Disc 1 - Ways of obtaining information		
Topic	Lesson Name	
What does physics deal with? Sources of information	The oldest science     What do we need physics for?	
How do we get to know the world?	How to collect information     Is it possible to plan scientific discoveries?     Basic notions of physics     Physical units     Discovering regularities	

# **EduROM – Physics Topic and Lesson List**

	Disc 2 - Forces and their effects
Topic	Lesson Name
How to describe the motion of a body?	What is motion?     Does only a tram move along a rail?     How to describe the motion of a body?
Uniform rectilinear motion	Studying uniform rectilinear motion     Graphic presentation of motion
Distance and velocity in uniform rectilinear motion	Relation between distance and time     Distance travelled depends on time     Graphic presentation of velocity     Units of velocity
Velocity as a vector quantity. The relativity of velocity	Velocity is a vector     Relativity of movement     Vector addition
Changes in velocity	Acceleration and retardation     Graphic presentation of the relation between location and time     Graphic presentation of the relation between velocity and time     Curvilinear motion
Path in uniform rectilinear motion and in uniform accelerated motion	Graphic representation of path     Is it possible to express area in metres?     Consolidationexercises
Interactions between bodies	Interaction between bodies is called force     Application of force may result in changes of velocity     Application of force may result in changes in shape
Graphical presentation of force	Force is a vector quantity     How to measure force magnitude?     Adding up component forces of the same direction     Adding up component forces of opposite directions
Adding up forces acting in different directions	How to substitute forces acting in different directions?     Parallelogram law     Adding up several vectors. "Initial to terminal point" method
Weight of a body	1. Why do things fall? 2. What do people know about gravitation? 3. Mass 4. Weight 5. Weight on the Moon 6. Weight and mass – what is the difference? 7. Pressure
Properties of friction	Friction impedes movement     What does the force of friction depend on?     Friction between smooth surfaces
The significance of friction	Walking involves friction     Let's skate     How to minimise friction?     Why does liquid reduce the force of friction?     Streamlined shapes

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Disc 3 - Work, Power and Mechanical energy		
Topic	Lesson Name	
Work	When do we work?     How to calculate the value of the performed work?     Unit of work     When is there no work done?	
Power	1. What is machine power? 2. How to calculate power 3. Power of a car engine 4. How to measure your own physical efficiency?	
Equilibrium principle of first class levers	What is a first class lever?     How does a first class lever work?     Application of the equilibrium principle of first class levers	
Types of first class levers	What does weighing on a laboratory balance consist of?     How to prepare a balance for weighing?     Fixed pulley	
Second class levers	Diagram of second class levers     How do second class levers work?     Applications of second class levers     Movable pulley     Equilibrium principle of a movable pulley     What are the advantages of combining two pulleys?	
Winch. Toothed gear	Structure of a winch     What are gears used for?	
Inclined plane. Screw	What are the advantages of using an inclined plane?    What force is needed to move a body along an inclined plane?    What does the force effort depend on?    Other applications of an inclined plane. Screw	
Do simple machines decrease the amount of the work performed?	First class lever     Movable pulley     Inclined plane	
Simple machines efficiency coefficient	Simple machines efficiency coefficient     Examples of how to calculate machine efficiency coefficient	
Potential energy of elasticity	What is energy?     Winding up a clock spring     What does "potential" mean     What does the magnitude of the potential energy of elasticity stored in a spring depend on?     Relation between work and potential energy of elasticity	
Potential energy of weight	1. How to change the potential energy of weight? 2. Relativity of the potential energy of weight 3. Examples of changes of the potential energy of weight	
Kinetic energy	Kinetic energy     What does the kinetic energy of a body depend on?     How to calculate the kinetic energy of a body?     Applications of kinetic energy	
Reciprocal transformations of mechanical energy.	Conservation of mechanical energy law     Is it possible to convert the potential energy of weight into kinetic energy?     Is it possible to convert kinetic energy into the potential energy of weight?     Conservation of mechanical energy law	
Impact of friction on the mechanical energy possessed by a body	What makes bodies stop? What happened to the kinetic energy of a body that stopped? What happens to the mechanical energy of bodies while they are falling through the air?	
Accidents and crashes	When does a car start to move down an inclined plane?     Braking distance. Pedestrians, be careful!     What happens to the kinetic energy of a car in a crash?     How to protect the passengers	

# **EduROM – Physics Topic and Lesson List**

Disc 3 - Work, Power and Mechanical energy		
Topic	Lesson Name	
Types of equilibrium	How to find the centre of gravity	
	Point of support in the centre of gravity	
	3. Stable equilibrium	
	Unstable equilibrium	
	Neutral equilibrium	
	<ol><li>How to prevent loss of balance?</li></ol>	
Energy processes taking place inside the	Energetic effects of biological processes	
human body	Approximate energetic effects of various processes	
	3. Food is the source of internal energy	
	Energy used while we rest	
	Energy we use while working	

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Disc 4 - Molecular structure of matter		
Topic	Lesson Name	
The structure and properties of solids, liquids and gases	The three states of matter The density of matter The density of matter The density of matter The density of matter	
Pascal's law applied to liquids	1. Liquids have low compressibility 2. Pressure 3. Where is pressure? 4. Does pressure act in a direction? 5. Force 6. Pascal's law in use	
Hydrostaticpressure	Hydrostaticpressure     When do liquids flow?     Hydrostaticpressure     Millimetres of a column of mercury as units of pressure     Communicating vessels	
Archimedes' principle. The conditions under which bodies float	More aboutforce     Buoyancy force     Checking Archimedes' principle     The conditions under which bodies float	
Gaspressure	1. The continual movement of gas molecules 2. Gas exerts pressure on the sides of its vessel 3. There is also pressure in gas 4. What is the origin of gas pressure? 5. Pascal's law applies to gases 6. Movement caused by differences in pressure 7. The relationships between the pressure p and temperature t of gas 8. The relationships between the volume V and temperature t of gas	
Atmosphericpressure	1. Atmosphericpressure 2. The Earth's atmosphere 3. Is air heavy? 4. Atmosphericpressure 5. Buoyancy force 6. Sub-atmosphericpressure 7. Stop and check activities	

# **EduROM – Physics Topic and Lesson List**

Dice E. Energy transformation in thermal phonomena		
Disc 5 - Energy transformation in thermal phenomena		
Topic		Lesson Name
Temperature	1.	What is heat, and what is cold?
	2.	How do various substances react to heating?
	3.	The Celsius temperature scale
	4.	Other temperature scales
	5.	The relationship between temperatures in different scales
	6.	The relationship between temperature and the average kinetic energy of chaotic molecular motion within a body
Internal energy and the ways it can be	1.	Types of energy
changed	2.	How can we change internal energy?
	3.	Thermal energy exchange
	4.	Work
	5.	The first law of thermodynamics
	6.	Stop and check
Thermal energy exchange	1.	The transfer of internal energy
	2.	Thermal conduction
	3.	Convection, which means rising
	4.	Radiation
Heat	1.	The 'caloric' theory
	2.	Heat and work
	3.	The quantity of heat
	4.	Specific heat
	5.	Heat and temperature
	6.	Stop and check
The results of changes in internal energy	1.	What happens inside a heated substance?
	2.	Changes in the state of matter as a result of increased internal energy
	3.	Temperature versus state of matter
The law of the conservation of energy in	1.	Latent heat
thermal phenomena	2.	Evaporating heat
	3.	Giving and taking heat
	4.	Consolidation
The properties of water and their importance	1.	The physical characteristics of water
for life	2.	Water in living organisms
	3.	Water circulation in nature
Natural energy resources	1.	Energy
	2.	Primary and secondary energy
	3.	Renewable sources of energy

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Disc 6 - Earth and its place in space		
Topic	Lesson Name	
Development of views regarding the structure of the Earth	1. Astronomy	
structure of the Earth	Geocentric system     Heliocentric system	
	Effects of the rotation of the Earth	
	5. Effects of the revolution of the Earth around the Sun	
Satellites of the Earth	What keeps the satellite moving in orbits?	
	Orbits of the satellites	
	3. The Moon	
	Artificial satellites	
	Geostationarysatellite	
Structure of the solar system	Origin and structure of the solar system	
	How do planets move?	
	Distance of the planets from the Sun	
	Characteristics of the planets in the solar system	
	<ol> <li>Small bodies in the solar system – Comets</li> </ol>	
	Small bodies in the solar system – Meteors	
	7. Examination of the solar system	
Hierarchical structure of the universe	1. Constellation	
	Distances between the stars	
	3. Galaxy	
	4. Milky Way	
	5. Groups of galaxies	

# **EduROM – Physics Topic and Lesson List**

Disc 7 - Light and Optical projections		
Topic	Lesson Name	
Sources of light. Propagation of light	Natural sources of light	
	From a bonfire to a laser     Light is all we can see	
	How does light propagate?	
	5. What can happen to a ray of light?	
	6. Energy and light	
Umbra and penumbra. Solar and lunar	When does umbra occur?	
eclipse	When does penumbra occur?	
	The cones of umbra and penumbra     Lunar eclipse	
	5. Solar eclipse	
	6. Angular dimensions	
Reflection of light. Flat mirrors and their	How does light reflect from a smoothflat surface?	
application	2. How do mirrors form images?	
	Diffusion of light	
	4. Why is the sky bright?	
	5. Virtual image	
Images in spherical mirrors	What should you know about spherical mirrors?     The path of characteristic rays in a concave mirror	
	The path of characteristic rays in a concave militor     How do spherical mirrors form images?	
	What are spherical mirrors used for?	
	5. Convex mirrors	
Refraction of light	What is the refraction of light?	
	The law of refraction	
	How much can light refract?	
Why does light refract?	What causes changes in the direction of movement?	
	Velocity of light in a vacuum and in transparent media     Refractive index of a transparent medium	
Optical illusions	Netractive index of a transparent medium     Optical illusions	
Optical flusions	Optical hidsions     Inferior mirages	
	3. Superior mirages	
	Atmospheric refraction	
Dispersion of light	Is light coloured?	
	How does light pass through a prism?	
	How to obtain a spectrum of white light?     Components of white light	
	Components of white light     Rainbow	
	6. The colours of bodies	
Types and properties of lenses	Types of lenses	
2	How does light refract in a converging lens?	
	The reversibility of the path of rays	
	4. How light is refracted in a divergent lens?	
Images formed by lenses	Properties of lenses     What kind of images can be formed by lenses?	
images formed by lenses	What kind of images can be formed by fenses?     What does the size of an image depend on?	
	Construction of images formed by lenses	
	4. Magnification	
The structure of the human eye.	1. Vision defects	
	The structure and system of the human eye	
	The mechanisms of seeing     Vision distortions and how to correct them	
	Vision distortions and now to correct them     Optical illusions	
Optical instruments	The path of rays in optical instruments	
Option matiniferia	Magnifying glass	
	3. The structure of a microscope	
	4. Telescope	
	5. Photographic camera	

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Disc 8 - Direct current circuits		
Topic	Lesson Name	
What is the nature of the flow of current?	Under what conditions does ordered movement of charges take place?     In what direction does current flow?     The intensity of current	
Sources of, and devices receiving, electrical energy	Power plants     What is electrical energy changed into?     Chemical effects of the flow of an electric current     Magnetic results of the flow of electric current	
Cells as tools creating voltage	1. Cells 2. The Leclanche cell 3. The electromotive force of a cell 4. Sources of EMF as pumps - a hydrodynamic analogy 5. Accumulators	
Electric circuits	The components of an electric circuit     What sustains the movement of electrons?     Consolidation	
Ohm's law	What is the relationship between intensity of current and electrical tension? (Voltage)     The resistance of conductors	
What the resistance of conductors depends on	The internal structure of metals     What is the nature of the flow of current in metals?     What does the resistance of a conductor depend on?     The variable rheostat	
Ways of connecting electrical energy receiving devices	Ways of connecting electrical energy receiving devices     Serial connection of resistors     Characteristics of electrical energy receiving devices connected in parallel     The total resistance of a parallel connection     The advantages of connecting electrical energy receiving devices in parallel     Fuses     The flow of current through junctions in the circuit	
Transformations of energy in electric circuits	Transformations of energy in electric circuits     The work of electric current     The cost of using electrical energy     Consolidation	
The power of current	The power of current     The amount of work done during one time unit     The power of a bulb     Saving energy     The weekly energy consumption of household appliances	
Current in liquids and gases	Current in liquids and gases     Electrolytes     The flow of current through an electrolyte     Gas ions     Thunderstorms	

# **EduROM – Physics Topic and Lesson List**

		Disc 9 - Motion and forces
Topic		Lesson Name
Action and reaction	1.	Force - revision of information
	2.	Interaction
	3.	Newton's third law of motion
	4.	The force of load and the opposite force of the surface
	5.	Consolidationactivity
Collisions between bodies	1.	Momentum of a body
	2.	Elastic collisions
	3.	Inelastic collisions
Principle of conservation of momentum	1.	Principle of conservation of momentum
	2.	A system of bodies and internal forces
	3.	Why does a rifle recoil at the moment of shooting?
	4.	Collision with a stationary body
	5.	Collision with an iceberg
Movement of a body influenced by a force	1.	Addition of forces - revision of information
	2.	Accelerated motion
	3.	Acceleration of a body
	4.	Path in uniformly accelerated motion
Newton's second law of motion	1.	What does acceleration of a body depend on?
	2.	Inertia
	3.	Newton's second law of motion
	4.	Unit of force
	5.	Acceleration resulting from the force of gravity
Newton's first law of motion	1.	Principle of inertia
	2.	No force is required to maintain a body in uniform motion
	3.	Newton's first law of motion
	4.	Inertia
Circular uniform motion	1.	What causes circular motion?
	2.	Centripetal force and its characteristics
	3.	Circulation period
	4.	Velocity in circular motion
	5.	Value of centripetal force
	6.	ConsolidationActivities
Motion induced by forces of elasticity	1.	Force determines the character of the motion
	2.	Amplitude of oscillation
	3.	Period and frequency of oscillation
	4.	Examples of oscillation
	5.	Resonance
	6.	The force determines the character of the motion
	7.	Deplacement of a vibrating point
	8.	The period and frequency of vibration
	9.	Examples of vibrations

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#### Disc 10 - Elements of nuclear physics Topic Lesson Name Structure of the atom and the atomic 1. Discovery of the atomic nucleus 2. Planetary model of an atom 3. Composition of the nucleus of an atom Isotopes of elements Relative atomic mass Natural radioactivity Becquerel's discovery 2. Alpha, beta and gamma radiation 3. Alpha decay Beta decay Application of radioactive elements Partial decay time Determination of age using carbon 14C 3. Applying the nuclear radiation energy in therapy 4. How to conduct diagnosis using radioactive elements Application of radioactive isotopes in industry Nuclear energy and mass defect Mass defect Binding energy Mega-electron-volt 4. Binding energy per nucleon Reactions of fission and fusion 1. Reactions of fission and fusion - Activities Application of nuclear energy 1. Uncontrolled chain reaction 2. Controlled chain reaction 3. Structure and operation of a nuclear reactor 4. Nuclear waste Nuclear test explosion 6. Tests of nuclear weapons 7. A letter from Einstein to Roosevelt

#### **EduROM – Physics Topic and Lesson List**

Disc 11 - Electrical fields		
Topic		Lesson Name
The two types of electrical charge	1.	How big is an atom?
		The structure of an atom
		Electrical charges in an atom
		Interactions between electrical charges
		Conductors and insulators
Coulomb's law		How great are the forces with which charges interact?
	2.	The unit of electrical charge
Ways to electrify bodies	1.	When is a body electrically charged?
	2.	Electrification by rubbing
		How is an electroscope constructed?
	4.	How an electroscope works
		How do we charge an electroscope positively?
	6.	How do you earth an electroscope?
Electrostaticfield	1.	Interactions at a distance
		A graphic description of electrostatic fields
		Homogenous fields
		Central fields
	5.	Dipolar electrical fields
The electrification of bodies by induction	1.	A 'magical' experiment
	2.	Checking the sign of the charge of electrified bodies
		The conservation law for electric charge
	4.	Why an electrostatic field reacts on non-electrifiedbodies
The energy of a charge in an electrostatic	1.	What causes a charge to move?
field. Voltage		Voltage
	3.	The work of an electrostatic field
	4.	Consolidation

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Disc 12 - Magnetic fields		
Topic	Lesson Name	
The magnetic properties of bodies	Magnetic needles     Interactions between magnetic poles     Magnetic fields     Can the poles of a magnet be separated?	
Creating a magnetic field	Temporary magnetisation     Magnetic field lines around a straight-line conductor through which an electric current is flowing     Magnetic field lines around a loop through which electric current is flowing     The lines of a coil's magnetic field     Electromagnets     Magnetisation within a coil	
How magnetic fields react on current carrying conductors	Electrodynamicforce     The left hand rule     The principle on which electric motors work     Interactions between conductors through which current is flowing	
The magnetic properties of substances	Magnetic and non-magnetic materials     Elementary magnets     Magnetic substances     Ferromagnetic metals     Loss of magnetic properties	
The Earth's magnetic field	The Earth's magnetic poles     The internal structure of the Earth     A hypothesis about the origin of the Earth's magnetic field     The Auroras	

# **EduROM – Physics Topic and Lesson List**

Disc 13 - Production and transmission of electrical energy		
Topic	Lesson Name	
The phenomenon of electromagnetic induction	Could magnetic fields be the reason for the flow of current?	
	How inductive current is induced	
	The direction in which inductive current flows	
	4. What determines the intensity of an inductive electric current?	
The principle on which an alternating current generator works	How does a dynamo work?	
	The construction of a dynamo	
The voltage and intensity of alternating current	Changes in voltage	
	Changes in the intensity of electric current	
	<ol><li>The frequency of changes of the voltage and intensity of electric current</li></ol>	
	4. Consolidation	
Effective quantities of the voltage and intensity of electric current	Amplitudes and momentary quantities of the voltage and intensity of electric current	
	The work of alternating current	
	Effective quantities of the voltage and intensity of electric current	
	The work and power of alternating current	
The structure of transformers and the principles on which they work	The structure of transformers	
	2. How do transformers work?	
	<ol><li>What are transformers used for?</li></ol>	
	Energy loss during the operation of a transformer	
	5. High voltage lines	
Ways to use the phenomenon of electromagnetic induction	1. Welding	
	2. Rotational currents	
	<ol><li>The telephone, the microphone, the tape recorder</li></ol>	
	4. The spark plug	

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Disc 14 - Gravitation fields		
Topic	Lesson Name	
Influence of gravitation	Force of gravity and gravitational acceleration	
	Lines of the gravitational field	
	Central gravitational field	
	4. Perpendicular	
Free fall of bodies	<ol> <li>What is the acceleration in the free fall of all bodies?</li> </ol>	
	How long do bodies fall?	
	3. What is the velocity of bodies that fall to the ground?	
	ConsolidationActivities	
Horizontal throw	1. Complex motion	
	2. Component motions	
	Range of a horizontal throw	
	4. ConsolidationActivities	
Transformation of mechanical energy during	Components of the velocity vector	
throws	Principle of independence of motion	
	Extreme height and range in an oblique throw	
	How can we obtain the longest range in an oblique throw?	
Oblique throw	Principle of conservation of mechanical energy	
	<ol><li>Transformation of energy during vertical throws</li></ol>	
	<ol><li>Principle of conservation of energy in complex motions</li></ol>	
	4. ConsolidationActivities	
Law of gravitation	Gravitational interaction	
	2. Gravitational pull of the Earth	
	3. Why do bodies fall to Earth?	
	Acceleration due to gravity	
	5. ConsolidationActivities	

# **EduROM – Physics Topic and Lesson List**

Disc 15 - Wave motion		
Topic	Lesson Name	
How do mechanical waves propagate?	Oscillation - revision of information	
	Oscillation of many points     Length of a wave	
	What kind of vibrations can be performed by the elements of the medium?	
	5. Mechanical waves	
Diffraction of mechanical waves	Plane and spherical waves	
Interference of mechanical waves	Diffraction of a wave	
	3. Huygens' Principle	
	Interference of mechanical waves     Overlapping of waves	
	When does constructive interference occur?	
	4. Interference	
Reflection and refraction of mechanical waves	Reflection of a wave	
What is sound?	1. How is sound formed?	
	2. Acoustic waves	
	3. Speed of sound	
	Sound as a mechanical wave     Consolidation Activities	
Application of ultrasound	Application of ultrasound	
Application of diffasound	Sound frequency	
	3. Infrasound	
	4. Ultrasound	
	Application and occurrence of ultrasound	
Source and characteristics of sound	Physical and physiological description of sound	
	String as a source of sound     Pieces	
	Pipes     Vibrating rods and membranes	
The sounds we can hear	Mechanical system of an ear	
The sounds we can hear	Mechanism of vibrations transmission in an ear	
	3. Mechanism of transmission of signals to the brain	
	Transmission of sound through bones	
	5. Sense of balance	
The structure of the human ear	Stimulus and sensation     Audible accords	
	Audible sounds     Evolution of the ear and adaptation to receive sounds	
Diffraction and interference of light	Diffraction of light in a slit	
Dimacion and interierence or light	Interference of light	
Light as an electromagnetic wave	1. Maxwell's equations	
	Maxwell's electromagnetic waves	
	Properties of electromagnetic waves	
Spectrum of electromagnetic waves	1. Light	
	Infrared     Ultraviolet	
	4. Radio waves	
	5. X-rays	
	6. Gamma radiation	
Measurement of the speed of light  Development of views on the nature of light	Speed of propagation of electromagneticwaves	
	Astronomic method of calculation of the speed of light	
	Early method of calculation of the speed of light	
	4. Speed of light	
	Light transports energy     Photoelectric phenomenon	
	Protoelectric phenomenon     Properties of photons as particles	
	Double nature of light	
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