Physics Form 5 Syllabus - September 2011 onwards

The new Physics SEC syllabus 2012 applies.

The new Physics SEC syllabus aims to develop students' understanding of Physics around them and how it affects their daily lives. It aims to develop students' questioning, analytical and problem solving approach to scientific problems and issues. It intends to develop students' practical skills in Physics and an understanding of how Physics works through an investigative approach. It aspires to connect the applications of Physics to technology and environmental issues and to develop students' understanding through a historical context within which scientific ideas are developed. It also intends to encourage a positive attitude towards science in general and the environment, and to create enthusiasm about Physics leading to further studies in the area.

The key features of the new syllabus are:

- Focus on a context-oriented approach.
- Focus on the needs of the students.
- Links with science, society and technology.
- Links with ICT.
- Reference to historical context.
- Encourages teaching through practical learning activities.

Topics to be covered in **Form 5**

Theme	***Reference nos***
Theme 5: Electricity in the Home - Part II	5.22 - 5.32.
Theme 6: Magnets and Motors	All
Theme 7: Radiation and its Uses	All

Theme 5: Electricity in the Home - (5.22 - 5.32)

Learning programme

- House wiring
- Risks and hazards associated with electricity.
- Safety measures.
- Paying for the electricity consumed.

Learning Outcomes

Learners will:

- Know that an alternating current changes direction.
- Identify the function of the live, neutral and earth wires as used in domestic mains.
- Identify the reason why the live wire has to be insulated from the earth and neutral wires.
- Use the equation P = I V as related to electrical devices.
- Identify the right rating of fuses to be used in different circuits according to the current flowing in the circuit.
- Give simple explanations of how fuses, earthing and circuit breakers are used in homes to prevent risk of fire and electrocution.
- State reasons why double insulated appliances do not need an earth wire while appliances with a metal case need to be earthed.
- Identify dangerous practices in the use of mains electricity such as overloading of mains wire, handling electrical components with wet hands or metallic devices, etc.
- Use the equation E = P t. Energy is given in Joules and in Kilowatt hours.
- Know that the amount of energy transferred from the mains is measured in Kilowatt hours, called Units.
- Calculate the cost of electrical energy, given the power of the electrical appliance, time of usage and cost per unit.

Theme 5: Magnets and Motors

Learning programme

- Describing magnets.
- Forces acting between two magnetic poles.
- Magnetising and demagnetising.
- The magnetic field formed around a magnet, a current in a straight wire and a solenoid.
- The Earth's magnetic field.
- Varying the strength of an electromagnet.
- Applications of electromagnetism.
- The effect of a conductor carrying a current in a magnetic field.
- Knowledge of Fleming's left hand rule.
- Faraday's Law. Electromagnetic induction.
- Lenz's law.
- The principle of operation of a basic iron-cored transformer.

Learning Outcomes

Learners will:

- Know that magnetic poles exist in pairs.
- Set up simple experiment to show that a magnetic material has different properties from a non-magnetic material.
- Set up simple experiment to show that forces exists between magnetic poles.
- Identify the different properties of iron and of steel as magnetic materials.
- Know the type of force between (i) like poles, (ii) unlike poles, and (iii) magnetic and non-magnetic materials.
- Describe how magnetism can be induced using (i) the stroking method, and (ii) the electrical method.

- Describe how demagnetisation can be achieved using (i) hammering, (ii) heating, and (iii) the electrical method.
- Know that a current flowing in a wire induces a magnetic field around the wire.
- Set up simple experiments to identify the pattern and direction of field lines formed by (i) a bar magnet, (ii) a current flowing in a straight wire, and (iii) a solenoid.
- Draw the pattern and direction of the field formed by (i) a bar magnet, (ii) a current flowing in a straight wire, and (iii) a solenoid (using the right hand grip rule).
- Know that the strength of the field lines is demonstrated by the density of the pattern of the magnetic flux lines.
- Know that the Earth has its own magnetic field and that the magnetic north pole and geographical North Pole are not on the same place on the Earth.
- Investigate how the strength of a solenoid can be changed by varying (i) the number of turns, (ii) the size of the current flow, and (iii) by introducing an iron core.
- Identify simple applications where the magnetic effect of an electric current is used.
- Set up apparatus required to investigate the force experienced by a straight current carrying wire in a magnetic field. Identify the effect of changing the direction of the current or the magnetic field on the force experienced.
- Apply Fleming's Left Hand Rule to identify the direction of the force in the above set-up.
- Investigate how a current-carrying conductor placed parallel to a magnetic field experiences no force on it.
- Investigate how a current-carrying conductor in a magnetic field experiences a turning effect and that this turning effect is dependent upon the number of turns of the coil.
- Apply this turning effect to the action of an electric motor.
- Set up the apparatus required to investigate how the e.m.f. induced in a conductor is directly proportional to the rate at which the magnetic field lines are cut by the conductor. Know that this is Faraday's law.
- Apply Lenz's law to identify the direction of the induced e.m.f. which opposes the change causing it.

- Relate the above phenomenon to the principle of conservation of energy.
- Describe the construction and the principle of operation of a basic iron-cored transformer.
- Know that for an ideal transformer, power input is equal to power output.
- Use the equation $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ and $V_p\ I_p = V_s\ I_s$ for an ideal transformer in simple calculations.

Theme 7: Radiation and its Uses

Learning Programme

- An atom is made up of a positively charged nucleus and negatively charged electron. It may contain neutrons.
- Some nuclei are unstable and give out radiation to get rid of excess energy.
- There are three different types of radiation and they have different properties.
- The activity of a radioactive source can be measured and used in practical situations.
- Radioactivity has many applications in everyday life.

Learning Outcomes

Learners will:

- Define the structure of an atom in terms of protons, neutrons and electrons.
- Describe the nuclei in the format ${}^{A}_{Z}\mathrm{N}$
- Define isotopes as atoms that have the same proton number but different nucleon number.
- Recall that some nuclei are unstable and give out radiation to get rid of excess energy. Such nuclei are said to be radioactive.
- State the three main types of radiation, α, β and γ.

- Recall the properties of the different types of radiation and their ability to penetrate and ionize.
- Identify the uses of radioactivity such as in irradiating food to make it last longer, thickness control of paper and leakage detection of underground pipes.
- Identify the uses of radioactivity in medical applications both for diagnosis and treatment of patients and in sterilization of equipment.
- Explain what is meant by background radiation and its origin from Earth and Space.
- Define half-life as the time taken for half the atoms of a radioactive substance to decay.
- Use the concept of half-life to carry out simple calculations using tabular and graphical data.
- Identify the ways in which radioactive materials need to be handled, used and stored.

Use of ICT as a tool for teaching and learning

The use of ICT in the classroom and beyond is an integral part of the teaching and learning of Physics. Each theme in the new Physics SEC syllabus is preceded by a number of web-links related to the theme. It is hoped that these links will be further developed by SEC over the years. Web simulations, PowerPoint presentations, web video clips, participation in online science projects and other innovate technology must be an integral part of the pedagogy in the classroom and beyond.

Language of Communication

The English language should be the principal language of communication during the Physics lessons. This may be supplemented with the Maltese language in those instances where the teacher feels it is appropriate. Communicate in the English language helps the students to grasp the key phrases, understand better the HW assignments and tests, communicate better both verbally and when writing. One must remember that all science resources, both in books and digital are in the English language.

Assessment

Assessment for Learning should be an integral part of each and every lesson. Each question asked during the lesson is an opportunity for further learning. Every feedback given and comment shared between the teacher and the students is an opportunity to assess, encourage and elaborate about the students' learning process.

Students will be assessed by means of a school-based examination for their Half Yearly Examination. Even this examination can be an opportunity for formative assessment when the teacher uses the answers provided by the students to identify needs and encourage further learning. The end-of-year summative assessment will be in the form of an Annual Examination which will consist of a national examination paper set by the Curriculum Management and eLearning Department. This examination will have a total of 85 marks. The remaining 15 marks will be assigned to the practical work done by students and reported in their Lab Book. Teachers are highly encouraged to use an inquiry based approach to practical work with the students as part of their practical work portfolio.

Experiments & Investigations

This new 2012 Physics SEC syllabus stipulates that at the end of the three year Physics course, students should present for SEC moderation:

Either 15 experiments

Or 13 experiments and a longer investigation which will be equivalent to the work done to perform two experiments.

It is also recommended that students present at least two experiments from each of the themes 1 - 6. The investigation may be chosen from any area of the syllabus. Simple experiments using data loggers are recommended.

A small number of candidates, chosen at random from all schools, will be called for an interview by Matsec Office. They will be asked about the practical work presented as part of their Physics SEC examination.

Report Writing

Each school should develop a policy of gradual introduction of laboratory work report writing, starting from Form 3 onwards. Students need to be slowly integrated into the norms of report writing of practical work or investigations. The skill of report writing needs to be learned. An added bonus for the students is when they know beforehand the detailed criteria of how the teacher will assess the experimental report.

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