet then, ( )  
 A) They will attract each other          B) They will repel each other  
 C) Neither attraction nor repulsion will takes place  
 D) All the above

12. When a charged body is brought closer to an uncharged body then ( )  
 A) Charged body attracts uncharged body  
 B) Charged body induces an opposite charge on uncharged body  
 C) Charged body repel the uncharged body  
 D) Both a and b
13. To know the presence of a charge on a body. ( )  
 A) Attraction is not a sure test      B) Repulsion is a suretest  
 C) Attraction is a sure test      D) Both a and b
14. Due to electrostatic Induction, ( )  
 A) Two inflated balloons rubbed with woolen cloth repel each other  
 B) A plastic scale rubbed on dry hair attracts very small pieces of paper  
 C) When a refill rubbed with polythene sheet is brought closer to inflated balloon rubbed with woolen cloth both are attracted each other  
 D) There will be attraction between a charged glass rod and a charged plastic straw which is rubbed with polythene sheet.
15. Choose the correct options. ( )  
 A) There are two kinds of electrical charges  
 B) When an uncharged body is brought closer to a charged body it will be attracted  
 C) When a body having no charge is brought into contact with a charged body it will be attracted  
 D) All the above
16. In buildings to protect us from electric shocks due to any leakage of electrical charge ( )  
 A) Electric Insulation is provided      B) Earthing is provided  
 C) Charge repellers are provided      D) All the above
17. During the development of thunderstorm ( )  
 A) There will be fast movement of air currents  
 B) The clouds moving in air acquire a charge on their surface due to friction with particles of air  
 C) Discharge takes place between oppositely charged clouds  
 D) All the above
18. Lightning conductor consists of ( )  
 A) Long, thick metal rod or strip      B) Blunted at its upper end  
 C) Sharp spikes at its upper end      D) Both a and c
19. Lightning strike produced during a thunderstorm ( )  
 A) Can destroy the life and property  
 B) Can help in fixation of atmospheric Nitrogen  
 C) Can help in formation of ozone from atmospheric oxygen  
 D) All the above

20. During thunderstorm ( )  
 A) Try to stay in openplace                      B) Try to take shelter under a tallest tree  
 C) Don't switch off radio and TV              D) Stay away from poles or metal objects
21. Objects are charged by ( )  
 A) Friction    B) Induction  
 C) With Charged body contact                  D) Any of these
22. The nature of force operating between two charged bodies is ( )  
 A) Frictional    B) Electromagnetic  
 C) Electrostatic                                        D) Electrostatic
23. When two bodies are rubbed together ( )  
 A) Charges are created in both the bodies  
 B) Charges are transferred from one body to the other  
 C) The bodies acquire similar charges  
 D) The bodies acquire unequal quantities of dissimilar charges
24. A lightning conductor installed in a building ( )  
 A) does not allow the lightning to fall on the building  
 B) provides easy route for the transfer of electric charges to the ground  
 C) stops the lightning from reaching the building  
 D) directs the lightning to strike on some far off places away from the building
25. Lightning rods are made of ( )  
 A) Plastic                      B) PVC                      C) Copper                      D) Iron
26. An electric charge ( )  
 A) resides only on the surface of the body  
 B) charges the entire body  
 C) is generated in a body, due to friction  
 D) is always positive in nature
27. When you are in open space, the safest way to protect yourself from lightning is ( )  
 A) To use an umbrella to cover yourself  
 B) to take shelter under a tall tree  
 C) to squat low on the ground                  D) to run away from the place of lightning
28. An earth quake ( )  
 A) is a sudden shaking or trembling of earth  
 B) take place for longtime  
 C) takes place for a very short period of time  
 D) both a and c
29. The movement in the earth crust is due to ( )  
 A) Energy released from the core of the earth due to radio active decay  
 B) Gravitational influence of moon  
 C) Gravitational influence of mars  
 D) Energy released by the ocean during continuous thrust on landmass.

30. When tectonic plates slide past each other then ( )  
 A) Sudden break in the ground takes place  
 B) the ocean floor plate raises up  
 C) valleys may takesplace D) all the above
31. When tectonic plates move towards each other then, ( )  
 A) Sudden break in the ground takes place  
 B) The ocean floor plate is forced under a continental plate called subduction  
 C) The ocean floor plate partially melts due to high temperature  
 D) both b and c
32. When tectonic plates move away from each other then, ( )  
 A) Crakes under seafloor takesplace  
 B) magma flows out resulting the formation of newrocks  
 C) mountains can be formed D) both a and b
33. The device used by seismologists to measure an earthquake ( )  
 A) Seismoscope B) seismometer C) seismograph D) All the above
34. The destructive earthquake have magnitude ( )  
 A) Lower than 7 B) higher than 7  
 C) equal to 7 D) None of these
35. Richter scale ranges from ( )  
 A) 0 to 7 B) 0 to 9 C) 0 to 12 D) 0 to 6
36. The another method of measuring the intensity of an earthquake involved basing on ( )  
 A) Moment magnitude  
 B) The amount of displacement that occurred along fault zone  
 C) The measurement of ground motion at a given point  
 D) Both a and b
37. Tremors are caused in which part of earth ( )  
 A) Crust B) mantle C) outercore D) innercore
38. Richter scale ( )  
 A) Linear scale B) Logarithmic scale  
 C) Conventional measure D) None of these
39. Crust of earth is fragmented into plates, the boundaries of earth plates are called ( )  
 A) Seismic zones B) fault zones C) boundaries D) both a and b
40. Which of the following event can lead to an earthquake ( )  
 A) Volcanic eruption B) underground nuclear bomb explosion  
 C) meteor hitting the earth D) Any of these
41. During earthquake, it is safer to ( )  
 A) move into the open area B) hiding yourself under a table  
 C) keeping away from high rise buildings  
 D) All the above

42. The earthquakes which read less than 3.5 on Richter ( )  
 A) Cause serious damage over larger areas  
 B) Often felt but rarely causes damage  
 C) Generally not felt, but recorded  
 D) Causes slight damage to the well designed buildings
43. Which of the following countries in the world is most prone to earthquakes( )  
 A) China                      B) Japan                      C) India                      D) Russia
44. In India the state most prone to earthquakes is ( )  
 A) Chattisgarh              B) Tamilnadu              C) Gujarat                      D) Kerala
45. **Matching :**  
 1) Richter scale ( )      a) Measures the energies of earth quake accurately  
 2) Earthquake ( )      b) Measures the time of occurrence of earthquake  
 3) Moment  
    magnitude scale ( )      c) Measures the seismic waves  
 4) Seismograph ( )      d) Ranges from 0 to 9  
 5) Seismoscope ( )      e) Movement of tectonic plates

**KEY FOR SOUND**

- |       |       |       |       |               |
|-------|-------|-------|-------|---------------|
| 1) D  | 2) C  | 3) B  | 4) D  | 5) D          |
| 6) C  | 7) D  | 8) C  | 9) A  | 10) A         |
| 11) A | 12) D | 13) B | 14) B | 15) D         |
| 16) B | 17) D | 18) D | 19) D | 20) D         |
| 21) D | 22) C | 23) B | 24) B | 25) C         |
| 26) A | 27) C | 28) D | 29) A | 30) A         |
| 31) D | 32) B | 33) B | 34) B | 35) B         |
| 36) D | 37) A | 38) B | 39) D | 40) D         |
| 41) B | 42) C | 43) B | 44) C | 45) D,E,A,C,B |

## 11. FRICTION

- Friction is one of the contact forces
- Friction is the resistance to the movement of a body over the surface of another body.
- Friction is the force which opposes the relative motion between two surfaces of bodies in contact with each other.

### **Factors on which friction depends :-**

- Friction depends upon the smoothness or roughness of surface, weight of the body.
- It does not depend up on the area of contact of the surfaces.
- Friction is proportional to the normal force (or) Normal reaction.

$$f \propto n \quad N = \text{Normal Reaction}$$
$$f = \mu N \quad \mu = \text{coefficient of friction}$$

$$\mu = \frac{f}{N}$$

- Friction is caused by the irregularities (ups and downs) on the two surfaces which are in contact.

### **Type of friction :-**

1. Static friction
2. Sliding friction (or) Dynamic friction (or) Kinetic friction
3. Rolling friction
4. Fluid friction (Drag)

### **Static friction :-**

It is the friction comes into play when surfaces of the objects are at rest relative to each other.

- Static friction is always equal to the applied force.
- It is a self adjusting force
- The maximum value of static friction is called limiting friction ( $f_s$ ).

$$\text{Coefficient of friction } \mu = \frac{\text{Limiting friction}}{\text{Normal force}}$$

$$\mu = \frac{f_s}{N} = \tan \theta$$

### **Sliding Friction :**

The friction comes into play when one body slides over the another body is called sliding friction.

**Rolling friction :-**

The friction comes into play when one body rolls over the surface of another body is called Rolling friction.

- Rolling friction is less than sliding friction.
- Limiting friction > Sliding friction > Rolling friction.

**Fluid friction (or) Drag :-**

It is the friction produced between the moving fluids or between the fluids and solids.

- Thinner fluids like water can have less friction compared to thicker fluids like glycerine.

**Effects of friction :-**

- There is an opposition caused by friction.
- Friction produces heat, causes wear and tear, power/energy loss.
- Friction is necessary to walk, to write, to move any vehicle on road, to construct a building, to hold any object etc.
- Friction is undesirable for machinery parts, we need to reduce it.

**Ways to reduce friction :-**

- To avoid wear and tear of machinery parts we need to apply lubricants like oil or grease for smooth running.
- Lubricants are the substances which reduce friction.
- We can reduce friction by using wheels and rollers under heavy objects like suitcase, washing machines, gas cylinders etc.
- Ball bearings are used to reduce friction between wheel and its axle.
- We can reduce the friction by making the surface smooth. Ex : Roads are concretised to make it smooth.
- Aeroplanes, ships etc are constructed in a shape called streamline to overcome the friction caused by air and water.
- Rolling friction is reduced at least 20 to 30 times when a ball bearing or roller bearing are used on rotating axles.

**Ways of increasing friction :-**

Tyres of vehicles, shoes have grooves to increase friction to prevent slipping on wet and oily roads.

- We can increase friction by making the surface rough
- Wet and snow covered roads are dusted with sand or salt to increase friction.
- An athlete has spikes in their shoes.

**MULTIPLE CHOICE QUESTIONS**

1. Friction ( )
- |                                    |                                  |
|------------------------------------|----------------------------------|
| 1. Acts in the direction of motion | 2. Depend on the area of contact |
| 3. It always nuisance              | 4. Opposes motion                |



2. Rohit is an athlete. He selects the shoes which has spikes than soft shoes for running. This is because, ( )
1. To reduce friction
  2. To increase friction
  3. To balance friction
  4. for Good looking
3. Friction caused by water on fish is ( )
1. Sliding friction
  2. Rolding friction
  3. Fluid friction
  4. Static friction
4. Which of the following friction is greater ( )
1. Dynamic friction (sliding friction)
  2. Rolling friction
  3. Limiting friction
  4. All are equal
5. The direction of frictional force with respect to the plane of contact (when two bodies are inrelative motion) is ( )
1. Perpendicular
  2. Parallel
  3. Normal
  4. Inclined
6. With increase of temperature, frictional force acting between two surfaces( )
1. Increases
  2. decreases
  3. Remains same
  4. Unpredictable
7. Frictional force exists in which of the following cases ( )
1. Exists only for moving bodies
  2. Exists only for bodies which are rest
  3. Exists for both moving and non moving bodies
  4. unpredictable
8. If a man is waking on the road, the direction of friction is ( )
1. Opposite to the direction of motion
  2. Same as that of direction of motion
  3. Perpendicular to that of direction of motion
  4. inclined to the direction of motion
9. Assertion (A): Staticfriction is a self adjusting force ( )
- Reason (R) : The magnitude of static friction is equal to the applied force and its direction is opposite to that of the applied force.
- A) Both 'A' and 'R' are true and. and 'R' is correct explanation of 'A'
  - B) Both 'A' and 'R' are true and 'R' is not correct explanation of 'A'
  - C) 'A' is true and 'R' is false.
  - D) 'A' is false and 'R' is true
10. Assertion (A) : Static friction is always to equal to applied force. ( )
- Reason (R) : For static friction, body must be at rest
- A) Both 'A' and 'R' are true and. and 'R' is correct explanation of 'A'
  - B) Both 'A' and 'R' are true and 'R' is not correct explanation of 'A'
  - C) 'A' is true and 'R' is false.
  - D) 'A' is false and 'R' is true
11. A Body just begins to slide over a roughsurface when pulled with a force of 20 N. If it is pulled with a force of 15 N the force of friction between the surface is
1. 5N
  2. 15 N
  3. 20 N
  4. 35N
- ( )

12. The minimum force required to move a body of mass 5 kg over a surface whose coefficient of friction is 0.3 ( $g=10\text{m/Sec}^2$ ) ( )  
 1. 15 N                      2. 13 N                      3. 12 N                      4. 10N
13. A force of 98 N is required to pull a body of mass  $10^2$  kg over the surface of ice then the coefficient of friction is ( $g=9.8\text{m/Sec}^2$ ) ( )  
 1. 0.2                      2. 0.3                      3. 0.1                      4. 0.5
14. A block of mass 2 Kg is kept on the floor. The coefficient of static friction is 0.4. If a force F of 2N is applied on the block as shown figure. The frictional force between the block and the floor will be ( $g=10\text{m/Sec}^2$ ) ( )  
 1. 2 N                      2. 5 N                      3. 8 N                      4. 10 N
15. Two bodies in contact but not moving with respect to each other can exert ( )  
 a. Static friction on each other                      b. Kinetic friction (or) Sliding friction  
 c. Rolling friction on each other                      d. No friction on each other
16. Statement A : Friction force increases with the increases of external force in case of static friction.  
 Statement B: Static friction is always equal to the applied force ( )  
 a. Both A and B are true                      b. Both A and B are false  
 c. A is true, B is false                      d. A is false, B is true
17. The maximum value of static friction that develops on a body when the body just tends to slide over the surface of another body is ( )  
 a. Kinetic friction    b. Rolling friction    c. Limiting friction    d. Normal Reaction
18. Frictional force between two bodies depends upon ( )  
 a. Materials in contact                      b. Condition of the sliding surfaces  
 c. The force with which the two bodies are pressed  
 e. All the above
19. The coefficient of static friction may be ( )  
 a. Less than 1                      b. Greater than 1  
 c. Equal to 1                      d. All the above
20. Frictional force is ( )  
 a. contact force                      b. gravitational force  
 c. electromagnetic force                      d. field force
21. When normal reaction is halved, the coefficient of friction is ( )  
 a. halved                      b. unchanged    c. doubled                      d. tripled
22. The limiting friction between two bodies in contact is independent ( )  
 a. Nature of surface in contact                      b. The area of surfaces in contact  
 c. Normal reaction between the surfaces  
 d. All the above







## Solutions

11. Reason : It is a self adjusting force. Frictional force equal to external force = 15N

12. Sol :  $f \propto N$                        $\mu =$  Coefficient of friction  
 $F = \mu N$                                $N =$  Normal force = weight of body  
 $\mu = 0.3$                                  $N = w = mg$   
Mass of body = 5 Kg  
 $\therefore$  weight =  $mg$   
  =  $5 \times 10 = 50 \text{ N}$   
 $N = 50 \text{ N}$   
 $F = \mu N.$   
  =  $0.3 \times 50 = 15 \text{ N}$

Minimum force required = frictional force = 15 N

13. Sol :  $F = \mu N.$

Frictional force ( $f$ ) = 98 N  
Normal force ( $N$ ) =  $w = mg$   
  =  $10^2 \times 9.8$   
  =  $100 \times 9.8 = 980 \text{ N}$   
 $\therefore \mu = \frac{f}{N}$   
 $= \frac{98}{980} = \frac{1}{10} = 0.1$

14. Reason : Frictional force is self adjusting force

Frictional force = external force = 2 N

39. Sol :  $\mu = \frac{f}{N}$

$F = 150 \text{ N}, \mu = 0.35$

$N = \frac{f}{\mu} = \frac{150}{0.35} = 428.5 \text{ N}$

42. (Sol :  $\mu = \frac{f}{N} = \frac{200}{500} = \frac{2}{5} = 0.4$ )

## **7. TEMPERATURE AND ITS MEASUREMENTS**

### **Important points:-**

- Temperature : Temperature is a measure of the degree of hotness or coldness of an object.
- Heat : Heat is a form of energy.
- Heat flows from an object at high temperature to another at lower temperature.
- When a warm object is placed close to a cooler object, heat energy moves from the warmer object to the cooler one until both objects attain the same temperature this is called “Thermal equilibrium”.
- When we stand in the sun or near fire, heat energy enters our body and we feel hot.
- When we touch a ice cube heat energy moves from our body to the ice. That’s why we feel cold.
- We can’t exactly decide hotness/coldness of substance just by touching.
- Thermometer : we use thermometer to measure temperature.
- First Thermometer was invented by Galileo in 1593 AD.
- Thermometer works on the principle of “matter expands on heating”.
- The liquid used in Thermometer is “Mercury”.
- Alcohol is used in such thermometers, which record very low temperature.
- We measure temperature in degree celsius ( $^{\circ}\text{C}$ ) or in degree fahrenheit ( $^{\circ}\text{F}$ ).
- The constant temperature at which ice melts is called “melting point of ice.” Melting point of ice is  $0^{\circ}\text{C}$ .
- The constant temperature at which water converted into steam is called boiling point of water boiling point of water is  $100^{\circ}\text{C}$ .
- Clinical Thermometer :Doctors use a clinical thermometer to measure the human body temperature.
- The normal temperature of human body is  $37^{\circ}\text{C}$  or  $98.4^{\circ}\text{F}$
- There are two types of scales marked on the clinical thermometer one scale starts with 35 degrees and ends at 45 degrees is celsius scale.
- The other scale starts with 94 degrees and ends at 108 degrees is the fahrenheit scale.
- A kink is present in the capillary tube near the bulb. This kink prevents mercury level from falling on its own.
- The maximum (highest) and minimum (lowest) temperatures of a day are measured by a thermometer called six’s maximum - minimum thermometers”
- Relations between celsius and Fahrenheit temperatures is
$$: \frac{C}{100} = \frac{F - 32}{180}$$
- Thermister thermometer : Thermister thermometer is used to measure the human body temperatures, particularly for infants and children.

- “Digital Thermometers” do not use “Mercury”.
- Laboratory thermometer is used to measure the temperature of objects.
- In electric heater electrical energy converts into heat.
- In a gas stove chemical energy is converted to heat.
- In solar heaters, solar energy is converted to heat.
- In a steam engine, heat energy is converted to mechanical energy.
- We wear woollen and dark coloured clothes during winter.
- We wear light coloured cotton clothes in during summer.
- In libiya (Africa) on a particular day in the year 1922, the temperature of air even in shade was high as 58°C.
- The lowest temperature in the world has been measured in antarctica where it once went down to about - 89°C.

**Properties of Mercury :**

1. Mercury is the one and only metal available in liquid state.
2. For equal amounts of heat its expansion is uniform.
3. It is a opaque and shining.
4. It does not stick to the sides of the glass tube.
5. It is a good conduction of heat.
6. It is easily available in pure state.

**Properties of Alcohol :**

1. It can record very low temperatures.
2. Its expansion per degree celsius rise in temperature is very large.
3. It can be coloured brightly.

Changes in water temperature after mixing the substances :

Water temperature in celsius	Water(100 ml each time) mixed with two table spoon ful of each	Prediction	Temperature of the solution immediately after mixing substance
30°C	Glucose	Decrease	25°C
30°C	Washing powder	Increase	36°C
30°C	Baking soda	Increase	34°C
30°C	Sugar	does not change	30°C

**BITS**

1. Woolen sweaters keep us warm by : ( )
  1. Duickening the loss of heat from our body
  2. trapping a layer of air
  3. Trapping a layer of dust
  4. keeping the surrounding air cold





17. The substance used in six maximum - minimum thermometer is .. ( )  
 1. Water                      2. Mercury                      3. Alcohol                      4. Air  
 1. 1,2                              2. 2,3                              3. 3,4                              4. 1,4
18. If we add glucose to water the temperature of water will... ( )  
 1. Decrease    2. Increase  
 3. No change    4. Increase and than decrease
19. Boiling point of water in fahrenheit scale ( )  
 1. 100°F                              2. 150°F                              3. 180°F                              4. 212°F
20. In gas stove ... energy is converted in to heat ( )  
 1. Mechanical                      2. Chemical                      3. Electorical                      4. Solar
21. Which of the following instrument is used to measure the body temperatures, particularly for infants and children.. ( )  
 1. Clinical                      2. Digital                      3. Six                      4. Thermister
22. Match the following
- |                                      |     |                      |
|--------------------------------------|-----|----------------------|
| i. clinical thermometer              | ( ) | a. A. form of energy |
| ii. Normal temperature of human body | ( ) | b. 100°C             |
| iii. Heat                            | ( ) | c. 37°C              |
| iv. Boiling point of water           | ( ) | d. 0°C               |
| v. Melting point of water            | ( ) | e. Link              |

**KEY FOR TEMPERATURE AND ITS MEASURMENTS**

- |       |               |       |       |       |
|-------|---------------|-------|-------|-------|
| 1) 2  | 2) 4          | 3) 2  | 4) 2  | 5) 3  |
| 6) 1  | 7) 2          | 8) 4  | 9) 1  | 10) 1 |
| 11) 3 | 12) 3         | 13) 4 | 14) 2 | 15) 4 |
| 16) 2 | 17) 2         | 18) 1 | 19) 4 | 20) 2 |
| 21) 4 | 22) E,C,A,B,D |       |       |       |