DIFFERENCES

CH # 02 MEASUREMENTS

	ATOMIC CLOCK	HYDROGEN MASER CLOCK
1.	The atomic clock uses cesium of mass number 133.	Hydrogen maser clock uses hydrogen.
2.	This clock has achieved a precision of 1 second in 300,000 years.	This clock has achieved a precision of 1 second in 30,000,000 years.

	FUNDAMENTAL QUANTITIES	DERIVED QUANTITIES
1.	All physical quantities of mechanics are fundamental quantities.	These are the quantities which can be expressed in terms of fundamental quantities.
2.	Length, mass and time are fundamental quantities.	Speed, Volume, acceleration etc. are derived quantities.

	FUNDAMENTAL UNITS	DERIVED UNITS
1.	The unit used to express the fundamental quantities are called base or fundamental units.	The unit which is derived from the fundamental units are called derived units.
2.	Length, mass and time are fundamental quantities.	Speed, Volume, acceleration etc. are derived quantities.

CH # 03 KINEMATICS OF LINEAR MOTION

	MOTION	REST
1.	If a body changes it position with respect to its surrounding it is said to be in motion.	If a body does not change it position with respect to its surrounding it is said to be in motion.
2.	There are three basic types of motion.	There are no types of rest.
3.	A moving train or cars etc. are in motion.	A book lying on a table is in the state of rest.

	KINEMATIC	DYNAMIC
1.	It is the branch of physics which deals with the motion of the object without the reference of force.	It is the branch of physics which deals with the motion of the object with the reference of force.
2.	In kinematics we study the position and motion of an object in space at a certain time without considering the causes of motion.	In dynamics we study the pushes or pulls which cause or resist the motion.

	SCALARS	VECTORS
1.	Those physical quantities which are completely specified by only their unit are called scalars.	Those physical quantities which are not completely specified by only their unit as well as direction is required are called vectors.
2.	Scalars can be added or subtracted by arithmetical laws.	Vectors can be added or subtracted by graphical method.
3.	Scalar can be represented by number.	Vector can be represented by an arrow.
4.	Distance, speed, time etc are the examples of scalars.	Displacement, velocity, acceleration are the examples of vectors.

	DISPLACEMENT	DISTANCE
1.	Least distance from one point to another point is called displacement.	Space between two points is called distance.
2.	It is denoted by ‘d’.	It is denoted by ‘S’.
3.	It is a vector quantity.	It is a Scalar quantity.

	SPEED	VELOCITY
1.	Distance cover in unit time is called speed.	The rate of change of position is called velocity.
2.	Its formula is: $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$	Its formula is: $\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$
3.	It is a scalar quantity.	It is a vector quantity.

UNIFORM VELOCITY	VERIABLE VELOCITY

1.	Velocity of a body is said to be uniform when it covers equal displacement in equal interval of time in a specified direction.	Velocity of a body is said to be variable when it covers unequal displacement in equal interval of time in a specified direction or variable direction.
2.	During uniform velocity, the velocity of a body remains constant in every moment.	During variable velocity, the velocity of a body changes in every moment.
3.	A body moving with uniform velocity has no acceleration.	A body moving with variable velocity has acceleration.

CH # 04 FORCES AND MOTION

	WEIGHT	MASS
1.	The force exerted by the earth on a body is called weight.	The quantity of a matter in a body is called mass.
2.	It is denoted by 'W'.	It is denoted by 'm'.
3.	Weight can be calculated by: W = mg	Mass can be calculated by: m = W/g
4.	It is vector quantity and always directed towards the center of the earth.	It is scalar quantity.
5.	It can be measured by spring balanced.	It can be measured by physical balanced.
6.	It is a variable quantity.	It is a constant quantity.

CH # 07 CIRCULAR MOTIONS AND GRAVITATION

	CENTRIPETAL FORCE	CENTRIFUGAL FORCE
1.	When a body moves in a circle with a uniform speed the force required to keep it moving in a circular path is called centripetal force.	When a body moves in a circle, according to Newton's 3rd law of motion, a force equal and opposite to the centripetal force acts on it and tends to move it away from the center of its circular path. This force is called centrifugal force.
2.	It is directed toward the center of the circle.	It is directed away from the center of the circle.
3.	It is acting on the body moving in circle.	It is acting on a body represents in the center of the circle.

4.	It can be calculated by $Fc = mV^2/r$	Magnitude of centrifugal force can be calculated by calculating centripetal force.

	g	G
1.	It is acceleration due to gravity.	It is gravitational constant.
2.	Its value does not remains constant throughout the universe.	Its value remains constant throughout the universe.
3.	Its value is 9.8 m/s^2.	Its value is 6.67 x 10^{-11} Nm^2/Kg^2.
4.	It is always directed towards the center of the earth.	It can and cannot be directed towards the center of the earth.
5.	Its value can be calculated by simple pendulum or by free fall method.	Its value can be calculated by Cavendish method.

CH # 08 WORK POWER AND ENERGY

	KINETIC ENERGY	POTENTIAL ENERGY
1.	The energy possessed by a body by virtue of its motion is called kinetic energy.	The energy possessed by a body by virtue of its position is called kinetic energy.
2.	It can be calculated by $K.E = \frac{1}{2}mV^2$.	It can be calculated by P.E = mgh.
3.	It value increases with velocity.	It value increases with the increase in altitude.

	FORCE	ENERGY
1.	Force is that agent which changes or tends to change the state of a body.	Ability of a body to do work is called energy.
2.	It is not constant everywhere.	Its remains constant everywhere.
3.	It is a vector quantity.	It is a scalar quantity.
4.	Its S.I unit is Newton(N).	Its S.I unit is Joule (J).

CH # 09 MACHINES

	MECHANICAL ADVANTAGE	EFFICIENCY
1.	It is the ratio of load and effort.	It is the ration between work done by the machine to the work done on the machine.
2.	If the M.A is greater than one, the machine will make our work easier.	We can never get more work out of a machine than we put. A machine cannot

		create any energy.

CH # 10 MATTERS

	STREES	STRAIN
1.	Opposing force per unit area is of an object that resists any change in shape is called stress.	Fractional change in length, area or volume is called strain.
2.	It is vector quantity.	It is scalar quantity.
3.	Its unit is Newton per meter(N/m)	It has no unit.
4.	Its formula is: $\sigma = \frac{F}{A}$	Its formula is: $\epsilon = \frac{\Delta L}{L}$

CH # 11 HEATS

	HEAT	TEMPERATURE
1.	Total kinetic energy of particles of any substance is called heat.	Average kinetic energy of particles of any substance is called temperature.
2.	Degree of hotness and coolness does not depend upon heat.	Degree of hotness and coldness depend upon the temperature.
3.	Direction of flow of heat does not depend upon heat.	Direction of flow of heat depends upon temperature.
4.	It is measured by calorimeter.	It is measured by thermometer.
5.	It is measured in joule calorie or British thermal units	It is measured in degree.

	HEAT CAPACITY	SPECIFIC HEAT
1.	It is define as the quantity of heat required to produce unit temperature change.	It is the quantity of heat to change the temperature of unit mass of substance by one degree Celsius.
2.	It is measured in J/K.	Its unit is J/Kg.K.
3.	It value is depends on mass and nature of the substances.	Its value is only depend on the nature of the substance.

CONDUCTION	CONVECTION

1.	Transfer of heat from one place to another place without actual movement of atoms or particles of the matter called conduction.	Transfer of heat energy from, one place to another place by actual movement of molecules is called convection.
2.	It occurs in solids.	It occurs in liquids and gases.
3.	During conduction molecules does not change their average position.	During convection molecules change their position.

CH # 12 WAVES AND SOUND

	TRANSVERSE WAVE	LONGITUDNALWAVE
1.	Such waves in which the particles of the medium execute simple harmonic motion at right angle to the direction of propagation of waves are known as transverse waves.	Such waves in which the particles of the medium execute simple harmonic motion along the direction of propagation of waves are known as transverse waves.
2.	In transverse wave particles of medium vibrates perpendicular to the direction of propagation of wave.	In longitudinal waves particles of the medium vibrate in the direction of propagation of waves.
3.	Transverse waves have crest and trough.	Longitudinal waves have compression and rarefaction.
4.	Distance between two consecutive crest or trough is known as wave length.	Longitudinal waves required a medium for their propagations.
5.	Some type of transverse waves has no need of medium for their propagation.	During propagation of longitudinal waves size of medium undergoes periodic changes.

	MUSICAL SOUND	NOISE
1.	It produces pleasant effect.	It produces unpleasant effect
2.	It has some regularity.	It is an abrupt sound.
3.	It depends upon pitch, quality and loudness of sound.	It depends upon intensity of sound.

CH # 13 REFLECTIONS

REGULAR REFLECTION	IRREGULAR REFLECTION

1.	When a beam of parallel rays of light is incident on a highly polished regular plane surface such as mirror, the reflected rays will also be parallel and reflection is known as regular reflection.	When a beam of parallel rays is incident on a rough irregular surface the reflected rays are scattered in different direction. These types of reflection are known as irregular reflection.
2.	Regular reflection takes places when light rays incident on a smooth plane surface.	Irregular reflection takes places when light rays incident on a rough and irregular surface.
3.	In regular reflection parallel incident rays after reflection will remain parallel.	In irregular reflection parallel incident rays after reflection will not remain parallel.
4.	Law of reflection verified by regular reflection.	Law of reflection cannot be verified by irregular reflection.

	REAL IMAGE	VIRTUAL IMAGE
1.	Real image is always inverted.	Virtual image is always inverted.
2.	Real image can be brought on screen.	Virtual image cannot be brought on screen.
3.	In case of mirror real image is always formed in front of the reflecting surface of the mirror.	In case of mirror virtual image is always formed in behind of the reflecting surface of the mirror.
4.	The sign of the distance of real image is positive.	The sign of the distance of Virtual image is negative.

CH # 14 REFRACTION OF LIGHT AND OPTICAL INSTRUMENTS

	REFLECTION	REFRACTION
1.	Turning back of light from a medium after striking is called reflection of light.	The change of direction and velocity of light as it enters from one medium into another is called reflection of light.
2.	The angle of incidence is equal to the angle of reflection.	The angle of incidence is not equal to the angle of reflection due to bending of light.
3.	Reflection takes place mostly in mirror or smooth shining surface.	Refraction takes place in lenses, plane glass and prism.

CONVEX LENS	CONCAVE LENS

1.	A convex lens is a piece of transparent material which is thick at the center and thin at the edges.	A concave lens is a piece of transparent material which is thin at the center and thick at the edges.
2.	Convex lenses are called converging lens.	Concave lenses are called diverging lens.
3.	It focal length is positive .	Its focal length is negative.
4.	It is used for correction of long sightedness.	It is used for the correction of short sightedness.

	CAMERA	HUMAN EYE
1.	In camera double convex lens of fixed focal length is used.	In human eye double convex lens of adjustable focal length is used.
2.	In camera image is formed on photographic film.	In human eye image is formed on retina.
3.	In camera amount of light is controlled by shutter.	In human eye amount of light is controlled by pupil.

	SHORT SIGHTEDNESS (MYOPIA)	LONG SIGHTEDNESS (HYPERMETROPIA)
1.	In short sightedness near objects can be seen clearly but distant objects are not seen clearly.	In long sightedness distant objects can be seen clearly but near objects are not seen clearly.
2.	The reason of this defect is either the focal length of the eye lens is too short or the eye ball is too elongated	The reason of this defect is either the focal length of the eye lens is too long or the eye ball is too short.
3.	In this defect image of distant object is formed in front of the retina.	In this defect image of near object is formed behind the retina.
4.	It can be corrected by wearing concave lens (negative power) in spectacles or contact lenses.	It can be corrected by wearing convex lens (Positive power) in spectacles or contact lenses.

	POWER	POWER OF LENS
1.	Power is the rate of doing work.	Power of lens is equal to the reciprocal of its focal length in meter.
2.	Its S.I unit is watt.	Its S.I unit is diopter.

	MICROSCOPE	TELESCOPE
1.	A microscope is an instrument which magnifies the small objects.	A telescope is an instrument used to see distant objects clearly.
2.	Image of the object to be seen is larger than the actual size of the object.	Image of the object to be seen is smaller than the actual size of the object.
3.	The focal length of the objective is short and the focal length of the eye piece is long.	The focal length of the objective is long and the focal length of the eye piece is short.
4.	The final image formed by the eye piece is erect, virtual and highly magnified.	The final image formed by eye piece is virtual and inverted.

CH # 15 NATURE OF LIGHT

	CORPUSCULAR THEORY	WAVE THEORY
1.	According to theory light consist of small particles.	According to wave theory light travels in the forms of waves.
2.	Light particles travel with the velocity of light in the straight line.	Wave travel with the velocity of light but not in straight line.
3.	Light travel with faster velocity in the denser medium.	Light travels slow velocity in denser medium.

CH # 16 ELECTRICITY

	SERIES COMBINATION	PARALLEL COMBINATION
1.	Resistor are said to be connected in series, when they are connected end to end consecutively.	Resistors are said to be connected in parallel when each of them is connected between the two common points.
2.	In this case there is only one path for the flow of current.	In this case there are multiple paths for the flow of current.
3.	In this case same amount of current flow through each resistor.	In this case variable amount of current flows through each resistor. $I = I_1 + I_2 + I_3 + ...+ I_n$
4.	The total voltage of the battery is equal to the sum of potential difference across the individual resistors i.e. $V = V_1 + V_2 + V_3 + ...+ V_n$	In this case potential difference across each resistor is same and equal to the potential difference of the battery 'V'.

5.	In this case combined resistance of all the resistors can be obtained by adding the individual resistors i.e. $R = R_1 + R_2 + R_3 + ... + R_n$	In this case reciprocal of equivalent resistance can be obtained by adding the reciprocals of the individual resistors. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ... + \frac{1}{R_n}$

	INSULATOR	CONDUCTOR
1.	Those objects which do not allow the charge to pass through them are called insulator or non-conductors.	Those objects which not allow the charge to pass through them are called conductors.
2.	In insulator electrons are bound tightly with the nuclei.	In conductor some of the electrons are loosely bound and can move about freely within the material.
3.	Wood, plastic and rubber etc. are insulators.	Gold, copper, iron etc. are conductors.

	CURRENT	POTENTIAL DIFFERENCE
1.	It is the rate of flow of electron from the negative terminal to the positive terminal through any cross section of conductor.	The potential difference between two points is equal to the amount of work done carrying a unit positive charge against the electric field.
2.	Current is the rate of flow of charges.	Potential difference is the work done of charges.
3.	It is measured in ampere.	It is measured in volts.

CH # 17 ELECTROMAGNETISM

	VOLTMETER	AMMETER
1.	It is used to measure the potential difference between the two points.	It is used to detect and measure electric current in a circuit.
2.	In voltmeter high value shunt is used.	In an ammeter low shunt is used.
3.	In voltmeter shunt is connected in series with the coil of the galvanometer.	In ammeter shunt is connected parallel with the coil of galvanometer.
4.	Voltmeter is connected in parallel with circuit.	Ammeter is connected in series with the circuit.

	PERMANENT MAGNET	ELECTROMAGNET
1.	It cannot be easily given required shape.	It can be easily given any shape.
2.	Its magnetic properties cannot be made zero easily.	Its magnetic properties cannot be made zero easily.
3.	Its strength is fixed.	Its strength can be increased up to any value.

CH # 18 ELECTRONICS

	n-TYPE	P-TYPE
1.	If a silicon or germanium crystal is doped with a penta valent element (arsenic), makes n-type semi-conductor.	If a silicon or germanium crystal is doped with a tri valent element (arsenic), makes P-type semi-conductor.
2.	In n-type semi-conductor electric current flows due to the flow of free electrons.	In P-type semi-conductor electric current flows due to the movement of holes.

CH # 19 NUCLEAR PHYSICS

	ALPHA RAYS (α)	BETA RAYS (β)
1.	The mass of each α-particle is nearly four times the mass of hydrogen nucleus.	Their mass is small so that, they are easily scattered by nuclei of atoms.
2.	The charge on alpha particle is positive.	The charge on beta particle is negative.
3.	The K.E of alpha rays is greater than that of beta rays.	The K.E of beta rays is less than that of alpha rays.
4.	Their penetration power is very small.	Their penetration power is greater than alpha rays.
5.	The ionization power of alpha rays is very large.	The ionization power of beta rays is very small.
6.	The velocity of alpha rays is from 1.47 x 10^7 to 1.7 x 10^7m/s.	The velocity of beta rays is from 9 x 10^7 to 27 x 10^7m/s.

	GAMMA RAYS	X-RAYS
1.	Gamma rays are emitted by nucleus of	X-Rays are produced by absorbing high

	radioactive element.	energy electrons in matter.
2.	Frequency of gamma rays is very high.	Frequency of X-Rays is lower than those of gamma rays.

	FISSION	FUSION
1.	The splitting of a large nucleus into fragments with the emission of energy is called fission.	Combining of two light nuclei to form a relatively heavy nucleus with the emission of large amount of energy is called fusion.
2.	In fission heavy parent nucleus splits into lighter daughter nuclei.	In fusion lighter nuclei combine to form a heavy nucleus.
3.	Large amount of energy is released.	The energy released is larger than that released in fission.
4.	Energy obtained by fission is controlled in nuclear reactors and it can be used for both peaceful and destructive (atom bomb) purpose.	Energy or heat obtained by fusion cannot be utilized for peaceful purpose. In hydrogen bomb fusion takes place which is very destructive.

	ATOM BOMB	HYDROGEN BOMB
1.	It is assembled on the principle that if a fission chain reaction is uncontrolled than the energy released will be enormous.	It is assembled on the principle of fusion.
2.	The heat energy released by atom bomb is less as compare to hydrogen bomb.	The heat energy released by hydrogen bomb is far greater than that of hydrogen bomb.
3.	In an atomic bomb explosion the heat energy released by it can destroy a small city.	The energy released by the explosion of first hydrogen bomb was equivalent to 1 million tons of TNT. Thus it is more destructive than atom bomb.