

Physics [Part 1 to 8]**Prepared from Samacheer Kalvi Books****1. Liquids**

1. Who is Archimedes?

He was one of the greatest Greek thinkers, mathematicians, physicist, engineer, inventor and astronomer of his time that is from BC 287 to BC 212.

2. What is principle of statics?

Physics relating to stationary objects

3. What is hydrostatics?

Science relating to liquids at rest

4. What is one of the principle named after Archimedes?

Archimedes Principles which is important principle of hydrostatics.

5. What is the relationship between pressure and depth?

As liquid increases the depth increases. The pressure depended on the vertical distance from the surface of the liquid.

6. What is the mathematical language for depth and pressure?

$P \propto d$, Where P is the pressure and d is depth

7. What is the mathematical language for pressure and gravity?

$P \propto g$, Where P is the pressure and g is the gravity

8. How to combine the three and write a simple formula to calculate the pressure at point in liquid?

$P = dpg$

9. How is density measured?

Density = mass/volume

10. How is relative density measured?

RD = density of substance/density of water

11. When do buoyant force comes into existence?

When body is immersed in any fluid (liquid or gas)

12. What is the statement of Archimedes principle?

It stated that when a body is immersed in a fluid, liquid or gas it experiences an apparent loss of weight which is equal to the weight of the fluid displaced.

13. What is the formula for verifying Archimedes principle?

$$(w_1 - w_2) = (w_4 - w_3).$$

Where, w_1 = the weight of the stone in air

w_2 = the weight of stone

w_3 = overflowing water in the beaker

w_4 = weigh the beaker with water

$w_4 - w_3$ = weight of the displaced water

$w_1 - w_2$ = loss of the weight of the stone

14. How is loss of weight measured?

Loss of weight = weight of water displaced

Weight in air - weight in water = density of water * volume of solid

15. How is volume of solid measured?

Volume of solid = weight in air - weight in water / density of water

16. How is density of solid measured?

Density of solid = $(w_1 - w_2) / \text{density of water}$

17. How can we find density of liquid?

$RD = \text{density of substance} / \text{density of water}$

Density of substance = $RD * \text{density of water}$

18. What is hydrometer?

It is an instrument that can be used to find the relative density of liquid.

2. Measurement and Motion

1. Name some measurement instruments?

Meter scale, balance, clock, measuring jar

2. What is measurement?

It is a process of comparison of unknown quantity with a standard quantity of the same kind.

3. What is standard measurement?

Any measurement that gives the same value for all is called standard measurement.

4. What is standard unit?

The units which are used in standard measurement are called as standard units.

5. What are fundamental quantities?

Length, mass and time

6. What is SI units?

It is System International Units

7. What is FPS system?

Foot, Pound Second system

8. What is CGS?

It is Centimeter, Gram, Second

9. What is MKS?

Meter, Kilogram, Second.

10. Name some physical quantity and its SI unit and Symbol?

Physical quantity	SI unit	Symbol
Length	Metre	M
Mass	Kilogram	Kg

Time	Second	s
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11. What is length?

The distance between two points is called length.

12. What is kilometer?

Larger distances such as the distance between two places are expressed as kilometer.

13. How is smaller lengths measured?

As centimeter and millimeter.

14. How is 1 meter converted to millimeters?

1000 millimeters

15. Why is sand heaviest?

It is heaviest because the amount of matter contained in sand is more than the amount of matter contained in rice and cotton.

16. What is kilogram?

The mass of a body is the amount of matter contained in it. the SI unit of mass is a kilogram.

17. What is used for measuring larger quantities?

Quintal and metric tone

18. What is time?

Time is the interval between two events. The SI units of time is second.

19. How are larger time intervals expressed?

As minutes, hour, day, week, month, year

20. What is millisecond or microsecond?

Any time interval less than 1 second is expressed as millisecond or microsecond.

21. How is time calculated?

- 1 minute = 60 seconds
- 1 hour = 60 minutes
- 1 day = 24 hours
- 1 year = 365 $\frac{1}{4}$ days
- 1 second = 1000 milliseconds
- 1 second = 1000000 microseconds

3. Measurement

1. How is length is measured?

Metre

2. What is area?

The measure of a surface is known as area

3. How is area measured?

Area = Length * breadth

The unit of area will be metre*metre = (metre)²

4. What are derived quantities?

Volume and density

5. What is derived quantity?

Quantities which have got the multiplication or division of fundamental physical quantities are called as derived quantities.

6. How is unit of length measured?

S. No	Unit of length	Unit of area
1	Centimeter(cm)	square centimeter
2	Millimetre (mm)	Square millimetre
3	Feet (ft)	Square feet (ft ²)

7. How is area of agricultural fields measured?

Measured in acre and hectare.

1 Acre = 4047 m² = 100 cent

1 hectare = 2.47 acre

8. What is square?

Its area is measured as length * length and the formula used is l^2

9. What is rectangle?

Its area is length * breadth and the formula used is $l \times b$

10. What is triangle?

Its area is $\frac{1}{2} \times \text{base} \times \text{height}$ formula used is $\frac{1}{2}bh$

11. What is circle?

Its area $\pi r^2 = \frac{22}{7} \text{ or } 3.14$

12. What is volume?

It is the space occupied by a body is called its volume.

13. What is volume of regular objects?

Volume = base area * height

14. What is the unit of volume of milli metre and centimeter?

- Unit of length milli metre (mm) unit of volume is cubic millimeter (mm³)
- Unit of length of centimeter (cm) unit of volume of cubic centimeter (cm³)

15. how is one cubic centimeter otherwise called as?

1 millilitre or ml

16. Which is used to measure and transfer a definite volume of liquid?

Pipette

17. What is the unit volume of the substance?

Density

18. What is oscillation?

It is one complete to and fro motion.

19. What is time period?

It is the time taken to complete one oscillation

20. What is length of the pendulum?

The distance between the point of the suspension and the centre of the bob is called as length of the pendulum.

21. What is amplitude?

It is the distance up to which the bob is pulled from the position of rest.

4. Measurements

1. What is Le Systeme International d` Unites?

SI system of units

2. When was decision on uniform system of measurement introduced?

1971

3. What is the uniform system of measurement called as?

SI system units

4. How many fundamental quantities are there?

Seven

5. How is temperature measured?

It is measure of degree of hotness or coldness of a body. It has different scales like Celsius, Fahrenheit etc

6. What is Kelvin Scale?

It is the primary unit of temperature in SI system

7. How can we avoid negative values in Celsius scale?

By using Kelvin Scale

8. What is the number of divisions between upper and lower fixed points?

In Celsius scale it is 100 and in Fahrenheit Scale is 180

9. What is ampere?

SI unit for electric current is ampere

10. What is mole?

SI unit for amount of substance is mole

11. What is candela?

It is the SI unit for luminous intensity

12. What are the units of lengths?

- 10 millimetre (mm) = 1 centimetre (cm)
- 10 centimetres = 1 decimetre (dm) = 100 millimetres
- 10 decimetres = 1 metre (m) = 1000 millimetres
- 10 metres = 1 decametre (dam)
- 10 decametres = 1 hectometre (hm) = 100 metre
- 10 hectometres = 1 kilometre (km) = 1000 metres

13. What is units of area?

- 100 square millimeters (mm²) = 1 square centimeter (cm²)
- 100 square centimeters = 1 square decimeter (dm²)
- 100 square decimeters = 1 square metre (m²)
- 100 square metres = 1 square decameter (dam²) = 1 are
- 100 square decameters = 1 square hectometer (hm²) = 1 hectare (ha)
- 100 square hectometers = 1 square kilometer (km²)

14. What are the units of liquid volume?

- 10 millilitres = 1 centilitre
- 10 centilitres = 1 decilitre (dl) = 100 millilitres
- 10 decilitres = 1 litre = 1000 millilitres

- 10 litres = 1 decalitre (dal)
- 10 decalitres = 1 hectolitre (hl) = 100 litres
- 10 hectolitres = 1 kilolitre (kl) = 1000 litres

15. What is the units of mass?

- 10 milligrams = 1 centigram
- 10 centigrams = 1 decigram = 100 milligrams
- 10 decigram = 1 gram = 1000 milligrams
- 10 grams = 1 decagram
- 10 decagrams = 1 hectogram = 100 grams
- 10 hectograms = 1 kilograms = 1000 grams
- 1000 kilograms = 1 megagram or 1 metric ton

5. Measurement and Measuring Instrument

1. What was the writing of Claudius Ptolemy?

He wrote that the moon, the sun and all the planets around the Earth in an almost circular path.

2. Who was the first to point out that Mercury, Venus, Saturn, Jupiter and Mars moved in a path that seemed to be centered around the sun not the Earth?

Claudius Ptolemy

3. Who built his own telescope?

Galileo

4. Who discovered three moons of Jupiter?

Galileo

5. What is range of the instrument?

The values between the minimum measurable values and the maximum value that can be measured is called the range of the instruments.

6. What are the three important characteristics of measuring instruments?

Least count, range, zero error

7. What is least count?

The smallest value that any instrument can measure is called as least count of the instrument.

8. What is observed value?

The value that is read off the instrument is called the observed value to which we apply the zero error correction and obtain the measured value.

9. Name the dimensions and SI unit?

Dimension	SI Unit
Length	Metre
Mass	Kilogram
Time	Second
Electric current	Ampere

10. Which is called as base unit?

The metre, the gram, the second and the ampere are known as the base units, to which we can add some prefixes.

11. What is base unit of mass?

Gram

12. What is SI unit of mass?

Kilogram

13. What is vernier caliper?

It is a device that is used a great deal in engineering work and in workshops which manufacture things.

14. What is called as ingenious device?

Vernier caliper because it has two scales with fairly large least counts are used in conjunction with one another to measure very small values of length.

15. What are the tips for measuring?

1. Recorded values of measurements must always be accompanied by the appropriate units.

2. As far as possible, measurements must be tabulated.

3. Values must be recorded to the appropriate decimal place.

16. Who was Pierre Vernier?

Pierre Vernier (1580 - 1637) was a French government official. Vernier was taught Mathematics and science by his father who was a lawyer and engineer.

17. What is the formula for Vernier Caliper principle?

Object length = Main scale reading + (Vernier coincident*least count)

18. What do Vernier Caliper consists of ?

- A thin long steel bar graduated in cm and mm (4). This is the Main scale.
- Fixed perpendicular to the bar at the left end of the steel bar carrying the main scale is an upper fixed jaw and a lower fixed jaw.
- To the right of the fixed jaws mounted on the steel bar is a slider with a upper movable jaw and a lower movable jaw.
- The slider can be fixed to any position using the tightening screw or friction nut.
- The Vernier scale (6) is marked on the slider and moves along with the movable jaws and the slider.
- The lower jaws (1) are used to measure the external dimensions and the upper jaws (2) are used to measure the internal dimensions of objects.
- The thin bar attached to the Vernier scale at the right side (3) is called the depth probe and is used to measure the depth of hollow objects.

19. What is beam balance?

A beam balance compares the sample mass with a standard reference mass (known masses such as 100g, 200g etc.). Least counts of 20g to 50 mg are possible.

20. What is Physical balance?

It is used in laboratories. It is similar to the beam balance but is a lot more sensitive and can measure mass of an object correct to a milligram.

21. What is two pan balance?

This type of balance is commonly used for measuring mass in shops. This balance too compares the sample mass with a standard reference mass. The pans rest on top of the beam and can be conveniently placed on a table top. Least counts are generally in the region of 10g to 50g.

22. What is Chandelier?

The pendulum as a reliable measure of time was first articulated by Galileo in 1602. In those days many lamps would be mounted on a large glass arrangement suspended from the ceiling. Such an elaborate arrangement was called a “chandelier”.

23. What is pendulum?

A pendulum is a heavy bob suspended by a light thread. The length [L] of the pendulum is measured from the point of suspension or pivot to the centre of gravity of the bob.

24. What is oscillation?

When the pendulum

is displaced from the centre position and released, it begins to swing to and fro. One complete to and fro motion is called an oscillation.

25. What is sundial?

The sundial has a stick or object to cast a shadow on the horizontal surface. As

the sun moves across the sky, the position of the shadow moves on the dial face to indicate time.

The least count of such sundials again varied a great deal and

improved from about one hour to about 15 minutes in the later years.

26. What is water clock?

It was an evenly marked container with a float and pointer into which water dripped in at a fixed rate. As the water dripped into the container, the level of water increased. The time was read off on the level markings on the wall of the container.

27. What is sand clock?

It was made up of two rounded glass bulbs connected by a narrow neck of glass, between them.

28. What is atomic clock?

Atomic clocks are the most accurate timekeepers ever known. The best ones lose or gain 1 second in 109 days (approximately 2739726 years).

6. Measuring Instruments

1. What is physics?

Physics is the most basic science, which deals with the study of nature and natural phenomena. It is a science of measurement.

2. What is screw gauge?

The Screw Gauge is an instrument to measure the dimensions of very small objects upto 0.01 mm. The Screw Gauge consists of a 'U' shaped metal frame.

3. What is pitch scale?

On the cylinder parallel to the axis of the screw a scale is graduated in millimeter called Pitch Scale.

4. What is head scale?

One end of the screw is attached to a sleeve. The head of the sleeve is divided into 100 divisions called the Head Scale.

5. What is principle of screw gauge?

The *screw gauge* works under the principle of the screw. When a screw is rotated in a nut, the distance moved by the tip of the screw is directly proportional to the number of rotations.

6. What is pitch of screw?

The pitch of the screw is the distance between two successive screw threads. It is also equal to the distance travelled by the tip of the screw for one complete rotation of the head.

7. What is the least count of screw gauge?

The distance moved by the tip of the screw for a rotation of one division on the head scale is called the least count of the Screw Gauge.

8. What is zero error of screw gauge?

When the plane surface of the screw and the opposite plane stud on the frame are brought into contact, if the zero of the head scale coincides with the pitch scale axis, there is no zero error.

9. What is positive zero error?

When the plane surface of the screw and the opposite plane stud on the frame are brought into contact, if the zero of the head scale lies below the pitch scale axis, the zero error is positive.

10. What is negative zero error?

When the plane surface of the screw and the opposite plane stud on the frame are brought into contact, if the Zero of the head scale lies above the pitch scale axis, the zero error is negative.

11. How to measure diameter with thin wire?

- Determine the Pitch, the Least Count and the Zero Error of the Screw Gauge.
- Place the wire between the two studs.
- Rotate the head until the wire is held firmly but not tightly, with the help of ratchet.
- Note the reading on the pitch scale crossed by the head scale (PSR) and the head scale division that coincides with the pitch scale axis (H.S.C).
- The diameter of the wire is given by $P.S.R + (H.S.C \times L.C) \pm Z.C$
- Repeat the experiment for different portions of the wire.

- Tabulate the readings.
- The average of the last column reading

12. How to measure long distance?

For measuring long distances such as distance of the moon or a planet from the earth, special methods are adopted. Radio echo method, laser pulse method and parallax method are used to determine very long distances. Units such as astronomical unit and light year are used to measure distance in space.

13. What is astronomical unit?

Astronomical Unit is the mean distance

of the centre of the sun from the centre of the earth. $\text{Astronomical Unit (AU)} = 1.496 \times 10^{11} \text{m}$

14. What is light year?

Light year is the distance travelled by light in one year in vacuum. Distance travelled by light in one year in vacuum = Velocity of light \times 1 year (in seconds)

$$= 3 \times 10^8 \times 365.25 \times 24 \times 60 \times 60$$

$$= 9.467 \times 10^{15} \text{ m}$$

Therefore , 1 light year = $9.467 \times 10^{15} \text{ m}$

7. Types of Energy

1. Why do we need energy?

We need energy to perform both mental and physical activities like thinking, reading, analysing, running, walking, cycling, climbing, playing and jumping.

2. Where from the energy did the vehicles get from?

The bus, the boat and the helicopter get the energy to run from fuel

3. Define Energy.

Energy as the capacity or ability to do work. The unit of energy is joule.

4. What are the Types of Energy ?

There are many different types of energy. Some of them are:

- Mechanical energy
- chemical energy
- light energy
- sound energy
- electrical energy
- heat energy
- wind energy.

5. What is Mechanical Energy?

Mechanical energy is the energy possessed by an object due to its movement or position.

6. What are the types of Mechanical Energy?

There are two types of mechanical energy.

- i) Potential energy
- ii) Kinetic energy.

7. What is meant by Potential Energy?

The energy possessed by an object by virtue of its position or configuration is called potential energy.

8. What is meant by Kinetic energy?

The energy possessed by a body by virtue of its motion is called kinetic energy.

9. How the Hydro power stations generate Electricity?

Potential energy and kinetic energy are inter convertible. This property is used to generate electricity in

hydro-electric power stations.

10. What is the process of generating electricity?

When water is stored in a dam, the stored water contains potential energy. When this water is allowed to flow down, it changes into kinetic energy. This kinetic energy of water is used to rotate the turbines and generate electricity.

11. What are the uses of Mechanical Energy?

Uses:

- i) Mechanical energy can bring a moving body to rest or can make a body at rest to move.
- ii) Using wind energy, we can generate electricity through windmills.

12. What is Mean by Chemical Energy?

Energy that is stored in the bonds of chemical compounds is called chemical energy. Chemical energy is released during a chemical reaction, often in the form of heat and light.

13. Which energy is used enable us to work?

The food we eat undergoes chemical reaction and releases energy to enable us to work

14. What are the uses of chemical energy?

Uses:

- 1. The chemical energy stored in the food of plants and animals is used for their growth and function.
- 2. A battery or an electric cell converts chemical energy into electrical energy.
- 3. While using fuels, chemical energy is converted into heat energy and light energy.

15.What is Electrical Energy?

In an electric bulb, electrical energy is converted into light energy and in an electric fan, electrical energy is converted into mechanical energy. In a windmill, the wind energy (kinetic energy) is converted into electrical energy.

16.What are the Uses of Electrical Energy?

1. In industries, electrical energy is used to operate machines and is also used in telecommunication.
2. In cities, electrical energy is used to run electric trains.

17. How was the Heat energy is formed?

The chemical energy stored in wood, kerosene and LPG is converted into heat energy. Due to friction and chemical reaction, heat energy is produced.

18.List out the uses of Heat energy?

Uses:

1. We get rain due to evaporation of water from water bodies. It is because of the heat energy from the sun.
2. In a thermal power station, of electricity is generated from the heat energy obtained by burning coal.
3. In an electric stove, electric iron etc., electrical energy is converted into heat energy.

19. From where do we have Solar Energy?

The energy obtained from the sun is called solar energy.

20.What are the uses of solar energy?

Uses:

1. Solar energy is directly used in solar heater, solar cooker etc.,

2. Solar cells are used in artificial satellites, watches, calculators and is used to operate solar vehicles.

21. Which energy is converted to produce electricity in Neyveli and Ennore, Thermal Power Station?

In Tamilnadu, at Neyveli and Ennore, thermal power stations, coal is burnt to generate electricity. Here the chemical energy of coal is first converted into heat energy and then into electrical energy.

22. How do the Loud Speaker Works?

The loudspeaker converts electrical energy into sound energy

23. How the Plants convert Energy?

During photosynthesis, plants convert light energy from the sun into chemical energy and store it.

24. Give some Examples for electrical energy into sound Energy?

In electric doorbells and horns of automobiles, electrical energy is converted into sound energy.

25. How does the Torch Light Work?

In a torch light, the chemical energy of the cell is first converted into electrical energy and then into light energy.

26. Define the Law of Conservation of Energy?

Energy can neither be created nor be destroyed, but can be transformed from one form into another. This is called the Law of Conservation of Energy.

27. How energy conversion takes place, when an electric motor pumps water?

To operate the electric motor, electrical energy is used. This electrical energy is converted into kinetic energy, sound energy and heat energy.

Electrical energy \rightarrow Kinetic energy + Sound energy + Heat energy (To operate the (to lift water) (released when electric motor works) electric motor).

8. Motion

1. What is mean by Speed?

The most obvious feature of an object in motion is speed. It is a measure of how fast or slow an object is moving.

2. Give one Example for measuring Speed?

Two of the most exciting events in any sports meet is the 100m dash and 4x100m relay. Though all athletes run the same distance, the athlete who runs the distance in the shortest time will be the winner. In other words, the athlete who has the highest speed or is the fastest will win.

3. What is speed?

- Speed of a body is the distance travelled by the body in one second.
- $\text{SPEED} = \text{DISTANCE TRAVELLED} / \text{TIME TAKEN}$
- Distance travelled is measured in metre and time in second
- Therefore, the unit of speed is metre / second . [m / s].
- It can also be expressed in kilometre / hour [km / h]

4. How do you find out the distance covered by an Object in a given time?

The speed of an object, we can find out the distance covered by it in a given time. All we do is to multiply the speed and time.

$$\text{Distance covered} = \text{Speed} \times \text{Time}$$

5. Explain the term Variable Speed?

The speed of a bus during a journey may vary. When the bus is nearing a bus stop, its speed decreases. On the highways the bus travels with greater speed. But in a city or town it travels with less speed due to heavy traffic. The bus has different speeds at different time intervals. So we say that it has variable speed.

6. How do you calculate the average speed?

We can calculate the average speed $\text{Average speed} = \frac{\text{Total distance travelled}}{\text{total time taken}}$

7. What is Uniform Speed?

If a body moves with the same speed at all times we say that it has uniform speed.

8. What is Displacement?

Displacement is the shortest distance between two points in a particular direction.

9. What is velocity? And how will you measure it?

velocity is the displacement of a body in one second.

$\text{VELOCITY} = \frac{\text{DISPLACEMENT}}{\text{TIME TAKEN}}$

Its unit is m / s. Velocity is nothing but speed in a definite direction.

10. What is Acceleration? How will you measure it?

Acceleration is the measure of change in velocity. Acceleration is the change of velocity in one second.

$\text{Acceleration} = \frac{\text{change in velocity}}{\text{Time taken}}$. Its unit is m / s^2 .

11. Define negative acceleration? Give an example?

If the velocity of a moving body decreases, we say that it has negative acceleration or retardation or deceleration. Example : A train slows down to stop at a station.

12. What will happen when a ball is thrown up vertically?

As the ball rises, its velocity gradually decreases till it becomes zero i.e., the body is decelerated. When the ball falls down its velocity gradually increases i.e., it is accelerated.

13. What is meant by acceleration due to Gravity?

- The deceleration or acceleration is due to the earth's gravitational force. It is known as acceleration due to gravity.
- It has an average value of 9.8 m/s^2 on the surface of the earth and is represented as g .
- $g=9.8\text{m/s}^2$. This means that the velocity of a body decreases by 9.8 m/s every second when it is thrown up and the velocity increases by 9.8 m/s every second when it falls down

14. What is Hang-gliding?

- Hang-gliding is a sport in which a pilot flies a light un-motorized aircraft called a hang glider launched by foot.

- Most modern hang-gliders are made of aluminium alloy. The pilot is safe when fastened to a harness suspended from the frame of the glider.

15. What is Paragliding?

Paragliding is the latest aero sport. A paraglide is a non-motorized, foot launched inflatable wing, easy to transport, launch and land. It is basically a parachute made of special nylon or polyester fabric. The pilot is clipped to a harness in a comfortable sitting position. A paraglider is much lighter than a hang glider and easier to operate.