Topics and Student Learning Outcomes of the Examination Syllabus

Part – I (Class XI)

Topics	Student Learning Outcomes	Cognitive level[2]		
		K	**U**	**A**
1. Measurement	**Candidates should be able to:**			
1.1 Scope of physics	1.1.1 describe the importance of physics in science, technology and society;	*		
1.2 S.I Units	1.2.1 describe S.I base units, derived units and supplementary units for various measurements;		*	
	1.2.2 show the derived units as products or quotients of the base units;			*
1.3 Errors and Uncertainty	1.3.1 differentiate between systematic and random errors;		*	
	1.3.2 identify the uncertainty in the derived quantity;			*
1.4 Precision and Accuracy	1.4.1 give two differences between precision and accuracy;		*	
1.5 Significant figures	1.5.1 show answers with correct scientific notations, number of significant figures in all numericals;			*
	1.5.2 identify that least count (L.C) of an instrument is the smallest increment measurable by it;			*
1.6 Dimensions	1.6.1 show the homogeneity of three physical equations by using dimension and basic units;			*
	1.6.2 derive formula for three physical quantities by using dimensions.			*

[2] K = Knowledge, U = Understanding, A= Application (for explanation see section 6: Definition of command words used in Student Learning Outcomes and in Examination Questions).

2. Vectors and Equilibrium	**Candidates should be able to:**		**K**	**U**	**A**
2.1 Cartesian coordinate system	2.1.1	describe the Cartesian coordinate system in two and three dimension systems;	*		
2.2 Addition of vectors by head to tail rule	2.2.1	explain the sum of vectors using head to tail rule;		*	
	2.2.2	define resultant, negative, unit, null, position and equal vectors;	*		
	2.2.3	represent a vector into its rectangular components;			*
2.3 Addition of vectors by rectangular component method	2.3.1	determine the sum of vectors using perpendicular components;			*
2.4 Scalar product of two vectors	2.4.1	define scalar product of two vectors;	*		
	2.4.2	describe the scalar product of two vectors in terms of angle between them;		*	
	2.4.3	discuss any five properties of scalar product of two vectors;		*	
2.5 Vector product of two vectors	2.5.1	define vector product of two vectors;	*		
	2.5.2	describe vector product of two vectors in terms of angle between them;		*	
	2.5.3	discuss any five properties of vector product;		*	
2.6 Torque	2.6.1	define torque as a vector product of $\vec{\mathbf{r}} \times \vec{\mathbf{F}}$;	*		
	2.6.2	list two applications of torque;	*		
2.7 Equilibrium of forces	2.7.1	define equilibrium;	*		
	2.7.2	state first and second condition of equilibrium.	*		

3. Motion and Force	Candidates should be able to:		K	U	A
3.1 Displacement	3.1.1	define displacement with illustrations;	*		
3.2 Velocity	3.2.1	define velocity, average velocity and instantaneous velocity with illustrations;	*		
	3.2.2	define acceleration, average acceleration and instantaneous acceleration;	*		
	3.2.3	manipulate velocity-time graph for constant direction and understand significance of area under velocity-time graph;			*
3.3 Acceleration	3.3.1	summarize the equations of motion for uniformly accelerated bodies in a straight line and in uniform gravitational field in a non-resistive medium;		*	
3.4 Equations of motion	3.4.1	state Newton's laws of motion;	*		
3.5 Force, Momentum and Impulse	3.5.1	describe the relation between Newton's 2nd law of motion and the rate of change of momentum;		*	
	3.5.2	infer impulse as product of impulsive force and time;		*	
	3.5.3	describe law of conservation of momentum;		*	
	3.5.4	apply law of conservation of momentum and study the special cases of elastic collision between two bodies in one dimension;			*
	3.5.5	describe the force produced due to flow of water;		*	
	3.5.6	apply the law of conservation of momentum to study explosive forces;			*
3.6 Projectile	3.6.1	explain forces applied on the process of rocket propulsion;		*	
	3.6.2	define projectile, projectile motion and trajectory of projectile;	*		
	3.6.3	describe projectile motion in non-resistive medium;		*	
	3.6.4	derive the relation for time of flight, maximum height and horizontal range of a projectile;		*	
	3.6.5	relate the motion of ballistic missiles with projectile motion.		*	

4. Work, Power and Energy	**Candidates should be able to:**		**K**	**U**	**A**
4.1 Work	4.1.1	define work;	*		
	4.1.2	describe work when force and displacement are acting at an angle (θ);	*		
	4.1.3	list three different units of work;	*		
	4.1.4	distinguish between positive, negative and zero work with three examples;		*	
	4.1.5	describe work done by variable and constant forces;	*		
4.2 Work done in a gravitational field	4.2.1	explain the work done in a gravitational field;		*	
4.3 Power	4.3.1	define power. Also write down its dimension;	*		
	4.3.2	list three different units of power;	*		
	4.3.3	derive a formula of power in terms of force and velocity;			*
4.4 Energy	4.4.1	define energy;	*		
	4.4.2	differentiate between potential and kinetic energy;			*
	4.4.3	write three different units of energy;			*
4.5 Work-energy relation	4.5.1	describe how energy is related with work			*
	CASES				
	(i)	when friction is present			
	(ii)	when friction is not present;			
4.6 Absolute gravitational energy	4.6.1	analyse the absolute gravitational energy and derive an expression for absolute P.E;			*
4.7 Escape velocity	4.7.1	describe the concept of escape velocity;	*		
	4.7.2	derive the formula for escape velocity;		*	
	4.7.3	compute escape velocity for the Moon and the Earth when mass and radius of the bodies are given;			*

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4.8 Conservation of energy	4.8.1	state and explain the law of conservation of energy;		*	
	4.8.2	interconversion of potential energy and kinetic energy in a resistive medium;	*		
4.9 Types of energy sources	4.9.1	list the conventional and non-conventional energies;	*		
	4.9.2	describe the uses of energy.			*
5. Circular Motion	**Candidates should be able to:**				
5.1 Angular motion	5.1.1	define angular displacement, angular velocity and angular acceleration;	*		
	5.1.2	produce the relation between linear and angular displacement, velocity and acceleration;	*		
5.2 Centripetal force and Centripetal acceleration	5.2.1	define centripetal force and centripetal acceleration;	*		
	5.2.2	derive centripetal acceleration when velocity is uniform;		*	
	5.2.3	convert centripetal acceleration in terms of angular velocity;		*	
5.3 Moment of inertia	5.3.1	define moment of inertia;	*		
	5.3.2	define the formula for moment of inertia;		*	
5.4 Angular momentum	5.4.1	define angular momentum;	*		
	5.4.2	write S.I unit and dimension of angular momentum;		*	
	5.4.3	state and explain law of conservation of angular momentum;	*		
5.5 Rotational kinetic energy	5.5.1	define rotational kinetic energy;	*		
	5.5.2	derive an expression for rotational kinetic energy;		*	
5.6 Artificial satellites and weightlessness	5.6.1	define weightlessness in artificial satellites;	*		
	5.6.2	categorize the different types of satellites;		*	
	5.6.3	explain how artificial gravity can be produced when a satellite revolves around the earth;			*

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5.7 Orbital velocity	5.7.1	define orbital velocity;	*		
	5.7.2	derive a relation for orbital velocity;		*	
5.8 Newton's and Einstein's views on gravitation	5.8.1	differentiate between Newton's and Einstein views on gravitation.		*	
6. Fluid Dynamics	**Candidates should be able to:**				
6.1 Streamline and Turbulent flow	6.1.1	define streamline and turbulent flow and state the conditions for turbulent flow;		*	
6.2 Equation of continuity	6.2.1	derive the equation of continuity and on the basis of this equation describe the motion of a rocket;		*	
6.3 Bernoulli's equation	6.3.1	derive Bernoulli's equation;			*
	6.3.2	interpret and apply Bernoulli Effect in the; filter pump, venturi meter and atomizers;			*
	6.3.3	solve problems by the help of Bernoulli's equation;			*
6.4 Viscous fluids	6.4.1	define viscous and non-viscous fluids;	*		
	6.4.2	describe that viscous force in a fluid causes a retarding force on an object moving through it;		*	
6.5 Fluid friction	6.5.1	define fluid friction;	*		
	6.5.2	apply dimensional analysis to confirm the form of the stokes law;			*
	6.5.3	apply Stokes law to derive an expression for terminal velocity of spherical body falling through viscous fluids;			*
6.6 Terminal velocity	6.6.1	define terminal velocity and describe the factors on which it depends.	*		

7. Oscillations	Candidates should be able to:		K	U	A
7.1 Simple harmonic motion (SHM)	7.1.1	define the following terms: oscillatory motion, periodic motion, time period, frequency, amplitude;	*		
	7.1.2	state and derive Hook's law;	*		
	7.1.3	derive an expression for acceleration of a body vibrating under elastic restoring force;		*	
7.2 Uniform circular motion and SHM	7.2.1	discuss SHM on the basis of uniform circular motion;		*	
	7.2.2	derive expression for displacement, instantaneous velocity and acceleration in terms of (ω);		*	
7.3 Phase	7.3.1	define phase angle;	*		
	7.3.2	derive an expression for the displacement "x";		*	
7.4 A horizontal mass-spring system.	7.4.1	derive an expression for instantaneous velocity in case of horizontal mass-spring system;			*
7.5 Simple pendulum	7.5.1	define simple pendulum also show that its motion is SHM;	*		
	7.5.2	derive an expression for the time period of simple pendulum;		*	
7.6 Energy conservation in SHM	7.6.1	relate between P.E, K.E and total energy for a body oscillating with SHM;		*	
7.7 Free and Forced oscillation	7.7.1	explain free and forced oscillation with three examples;		*	
7.8 Resonance	7.8.1	explain the phenomenon of resonance, give its three examples also list its different applications;		*	
7.9 Damped oscillations	7.9.1	define damped oscillation, list down its different applications.	*		

8. Waves	**Candidates should be able to:**		**K**	**U**	**A**
8.1 Wave motion	8.1.1	define wave motion with the help of two examples;	*		
	8.1.2	define periodic waves;	*		
	8.1.3	describe the propagation of waves with the help of an example;		*	
	8.1.4	define progressive waves;	*		
	8.1.5	explain how energy is transferred through a progressive wave;		*	
	8.1.6	differentiate between transverse and longitudinal waves;		*	
	8.1.7	show the relation $V = \upsilon \lambda$;		*	
8.2 Speed of sound	8.2.1	show that the speed of sound depends on the properties of medium in which it propagates;		*	
	8.2.2	describe Newton's formula for speed of sound;	*		
	8.2.3	discuss Laplace's correction in Newton's formula;		*	
	8.2.4	manifest the effects of pressure, density and temperature on the speed of sound in air;		*	
	8.2.5	show the expression $V = V_o + 0.61\ t$;		*	
8.3 Superposition of waves	8.3.1	state the principle of superposition of two waves;	*		
	8.3.2	describe the phenomenon of interference of sound waves;		*	
	8.3.3	discriminate the formation of beats giving an illustration;			*
8.4 Stationary waves	8.4.1	define stationary waves and describe their formation using graphical approach;	*		
	8.4.2	define the terms nodes and antinodes;	*		
	8.4.3	describe with illustration the formation of stationary waves in string;			*
	8.4.4	identify the formation of stationary waves in a vibrating air column;			*
	8.4.5	describe modes of vibration in string and explain using $L = n \lambda / 2$;		*	

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8.5 Doppler's effect	8.5.1	define Doppler's effect;	*		
	8.5.2	derive the relation between the original frequency of source of sound and the apparent frequency detected by the listener in four different conditions;		*	
	8.5.3	explain that the Doppler's effect is also applicable in electromagnetic waves;		*	
	8.5.4	apply Doppler's effect to understand the following: radar, sonar, astronomy and satellites;			*
8.6 Ultrasonic waves	8.6.1	define ultrasonic waves;	*		
	8.6.2	determine the principle of generation and detection of ultrasonic waves;		*	
	8.6.3	interpret the principle used in ultrasound for diagnostic purposes.			*
9. Physical Optics	**Candidates should be able to:**				
9.1 Nature of light	9.1.1	discuss different point of views about nature of light briefly;	*		
	9.1.2	understand the concept of wave front;		*	
	9.1.3	state Hygen's principle and use it to explain linear superposition of light;	*		
9.2 Interference of light	9.2.1	define interference of light and necessary conditions for it;	*		
	9.2.2	describe and explain Young's double slit experiment;		*	
	9.2.3	derive relation for fringe spacing;			*
9.3 Interference in thin films	9.3.1	give basic concept of interference in thin films;		*	
9.4 Newton's ring	9.4.1	explain the phenomenon of formation of Newton's rings and give three examples;		*	
9.5 Michelson's interferometer	9.5.1	understand the working and use of Michelson's interferometer;		*	

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9.6 Diffraction of light	9.6.1	define diffraction of light;	*		
	9.6.2	describe diffraction of light by diffraction gratting;		*	
	9.6.3	describe and explain diffraction in a narrow slit;		*	
	9.6.4	describe X-rays diffraction through crystals;		*	
9.7 Bragg's law	9.7.1	define Bragg's law;	*		
	9.7.2	derive the equation 2 d sin θ = m λ;			*
9.8 Polarization	9.8.1	define polarization;	*		
	9.8.2	understand polarization as a phenomenon associated with transverse waves;		*	
	9.8.3	recognize and express that polarization is a product by a polaroid.			*
10. Thermodynamics	**Candidates should be able to:**				
10.1 Kinetic theory of gases	10.1.1	state basic postulates of kinetic theory of gases;	*		
	10.1.2	calculate pressure on a gas molecule inside a gas container;			*
	10.1.3	interpret temperature in terms of kinetic energy;		*	
10.2 Gas laws	10.2.1	define Boyle's and Charle's law with the help of kinetic theory;	*		
10.3 Internal energy	10.3.1	explain that internal energy is function of state and is independent of paths;	*		
10.4 Work and heat	10.4.1	describe that heat flow and work are two form of energy transfer between systems and calculate the heat beings transferred;		*	
	10.4.2	express work in terms of change in volume;		*	

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10.5 Thermodynamics	10.5.1	define thermodynamics and thermal equilibrium;	*		
	10.5.2	state and explain 1st law of thermodynamics;		*	
	10.5.3	apply the 1st law of thermodynamics in (i) isothermal, (ii) adiabatic, (iii) isobaric, (iv) isochoric;			*
	10.5.4	describe 1st law of thermodynamics in terms of change in internal energy, work done on the system and work done by the system;			*
	10.5.5	explain 1st law of thermodynamics in terms of conservation of energy;		*	
10.6 Specific and Molar specific heat of gases.	10.6.1	define the terms: (i) specific heat (ii) molar specific heat;	*		
	10.6.2	apply 1st law of thermodynamics to show that $C_p - C_v = R$, also explain $C_p > C_v$;			*
10.7 Reversible and Irreversible process	10.7.1	define reversible and irreversible process;	*		
10.8 Second Law of thermodynamics	10.8.1	state and explain the 2nd law of thermodynamics with the help of schematic diagram;		*	
10.9 Carnot engine	10.9.1	define heat engine in terms of 2nd law of thermodynamics;	*		
	10.9.2	explain the working principle of carnot engine with its four processes and also draw PV diagram;			*
	10.9.3	derive the formula for efficiency of carnot engine and explain it;			*

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10.10	Refrigerator	10.10.1 describe refrigerator as it is a reverse of heat engine and derive expression for its efficiency;		*	
10.11	Entropy	10.11.1 explain the term entropy;	*		
		10.11.2 describe positive and negative entropy;		*	
		10.11.3 explain that increase in entropy is an evidence of increase of temperature of a system;			*
		10.11.4 appreciate environmental crisis as an entropy crisis.	*		

Part-II (Class XII)

			K	U	A
11. Electrostatics	**Candidates should be able to:**				
11.1 Electrostatics	11.1.1	define charge and types of charge;	*		
11.2 Coulomb's law	11.2.1	state and explain Coulomb's law for static charges;		*	
	11.2.2	describe briefly the effect of medium on coulomb's force;		*	
	11.2.3	apply the principle of electrostatic phenomenon on ink-jet printer and photocopier;			*
11.3 Electric field and Electric intensity	11.3.1	define electric intensity and derive an expression for the magnitude of electric field of a distance or from a point charge "q";	*		
	11.3.2	draw electric field lines due to (i) same charges, (ii) opposite charges;		*	
	11.3.3	describe the concept of electric dipole;	*		
11.4 Electric flux	11.4.1	define and explain electric flux;		*	
11.5 Gauss's law with its applications	11.5.1	state and explain Gauss's law;		*	
	11.5.2	apply Gauss's law to find field due to a hollow charged spherical conductor near charged plane surface and between two oppositely charged plates;			*
11.6 Electric potential	11.6.1	define electric potential at a point in terms of work done in bringing a unit charge from infinity to that point;	*		
	11.6.2	define unit of electric potential;	*		
	11.6.3	describe electric field as potential gradient;		*	
	11.6.4	define electron volt (eV);	*		

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11.7 Capacitor	11.7.1	define capacitance of a capacitor and its S.I unit;	*		
	11.7.2	describe functions of capacitors in simple circuit by drawing a labelled diagram;			*
	11.7.3	calculate capacitance of different capacitors in series and in a parallel using formulas;		*	
	11.7.4	explain polarization of dielectric of a capacitor;		*	
11.8 Energy stored in a capacitor	11.8.1	prove that energy stored in a capacitor is $W = ½ QV$ and $W = ½ CV^2$.		*	
12. Current Electricity	**Candidates should be able to:**				
12.1 Current Electricity	12.1.1	define current;	*		
	12.1.2	describe the flow of current in a conductor;	*		
	12.1.3	distinguish any two points between conventional and non-conventional current;		*	
12.2 Resistance	12.2.1	define resistance and conductance;	*		
	12.2.2	define voltage;	*		
	12.2.3	state Ohm's law and give one example of a conductor which obeys ohm's law;		*	
	12.2.4	explain any three factors on which resistance depends;		*	
	12.2.5	explain non-ohmic relationship between current and voltage for semi-conductor diode and a filament lamp;		*	

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12.3 Resistivity and Conductivity	12.3.1	define resistivity;	*		
	12.3.2	define conductivity;	*		
	12.3.3	give three differences between resistivity and conductivity;		*	
	12.3.4	derive a relation between resistance and resistivity;		*	
	12.3.5	show a relation between temperature and resistance;			*
	12.3.6	calculate the value of carbon resistance by using colour code.			*
12.4 Internal resistance	12.4.1	define emf;	*		
	12.4.2	derive a relation between emf and P.D with the help of formula;		*	
	12.4.3	give any two examples of effect of internal resistance on external circuit in terms of current and voltage;		*	
	12.4.4	define power;	*		
	12.4.5	calculate the formula of power in terms of I, V and R;			*
	12.4.6	calculate the power dissipation due to the internal resistance of a circuit;			*
12.5 Kirchoff's laws	12.5.1	state Kirchoff's Laws;		*	
	12.5.2	show conservation of charge in a circuit with the help of Kirchoff's 1st law;			*
	12.5.3	show conservation of energy in a circuit with the help of Kirchoff's 2^{nd} law;			*
12.6 Potential divider	12.6.1	define potential divider with two examples;	*		
	12.6.2	briefly explain the construction and working of a rheostat with the help of a diagram;		*	
	12.6.3	explain the functions of a rheostat as a potential divider;		*	

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12.7 Balanced potential	12.7.1	define Wheatstone bridge with the help of diagram;	*		
	12.7.2	describe the usage of Whetstone bridge to measure unknown resistance;		*	
	12.7.3	define potentiometer with the help of diagram;	*		
	12.7.4	demonstrate the measurement and comparison of emfs by using potentiometer;		*	
	12.7.5	show that potentiometer is the most accurate device for emf's measurement and comparison.			*
13. Electromagnetisms	**Candidates should be able to:**				
13.1 Current carrying conductor in a magnetic field	13.1.1	define domain theory;	*		
	13.1.2	give a comparison between strong and weak magnetic fields;		*	
	13.1.3	derive an expression for force F = ILB $\sin\theta$;		*	
	13.1.4	differentiate between magnetic flux and magnetic flux density;	*		
	13.1.5	give the factors governing field produced by long straight wire;			*
	13.1.6	derive the equation for flux $\phi = \vec{B}.\vec{A}$;		*	
	13.1.7	state and explain Ampere's current law and its use to find the magnetic flux density inside a solenoid;		*	
	13.1.8	give applications of Ampere's law;			*
13.2 Force on a moving charged particle	13.2.1	derive equation for force on a moving charge in a uniform magnetic field and (beam of particles);		*	
	13.2.2	calculate e/m value by using beam of charged particles in a uniform magnetic field;		*	

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13.3 Cathode rays oscilloscope (CRO)	13.3.1	briefly describe basic principle and uses of CRO;		*	
13.4 Current carrying rectangular coils in a uniform magnetic field	13.4.1	derive an expression of torque due to a couple acting on a coil;		*	
	13.4.2	define sensitivity of galvanometer;	*		
13.5 Electrical instruments	13.5.1	briefly explain the principle, construction and working of galvanometer, voltmeters , ammeter, AVO meter analogue and digital multimetre (DMM);			*
	13.5.2	explain different types of galvanometer;		*	
	13.5.3	list the important steps to change G.M into voltmeter and ammeter.			*
14. Electromagnetic induction	**Candidates should be able to:**				
14.1 Law of electromagnetic induction	14.1.1	describe electromagnetic induction;	*		
	14.1.2	explain Faraday's law of electromagnetic induction;			*
	14.1.3	apply Lenz's law to determine the direction of induced emf;			*
14.2 Inductance	14.2.1	distinguish between inductance and induction;		*	
	14.2.2	explain self and mutual induction with formula and define its units;		*	
14.3 Energy stored in an inductor	14.3.1	evaluate the formula $E = \frac{1}{2} L I^2$ and show how the energy is stored in an inductor;	*		
14.4 Simple AC generator, DC generator and DC motor	14.4.1	describe principle, construction and working of an AC and DC generator;	*		
	14.4.2	difference between AC and DC generators;		*	
	14.4.3	Identify back emf in motor and back motor effect in generator;		*	

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14.5 Transformer	14.5.1	describe the principle, construction and working of a transformer;	*		
	14.5.2	differentiate between step up and step down transformer;		*	
	14.5.3	uses of step up and step down transformers in daily life;			*
	14.5.4	show $\frac{N_s}{N_p} = \frac{V_s}{V_p}$ and $V_s I_s = V_p I_p$ for an ideal transformer, use given equation to solve problems;		*	
	14.5.5	describe the simple energy losses due to eddy current and hystersis.	*		
15. Alternating Current	**Candidates should be able to:**				
15.1 Root mean square value (rms)	15.1.1	define alternating current;	*		
	15.1.2	describe time period, frequency, the peak and rms value of alternate current and alternate voltage;	*		
	15.1.3	interpret sinusoidal waves;	*		
15.2 AC Circuits	15.2.1	explain flow of AC through resister, capacitor and inductor;		*	
	15.2.2	show how 'phase lag lead' in a circuit through a vector diagram;		*	
15.3 Impedance	15.3.1	describe impedance as vector summation of resistance in series (R-C and R-L) circuits);	*		
15.4 Power in AC circuits	15.4.1	knowledge and uses of formula for AC power P = VI cos θ (power factor), use this equation in solving problems;			*

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15.5 Resonant circuit	15.5.1	generalise knowledge about the resonance circuit and quantitative understanding of the properties of the circuits containing inductors and capacitors in series and parallel;	*		
	15.5.2	outline the principle of metal detector for security checks and choke coil;			*
	15.5.3	know the uses of cardiogram;			*
15.6 Three phase AC supply	15.6.1	describe three phase AC supply;		*	
15.7 Electromagnetic waves	15.7.1	know the electromagnetic waves and spectrum (ranging from radio waves to gamma rays);	*		
	15.7.2	know the production, transmission and receptions of EM waves;			*
	15.7.3	describe the amplitude modulation (A.M) and frequency modulation (F.M).		*	
16. Physics of Solids	**Candidates should be able to:**				
16.1 Classification of solids	16.1.1	distinguish between the structure of crystalline, amorphous and polymeric solids;	*		
	16.1.2	define lattice and unit cell;	*		
16.2 Mechanical properties of solids.	16.2.1	differentiate between elastic and plastic deformations in solids;		*	
	16.2.2	define tensile compression stress;	*		
	16.2.3	define Young's modulus, shear modulus and bulk modulus and derive their formulae;	*		
	16.2.4	define elastic limit and yields strength;	*		
	16.2.5	deduce the strain energy in a deform materials from the area under the force extension graph;			*

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16.3 Electric properties of solids	16.3.1	define conductors, insulators and semi conductors;	*		
	16.3.2	describe energy bands in solids;		*	
	16.3.3	define energy gaps in insulators, intrinsic and extrinsic semi conductors;	*		
16.4 Super conductors	16.4.1	to become familiar with the behaviour of super conductors and their potential uses;	*		
16.5 Magnetic properties of solids	16.5.1	describe dia, para and ferro magnetic solids;	*		
	16.5.2	describe ferro magnets as a special case of para-magnets, magnetic dipoles and domains;		*	
	16.5.3	define curie point, paramagnetic substances, dia-magnets substances, ferro- magnetic substances, soft and hard magnetic substances.	*		
17. Electronics	**Candidates should be able to:**				
17.1 Electronics	17.1.1	define electronics;	*		
17.2 Semi-conductors devices	17.2.1	difference between conductors and insulators;		*	
	17.2.2	explain semi-conductors;		*	
	17.2.3	differentiate p-type and n-type semi-conductors with the help of diagrams;		*	
	17.2.4	define p-n junction and p-n junction diode with labelled diagrams;	*		
	17.2.5	define forward and reverse bias;	*		
	17.2.6	explain direct current;		*	
	17.2.7	define rectification;	*		
	17.2.8	define half and full wave rectification;	*		
	17.2.9	describe the function and uses of LEDs and photo diode;	*		
	17.2.10	define transistor;	*		
	17.2.11	distinguish between PNP and NPN transistor;		*	
	17.2.12	deduce current equation and its application;			*

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17.3 Operational amplifier	17.3.1	explain the uses of transistor as a switch and as a amplifier;		*	
17.4 Digital system	17.4.1	differentiate between analogue and digital system;		*	
	17.4.2	describe logic gates and show their function with the help of truth table;			*
	17.4.3	explain and relate different logic gates and their control function.			*
18. Dawn of Modern Physics	**Candidates should be able to:**				
18.1 Special theory of relativity	18.1.1	distinguish between inertial and non-inertial frames of reference with two points;		*	
	18.1.2	explain any two postulates of special theory of relativity;		*	
	18.1.3	identify that if (C) is constant then space and time become relative;	*		
	18.1.4	show any four consequences of special theory of relativity;			*
	18.1.5	explain the implification of mass increase, time dilation and length contraction for speed travel;		*	
18.2 Quantum theory	18.2.1	discuss the black body radiations with the help of wavelength-energy graph;		*	
	18.2.2	describe any four laws governing black body radiations with their draw backs;		*	
	18.2.3	explain planks hypothesis for black body;	*		
	18.2.4	show that the radiations emitted and absorbed by black body is quantized;		*	
	18.2.5	identify photon as an electromagnetic radiation;		*	
18.3 Photoelectric effect	18.3.1	describe the phenomenon of photoelectric effect;	*		
	18.3.2	explain different features of photoelectric effect with the help of graph;		*	
	18.3.3	derive Einstein's photoelectric equation;		*	
	18.3.4	define photocell;	*		
	18.3.5	give any three uses of photocell;			*

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18.4 Compton's effect	18.4.1	give short account on Compton's effect;	*		
	18.4.2	compare the phenomenon of pair production and pair annihilation;		*	
	18.4.3	give short account on particle nature of light;		*	
	18.4.4	briefly describe the wave nature of light;		*	
	18.4.5	conclude the nature of light;		*	
	18.4.6	state de-Broglie's hypothesis;	*		
	18.4.7	explain de-Broglie's hypothesis to show that every particle has wave nature as well as particle nature;		*	
	18.4.8	describe Davvison and Germer experiment;	*		
	18.4.9	state uncertainty principle;	*		
	18.4.10	explain uncertainty principle with the help of experiment.		*	
19. Atomic Spectra	**Candidates should be able to:**				
19.1 Atomic Spectra, Spectrum of Hydrogen, Bohr's model of Hydrogen atom	19.1.1	describe the origin of different types of optical spectra;	*		
	19.1.2	analyze the experimental facts of hydrogen spectrum;			*
	19.1.3	describe Bohr's postulate of atomic model of hydrogen atom;	*		
	19.1.4	explain hydrogen spectrum in terms of energy levels;		*	
	19.1.5	produce the expression for quantized radii;			*
	19.1.6	prove $\frac{1}{\lambda} = R_H\left[\frac{1}{p^2} - \frac{1}{n^2}\right]$;			*
19.2 Emission of spectral lines	19.2.1	deduce spectral lines through discrete electron energy level;	*		
19.3 Excitation and Ionization potential	19.3.1	define excitation potential and ionization potential;		*	
	19.3.2	determine the ion energy and various excitation energy of an atom using an energy level diagram;	*		

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19.4 Inner shell transition and Characteristics	19.4.1	describe inner shell transitions;		*	
	19.4.2	explain production and characteristics of X-rays by understanding inner shell transition;		*	
	19.4.3	explain how X-rays are produced, write down any five properties and uses of X-rays;		*	
19.5 LASER	19.5.1	explain the terms spontaneous emission, stimulated emission, meta-stable state,. population inversion and laser action;	*		
	19.5.2	describe the structure and purpose of main component of He-Ne laser gas.		*	
20. Nuclear Physics	**Candidates should be able to:**				
20.1 Composition of atomic model	20.1.1	describe simple model of an atom to include electrons, protons and neutrons;		*	
20.2 Atomic no, mass no, isotopes, isobars	20.2.1	define atomic number, mass number, isotopes and isobars;	*		
	20.2.2	determine number of protons, neutrons and nucleons for the specification of nucleus in the form ${}^{A}_{Z}X$;		*	
20.3 Mass spectrograph	20.3.1	describe the principle, construction and working of mass spectrograph;	*		
20.4 Mass defect and Binding energy	20.4.1	define the terms mass defect, binding energy and draw graphically variation of binding energy per nucleon with the help of mass number;	*		
20.5 Radioactivity	20.5.1	define radioactivity, list the properties of α, β *and* γ radiations;	*		

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20.6 Law of radioactive decay	20.6.1	explain the phenomenon of radioactive decay and also describe α, β *and* γ decay with balance equations;		*	
	20.6.2	define half-life of a radioactive element;		*	
	20.6.3	drive the equation for two half-life from the decay of radioactive element;		*	
20.7 Detection of ionizing radiation	20.7.1	briefly describe the interaction between α, β particle and γ rays with matter;		*	
	20.7.2	detect the nature of radiations emitted from a radioactive particle by using Wilson cloud chamber, G.M counter and Solid state detector;			*
20.8 Nuclear fission and fusion	20.8.1	describe the phenomena of nuclear fission and fusion;		*	
20.9 Nuclear reactor	20.9.1	explain the working principle of a nuclear reactor.		*	
	20.9.2	list the various types of nuclear reactor;	*		
20.10 Nuclear radiations and exposure	20.10.1	give the awareness about nuclear radiation exposure and biological effects of radiations.		*	
20.11 Medical physics	20.11.1	describe in simple terms the uses of radiations for medical diagnosis and therapy;		*	
	20.11.2	understand qualitatively the importance of limiting exposure to ionizing radiations;		*	
20.12 Basic forces of nature	20.12.1	describe basic forces of nature;	*		
20.13 Building blocks of nature	20.13.1	describe the modern view of the building blocks of matter based on hadrons, leptons and quarks.	*		