Class 9 Physics Formula and Important terms

CBSE Class 9 Physics Summary

This pdf lists all the Class 9 CBSE physics formula and summary in a concise manner to help the students in revision and examination as per NCERT syllabus

Motion

S.no	Quantities	Description
1	Distance	It is the length of the path (the line or curve) described by an object moving through space. Distance is independent of direction. Thus, such physical quantities that do not require direction for their complete description are called **scalars**.
2	Displacement	When a body moves from one position to another the shortest distance between the initial and final position of the body along with its direction is known as **displacement**. Displacement has both direction and magnitude for its complete description and hence such physical quantities are called a **vectors**.
3	Uniform Motion	If a body covers equal distances in equal intervals of time
4	Non Uniform Motion	if a body covers unequal distances in equal intervals or equal distances in unequal intervals
5	Speed	It is defined as the total distance travelled by the object in the time interval during which the motion takes place. SI unit of speed is meter per second. $speed = \frac{total\ distance\ travelled}{total\ time\ taken}$ Speed is a Scalar quantity A body is said to have constant or uniform speed if it travels equal distance in equal intervals of time.
6	Average Speed	The ratio of total distance to total time taken by the body gives its average speed. $speed = \frac{total\ distance\ travelled}{total\ time\ taken}$

7	velocity	It is the rate of change of displacement of a body with the passage of time. Velocity of an object is measured in meter per second in SI units. $$Velocity = \frac{Total\ displacement\ taken}{Total\ time\ taken}$$ It is a vector quantity a body is said to be moving with **uniform velocity** if it covers equal distances in equal intervals of time in a specified direction
8.	Average velocity	The ratio of total displacement to total time taken by the body gives its average velocity $$Velocity = \frac{Total\ displacement\ taken}{Total\ time\ taken}$$
9	Acceleration	It is a measure of the change in the velocity of an object per unit time and mathematically it is given as $$Acceleration = \frac{change\ in\ velocity}{time\ taken}$$ • SI unit of acceleration is ms^{-2}. • It is a vector quantity • A body has uniform acceleration if it travels in a straight line and its velocity increases by equal amount in equal intervals of time for example freely falling bodies

Equations of uniformly accelerated motion

First Equation of motion

v=u+at

Second Equation of motion

$$s = ut + \frac{1}{2}at^2$$

Third equation of motion

$$v^2 = u^2 + 2as$$

Graphs for Motion

Distance Time

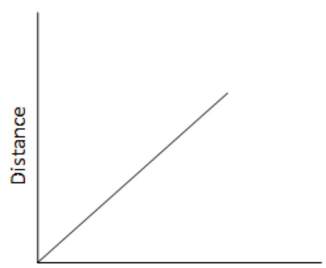


Figure 1: - Distance time graph for uniform speed

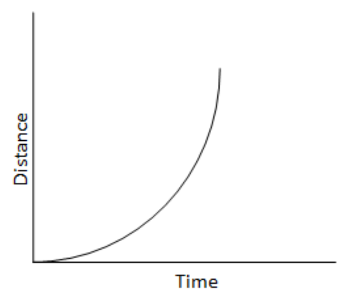


Figure 2: - Distance time graph for non uniform speed

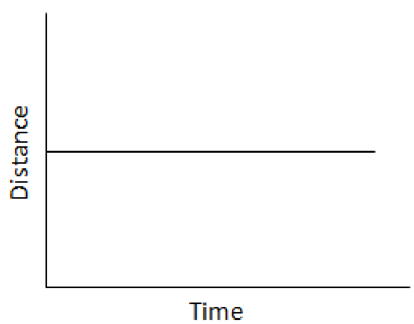


Figure 3: - Distance time graph for objects at rest

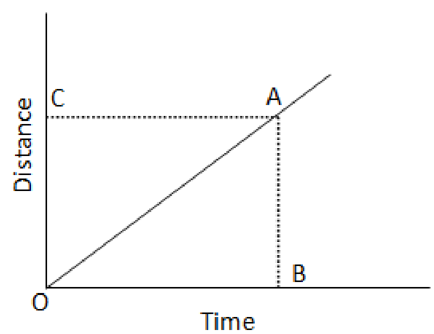


Figure 4: - Calculation of speed from distance time

Velocity
Time

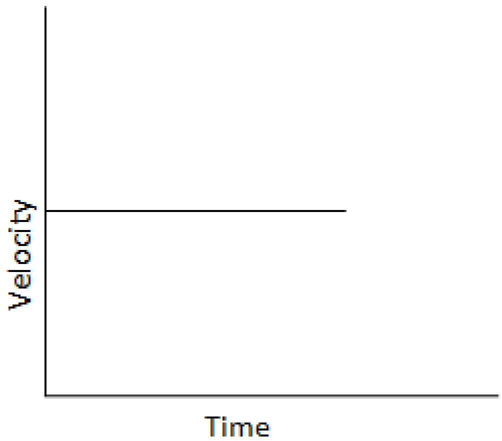


Figure 5: - Velocity time graph when speed remains constant (no acceleration)

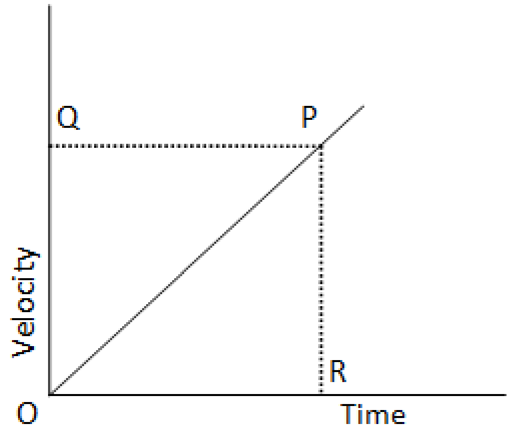


Figure 6: - Velocity time graph showing uniform acceleration

Some Important things

Speed	Velocity
Speed is the distance travelled by an object in a given interval of time.	Velocity is the displacement of an object in a given interval of time.
Speed = distance / time	Velocity = displacement / time
Speed is scalar quantity i.e. it has only magnitude.	Velocity is vector quantity i.e. it has both magnitude as well as direction.

Uniform acceleration	Non-uniform acceleration
A body is said to be in uniform acceleration if it travels in a straight line and its velocity increases or decreases by equal amounts in equal intervals of time.	A body is said to be in non-uniform acceleration if the rate of change of its velocity is not constant.

Interesting facts about Motion

S.no	Points
1	The fastest possible speed in the universe is the speed of light. The speed of light is 299,792,458 meters per second. In physics this number is represented by the letter "c."
2	The first scientist to measure speed as distance over time was Galileo
3	The escape velocity of Earth is the speed needed to escape from Earth's gravitational pull. It is 25,000 miles per hour.
4	A speedometer is a great example of instantaneous speed.
5	Average speed tells us how quickly the body travelled the specific distance, but it tells us little of what happened during the time that the body was travelling the distance. It doesn't tell us if there was any speeding up or slowing down during the time.
6	Motion along a straight line is call is rectilinear and If the line is curved, the motion is curvilinear.
7	Kinematics is the branch of classical mechanics which describes the motion of points (alternatively "particles"), bodies (objects), and systems of bodies without consideration of the masses of those objects nor the forces that may have caused the motion.

Practice Questions

Question 1

An airplane accelerates down a runway at 3.20 m/s^2 for 32.8 s until is finally lifts off the ground. Determine the distance traveled before takeoff.

Question 2

A Jeep starts from rest and accelerates uniformly over a time of 5.21 seconds for a distance of 110m. Determine the acceleration of the Jeep.

Question 3

John is riding the Giant Drop at Canada. If John free falls for 2.6 seconds, what will be his final velocity and how far will he fall?

Question 4

A race car accelerates uniformly from 18.5 m/s to 46.1 m/s in 2.47 seconds. Determine the acceleration of the car and the distance traveled.

Question 5

A feather is dropped on the planet other than earth which has very low acceleration due to gravity from a height of 1.40 meters. The acceleration of gravity on the other planet is 1.67 m/s^2. Determine the time of feather to fall to the surface of the other planet

Question 6

Rocket-powered sleds are used to test the human response to acceleration. If a rocket-powered sled is accelerated to a speed of 444 m/s in 1.8 seconds, then what is the acceleration and what is the distance that the sled travels?

Question 7

Honda Activita accelerates uniformly from rest to a speed of 7.10 m/s over a distance of 35.4 m. Determine the acceleration of the bike.

Question 8

An Aeronautics engineer is designing the runway for an airport. Of the planes that will use the airport, the lowest acceleration rate is likely to be 3 m/s^2. The takeoff speed for this plane will be 65 m/s. Assuming this minimum acceleration, what is the minimum allowed length for the runway?

Question 9

A BMW car travelling at 22.4 m/s skids to a stop in 2.55 s. Determine the skidding distance of the car (assume uniform acceleration)

Question 10

A kangaroo is capable of jumping to a height of 2.62 m. Determine the takeoff speed of the kangaroo.

Question 11

If Rahul has a vertical leap of 1.29 m, then what is his takeoff speed and his hang time (total time to move upwards to the peak and then return to the ground)?

Question 12

A bullet leaves a rifle with a muzzle velocity of 521m/s. While accelerating through the barrel of the riffle, the bullet moves a distance of 0.840 m. Determine the acceleration of the bullet (assume a uniform acceleration).

Question 13

A baseball is popped straight up into the air and has a hang- time of 6.25 s. Determine the height to which the ball rises before it reaches its peak. (Hint: the time to rise to the peak is one- half the total hang-time.)

Question 14

The observation deck of the tall skyscraper 370 m above the street. Determine the time required for a penny to free fall from the deck to the street below.

Question 15

A bullet is moving at a speed of 367 m/s when it embeds into a lump of moist clay. The bullet penetrates for a distance of 0.0621 m. Determine the acceleration of the bullet while moving into the clay. (assume a uniform acceleration.)

Question 16

A coin is dropped into a deep well and is heard to hit the water 3.41 s after being dropped. Determine the depth of the well.

Question 17

It was once recorded that a Jaguar left skid marks that were 290 m in length. Assuming that the Jaguar skidded to a stop with a constant acceleration of -3.90 m/s^2 , determine the speed of the Jaguar before it began to skid.

Question 18

A plane has a takeoff speed of 88.3 m/s and requires 1365 m to reach that speed. Determine the acceleration of the plane and the time required to reach this speed.

Question 19

A dragster accelerates to a speed of 112 m/s over a distance of 398 m. Determine the acceleration (Assume uniform) of the dragster.

Question 20

With what speed in miles/ h (1 m/s= 2.23 mi/hr) must an object be thrown to reach a height of 91.5 m (equivalent to one football field)? Assume negligible air resistance.

Question 21

A Truck starting from rest moves with a uniform acceleration of 0.2 m /s^2 for 2 minutes. Find

(a) the speed acquired

(b) the distance travelled.

Question 22

Match the column

Column A	Column B
Speed	Scalar
Distance	Vector

Displacement	
Acceleration	
Velocity	

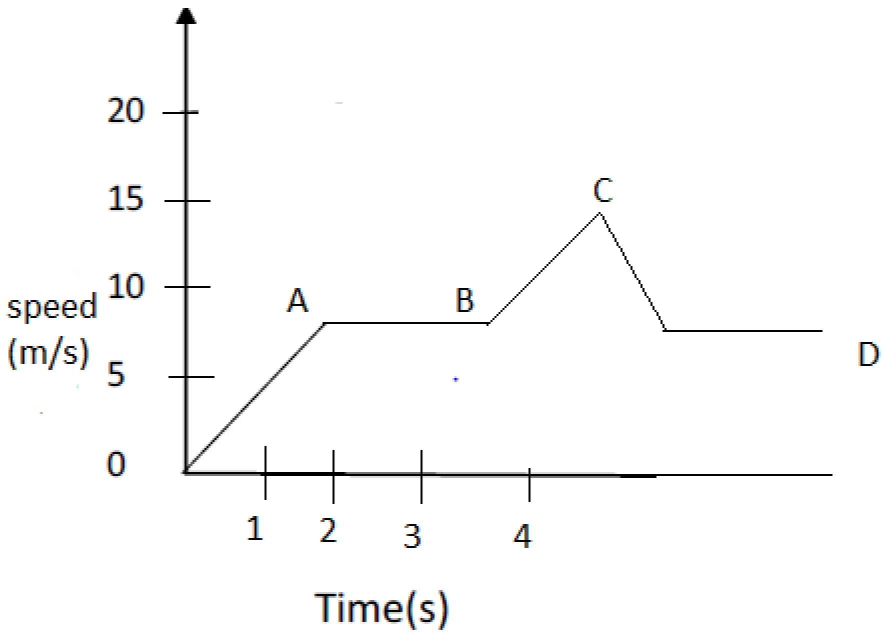
Question 23

Match the column

Column A	**Column B**
22 km/h	.166 m/s
100 Km/h	6.11 m/s
10 m/min	27.77 m/
2 km/s	83.33 m/s
5 km/min	2000m/s

Question 24

Study the speed time graph



Find following based on the graph

a) Which paths have constant speed

b) when is the maximum speed reached

c) when is the acceleration happened

d) when is the deceleration happened

Answers

1. distance= 1720 m

2. acceleration = 8.10 m/s^2
3. Velocity = -25.5 m/s (-indicates direction)
4. acceleration = 11.2 m/s^2 , d= 79.8 m
5. time= 1.29 s
6. acceleration = 247m/s^2
7. acceleration = 0.712 m/s^2
8. distance= 704m
9. distance= 28.6m
10. speed= 7.17m/s
11. speed= 5.03m/s, hang time = 1.03s
12. acceleration = 162 ×105m/s^2
13. speed=30.6m/s, d= 47.9m
14. time= 8.69s
15. acceleration = -1.08 × 106m/s^2 (Negative sign shows deceleration)
16. distance= 57.0m
17. speed= 47.6m/s
18. acceleration = 2.86m/s^2
19. time= 30.8s, acceleration = 15.8m/s^2
20. vi= 42.3m/s

What is force

- When we push or pull anybody we are said to exert force on the body
- Push or pull applied on a body does not exactly define the force in general. We can define force as an influence causing a body at rest or moving with constant velocity to undergo acceleration

S.no	Quantities	Description
1	Balanced Forces	If the resultant of all forces acting on a body is zero, then the forces are called *balanced forces.* .
2	Unbalanced Forces	If the resultant forces acting on a body is not zero, the forces are called *unbalanced forces.*

3	Friction Force	The force that opposes the relative motion between the surfaces of two objects in contact and acts along the surfaces in contact is called the force of friction or simply friction.
4	Momentum	The momentum, p of an object is defined as the product of its mass, m and velocity, v That is, Momentum p=mv Momentum has both direction and magnitude so it is a vector quantity. Its direction is the same as that of velocity, v SI unit of momentum is kilogram-meter per second (kg m s^{-1}).

Newton's Law of Motion

Concept	Description
Newton's First Law of motion	An object remains in a state of rest or of uniform motion in a straight line unless compelled to change that state by an applied force.
Newton's Second Law of Motion	The rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force Newton's second law of motion can be expressed as $$Force \propto \frac{change\ in\ momentum}{Time\ taken}$$ This can be written as after some derivation *F = ma* The unit of force is $kgms^{-2}$ or Newton, which has the symbol *N*. The second law of motion gives us a method to measure the force acting on an object as a product of its mass and acceleration.

Newton's third law of motion	Whenever a body exerts a force on another body, the second body exerts an equal and opposite force on the first body

Law of Conservation of Momentum

When two or more bodies acts upon each other their total momentum remains constant provided no external forces are acting

When this law is applied for a collision between two bodies, the total momentum of the colliding bodies before collision is equal to the total momentum after collision.

Total initial Momentum = Final Total Momentum

Some Important point to Note

1	**Why can dust be removed by shaking it, or beating it by a carpet?**	**Before the carpet was shaken, the dust was at rest. When the carpet was set in motion, the dust tends to remains at rest due to inertia. As a result, dust got removed from carpet**
2	Why do passengers in the bus tend to fall back when it starts suddenly?	When the bus accelerates from rest, the lower part of our body comes into motion along with the bus while the upper part of body tends to remain at rest due to inertia of motion and as a result which we fall backwards.
3	Why is it difficult for a fireman to hose, which ejects large amount of water at a high velocity?	Water is ejected with a large forward force (action). As we know by Newton's third law of motion that every action has an equal and opposite reaction so, because of this action fireman experiences a large backward force or reaction. That is why he feels difficulty in holding the hose.
4	Why is it advised to tie a rope on the luggage while you travel by the bus?	Bus starts and stop suddenly during the journey and luggage can move because of law of inertia
5	Why do passengers jumping out of a rapidly moving bus fall forward with his face	The passenger's upper portion will remain in motion due to inertia even on falling on the ground and his lower portion will come to rest. So it will fall forward

	downwards, if he does not run forward?	
6	Why the cricket player moves his hand backwards on catching a fast cricket ball	This is to prevent injuries to the hand. The time taken to reduce the momentum is increased in this way and less force acts on the hand
7	What is the use of seat belt in Cars	1) if the car is stopped due to emergency braking, then the driver and passengers are no thrown forward so as to hit the steering wheel or wind screen 2) The slightly stretchable seat belts worn by the passengers increase the time taken by the passengers to fall forward and thus less stopping force acts on them

Gravitation

What is Gravitation

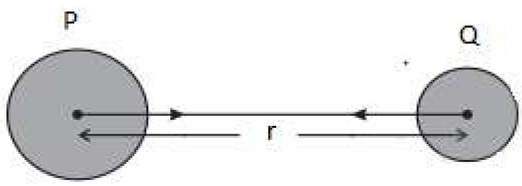
Gravitation is the force of attraction between the any two bodies having mass

S.no	Points
1	Laws of nature are same for earthly and celestial Bodies.
2	Kepler (1571-1631) Studied the planetary motion in detail and formulated his three laws of planetary motion, which were available Universal law of gravitation.
3	Gravitational force or gravity of earth is responsible for pulling you and keeping you on earth.
4	Fact that all bodies irrespective of their masses are accelerated towards the earth with a constant acceleration was first recognized by Galileo (1564-1642).

Universal law of Gravitation

As stated by Newton's

Everybody in universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of distance between them. The force acts along the line joining the two bodies



$$F = G\frac{Mm}{r^2}$$

- Here G is the constant known as Universal Gravitational constant.
- SI unit of gravitational constant G is Nm^2kg^{-2}
- Value of G was first found by Henry Cavendish (1731-1810) and it is $G=6.673\times10^{-11}\ Nm^2kg^{-2}$

S.no	Points
1	the gravitational force is a central force that is It acts along the line joining the centers of two bodies.
2	It is a conservative force. This means that the work done by the gravitational force in displacing a body from one point to another is only dependent on the initial and final positions of the body and is independent of the path followed.
3	It is always attractive in nature
4	It is responsible for the motion of planets around the sun, motion of moon around earth

5	The tides formed by rising and falling of water level in the ocean are due to the gravitational force exerted by both sun and moon on the earth
6	Artificial satellites revolve around the earth.

Free Fall

The falling of a body (or object) from a height towards the earth under the gravitational force of earth (with on other force acting on it) is called *free fall*

whenever the objects fall towards earth an acceleration is involved due to earth's gravitational force.

This acceleration due to earth's gravitational force is called *acceleration due to gravity* which is denoted by *'g'* and its unit is m/s^2

g value on earth surface is around 9.8 m/s^2

Motion Under Free fall

$v=u+gt$ when object is falling downwards

$v=u-gt$ when object is thrown upwards

$h=ut+(1/2)gt^2$

and $v^2-u^2=2gh$

where h is the height of the object from the ground.

Difference between acceleration due to gravity (g) and universal gravitational constant (G)

Acceleration due to gravity(g)	**Universal gravitational constant(G)**
It is the acceleration produced in a freely falling object under the action of the earth's gravitational force.	It is the gravitational force of attraction between two objects of unit masses separated by a unit distance
The value of g is different at different places on the earth as well as other planets.	The value of G remains same everywhere in the universe.

Interesting facts about Force and Gravitation

S.no	Points
1	Unlike the Force, with its dark and light sides, gravity has no dual nature; it only attracts, never repels.
2	Gravity is by far the weakest of the four fundamental forces. The other three are electromagnetism; weak nuclear force, which governs how atoms decay; and strong nuclear force, which holds atomic nuclei together.
3	Gravity takes time, meaning that if the sun disappeared, Earth would still orbit it for as long as we saw light from it (about 8 minutes)
4	The gravitational force on the surface of Earth accelerates every object at the same rate, regardless of its weight. If you drop a big box and a small box in vacuum from a certain height, they would hit the ground at the same time.
5	Einstein gave a whole new concept of gravity. His general theory of relativity was the first to treat gravity as a space-time distortion. He described space-time as a “fabric” that physically embodies the universe. Anything with a mass wraps the space-time around it.
6	A force is a push or a pull. It can make something start to move, slow down or speed up, change direction or change shape or size.
7	Mass is the measure of inertia. Or in other words Inertia is measure to mass of an object. The larger is the mass, larger is the inertia and vice-versa

Work and energy

S.no	Terms	Descriptions
1	Work	Work done by force acting on an object is equal to the product of force and the displacement of the object in the direction of the force. W=Fd

		Work, which is the product of force and displacement, has only magnitude and no direction. it is a scalar quantity The unit of work is Newton meter (N m) or joule (J). The work done by a force can be either positive or negative or zero.
2	Positive work	If a force displaces the object in its direction, then the work done is **positive** So, $W=Fd$
3	Negative work	If the force and the displacement are in opposite directions, then the work is said to be **negative**. $W=-Fd$
4	Zero Work	If the directions of force and the displacement are perpendicular to each other, the work done by the force on the object is **zero**
5	Work when displacement at an angle with Force	If displacement d of any object makes an angle θ with the force F acting on it as shown below in the figure, then the work done by the force is $W=Fd\cos\theta$
6	Energy	The capacity of an object to do work is called energy of the object. The energy possessed by an object is measured in terms of its capacity of doing work. The unit of energy is, therefore, the same as that of work, that is, joule (J). 1 J is the energy required to do 1 joule of work.

7	Kinetic Energy	Kinetic energy of a body moving with a certain velocity is equal to the work done on it to make it acquire that velocity. kinetic energy possessed by an object of mass m and moving with uniform velocity v is $$E_k = \frac{1}{2}mv^2$$
8	Potential Energy	Potential energy is the energy stored in the body or a system by virtue of its position in field of force or by its configuration. Potential energy is denoted by letter U. Potential energy for a body placed height H above from ground is given by U=mgH
9	Power	It is defined as rate of doing work or work done per unit time by an object. $$Power = \frac{Workdone}{Time\ taken} = \frac{W}{t}$$ SI unit of power = SI unit of Work done / SI unit of t = J / s = watt, W 1 W = 1 J / 1 s Definition of SI unit of power – Power of an object or agent is said to be 1 watt when it does 1 joule of work in 1 second.

Law of Conservation of energy

Statement 1 – Energy can neither be created nor destroyed, but can be changed from one form to another.

Statement 2 – When one form of energy is changed or transformed into other forms of energy, the total energy of an isolated system remains the same.

Example: Case of Oscillating Pendulum

In case of an oscillating pendulum. When a pendulum moves from its mean position to either of its extreme positions, it rises through a certain height above the mean level. At this point, the kinetic energy of the bob changes completely into potential energy. The kinetic energy becomes zero, and the bob possesses only potential energy. As it moves towards point mean position its potential energy decreases progressively. Accordingly, the kinetic energy increases. As the bob reaches point Mean position its potential energy becomes zero and the bob possesses only kinetic energy. This process is repeated as long as the pendulum oscillates.

So

Total energy at Extreme Position = PE

Total energy at Mean position = KE

In between Total energy = KE + PE

So total energy remains conserved

Units of Power

1 horse power	**746 W**
1 kilowatt	**1000 W**
1 MW	**106W**

Commercial Unit of Energy KWH (Kilo Watt hour)

Definition of 1 kWh
A kilowatt hour is the amount of electric energy used by 1000 W electric appliance when it operates for 1 hour

Relationship between joule (J) and kilowatt-hour (kWh)
1 kWh =3.6 x 106 J

Forms of energy

Mechanical energy	Sum of kinetic and potential energy.
Thermal energy	Energy possessed by an object due to its temperature.
Chemical energy	Energy released in chemical reactions.
Sound energy	Energy of a vibrating object producing sound
Electrical energy	Energy of moving electrons in a conductor connected with a battery
Solar energy	Energy radiated by the sun.

Interesting Facts about Energy

S.no	Points
1	The word energy comes from the Greek word Energeia.
2	Stretched rubber bands and compressed springs are examples of elastic potential energy.
3	During chemical reactions, chemical energy is often transformed into light or heat
4	The mechanical energy of an object is associated with the objects' position and motion
5	James Joule is the physicist who discovered the relationship between the loss of mechanical energy and the gain of heat.
6	Energy cannot be destroyed or created—only transformed.
7	Albert Einstein defined energy as mass multiplied by the speed of light squared, or $e=mc^2$
8	A "watt" is a unit of power that measures the rate of producing or using energy. The term was named after Scottish engineer James Watt (1736-1819), who developed an improved

	steam engine. Watt measured his engine's performance in horsepower. One horsepower equaled 746 watts.

Sound

What is sound: It is a form of energy which produces the sensation of hearing in our ears.

S.no	Terms	Descriptions
1	Sound	It is a form of energy which produces the sensation of hearing in our ears.
2	Wave	The movement of the disturbance through a medium due to the repeated periodic motion of the particles of the medium about their mean position is known as wave. Wave transfers energy and not matter
3	Mechanical Wave	It is a periodic disturbance which requires a medium (solid, liquid or gas) for its propagation Example Sound waves Two types Transverse and Longitudinal waves
4	**Transverse waves**	In thie case,particles of a medium vibrate or oscillate about theirmean position at right angles to the direction of the **Crest** – The point on the elevation of the medium whose distance is maximum from the mean position is called crest. **Trough** – The point on the depressed part of the medium whose distance is maximum from the mean position is called trough. **Wevelength**: The distance between two successive crests or troughs It is represented by λ (lambda).

5	Longitudinal waves	In this case, the particles of the medium vibrate or oscillate to and fro about their mean position parallel to the the direction of the propagation of the disturbance When longitudinal waves passes through a medium, the medium is divided into regions of Compression and Rarefaction **Compression** -It is the region of the medium where the density of the medium is high the particles of the medium are very close to each other. **Rarefaction** – It is the region of the medium where the density of the medium is low i.e. the particles of the medium are far apart from each other. **Wavelength**-The distance between two successive compressions or rarefactions

Characteristics of Sound Waves

S.no	Terms	Descriptions
1	Wavelength	The distance between two consecutive compressions or two consecutive rarefactions is known as the wavelength. Its SI unit is metre (m).
2	Frequency	The number of complete oscillations per second is known as the frequency of a sound wave. It is measured in hertz (Hz).
3	Amplitude	The maximum height reached by the crest or trough of a sound wave is called its amplitude.

4	Relationship between frequency, speed and wavelength	Speed, wavelength, and frequency of a sound wave are related by the following equation: Speed (v) = Wavelength (λ) x Frequency (ν) $v = \lambda \times \nu$
5	Time period	The time interval between two successive compressions is equal to the time period of the wave. This time period is reciprocal of the frequency of the wave and is given by the relation T= 1 / Frequency
6	Pitch	It is the characteristic property of a sound which depends on frequency of the sound wave More is the frequency, more is the pitch and vice versa. High pitch is characterized by a shrill voice.
7	Loudness	Loudness is a measure of the response of the ear to the sound. The loudness of a sound is defined by its amplitude. The amplitude of a sound decides its intensity, which in turn is perceived by the ear as loudness
8	Quality / Timbre	Timbre is the quality of sound which allows us to distinguish between different sound sources producing sound at the same pitch and loudness. The vibration of sound waves is quite complex; most sounds vibrate at several frequencies simultaneously. The additional frequencies are called overtones or harmonics. The relative strength of these overtones helps determine a sound's timbre.
9	Intensity of Sound	Intensity of a sound wave is defined as the amount of sound energy passing through a unit area per second

Range of frequencies

Infrasound	It has frequencies less than 20 Hz.

Audible Range	It has frequencies between 20 Hz and 20000Hz
Ultrasound	It has frequencies more than 20,000 Hz.

Reflection of sound

When a sound waves travelling in a medium bounce back to the same medium after striking the second medium (a solid), reflection of sound wave is said to take place.

Laws of reflection

(1) The angle of incidence of sound wave is equal to the angle of incidence of the sound wave.
(2) The incident direction of sound, reflected direction of sound and the normal to the point of incidence, all lie in the same plane.

Echo in sound

It is the repetition of sound due to the reflection of original sound by a large and hard obstacle.

Condition for echo

i) To hear a distinct echo, the time interval between the original sound and the reflected one must be at least 0.1 s.
This is because we can hear two sounds distinctly when the time gap between two sound is more than 0.1 s as our persistence of hearing is 1/10th of a second i.e. 0.1 s. It means that the impression of a sound remains for 0.1 s in our brain.

(ii) For hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be 17.2 m.

Reverberation

It is the repeated reflection of sound which results in persistence of sound for a long time after the source of sound has stopped producing sound and its gradual fading away until it is no longer audible.

Reverberation time – The time during which the audible sound persists after the production of sound.

Ultrasonic Sounds

The term "ultrasonic" applied to sound refers to anything above the frequencies of audible sound, and nominally includes anything over 20,000 Hz. Frequencies used for medical diagnostic ultrasound scans extend to 10 MHz and beyond.

1) Sounds in the range 20-100kHz are commonly used for communication and navigation by bats, dolphins, and some other species.
2) Much higher frequencies, in the range 1-20 MHz, are used for medical ultrasound.
3) Bats produce high-pitched ultrasonic squeaks. These high-pitched squeaks are reflected by objects such as preys and returned to the bat's ear. This allows a bat to know the distance of his prey.
4) It is also used in diagnosing diseases in human body, to kill bacteria in liquids like milk, to detect faults and cracks

Practical Application of Sounds

1) Reflection of sound is used to measure the distance and speed of underwater objects. This method is known as SONAR.
2) Working of a stethoscope is also based on reflection of sound. In a stethoscope, the sound of the patient's heartbeat reaches the doctor's ear by multiple reflection of sound.

Interesting facts about Sounds

S.no	Points
1	Our ears vibrate in a similar way to the original source of the vibration, allowing us to hear many different sounds.
2	Dogs can hear sound at a higher frequency than humans, allowing them to hear noises that we can’t.
3	Sound is used by many animals to detect danger, warning them of possible attacks before they happen.
4	Sound can’t travel through a vacuum (an area empty of matter).
5	When traveling through water, sound moves around four times faster than when it travels through air.
6	The scientific study of sound waves is known as acoustics.

7	the loudest natural sound on Earth is that of an erupting volcano
8	The sound of thunder is produced by rapidly heated air surrounding lightning which expands faster than the speed of sound.

SI units

Physical Quantity	Symbol	Name	Unit
Mass	m, M	kilogram	kg
Linear position **Length, Distance** **Radius**	x, r l, d R	meter	m
Time	t, τ	second	s
Area	A	-	m^2
Volume	V	-	m^3
Density	ρ	-	kg/m^3
Linear velocity	v, u, c	-	m/s
Linear momentum	p	-	kg*m/s
Linear acceleration	a	-	m/s^2
Force	F	newton	$N=kg*m/s^2$
Impulse	I	-	N*s
Work **Energy**	W E	joule	J=N*m
Power	P	watt	W=J/s