Syllabus	الإطار المنهجي
Physics	مادة الفيزياء
Bilingual Program	برنامج ثنائي اللغة
Grade: 11-12	الصف: ١١-١٢
2021-2022	٢٠٢١/٢٠٢٢م

Contents

Introduction	− Aims of science standards − Important skills − Skills and abilities to be assessed	3-8
Grade (11)	Syllabus	10
	Learning Outcomes	13
	Yearly Plane	23
	Resources for Teachers to Upgrade their Knowledge and Skills	23
	References	24
Grade (12)	Syllabus	26
	Learning Outcomes	29
	Yearly Plane	45
	Resources for Teachers to Upgrade their Knowledge and Skills	45
	References	46

Introduction

Science plays a major role in the evolution of knowledge. It empowers us to use creative and independent approaches to problem solving. It arouses our natural curiosity and enables us to meet diverse and ever expanding challenges. It enhances our ability to inquire, seek answers, research and interpret data. These skills lead to the construction of theories and laws that help us to explain natural phenomena and exercise control over our environment. Science is, thus, an integral component of a balanced education.

This syllabus focus on the content essential for preparing students to be engaged and productive citizens. A good foundation in the sciences will help citizens to respond to the challenges of a rapidly changing world using the scientific approach. It addresses, in addition to a specific knowledge base, the development of related skills and attitudes. Critical thinking, enquiry and reasoning are emphasized to ensure that students develop the ability to work creatively, think analytically and solve problems. The syllabus also ensure that students become aware of their moral, social, and ethical responsibilities, as well as, the benefits intrinsic to the practical application of scientific knowledge to careers in the scientific field. Teaching these standards requires teaching methods that are varied and experiential. Effective lessons will concert and incorporate with: Practical work and the science standards, the place of information and communications technology in the science standards, teaching about science, technology and society, the mathematical requirements of the science standards.

The overall aims of science standards are that students should:

1. develop and sustain an interest in science and its applications.
2. have a sound and systematic knowledge of important scientific facts, concepts and principles, and possess the skills needed to apply these in new and changing situations in a range of personal, domestic, industrial and environmental contexts.
3. recognize the importance of the application of scientific knowledge in the modern world and be aware of the moral, ethical, social and environmental implications.
4. develop relevant attitudes, such as a concern for accuracy and precision, objectivity, integrity, enquiry, initiative and inventiveness.
5. develop an understanding of the scientific skills essential for both further study and everyday life.
6. plan, design and perform experiments to test theories and hypotheses.
7. be proficient in the use of a range of scientific methods and techniques and in handling apparatus.
8. develop the ability to work independently and collaboratively with others when necessary.
9. integrate Information and Communication Technology (ICT) tools and skills.

Important Skills:

- **Scientific enquiry skills:** Scientific enquiry, which ensures the development of scientific skills, intellectual and practical, should be integrated in the learning of the scientific content across all the science branches. Scientific enquiry skills include the following:

1. carry out the practical experiments to developed the practical skills which will be mentioned in details below.
2. find secondary information sources such as the resources available in the public libraries and on the Internet and use this after validation and making sure of the suitability of the subject.
3. apply scientific knowledge and procedures to the situations of the reality Life.
4. recognizes the importance of cooperative teamwork, put work plans, distributes responsibilities and regulates and sets specific targets for work.

- **Know how scientists are working:**

1. realize that with science we can bring great benefits to humanity also if it is abused can cause serious damage to the environment.
2. know how scientists are carrying out their work, such as environmental monitoring and control of industrial processes.
3. know how scientists publish and present their ideas and results in order to encourage debate and development.
4. know that science could lead to the emergence of ethical considerations, and discuss them.
5. know that there are many questions and considerations that cannot be answered by Science.
6. trace the historical development of some key scientific models and knows what contributions Scientists presented in this development.

- **Processing and delivery of information**

1. present qualitative and quantitative data using a variety of methods, such as descriptive texts, graphics, images, tables, and maps with the use of technology methods and computer when it is appropriate, then analyse and explain these date to extract conclusions from them.
2. use mathematical relationships routinely to calculate the quantities.
3. do calculations based on data taken from the graphs, and distinguishes between Independent and dependent variables.
4. handle data and writes reports about the results.
5. use symbolic equations to represent chemical reactions and simple physical relationships.
6. use the appropriate methods to deliver scientific information.

- **ICT application:**

This syllabus provides students with a wide range of opportunities to use ICT in their study of science in order to play a full part in modern society, students need to be confident and effective users of ICT. Opportunities for ICT include:

1. gathering information from the internet, DVDs and CD-ROMs.
2. using spreadsheets and other software to process data.
3. using animations and simulations to visualize scientific ideas.
4. using software to present ideas and information on paper and on screen.
5. using distance learning programs and platforms.

Skills and abilities to be assessed:

The skills students are expected to develop on completion of this syllabus, have been grouped under three main headings:

1. knowledge and understanding.
2. application of knowledge and understanding, analysis and evaluation of information.
3. scientific enquiry skills and procedures.

1. Knowledge and understanding

Assessment Objectives	Skills: The ability to
Knowledge	● identify, remember and grasp the meaning of basic facts, concepts and principles.
Understanding	● select appropriate ideas, match, compare and cite examples of facts, concepts and principles in familiar situations; ● explain familiar phenomena in terms of theories, models, laws and principles.

Questions testing these skills will often begin with one of the following words: define, state, describe, explain.

2. Application of knowledge and understanding, analysis and evaluation of information

Assessment Objectives	Skills: The ability to
Application	● use facts, concepts, principles and procedures in unfamiliar situations. ● transform data accurately and appropriately ● use common characteristics as a basis for classification ● use information to identify patterns, report trends and draw inferences. ● use formulae accurately
Analysis and Interpretation	● identify and recognize the component parts of a whole and interpret the relationships between those parts; ● identify causal factors and show how they interact with each other; ● infer, predict and draw conclusions; ● make necessary and accurate calculations and recognize the limitations and assumptions of data. ● present reasoned explanations for phenomena, patterns and relationships
Synthesis	● combine component parts to form a new meaningful whole; ● make predictions and solve problems. ● locate, select, organize and present information from a variety of sources.
Evaluation	● make reasoned judgments and recommendations based on the value of ideas and information and their implications.

Questions testing these skills will often begin with one of the following words: predict, suggest, calculate or determine.

3. Scientific enquiry skills and investigations.

Assessment Objectives	Skills: The ability to
Planning and designing a practical procedure	● identify problems, make predictions, and design a practical procedure to answer a question, solve a problem or test a hypothesis. ● select and use suitable apparatus for carrying out experiments accurately and safely. ● take into account possible sources of errors and danger in the design of an experiment; ● evaluating experimental procedures and identifying weaknesses and develop realistic strategies for improvement ● work in a way that is committed to ethical and moral standards such as honesty and authenticity of his results and writing of the used references.
Control	● use experimental controls where appropriate; ● appreciate that, unless certain variables are controlled, experimental results may not be valid ● recognize the need to choose appropriate sample sizes, and study control groups where necessary.
Risk assessment	● identify possible hazards in practical situations, the risks associated with these hazards, and methods of minimizing the risks.
Manipulation and measurement	● follow a detailed set or sequence of instructions. ● make measurements with due regard for precision and accuracy. ● use apparatus and measuring instruments.
Observation, recording and reporting	● select observations relevant to the particular activity. ● make accurate observations and minimise experimental errors ● record observations, measurements, methods and techniques with due regard for precision, accuracy and units. ● record and report unexpected results. ● select and use appropriate models of recording data or observations, for example, tables and diagrams. ● organize and present information, ideas, descriptions and arguments clearly and logically in a complete report, using spelling, punctuation, grammar and scientific terminology with an acceptable degree of accuracy.

Assessment Objectives	Skills: The ability to
Analyzing and interpreting data	● appreciate when it is appropriate to calculate a mean, calculate a mean from a set of at least three results and recognize when it is appropriate to ignore anomalous results in calculating a mean. ● recognize patterns in data, form hypotheses and deduce relationships. ● use and interpret tabular and graphical representations of data. ● evaluate data, considering its repeatability, reproducibility and validity in presenting and justifying conclusions.
Making conclusions	● draw conclusions that are consistent with the evidence obtained and support them with scientific explanations
Drawing	● draw the best-fit lines for the graphs representing data that varies continuously. ● use fix scales for each of the x and y axes. ● label the axes including the measurements and units. ● draw precise diagrams e.g. (electric circuits, ray diagrams for the mirrors and lenses).

الإطار المنهجي للصف الحادي عشر

Grade 11 Syllabus

Grade 11 Syllabus

Physics is a science that is concerned with systems, laws, models, principles and theories that explain the physical behavior of our world and the universe. Physics is an enquiry-based discipline involving practical and investigational skills as well as knowledge and is regarded as a fundamental scientific discipline since all advances in technology can be traced either directly or indirectly to the physical laws and theories. This syllabus emphasizes on the application of scientific concepts and principles. Such an approach is adopted in order to develop those long-term transferrable skills of ethical conduct, team work, problem solving, critical thinking, innovation and communication. The syllabus will assist students to develop positive values and attitudes towards the physical components of the environment and will also provide a sound foundation for those who wish to pursue further studies in science.

Aims: Physics syllabus enables students to:

1. develop their knowledge and understanding of physics.
2. develop and apply their knowledge and understanding of the scientific process.
3. develop their understanding of the relationships between hypotheses, evidence, theories and explanations.
4. develop and apply their observational, practical, modeling, enquiry and problem-solving skills, and their understanding in laboratory, field and other learning environments.
5. develop their skills in reporting and presenting information clearly and logically in different formats.
6. develop their skills in communication, mathematics and the use of technology in scientific contexts.
7. appreciate the contributions of some of the outstanding regional and international scientists to the development of Physics.
8. develop the ability to evaluate information critically, identify patterns, cause and effect, stability and change, and evaluate ideas.

How to use grade 11 syllabus?

This syllabus is arranged according to the following manner:

- **Outcomes:**

Indicate the scope of the content, including practical work which will be examined as well. However, practical work should not necessarily be limited to these objectives.

The numbering key: [Unit – Topic –Learning outcome]
e.g. **Unit 2**. (2. Kinematics); **Topic 1** (2.1 motion in one direction); and **a) is the first learning outcome** (a) distinguish between distance and displacement, speed and velocity with applications).

1. For the topics refer to the textbooks:
   - Cambridge International AS and A Level Physics, Third Edition, Mike Crundell and Geoff Goodwin, Hodder Education, 2020.
   - Cambridge International AS and A Level Complete Physics, Third Edition, Jim Breithaupt, Hossam Attya, Camille Pervenche and Jaykishan Sharma, Oxford University Press, 2020
2. For the practical works and activities refer to:
   - Practical lab manual for Grade 11 Physics, Hajir Al Balushi, Ministry of Education, 2021.
   - Physics for Cambridge International AS and A Level, Practical Workbook, Second Edition, Graham Jones, Steve Field, Chris Hewlett and David Styles, Cambridge University Press, 2020.
   - **Practical experiments and activities:**

Show some examples of active learning activities and do not represent full -scale activities can be done. It is recommended that all of the suggested laboratory-related activities, such as conducting experiments must be done. Other activities like making field trips and viewing audio-visual materials, can be done also. Take into account the sufficient time to carry out the practical experiments determined in this syllabus and explained in details in the student text book and in the practical resources and train students in practical skills related to them. The teachers should get benefit from the student text books, teacher's resources, practical workbooks and the interactive digital resources, that are recommended by MOE in the approved books list. The teachers should include the practical lessons in the semester plan.

- **Resources for teachers to upgrade their knowledge and skills**

The main resources for the teachers are the textbooks and the teacher's guide. There are also a list of approved supplementary resources for teachers that support them in their teaching. These resources include:

1. Cambridge International AS & A Level Physics, Practical Skills Workbook, Third Edition, Hodder Education, 2020.
2. Cambridge International AS & A Level Physics, Whiteboard eTextbook, Third Edition, Hodder Education, 2020.

Some other resources as websites are listed in this syllabus can provide support for teachers for this syllabus. The range of resources covers a large area of this syllabus so it is well worth exploring these sites before the course starts to discover relevant resources that can be used or recommended to students when appropriate.

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
1. Physical quantities and units					
1.1 Errors and Uncertainties	a) Understand what is meant by uncertainty, accuracy, and precision. b) Distinguish between random and systematic (uncertainty and bias) errors. c) Determine uncertainty when addition, subtraction, multiplication, and division combine data.		Practical skills	**AS level** Topic 1	**1**
1.2 vectors	a) Determine mathematically the resultant of two vectors in the case of: i. Collinear vectors (same and opposite directions). ii. Perpendicular vectors (Pythagoras theorem). iii. two vectors with an angle θ (this outcome requires dividing the oblique vector(s) into x and y components).		**AS level** Topic 1	**AS level** Topic 1	**2**
2. Kinematics					
2.1 motion in one dimension	a) Recall displacement, distance, velocity and speed. b) define acceleration. c) Represent graphically the displacement-time graph and velocity-time graph for an object moving at constant acceleration. d) Determine the displacement using area, acceleration using the gradient of the velocity-time graph. e) Derive and use the equations of uniformly accelerated rectilinear motion (UARM). f) Relate the motion of a freely falling body to motion with constant acceleration.	**Experiment 1** (in the lab manual) OR Practical 1.4 in the practical workbook (Determining the average speed of a cylinder rolling down a ramp)	**AS level** Topic 1	**AS level** Topic 2	**11**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
	g) Solve problems using equations of uniformly accelerated rectilinear motion including free falling bodies. h) Describe an experiment to determine the acceleration of free fall using a falling body.	**Experiment 2** (in the lab manual)			
2.2 motion in two dimensions	a) Describe and explain motion due to a uniform acceleration in two perpendicular dimensions (projectile motion). b) Solve problems to determine the maximum height, the range, and the time of flight for projectile motion.		**AS level** Topic 1	**AS level** Topic 2	**4**
3. Dynamics					
3.1 Newton's laws of Motion	a) Understand that mass is the property of a body that resists change in motion and give applications (Newton's first law of motion). b) Recall the relationship $F = ma$ and solve problems using it, appreciating that acceleration and resultant force are always in the same direction. c) Solve problems of balanced and unbalanced forces and Appreciate that for balanced forces resultant $F=0$ and $a=0$ d) recall and apply Newton's third law of motion.	**Experiment 3 (**in the lab manual)	**AS level** Topics 2&4	**AS level** Topic3	**4**
3.2 applications on Newton's second law	a) Describe and use the concept of weight as the effect of a gravitational field on a mass and recall that the weight of a body is equal to the product of its mass and the acceleration of free fall. b) Describe qualitatively the non-uniform motion of bodies falling with air resistance (e.g. parachutes). c) Describe and use the concept of normal force as the contact force which acts at right angle on the surface.		**AS level** Topics 1, 2&3	**AS level** Topic 3 (outcomes a-e) &External resources for	**10**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
	d) Describe the tension, the friction and the drag forces. e) Draw and analyze the force diagram for a body moving on a horizontal surface and solve related problems. (consider the air resistance and the friction force) f) Draw and analyze the force diagram for a body moving on an inclined plane and solve related problems. (consider frictionless and frictional surfaces) g) Analyze and solve problems in acceleration and apparent weight for an elevator in different situations.			learning outcome (f) Outcome (g) is covered in **A level** topic 13	
3.3 Linear momentum and its conservation	a) Define and use linear momentum as the product of mass and velocity. b) State the principle of conservation of momentum. c) Apply the principle of conservation of momentum to solve simple problems, including elastic and inelastic interactions between bodies in both one and two dimensions (knowledge of the concept of coefficient of restitution is not required). d) Recognize that, for a perfectly elastic collision, the relative speed of approach is equal to the relative speed of separation. e) Understand that, while momentum of a system is always conserved in interactions between bodies, some change in kinetic energy may take place. f) Derive the relationship between the force and rate of change of momentum.	**Experiment 4** (in the lab manual)	**AS level** Topic 4	**AS level** Topic 3	**6**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
4. Force, work, energy and power					
4.1 moment of a force and torque	a) Define and apply the moment of a force. b) understand that a couple is a pair of forces that tends to produce rotation only. c) State and use the principle of moment to find an unknown force (the pivot is in different points). d) Define and apply the torque of a couple. e) Understand that, when there is no resultant force and no resultant torque, a system is in equilibrium.		**AS level** Topic 3	**AS level** Topic 4	**4**
4.2 work, energy and power	a) Understand and use the concept of work. b) Derive and use the formula for the kinetic energy. *Change in kinetic energy=work done* c) Derive and use the formula for the potential energy. d) State the principle of conservation of energy. e) Give examples of conservation of energy between different forms. *decrease in g.p.e=gain in k.e* f) Apply the principle of conservation of energy to solve problems involving energy in different forms. g) Define and use the equations for power (including moving power).	**Experiment 5** (in the lab manual)	**AS level** Topic 2	**AS level** Topic 5	**6**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
1. Motion in a circle					
1.1 uniform circular motion and centripetal force	a) Define the radian and express angular displacement in radians. b) Understand and use the concept of angular velocity to solve problems. $\omega = \frac{\Delta\theta}{\Delta t}$ c) Recall and use $v = r\omega$ to solve problems. d) Describe qualitatively motion in a curved path due to a perpendicular force, and understand the centripetal acceleration in the case of uniform motion in a circle. e) Recall and use centripetal acceleration equations $a = v\omega$ and $a = \frac{v^2}{r} = r\omega^2$ f) Recall and use centripetal force equations $F = mr\omega^2 = m\frac{v^2}{r}$	**Experiment 1** (in the lab manual) OR Practical 10.1 in the practical workbook (circular motion)	**AS level** Topic 8 & **A level** Topic 11	**A level** Topic 12	**4**
2. Gravitational field					
2.1 Gravitational force between point masses	a) Recall and use Newton's law of gravitation in the form $F = G\frac{m_1 m_2}{r^2}$ b) Understand that, for a point outside a uniform sphere, the mass of the sphere may be considered to be a point mass at its center. c) Analyze circular orbits in inverse square law fields, including geostationary orbits, by relating the gravitational force to the centripetal acceleration it causes.		**A level** Topic 13	**A level** Topic 13	**3**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
	d) Derive and use speed of a satellite orbiting the Earth $v = \sqrt{G\frac{M}{r}}$				
2.2 Gravitational field of a point mass	a) Understand the concept of a gravitational field as an example of a field of force and define gravitational field strength as force per unit mass $g = \frac{F}{m}$ b) Derive, from Newton's law of gravitation and the definition of gravitational field strength, the equation $g = G\frac{M}{r^2}$ for the gravitational field strength of a point mass (M is the mass of the Earth). c) Solve problems using the equation $g = G\frac{M}{r^2}$ d) Show an appreciation that on the surface of the Earth *g* is approximately constant.		**A level** Topic 13	**A level** Topic 13	**2**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
2.3 Gravitational potential	a) Define potential at a point as the work done per unit mass in bringing a small test mass from infinity to the point. b) Solve problems using the equation $\phi = -\frac{GM}{r}$ for the potential in the field of a point mass.		**A level** Topic 13	**A level** Topic 13	**2**
3. Oscillations					
3.1 Simple harmonic oscillations	a) Describe simple examples of free oscillations. b) Understand and use the terms amplitude, period, frequency, angular frequency and phase difference and express the period in terms of both frequency and angular frequency. c) Investigate simple harmonic motion using graphs. d) Recognize and use the equation $a = -\omega^2 x$ as the defining equation of simple harmonic motion. e) Describe, using the following equations with graphical illustrations, the changes in displacement, velocity and acceleration during simple harmonic motion: i. $x = x_\circ \sin(\omega t)$ ii. $v = v_\circ \cos(\omega t) = \omega x_\circ \cos(\omega t)$ iii. $a = -a_\circ \sin(\omega t) = -\omega^2 x_\circ \sin(\omega t)$ (these equations represent S.H.M when the oscillation starts from the equilibrium position). f) Recognize and use the equation $v = \pm\omega\sqrt{x_\circ^2 - x^2}$	**Experiment 2** (in the lab manual: Simple harmonic motion (spring)) OR Practical 11.4 in the practical workbook (simple harmonic oscillation of a mass on a spring) **&** **Experiment 3** (in the lab manual: Simple harmonic motion(pendulum))	**A level** Topic 12	**A level** Topic 17	**10**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
3.2 Energy in simple harmonic motion	a) Solve problems related to the: i. kinetic energy using $E_k = \frac{1}{2} m\omega^2 (x_\circ^2 - x^2)$ ii. potential energy using $E_p = \frac{1}{2} m\omega^2 x^2$ iii. total energy $E_{tot} = \frac{1}{2} m\omega^2 x_\circ^{\ 2}$ b) Describe graphically the interchange between kinetic, potential and total energy during simple harmonic motion. c) Apply the conservation of energy in S.H.M $(E_p + E_k = E_{tot})$		**A level** Topic 12	**A level** Topic 17	**4**
3.3 Damped and forced oscillations, resonance	a) Define damped oscillations and describe practical examples. b) Define and describe practical examples of resonance. c) Describe graphically how the amplitude of a forced oscillation changes with frequency near to the natural frequency of the system. d) Appreciate that there are some circumstances in which resonance is useful and other circumstances in which resonance should be avoided.		**A level** Topic 12	**A level** Topic 17	**1**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
4. Electric fields					
4.1 Coulomb's law	a) Understand that, for any point outside a spherical conductor, the charge on the sphere may be considered to act as a point charge at its center. b) Recall and use Coulomb's law to solve problems about electric force: i. between two point charges. ii. exerted by two charges on a third one in one and two dimensions (using Pythagoras theorem).		**A level** Topic 14	**A level** Topic 18 & External resources for learning outcome b (ii)	**4**
4.2 Concept of an electric field and field strength	a) Understand the concept of an electric field. b) Represent an electric field by means of field lines. c) Define electric field strength as force per unit positive charge acting on a stationary point charge ($E = \frac{F}{Q}$) d) Calculate the electric field strength due to a point charge (radial field) using the formula ($E = \frac{Q}{4\pi\varepsilon_{\circ} r^2}$) e) Calculate the electric field strength between two point charges in one and two dimensions (using Pythagoras theorem). f) Solve problems to determine the point at which the net electric field strength exerted by two charges placed in a straight line is equal to zero.	**Experiment 4** (in the lab manual)	**A level** Topic 14	**A level** Topic 18 & & External resources for learning outcomes (e and f)	**3**

Grade 11 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (from Cambridge +MOE lab manual)	**Topics (Oxford)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
4.3 Electric potential of a point charge	a) Define electric potential at a point as the work done per unit positive charge in bringing a small test charge from infinity to the point. b) Calculate the electric potential due to a point charge (radial field) $(V = \frac{Q}{4\pi\varepsilon_{\circ} r})$ c) State that the field strength of the electric field at a point is equal to the negative of potential gradient at that point. d) Define potential difference between two points (P.d) as the work done per unit positive charge. $P.d = V = \frac{W}{Q} = \frac{\Delta PE}{Q}$ e) Describe electric potential energy and the changes of electrostatic potential energy in a uniform field. f) Compare and contrast electric and gravitational field.		**A level** Topic 14	**A level** Topic 18	**10**
4.4 Uniform electric fields	a) Calculate the field strength of the uniform field between charged parallel plates in terms of potential difference and separation $E = \frac{V}{d}$. b) Calculate the forces on charges in a uniform electric field $F = QE = Q\frac{V}{d}$ c) Describe the effect of a uniform electric field on the motion of charged particles.		**A level** Topic 14	**A level** Topic 18	**5**

Yearly plan for physics grade 11

	Grade 11– semester one		Grade 11– semester two
1	Physical Quantities and units	5	Motion in a circle
2	Kinematics	6	Gravitational field
3	Dynamics	7	Oscillations
4	Force, work, energy and power	8	Electric fields

Resources for teachers to upgrade their knowledge and skills

Teacher support	http://www.cie.org.uk/teaching-and-learning/
How to teach	https://www.international.heacademy.ac.uk/
Past paper resource	http://papers.xtremepapers.com/CIE
Teaching strategies	http://www.teachthought.com/pedagogy/instructional-strategies/50-teaching-strategies-to-jumpstart-your-teacher-brain/

References:

1. Bloom's Taxonomy of action verbs: http://www.educatorstechnology.com.
2. AS and A level physics, second edition, David Sang, Graham Jones, Gurinder Chadha and Richard Woodside. Cambridge University Press. 2014
3. Cambridge International AS and A Level physics, Teacher's Resource CD-ROM, second edition David Sang, Graham Jones, Gurinder Chadha, Miller J., Stark W., and Richard Woodside. Cambridge University Press. 2014.
4. College Physics. Vuilly(C). Seruuey (R), Faughn (J)., eight edition, BROOKs/COLE CENGAGE learning. 2009.
5. Essential knowledge and skill statements. www. bradford-pathways.org.uk
6. https://education.ohio.gov/getattachment/Topics/Teaching/Educator-Evaluation-System/How-to-Design-and-Select-Quality-Assessments/DOK-Compared-to-Blooms-Taxonomy.pdf.aspx
7. https://www.csun.edu/science/ref/reasoning/questions_blooms/blooms.htmlPhysics Syllabus, Caribbean Examinations Council, Caenwood Centre, Jamaica, 2013. www.cxc.org.
8. International AS and A level physics syllabus (9630). For teaching from September 2016 onwards. For International AS exams May/June 2017 onwards For International A-level exams May/June 2018 onwards. Oxford International AQA Examinations, United Kingdom. oxfordaqaexams.org.uk.
9. Physics in context for Cambridge International AS and A level, second edition, 2015, Jim Breithaupt and John Quill, Oxford University Press.

الإطار المنهجي للصف الثاني عشر

Grade 12 Syllabus

Grade 12 Syllabus

Physics is a science that is concerned with systems, laws, models, principles and theories that explain the physical behavior of our world and the universe. Physics is an enquiry-based discipline involving practical and investigational skills as well as knowledge and is regarded as a fundamental scientific discipline since all advances in technology can be traced either directly or indirectly to the physical laws and theories. This syllabus emphasize on the application of scientific concepts and principles. Such an approach is adopted to develop those long-term transferrable skills of ethical conduct, teamwork, problem solving, critical thinking, innovation, and communication. The syllabus will assist students to develop positive values and attitudes towards the physical components of the environment and will also provide a sound foundation for those who wish to pursue further studies in science.

Aims: Physics syllabus enables students to:

1. develop their knowledge and understanding of physics.
2. develop and apply their knowledge and understanding of the scientific process.
3. develop their understanding of the relationships between hypotheses, evidence, theories, and explanations.
4. develop and apply their observational, practical, modeling, enquiry and problem-solving skills, and their understanding in laboratory, field, and other learning environments.
5. develop their skills in reporting and presenting information clearly and logically in different formats.
6. develop their skills in communication, mathematics, and the use of technology in scientific contexts.
7. appreciate the contributions of some of the outstanding regional and international scientists to the development of Physics.
8. develop the ability to evaluate information critically, identify patterns, cause and effect, stability, and change, and evaluate ideas.

How to use grade 12 syllabus

This syllabus is arranged according to the following manner:

- **Outcomes:**

Indicate the scope of the content, including practical work which will be examined as well. However, practical work should not necessarily be limited to these objectives.

The numbering key :[Unit – Topic –Learning outcome]
e.g. **Unit 1**. (1. Electricity); **Topic 1** (1.1 Electric current); and **a) is the first learning outcome** (a) define the coulomb).

1. For the topics refer to the text book:
   - Cambridge International AS and A Level Physics, Second Edition, Mike Crundell, Geoff Goodwin and Chris Mee, Hodder Education, 2014.
   - Cambridge International AS and A Level Physics, Second Edition, David Sang, Graham Jones, Gurinder Chadha and Richard Woodside, Cambridge University Press, 2014.
2. For the practical works and activities refer to the teacher resource CD:
   - Cambridge International AS and A Level Physics, Teacher Resource, Second Edition, David Sang, Graham Jones, Gurinder Chadha, John Miller, Will Stark and Richard Woodside.
   - Practical lab manual for Grade 12 Physics, Hajir Al Balushi, Ministry of Education, 2021.

- **Practical experiments and activities:**

Show some examples of active learning activities and do not represent full -scale activities can be done. It is recommended that all of the suggested laboratory-related activities, such as conducting experiments must be done. Other activities like making field trips and viewing audio-visual materials, can be done also. Consider the sufficient time to carry out the practical experiments determined in this syllabus and explained in detail in the student textbook and in the teacher guide and training students in practical skills related to them. The teachers should get benefit from the student text book, teacher's guide (CD) from Hodder Education and Teacher's resource CD-ROM from Cambridge that are recommended by MOE in the approved books list. The teachers should include the practical lessons in the semester plan.

- **Resources for teachers to upgrade their knowledge and skills**

The main resources for the teachers are the textbook and the teacher's guides. The two recommended teacher's guides in the approved books list (teacher's guide (CD) from Hodder Education and teacher's resource CD-ROM from Cambridge) provide the needed support for the teachers. They include the following:

1) Teaching guide for each chapter includes teaching plan for the chapter with resources available for each topic in the chapter, introduction about the topic, topic summary, suggested teaching methods, key terms, common misunderstandings and misconceptions, methods for supporting struggling students, methods for challenging high achievers, homework suggestions and suggested activities and practicals.
2) Answers to examination style questions (end-of-chapter questions).
3) Extra activities.
4) Homework with answer scheme.
5) Practical guidance.
6) Suggested websites.
7) Revision checklist.
8) Interactive tests.
9) Copies of diagrams and tables from textbook.
10) Useful appendix.

Some other resources as websites are listed in this syllabus can provide support for teachers for this syllabus. The range of resources covers a large area of this syllabus so it is well worth exploring these sites before the course starts to discover relevant resources that can be used or recommended to students when appropriate.

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual**)**	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
1. Electricity					
1.1 Electric current	a) Define electric current as the flow of charge carriers. b) Solve problems using $Q = It$. (Where Q=Ne, N is the number of electrons) c) Define the coulomb. d) Derive and use, for a current-carrying conductor, the expression $I = Anve$, where n is the number density of charge carriers. e) Solve problems involving the mean drift velocity of charge carriers.		**Chapter 9**	**AS level** Topic 19	**2**
1.2 Potential difference, e.m.f, resistance and electric power	a) Define potential difference and the volt. b) Recall and use $V = \frac{W}{Q}$ c) Define electromotive force (e.m.f). d) Use energy consideration to distinguish between (P.d) and (e.m.f). e) Define resistance and the ohm. f) State Ohm's law. g) Solve problems using $V = IR$ h) Sketch and discuss the I–V characteristics of a metallic conductor at constant temperature (Ohmic conductor), a filament lamp, a semiconductor diode.	(Practical 9.2 in the CD) Measurement of resistance OR (**Experiment 1** in the lab manual) (Practical 11.3 in the CD) Identifying a material from its resistivity	**Chapter 9&11**	**AS level** Topic 19&20	**8**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
	i) Distinguish between forward bias and reverse bias in the diode. j) Distinguish between the effect of temperature on the resistance in metals and semiconductors. k) Recall the factors that effect on the resistance for a metal in the shape of a wire. l) solve problems involving the resistivity of a material $(R = \frac{\rho L}{A})$ m) recall and use $P = VI$, $P = I^2R$, $P=W/t$ and $P=V^2/R$	OR (**Experiment 2** in the lab manual)			

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
1.3 Kirchhoff's laws	a) Recall Kirchhoff's first law and appreciate the link to conservation of charge. b) Recall Kirchhoff's second law and appreciate the link to conservation of energy. c) Derive, using Kirchhoff's laws, the formulae for the combined resistance of two or more resistors in series. d) Solve problems using the formula for the combined resistance of two or more resistors in series. e) Derive, using Kirchhoff's laws, the formulae for the combined resistance of two or more resistors in parallel. f) Solve problems using the formula for the combined resistance of two or more resistors in parallel. g) Solve problems using the formula for the combined resistance of two or more resistors in series and parallel. h) Apply Kirchhoff's laws to solve circuit problems (with maximum two simultaneous equations).	(Practical 10.1 in the CD) Introduction to Kirchhoff's first law OR (**Experiment 3** in the lab manual) (Practical 10.3 in the CD) Resistors in series and parallel OR (**Experiment 4** in the lab manual)	**Chapter 10**	**AS level** Topic 20	**7**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual**)**	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
1.4 Practical circuits	a) Understand the effects of the internal resistance of a source of e.m.f. on the terminal potential difference. b) use the equation $(emf = IR + Ir)$ c) Understand the principle of a potential divider circuit as a source of variable p.d. d) Recall and solve problems using the principle of the potentiometer as a means of comparing potential differences.	(Practical 12.1 in the CD) Introduction to internal resistance OR (**Experiment 5** in the lab manual)	**Chapter 12**	**AS level** Topic 20	**3**
2. Capacitance					
2.1 Capacitors and Capacitance	a) Define capacitance and the farad, as applied to paralleled plate capacitors. b) Show the function of a capacitor in simple circuits. c) Recall and use $C = \frac{Q}{V}$. f) derive and use formulae for combined capacitance for capacitors in series and in paralle.l g) Distinguish between capacitors connected in series and in parallel and solve problems. h) deduce, from the area under a potential-charge graph, the equation $W = \frac{1}{2}QV = \frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$ i) Explain discharging capacitors in terms of charge and show charge-time graph during discharging. j) State some uses of capacitors in electric circuits.		**Chapter 24**	**A level** Topic 18	**4**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
3. Magnetic fields and electromagnetism					
3.1 Concept of magnetic field	a) Understand that a magnetic field is an example of a field of force produced either by current-carrying conductors or by permanent magnets. b) Sketch magnetic field patterns due to permanent magnets, long straight wires, flat circular coils, and long solenoids. c) Use the right-hand rule to determine the direction of magnetic field or current in a long straight wire, a flat circular coil, and a long solenoid.		**Chapter 26**	**A level** Topic 22	**2**
3.2 Force on a current carrying conductor	a) Appreciate that a force might act on a current-carrying conductor placed in a magnetic field. b) Recall and solve problems using the equation $F = BIL\sin\theta$ with directions as interpreted by Fleming's left-hand rule. c) Define magnetic flux density and the tesla using the equation $F = BIL\sin\theta$. d) Understand how the force on a current-carrying conductor can be used to measure the flux density of a magnetic field using a current balance. e) Explain the force between two parallel current-carrying conductors and predict the direction of the force.		**Chapter 26**	**A level** Topic 22	**4**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
3.3 Force on a moving charge	a) Predict the direction of the force on a positive and a negative charge moving in a magnetic field using Fleming's left-hand rule. b) Derive and use the equation of the force exerted on a charge moving in a magnetic field. $F = QvB\sin\theta$ c) Recall that the charge moves in a circular path when the velocity is perpendicular with the magnetic field. d) Derive the radius of the circular path of a charge moving in a magnetic field and use the formula $r = \frac{mv}{Be}$ e) Recall the construction of an electron beam tube. f) use the specific charge of the electron $\frac{e}{m_e} = \frac{2V}{B^2 r^2}$ g) Describe and analyze the deflection of beams of charged particles by uniform electric and uniform magnetic fields. (velocity selection) h) Determine the magnitude and the direction of the electric force exerted on an electron beam moving in an electron beam tube. i) Derive the velocity of the path of the charge particles when no deflection $v = \frac{E}{B}$	(Practical 27.1 in the CD) Investigating the path described by electrons in a uniform Electric and magnetic field OR (**Experiment 6** in the lab manual)	**Chapter 27**	**A level** Topic 22	**7**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
4. Electromagnetic induction					
4.1 Electromagnetic induction	a) Define magnetic flux and the weber. b) Recall and use: ● $\emptyset = BAcos\theta$ (where θ is the angle between B and the normal to A) OR ● $\emptyset = BAsin\theta$ (where θ is the angle between B and A) c) Define magnetic flux linkage. d) State Faraday's law of electromagnetic induction. e) Apply Fleming's right-hand rule to determine the direction of the induced current f) Solve problems using Faraday's law of electromagnetic induction to find the magnitude of the induced e.m.f $E = \frac{N(\Delta\emptyset)}{(\Delta t)}$ g) Infer from appropriate experiments on electromagnetic induction: • that a changing magnetic flux can induce an e.m.f. in a circuit. • the cases when e.m.f is not induced. • that the direction of the induced e.m.f. opposes the change producing it (Lenz's law). • the factors affecting the magnitude of the induced e.m.f. i) Define eddy currents.	(Practical 28.1 in the CD) Student experiments on electromagnetic induction – A: Magnet and coil, B: magnet and wire. OR (**Experiment 7** in the lab manual)	**Chapter 28**	**A level** Topic 23	**8**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
5. Alternating currents					
5.1 The transformers	a) Understand the principle of operation of a simple laminated iron-cored transformer and state the types of transformers. b) Recall and solve problems using $\frac{N_s}{N_P} = \frac{V_s}{V_P} = \frac{I_P}{I_s}$ for an ideal transformer.		**Chapter 29**	**A level** Topic 24	**2**
5.2 Transmission of electrical energy	a) Appreciate the practical and economic advantages of alternating current and of high voltages for the transmission of electrical energy. b) Solve problems using $P=IV=I^2R$ for power loss.			**A level** Topic 24	**1**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
5.3 Rectification	a) Understand the characteristic of an alternating current or voltage. b) Understand the meaning of rectification. c) Distinguish graphically between half-wave and full-wave rectification. d) Explain the use of a single diode for the half-wave rectification of an alternating current. e) Explain the use of four diodes (bridge rectifier) for the full-wave rectification of an alternating current. f) Define smoothing by capacitors. g) Analyze the effect of a single capacitor in smoothing, including the effect of the value of capacitance in relation to the load resistance.		**Chapter 29**	**A level** Topic 24	**4**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 2					
1. Waves					

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
1.1 Progressive waves	a) Describe what is meant by wave motion as illustrated by vibration in ropes, springs, and ripple tanks. b) Understand and use the terms displacement, amplitude, phase difference, period, frequency, wavelength, and speed. c) deduce, from the definitions of speed, frequency and wavelength, the wave equation $v = f\lambda$ d) Recall and use the equation $v = f\lambda$ e) Understand that energy is transferred by a progressive wave. f) recall and use the relationship *intensity* $\propto$ (*amplitude*)^2		**Chapter 13**	**AS level** Topic 14	**3**
1.2 Doppler effect	a) Define Doppler effect. b) Understand that whenever there is a relative motion between the source of wave and the observer there is a change in the observed frequency. c) Use the expression $f_{\circ} = \frac{f_s v}{(v \mp v_s)}$ for the observed frequency when a source of sound waves moves relative to a stationary observer. g) Appreciate that Doppler effect is observed with all waves, including sound and light. (Applications of Doppler effect need not to be discussed in light).		**Chapter 13**	**AS level** Topic 14	**4**
2. Superposition of waves					

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
2.1 Interference, two source interference	a) State the principle of superposition of waves. b) Understand the terms interference, fringes, crest, trough, and coherence. c) Explain the constructive and destructive interferences. d) Discuss the conditions of constructive and destructive interference quantitatively. d) Show an understanding of experiments that demonstrate two source interference using water ripples. e) Show an understanding of two sources interference in sound waves and light. f) Understand the conditions required if two-source interference fringes are to be observed. g) Use Young's double-slit experiment to calculate the wavelength of light. h) Recall and solve problems using the equation $\lambda = \frac{ax}{D}$	(Practical 14.3 in the CD) Measurement of wavelength using Young's slits OR (**Experiment 1** in the lab manual)	**Chapter 14**	**AS level** Topic 15	**7**
2.2 Diffraction	a) Explain the meaning of the term diffraction. b) Show an understanding of experiments that demonstrate diffraction with both a wide gap and a narrow gap using a ripple tank. (You can use video or simulation to change both width gap and wavelength.		**Chapter 14**	**AS level** Topic 15	**2**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual**)**	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
	a) Define the diffraction grating. b) Recall and solve problems using the formula $d \sin \theta = n\lambda$ c) Explain the production of the spectrum of white light with a	(Practical 14.4 in the CD) Determining the wavelength of light using a diffraction grating OR (**Experiment 2** in the lab manual)	**Chapter 14**	**AS level** Topic 15	**4**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
3.4 Energy levels in atoms and line spectra	a) Show an understanding of the existence of discrete electron energy levels in isolated atoms (e.g. atomic hydrogen) and deduce how this leads to spectral lines. b) Distinguish between emission and absorption line spectra c) Recall and solve problems using the relation $\Delta E = hf = E_2 - E_1 = \frac{hc}{\lambda}$		**Chapter 30**	**A level** Topic 25	**3**
4. Particle and nuclear physics					
4.1 Atoms, nuclei and radiation	a) Infer from the results of the α-particle scattering experiment the existence and small size of the nucleus. b) Describe a simple model for the nuclear atom to include protons, neutrons, and orbital electrons. c) Distinguish between nucleon number and proton number. d) Understand that an element can exist in various isotopic forms, each with a different number of neutrons. e) Use the usual notation for the representation of nuclides. f) Appreciate that nucleon number, proton number, and mass-energy are all conserved in nuclear processes. g) Show an understanding of the nature and properties of α-, β- and γ-radiations (both β– and β+ are included). h) State that antineutrinos and neutrinos are produced during β– and β+ decay. i) Explain the changes occurs in a nuclide during a nuclear emission.		**Chapter 16&31**	**AS level** Topic 26	**4**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
4.2 Mass defect and nuclear binding energy	a) Show an appreciation of the association between energy and mass as represented by $E = mc^2$ and recall and use this relationship. b) Understand the significance of the terms mass defect and mass excess in nuclear reactions. c) Represent simple nuclear reactions by nuclear equations of the form ${}^{14}_{7}N + {}^{4}_{2}He \rightarrow {}^{17}_{8}O + {}^{1}_{1}H$ d) Define and calculate mass defect, binding energy and binding energy per nucleon. e) Sketch the variation of binding energy per nucleon with nucleon number. f) Explain what is meant by nuclear fusion and nuclear fission with giving examples. g) Explain the relevance of binding energy per nucleon to nuclear fusion and to nuclear fission.		**Chapter 31**	**A level** Topic 26	**5**
4.3 Radioactive decay	a) Infer the random nature of radioactive decay from the fluctuations in count rate. b) Show an appreciation of the spontaneous and random nature of nuclear decay. c) Define the terms activity and decay constant and recall and solve problems using $A = \frac{\Delta N}{\Delta t} = -N\lambda$		**Chapter 31**	**A level** Topic 26	**5**

Grade 12 (Bilingual) Physics - Learning outcomes					
Subtopics	**Learning Outcomes**	**Practical work** (Teacher's resource CD-ROM from Cambridge +MOE lab manual)	**Topics (Cambridge)**	**Topics (Hodder)**	**No. of lessons**
Semester 1					
	d) Infer and sketch the exponential nature of radioactive decay and solve problems using the relationship $x = x_o e^{-\lambda t}$, where x could represent activity A, number of undecayed nuclei N or received count rate R. e) Define half-life. f) Solve problems using the relation $\lambda = \frac{0.693}{t_{1/2}}$				

Yearly plan for physics grade 12

	Grade 12– semester one		Grade 12– semester two
1	Electricity	6	Waves
2	Capacitance	7	Superposition
3	Magnetic fields and electromagnetism	8	Quantum physics
4	electromagnetic induction	9	Particle and nuclear physics
5	Alternating currents		

Resources for teachers to upgrade their knowledge and skills

Teacher support	http://www.cie.org.uk/teaching-and-learning/
Past paper resource	www.s-cool.co.uk/
Teaching strategies	http://www.teachthought.com/pedagogy/instructional-strategies/50-teaching-strategies-to-jumpstart-your-teacher-brain/

References:

1. Bloom's Taxonomy of action verbs: http://www.educatorstechnology.com.
2. Cambridge International AS and A Level Physics (9702). 2016, Cambridge International Examinations, United Kingdom. www.cie.org.uk.
3. Cambridge International AS and A level physics, second edition, Mike Crundell, Geoff Goodwin and Chris Mee. Hodder education, 2014.
4. Cambridge International AS and A level physics, Teacher's CD, Mike Crundell and Geoff Goodwin. Hodder education, 2014.
5. Cambridge International AS and A level physics, second edition, David Sang, Graham Jones, Gurinder Chadha and Richard Woodside. Cambridge University Press. 2014
6. Cambridge International AS and A Level physics, Teacher's Resource CD-ROM, second edition David Sang, Graham Jones, Gurinder Chadha, Miller J., Stark W. and Richard Woodside. Cambridge University Press. 2014.
7. College Physics. Vuilly(C). Seruuey (R), Faughn (J)., eight edition, BROOKs/COLE CENGAGE learning. 2009.
8. Essential knowledge and skill statements. www. bradford-pathways.org.uk
9. https://education.ohio.gov/getattachment/Topics/Teaching/Educator-Evaluation-System/How-to-Design-and-Select-Quality-Assessments/DOK-Compared-to-Blooms-Taxonomy.pdf.aspx
10. https://www.csun.edu/science/ref/reasoning/questions_blooms/blooms.htmlPhysics Syllabus, Caribbean Examinations Council, Caenwood Centre, Jamaica, 2013. www.cxc.org.
11. International AS and A level physics syllabus (9630). For teaching from September 2016 onwards. For International AS exams May/June 2017 onwards For International A-level exams May/June 2018 onwards. Oxford International AQA Examinations, United Kingdom. oxfordaqaexams.org.uk.
12. Physics in context for Cambridge International AS and A level, second edition, 2015, Jim Breithaupt and John Quill, Oxford University Press.

نهاية الإطار المنهجي

End Of physics Syllabus