LEARNING CONTENTS AND STUDENTS' LEARNING OUTCOMES Grade XII

Contents:	Students' Learning Outcomes	R	U	Ap.	An.	E	C
PART-5(ELECTRICITY AND MAGNETISM)	Students will be able to:						
UNIT-12(ELECTROSTATICS)							
Force between charges in different media	• State Coulomb's law and explain that force between two point charges is reduced in a medium other than free space using Coulomb's law.	*					
Polarization of dielectric	• Recognize that positive and negative parts of the atoms/molecules of a dielectric separate and produce their own reverse electric force which reduces external force.			*			
Electric field	• Describe the concept of an electric field as an example of a field of force.	*					
	• Define electric field strength as force per unit positive charge and solve problems and analyse information using E = F/q.	*					
	• Derive the expression E = l/4πεo q/r2 for the magnitude of the electric field at a distance 'r' from a point charge 'q' and solve problems involving the use of the expression . E = l/4πεo q/r2			*			
Electric flux	• Define and explain electric flux.	*					
	• Describe electric flux through a surface enclosing a charge.	*					
Gauss's law and its applications	• State and explain Gauss's law.	*					

	• Derive the expression for electric field produced by a hollow spherical charged conductor at a point inside and outside the conductor.			*			
	• describe and draw the electric field due to an infinite size sheet of charge.	*					
	• Describe and draw the electric field between two infinite size oppositely charged parallel plates.	*					
Electric potential Energy and Electric Potential	• define electric potential energy between two point charges and solve potential energy problems.	*					
	• Define electric potential as electric potential energy per unit charge or work done in moving unit positive charge from infinity to reference point.(Absolute electric potential) (V=W/q)	*					
	• Derive the expression for electric Potential by a hollow spherical charged conductor at a point inside and outside the conductor.			*			
	• find the final velocity of charged particle when it falls through a given electric potential difference. Using relation qV=1/2 mv2			*			
	• Express elecltric field as rate of change of potential with respect to position. (i.e E=-ΔV/Δr)			*			
	• Solve problems about E = V/d.			*			
	• Outline a method for detemination of charge of electron.				*		
Science, Technology and Society Connections							
	describe the principle of inkjet printers and Photostat copier as an application of electrostatic phenomenon.	*					

	describe the applications of Gauss's law to find the electric force due to various charge configurations	*					
UNIT-13(CAPACITORS)							
Capacitors	• define capacitance and show a graphical relation between charge stored and electric potential acquired.	*					
	• Use graph to determine capacity of capacitor and energy stored.			*			
	• Solve problems using above derived relation.			*			
Parallel Plate capacitor	• Derive the relation for capacitance of parallel plate capacitor both for vaccuum and dielectric medium between the plates.			*			
	• Explain Effect of electric polarization of dielectric on Capacitance of capacitor.		*				
Combinations of capacitors	• Solve problems using formula for capacitors in series and in parallel.			*			
Practical Capacitor	• Define oiled paper capacitor , mylar capacitor, electrolytic capcitor , variable capacitor.	*					
	• Explain Safe working voltage of capacitor.		*				
Energy stored in a capacitor	• Derive a relation for energy stored in electric field per unit volume.			*			
Investigation Skills/Laboratory Work							
	• Draw graphs of charging and discharging of a capacitor through a resistor.			*			

Science, Technology and Society Connections							
	• List the use of capacitors in various household appliances such as in flash gun of camera, refrigerator, electric fan, rectification circuit etc.			*			
UNIT-14(CURRENT ELECTRICITY)							
Electric Current	• Desribe Current as rate of flow of charge. (I=q/t)	*					
	• Describe examples of currnet as flow of electrons in metal, flow of positive and negative ions in gases and liquids.	*					
	• Show that current flowing through a metal may be considered as motion of charged particle in a metal and arrive at relation I=nevA			*			
Sources of emf	• Define emf (E=W/q) and identify different sources of emf such as electrochemical cells, photovoltaic cell and electric generators.	*					
	• Recognize that all sources of emf have some internal resistance.			*			
Electric Potential Difference	• Define electric potential difference of an electric energy consuming device (V=W/q)	*					
	• State and explain relation between potential difference and electric current (Ohm's Law: V=IR) for a conductor.	*					
	• Explain resistance as opposition to charge carriers moving through a metal, gas or liquid.		*				
Power dissipation in resistors	• Derive a formula for power dissipation in resistors when a current flows through them from the definition of electric potential.			*			

	• Explain the internal resistance of sources and its consequences for external circuits and conclude the condition for maximum power transfer.		*				
Resistivity and its dependence upon temperature	• Define resistivity and explain its dependence upon temperature.	*					
	• Solve problems using relation: α=(Rt-Ro)/Rot			*			
DC Circuits	• Recognize that Ohm's Law (V=IR) is the law for a branch.			*			
	• Recognize that Kirchhoff's Current rule is the rule is law of conservation of charge for a node , and Kirchhoff's Voltage rule is the rule is the law of conservation of energy for a loop			*			
	• Apply Kirchhoff's voltage rule to find the relation for the resistances connected in series.			*			
	• Use a series combination of resistors as potential divider/slide wire potentiometer.			*			
	• Apply Kirchhoff's current rule to derive a relation for resistances in parallel.			*			
	• Use Wheatstone bridge to determine unknown resistance.			*			
	• Explain how a given galvanometer can be converted into voltmeter or ammeter of a specified range.		*				
Investigation Skills/Laboratory Work							
	indicate the value of resistance by reading colour code on it.		*				
	determine resistance of wire by slide wire bridge.			*			

	• Determine resistance of voltmeter by drawing graph between R and I/V.			*			
	• Determine resistance of voltmeter by discharging a capacitor through it.			*			
	• Analyze the variation of resistance of thermistor with temperature.				*		
	• Determine internal resistance and emf of a cell using potentiometer.			*			
	• Compare e.m.fs of two cells using potentiometer.				*		
	• Determine the e.m.f. And internal resistance of a cell by plotting v against i graph.			*			
	• Investigate the relationship between current passing through a tungsten filament lamp and the potential applied across it.				*		
Science, Technology and Society Connections							
	• Describe the use of electrocardiograph (E.C.G.), electroencephalograph (E.E.G) instruments to study heart and brain disorders.	*					
	• Explain that the inspectors can easily check the reliability of a concrete bridge with carbon fibres as the fibre conduct electricity.		*				
	• Identify the function of thermistor in fire alarms and thermostats that control temperature.		*				
	• Identify the use of platinum resistance thermometer as standard thermometer for temperatures between -185oc to 630oc.		*				

	• Identify the use of thermoelectric thermometer as a standard thermometer to measure temperatures between 630oc and 1063oc.		*				
	• Describe thermocouple and its function.	*					
	• Explain variation of thermoelectric e.m.f. With temperature.		*				
UNIT-15(ELECTROMAGTEISM)							
Ampere's Law	• State ampere's law and use its simple form to determine the magnetic field around a straight current carrying conductor.	*					
	• Use right hand rule to determine the direction of magnetic field around a straight current carrying conductor.			*			
	• Describe a solenoid and use Ampere's Law to determine the magnetic field inside a long current carrying solenoid.	*					
	• Use right hand rule to determine the direction of magnetic field inside long current carrying solenoid.			*			
Magnetic force on a current-carrying conductor	• Explain that a force might act on a current-carrying conductor placed in a magnetic field.		*				
	• Investigate the factors affecting the force on a current carrying conductor in a magnetic field and compose a relation F=BILsinθ			*			
	• Define magnetic induction (B) using the relation F=BILsinθ	*					
	• Solve problems involving the use of F = BIL sin θ.			*			

Force on a moving charged particle in a uniform magnetic field	• Using the relation F=ilbsinθ, Derive the formula for force on moving charged particle in a uniform magentic field.			*			
	• Using the relation F=qvb sinθ, determine the radius of path of charged particle when projected perpendicularly in uniform magnetic field			*			
Charge to mass ratio	• Describe a method to measure the e/m of an electron by applying electric field and magnetic field on a beam of electrons.	*					
Torque on a current carrying coil in a magnetic field	• Predict the turning effect on a current carrying coil in a magnetic field and use this principle to understand the construction and working of a galvanometer.						*
Magnetic flux	• Describe the concept of magnetic flux (Ø) as scalar product of magnetic field (B) and area (A) using the relation $\emptyset B = B^{\perp} A = B.A.$	*					
	• Define magnetic flux density and its units.	*					
Investigation Skills/Laboratory Work							
	• Construct a simple electromagnet and investigate the factors which influence the strength of an electromagnet.			*			
	• Convert a galvanometer into voltmeter of range zero to 3 V.			*			
	• Interpret and illustrate on the basis of experimental data, the magnetic field produced by a current flowing in a coil is stronger than a straight conductor.			*			
	• Examine the motion of electrons in an electric field using a Cathode Ray tube.			*			

	• Examine the motion of electrons in a magnetic field using a Cathode Ray tube.			*			
Science, Technology and Society Connections							
	• Explain the following:		*				
	(a)magnets are often fitted to the doors of refrigerators and cupboards						
	(b)a crane in a steelworks is fitted with a large electromagnet						
	(c)wheat flour is usually passed near a magnet before being packed						
	(d)a steel ship becomes magnetized as it is constructed						
	• Explain how magnetic effect of a current has been put to the service of mankind in domestic life and in industry e.g.		*				
	• Bullet train, an electromagnetic door lock, a circuit breaker, computers, credit cards						
	• Analyse information and use available evidence to assess the impact of medical application of physics on society (e.g. Identify the function of the electromagnetic field produced in the medical equipments)				*		
	• Explain magnetic resonance image(MRI) scans can be used to		*				
	(a)detect cancerous tissues.						
	(b)wheat flour is usually passed near a magnet before being packed						
	(c)a steel ship becomes magnetized as it is constructed						

	(d)distinguish between gray and white matter in the brain.						
UNIT-16(ELECTROMAGNETIC INDUCTIONS)							
Magnetic flux	• Define of magnetic flux (Ø) as scalar product of magnetic field (B) and area (A) using the relation ØB = $B^{\perp}$ A=B.A. and write its SI unit.	*					
	• Illustrate the instants when magnetic flux passing through is maximum or minimum.			*			
Faraday's law	• State Faraday's law of electromagnetic induction, indicating factors affecting the induced emf.	*					
Lenz's law	• State Lenz's law to predict the direction of an induced current and relate to the principle of conservation of energy.	*					
	• Apply Faraday's law of electromagnetic induction and Lenz's law to solve problems.			*			
Eddy currents	• Explain the production of eddy currents and identify their magnetic and heating effects.		*				
	• Explain the need for laminated iron cores in electric motors, generators and transformers.		*				
Mutual inductance and Self Inductance	• Define mutual inductance (M) and self-inductance (L), and their unit henry.	*					
Energy stored in an inductor	• Find the formula for energy stored in inductor and describe energy density of magnetic field.			*			
Motional emf	• Explain what is meant by motional emf. Given a rod or wire moving through a magnetic field in a simple way, compute the potential difference across its ends. (E=-vBLsinθ)		*				

A.C. Generator	• Describe the main components of an A.C generator and explain how it works and derive the relation ($E=n\omega ab\sin\theta$)	*					
Transformer	• Describe the construction of a transformer and explain how it works.	*					
	• Identify the relationship between the ratio of the number of turns in the primary and secondary coils and the ratio of primary to secondary voltages.		*				
	• Describe how set-up and step-down transformers can be used to ensure efficient transfer of electricity along cables.	*					
Investigation Skills/Laboratory Work							
	• Perform an investigation to predict and verify the effect on an electric current generated when: (a)the distance between the coil and magnet is varied. (b)the strength of the magnet is varied.			*			
	• Demonstrate electromagnetic induction by a permanent magnet, coil and demonstration galvanometer.						
	• Conduct a demonstration of step-up and step-down transformer by dissectible transformer.						
	• Demonstrate an improvised electric motor.			*			
	• Demonstrate the action of an induction coil by producing spark.			*			

	• Gather information and choose equipment to investigate “multiplier “ effect (a small magnetic field created by current carrying loops of wire (wrapped around a piece of iron core lead to a large observed magnetic field).			*			
Science, Technology and Society Connections							
	• Analyze and present information to explain how induction heating is used in furnaces to provide oxygen free heating environment.				*		
	• Identify how eddy currents have been utilized in electromagnetic braking.		*				
	• Analyze the earthquake detecting instrument – seismometer as a good example of an application of electromagnetic induction and explain				*		
	• (A)any movement or vibration of the rock on which the seismometer rests (buried in a protective case) results in relative motion between the magnet and the coil (suspended by a spring from the frame.						
	(b)the emf induced in the coil is directly proportional to the displacement associated with the earthquake.						
	• Describe the use of step-down and step-up transformers for the electric supply from power station to houses and electric appliances at home.	*					
	• Search and analyze information to identify how transmission lines are:					*	
	(a)Insulated from supporting structure.						

	(b)Protected from lightning strikes.						
	• Explain that induction coil is a form of mutual inductor widely used to generate the high voltage sparks needed to ignite the petrol-air mixture in car and motorbike engines.		*				
	• Explain in a car the wind screen wipers are usually driven by one and the engine is started by another.		*				
PART-6 (A.C Circuits)							
UNIT-17 (ALTERNATING CURRENT)							
Alternating emf	• Represent a sinusoidally alternating voltage by an equation of the form E = Eo sin ωt.			*			
	• Describe the flow of Alternating Current in a closed circuit containing components such as Resistor , capacitor or inductor. (I=Iosin(ωt±φ)	*					
Instantaneous, peak and rms values of AC	• Describe the terms time period, frequency, instantaneous peak value and root mean square value of an alternating current and voltage.	*					
Phase, phase lag and phase lead in AC	• Describe the phase of A.C and how phase lags and leads in A.C Circuits.	*					
A.C Circuits	• Explain the flow of A.C through resistors , capacitors and inductors.		*				
	• Discuss Phase lead or lag of current produced when an alternating voltage is applied to a capacitor or inductor using phasor diagram		*				

	• Describe impedance as vector summation of resistances and reactances, in cases of RC, RL and RLC circuits.		*				
	• Construct phasor diagrams and carry out calculations on circuits including resistive and reactive components in series.			*			
	• Solve the problems using the formula of A.C Power and realize the importance of power factor.			*			
Resonant Circuits.	• Realize that impedance of A.C circuits may be frequency dependent and explain resonance in an A.C circuit and carry out calculations using the resonant frequency formula.				*		
Maxwell's equations and electromagnetic waves (descriptive treatment)	• Describe the qualitative treatment of Maxwell's equations and explain the production of electromagnetic waves.	*					
	• Explain electromagnetic spectrum (ranging from radio waves to γ-rays).		*				
	• Describe that the information can be transmitted by radio waves.	*					
	• Identify that the microwaves of a certain frequency cause heating when absorbed by water and cause burns when absorbed by body tissues.		*				
	• Describe that ultra violet radiation can be produced by special lamps and that prolonged exposure to the Sun may cause skin cancer from ultra violet radiation.	*					
Investigation Skills/Laboratory Work							

	• Determine the relation between current and capacitance when different capacitors are used in AC circuit using series and parallel combinations.			*			
	• Measure DC and AC voltages by a CRO.			*			
	• Determine the impedance of RL circuit at 50Hz and hence find inductance.			*			
	• Determine the impedance of RC circuit at 50Hz and hence find capacitance.			*			
Science, Technology and Society Connections							
	• Apply the use of infra red waves in radiant heaters, optical fibre commutations and for the remote control of TV sets and VCR's.			*			
	• Describe the effect of ozone layer depletion.	*					
	• Illustrate the principle of metal detectors used for security checks.			*			
	• State the principle of electro-cardiograph in medical diagnostic.	*					
	• Describe the importance of oscillator circuit as broadcaster of radiowaves.	*					
	• Describe the principle of resonance in tuning circuits of a radio.	*					
	• Explain why transmission from some country TV channels are polarized at right angle to city channels.		*				

	• Realize that resonant circuits are main parts of metal detectors.			*			
PART-7(SOLID STATE PHYSICS)							
UNIT-18(PHYSICS OF SOLIDS)							
Classification of solids	• Distinguish between the structure of crystalline, amorphous and polymeric solids.				*		
Electrical properties of solids	• Describe the idea about energy bands in solids.	*					
	• Classify insulators, conductors, and semiconductors on the basis of energy bands.				*		
Magnetic properties of solids	• Distinguish between dia, para and Ferro magnetic materials.				*		
	• Describe the concepts of magnetic domains in a material.	*					
	• Discuss how magnetic induction varies with magnetizing current in ferromagnetic sample and hence describe hysteresis loop.			*			
	• Infer from hysteresis loop, hard and soft ferromagnetic substances.				*	*	
	• Realize that area of the hysteresis loop represents the energy loss per unit volume per cycle of magnetizing current.				*		
Science, Technology and Society Connections							
	• Describe the applications of superconductors in magnetic resonance imaging (MRI), magnetic levitation trains, powerful but small electric motors and faster computer chips.	*					

	• Identify the importance of hysteresis loop to select materials for their use to make them temporary magnets or permanent magnets.			*			
	• Describe the function and use of LED, Photodiode and Photo voltaic cell.	*					
	• Analyze that the modern world is the world of digital electronics.				*		
	• Analyze that the computers are the forefront of electronic technology.				*		
	• Realize that electronics is shifting low-tech electrical appliances to high-tech electronic appliances.				*		
	• Analyze behaviour of superconductors and their potential uses.				*		
UNIT-19(ELECTRONICS)							
Intrinsic and extrinsic semiconductors	• Distinguish between intrinsic and extrinsic semiconductors.				*		
	• Explain on the basis of presence of holes and free electrons the distinction between P & N type Semiconductors.		*				
PN Junction and its forward and reversed biased states	• Describe PN junction and explain how electrons and holes flow across a junction during forward and reverse biased conditions.	*					
	• Discuss the current voltage behavious of PN junction in forward and reverse biased conditions.		*				
Half and full wave rectification	• Describe half and full wave rectifiers and bridge rectifiers.	*					

Transistor and its characteristics	• Distinguish PNP & NPN transistors.				*		
	• Describe the operations of transistors.	*					
	• Deduce current equation and apply it to solve problems on transistors.					*	
Transistor as an amplifier (C-E configuration)	• Explain the use of transistors as a switch and an amplifier.		*				
Investigation Skills/Laboratory Work							
	• Draw characteristics of semiconductor diode and calculate forward and reverse current resistances.			*			
	• Study the half and full waver rectification by semiconductor diodes by displaying on C.R.O.	*					
	• Use multimeter to (i) identify base of transistor (ii) distinguish between NPN and PNP transistor (iii) see the unidirectional flow of current in case of diode and a led. • (to check whether a given electric component e.g. Diode or transistor is in working order.				*		
	• Demonstrate the amplification action of a transistor graphically by CRO			*			
PART-8(MODERN PHYSICS)							
UNIT-20(DAWN OF MODERN PHYSICS)							
Special theory of relativity	• Distinguish between inertial and non-inertial frames of reference.				*		
	• Describe the significance of Einstein's assumption of the constancy of the speed of light.	*					

	• Explain qualitatively and quantitatively the consequence of special relativity in relation to: • (a)length contraction • (b)time dilation • (c)mass increase • (d)the equivalence between mass and energy		*				
Photoelectric effect	• Describe the phenomenon of photoelectric effect on the basis of Einstein's Explanation.	*					
	• Solve problems and analyse information using: E = hf and c = f λ.			*			
	• Describe Photo voltaic cell as an application of Photoelectric effect.	*					
Compton's effect	• Describe Compton Effect qualitatively.	*					
Pair production and pair annihilation	• Explain the phenomena of pair production and pair annihilation.		*				
Wave nature of particles	• Understand that E2+B2 is proportional to chances of detection of photon.(wave particle duality)		*				
	• Understand that electric and magnetic fields are wave functions of photon.		*				
	• Derive E2=P2c2+mo2c4 using the formula for mass increase.			*			
	• Use E=hf and E=pc to derive p=h/λ for photon			*			
	• Understand how de-Broglie generalized p=h/λ to electron.		*				

	• Describe the confirmation of de Broglie's proposal by Davisson and Germer experiment in which the diffraction of electrons by the surface layers of a crystal lattice was observed.	*					
	• Understand that like photon, electron also has wave function whose square gives chances of detection of electron.		*				
Electron microscope	• Explain how the very short wavelength of electrons, and the ability to use electrons and magnetic fields to focus them, allows electron microscope to achieve very high resolution.		*				
Uncertainty Principle	• State uncertainty principle and discuss with the help of example.	*					
Bohr's Model of Hydrogen Atom	• State Three Postulates of Bohr's model of hydrogen atom.	*					
	• Understand that energy is discrete in Hydrogen atom and define atomic shells.		*				
X-Rays	• Explain Inner shell transition and characteristic X-rays.		*				
	• Analyze the process of X-ray Production.				*		
	• Explain Bremsstrahlung/Continuous X-rays.		*				
LASER	• Define LASER.	*					
	• Describe induced absorption, spontaneous emission, induced/stimulated emission.	*					
	• Understand Population Inversion and LASER Action.		*				
	• Understand working of He-Ne LASER.		*				
Investigation Skills/Laboratory Work							

	• Investigate the variation of electric current with intensity of incident light on a photocell.			*			
	• Determine Planck's constant using internal potential barrier of different light emitting diodes.			*			
Science, Technology and Society Connections							
	• Predict the motion of an object relative to a different frame of reference e.g. dropping a ball in a moving vehicle observed from the vehicle and by a person standing on the side walk.						*
	• Identify the role of special theory of relativity in global positioning, NAVSTAR system.			*			
	• Summarize the use of solar cell and photoelectric cell in our daily life.				*		
	• Search and describe the role of electron microscope to study the micro structures and properties of matter.			*			
	• Describe Uses of X-rays in medical science and industry.	*					
	• Describe Uses of LASER.	*					
UNIT-21(NUCLEAR PHYSICS)							
Composition of atomic nuclei	• Describe a simple model for the atom to include protons, neutrons and electrons.	*					
	• Determine the number of protons, neutrons and nucleons it contains for the specification of a nucleus in the form $^{A}_{z}X$.			*			
	• Define the terms unified mass scale.	*					

Isotopes	• Explain that an element can exist in various isotopic forms each with a different number of neutrons.		*				
Mass spectrograph	• Explain the use of mass spectrograph to demonstrate the existence of isotopes and to measure their relative abundance.		*				
Mass defect and binding energy	• Define mass defect and calculate binding energy using Einstein's equation.	*					
	• Illustrate graphically the variation of binding energy per nucleon with the mass number.			*			
	• Explain the relevance of binding energy per nucleon to nuclear fusion and to nuclear fission.		*				
Radioactivity (properties of α, β and γ rays)	• Identify that some nuclei are unstable, give out radiation to get rid of excess energy and are said to be radioactive.		*	*			
	• Understand that Electrostatic repulsive force is long range and Strong Nuclear attractive force is short range.		*				
	• Explain when no. of Neucleons increases and size of nucleus increases, then for some neucleons strong nuclear attractive force becomes negligible as compared to Electrostatic repulsive force. Hence nucleus becomes unstable.		*				
	• Describe that an element may change into another element when radioactivity occurs.	*					
	• Identify the spontaneous and random nature of nuclear decay.			*			
Half life and rate of decay	• Describe the term half life and solve problems using the equation λ=0.693/T1/2	*					

Interaction of nuclear radiation with matter	• Describe the interaction of alpha, beta, gamma rays with matter, Their penetration and range.	*					
Radiation detectors (GM counter and solid state detector)	• Describe the use of Geiger Muller counter and solid state detectors to detect the radiations.	*					
Nuclear reactions	• Explain that atomic number and mass number conserve in nuclear reaction.		*				
	• Determine the release of energy from different nuclear reactions.			*			
	• Describe energy and mass conservation in simple reactions and in radioactive decay.	*					
Nuclear fission (fission chain reaction)	• Describe the phenomena of nuclear fission.	*					
	• Describe the fission chain reaction.	*					
Nuclear reactors:	• Describe the function of various components of a nuclear reactor.	*					
Nuclear fusion (nuclear reaction in the Sun)	• Describe the phenomena of nuclear fusion.	*					
	• Describe nuclear fusion reactions in sun and other stars.	*					
Basic forces of nature	• Describe the basic forces of nature.	*					
Elementary particles and particle classification (hadrons, leptons and quarks)	• Describe the building blocks of matter including hadrons, leptons and quarks.	*					
Investigation Skills/Laboratory Work							
	• Simulate the radioactive decay of nuclei using a set of at least 100 dice and measure the simulated half life of the nuclei.			*			

	• Draw the characteristics curve of a Geiger Muller tube.						
	• Determine the amount of background radiation in your surroundings and identify their possible sources.			*			
	• Set up a G.M. point tube and show the detection of Alpha particles with the help of CRO and determine the count rate using a scalar unit.			*			
Science, Technology and Society Connections							
	• Explain the basic principle of nuclear reactor.		*				
	• Describe and discuss the function of the principle components of a water moderated power reactor (core, fuel, rods, moderator, control rods, heat exchange, safety rods and shielding).	*					
	• Explain why the uranium fuel needs to be enriched.		*				
	• Compare the amount of energy released in a fission reaction with the (given) energy released in a chemical reaction.				*		
	• Describe how the conditions in the interiors of the Sun and other stars allow nuclear fusion to take place and hence, how nuclear fusion is their main energy conversion process.	*					
	• Show an awareness about nuclear radiation exposure and biological effects of radiation.			*			
	• Describe the term dosimeter.	*					
	• Describe the use of radiations for medical diagnosis and therapy.	*					

	• Explain the importance of limiting exposure to ionizing radiation.		*				
	• Describe the examples of the use of radioactive tracers in medical diagnosis, agriculture and industry.	*					
	• Assess Biological and medical uses of radiations (radiation therapy, diagnosis of diseases, tracers techniques)					*	