سلطنة عمان
وزارة التربية والتعليم
المديرية العامة للمدارس الخاصة
دائرة برامج ومناهج المدارس الخاصة

نظام إدارة الجودة
Quality Management System

رؤية عمان 2040
نمضي بثقة
Moving Forward with Confidence

Syllabus	الإطار المنهجي
Physics	مادة الفيزياء
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Contents

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 these 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.

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; • handle chemicals and living organisms with care; • assemble and use simple 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, graphs, tables, diagrams and drawings; • 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	• make clear, accurate line representations of specimens, with no shading or unnecessary details; and with clean continuous lines. • label drawings accurately and use label lines which do not cross each other or carry arrowheads or dots • make drawings which are large enough to display specific details • calculate the magnification of the drawings.

Physics 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 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 this 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.

1- The numbering key :[Unit – Topic –Learning outcome]
2- (S) skill objective.

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 approximately 70 % of suggested laboratory-related activities, such as conducting experiments, making field trips and viewing audio-visual materials,must be done. Take into account the sufficient time to carry out practical experiments in the student text book and the wok book and training students in practical skills related to them. The teachers should get benefit from the work book and laboratory practical book that are recommended by MOE in the approved books list.

Grade 9 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics		Learning Outcomes	pages			Practical activities
			Oxford	Cambridge	Hodder	
Unit 1: Measurements and motion						
1.1 Length and time	1.1.1	Name the SI units of mass, time and length	12-16	2 - 10	1-8	1.Determine the volume of regular and irregular objects 2.Measure thicknesses using micrometer screw gauge
	1.1.2(s)	Use the rules and measuring cylinders to find a length or a volume				
	1.1.3(s)	Use the clocks and devices, both analogue and digital, for measuring an interval of time				
	1.1.4(s)	Use the micrometer screw gauge to measure very small distances				
1.2 Mass and Weight	1.2.1	Define the mass of a body	20, 42, 43	37-39	24	Use of Newton meter
	1.2.2	State that weight is a gravitational force				
	1.2.3	Distinguish between mass and weight				
	1.2.4	Use the equation W = mg				
1.3 Density	1.3.1	Define density	16-21	6-8	21-23	Determine density by displacement method
	1.3.2	Use the equation $\rho = m/V$				
	1.3.3(s)	Describe an experiment to determine the density of a liquid and of a regularly shaped solid and make the necessary calculation				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	Learning Outcomes		pages			Practical activities
			Oxford	Cambridge	Hodder	
1.4 Scalars and vectors	1.4.1	Demonstrate the difference between scalars and vectors and give common examples	50-51	46,47	27-28	
	1.4.2(s)	Determine graphically the resultant of two vectors in straight lines (same and different directions)				
	1.4.3	Determine graphically the resultant of two vectors using the method of triangle				
1.5 Motion	1.5.1	Distinguish between distance and displacement	26-29, 34-35	21-27, 40	9-16	Demonstrate the velocity and acceleration of moving trolley down a slope
	1.5.2	Distinguish between speed and velocity				
	1.5.3	Calculate velocity using change of displacement/time taken				
	1.5.4(s)	Interpret a (displacement-time) graph for objects at rest, moving with constant velocity and moving with changing velocity				
	1.5.5(s)	Calculate velocity from the gradient of (displacement-time) graph				
	1.5.6	Define acceleration				
	1.5.7	Calculate acceleration using change of velocity/time taken				
	1.5.8(s)	Calculate acceleration from the gradient of a (Velocity-time) graph				
	1.5.9	Define deceleration as a negative acceleration				
	1.5.10(s)	Interpret a (velocity-time) graph for objects moving with constant velocity and moving with changing velocity (acceleration or deceleration)				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	Learning Outcomes		pages			Practical activities
			Oxford	Cambridge	Hodder	
Unit 2: Forces						
2.1 Newton's laws of motion	2.1.1	Describe the ways in which a force may change the motion of a body	36-39, 42-45, 50-51, 64-65	35 -42	25-26, 30-34	Determine the spring constant
	2.1.2	Define newton				
	2.1.3	Stat Newton's firs law of motion				
	2.1.4	Define inertia				
	2.1.5	Describe that the mass is a property that resist change in motion				
	2.1.6	State the Newton's second law of motion				
	2.1.7	Solve problems using equation F=ma (including the direction)				
	2.1.8	Find the of resultant of two or more forces (magnitude and the direction) acting along the same line				
	2.1.9	Describe the effect of the resultant force on the state of the motion of a body (Either remaining at rest or continue moving with steady or changing velocity)				
	2.1.10	State the Newton's third law of motion				
	2.1.11	State some applications of Newton's third law of motion				
	2.1.12	Describe Hooke's law (the expression F=kx where k is the spring constant)				
	2.1.13	Describe the experimental procedure associated for Hooke's law				
	2.1.14(S)	Interpret extension-load graphs				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	Learning Outcomes		pages			Practical activities
			Oxford	Cambridge	Hodder	
2.2 Turning effect of force	2.2.1	Define the moment of a force and give everyday examples	58-59, 62-3	52-56	39-42	Find the mass of an unknown object using moments
	2.2.2	Understand that increasing force or distance from the pivot increases the moment of a force				
	2.2.3	Calculate moment using the product force × perpendicular distance from the pivot				
	2.2.4	State the principle of moments to the balancing of a beam about a pivot				
	2.2.5(s)	Perform an experiment (involving vertical forces) to show that there is no net moment on a body in equilibrium				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**pages**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
Unit 3: Work and energy						
3.1 Work	3.1.1	Demonstrate the concept of work using equation (W= force × distance in the direction of the force)	82	104-108	52	
	3.1.2	Solve problem using the equation (W=F× d)				
3.2 Energy	3.2.1	State Energy as the capacity of doing work	82-89	80, 84, 87-89, 104-106, 96-101, 109	50-65	Conservation of Kinetic Energy and Potential Energy using trolley , runway and hanger
	3.2.2	State different forms of Energy				
	3.2.3	Define the kinetic energy				
	3.2.4	Calculate the kinetic energy (KE) using the expression $\left(kE = \frac{1}{2}mv^2\right)$				
	3.2.5	Define the gravitational potential energy				
	3.2.6	Calculate gravitational potential energy (PE) using the expression (PE= mgh)				
	3.2.7	State the principle of the conservation of energy				
	3.2.8	State that mechanical energy (E) is the sum of kinetic energy (KE) and gravitational potential energy (PE)				
	3.2.9(s)	Apply the principle of the conservation of energy to mechanical system (Δ KE = - ΔPE)				
	3.2.10	Describe the transformation of energy				
	3.2.11(s)	Relate the work done (W) to the transformed energy (ΔE) using the expression (W= Fd =ΔE)				
	3.2.12	State the qualitative understanding of efficiency				
	3.2.13(S)	Use the equation $\left(\boldsymbol{efficiency} = \frac{\boldsymbol{useful\ output\ energy}}{\boldsymbol{total\ input\ energy}} \times \mathbf{100}\%\right)$				
	3.2.14	Define the power as the work done per unit time				
	3.2.15	Use the equation (P=ΔE/t) in simple systems				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**pages**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
Unit 4: Thermal Physics						
4.1 Molecular model	4.1.1	State the properties of solids, liquids and gases	102 -103	117-123. 133	72-75	
	4.1.2	Describe qualitatively the molecular structure of solids, liquids and gases in terms of the arrangement, separation and motion of the molecules				
	4.1.3	Describe Brownian motion				
	4.1.4	Describe that random motion of particles in a suspension as evidence for the kinetic molecular model of matter				
4.2 Evaporation	4.2.1	Describe evaporation in terms of the escape of more-energetic molecules from the surface of a liquid	118-119	122-124	93-92	
	4.2.2	Relate evaporation to the consequent cooling of the liquid				
	4.2.3	Understand that temperature, surface area and draught over a surface influence evaporation				
4.3 Gas laws	4.3.1	Describe qualitatively the pressure of a gas in terms of the motion of its molecules	74-75, 110-111		76-80	
	4.3.2	Relate change in volume of a gas to change in pressure applied on it at constant temperature (Boyle's law)				
	4.3.3	Use the equation PV=constant for a fixed mass of a gas at constant temperature				
	4.3.4	Relate change in temperature of a gas to change in pressure applied on it at constant volume				
	4.3.5	Use the equation P/T=constant for a fixed mass of a gas at constant volume				
	4.3.6	Study the effect of temperature on volume of a gas at constant pressure				
	4.3.7	Use the equation V/T=constant for a fixed mass of a gas at constant pressure				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**pages**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
4.4 Thermal expansion of solids, liquids and gases	4.4.1	Describe qualitatively the thermal expansion of solids, liquids, and gases at constant pressure	108-109, 111	137-138	81-84	
	4.4.2	Explain some of the everyday applications and consequences of thermal expansion				
	4.4.3	Explain, in terms of the motion and arrangement of molecules, the relative order of the magnitude of the expansion of solids, liquids and gases				
4.5 Measurement of Temperature	4.5.1	Explain how thermal expansion may be used for the measurement of temperature	104-107	133-136	85-87	
	4.5.2	Recognise the need for and identify fixed points				
	4.5.3	Explain the structure of liquid-in-glass thermometers				
	4.5.4	Understand the sensitivity, range and linearity of thermometers				
	4.5.5	Describe the structure of thermocouple				
	4.5.6	Describe how the thermocouple works				
4.6 Thermal capacity (Heat capacity)	4.6.1	Relate a rise in the temperature of a body to an increase in its internal energy	120-121	133, 140-143	88- 90	Determine the Specific Heat Capacity of Solids and Liquids
	4.6.2	Define the thermal capacity of a body				
	4.6.3	Define the specific heat capacity of a body				
	4.6.4	Use the equation thermal capacity = mc				
	4.6.5	Use the equation change in energy = mcΔT				
	4.6.6(s)	Describe an experiment to measure the specific heat capacity of a substance				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**pages**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
4.7 Melting and boiling	4.7.1	Describe melting and boiling in terms of energy input without a change in temperature	118 -119, 122-123	117-123. 144-145		Determine the latent heat of fusion and vaporization
	4.7.2	State the meaning of melting point and boiling point				
	4.7.3	Describe condensation and solidification in terms of molecules				
	4.7.4	Distinguish between boiling and vaporisation				
	4.7.5	Define specific latent heat of fusion				
	4.7.6	Use the equation (energy = mas× specific latent heat of fusion)				
	4.7.7	Define specific latent heat of vaporization				
	4.7.8	Use the equation (energy = mas× specific latent heat of vaporisation)				
	4.7.9	Describe the molecular interpretation of latent heat of vaporisation and latent heat of fusion				
	4.7.10	Describe an experiment to measure specific latent heats for steam and for ice				
4.8 Thermal Processes	4.8.1	Demonstrate the properties of good and bad thermal conductors	112-117	150-158	97-103	1.Compare the conductivity between metals and non-metals 2.Demonstrate convection experimentally 3.Properties of good and bad emitters and absorbers
	4.8.2	Explain conduction in solids including lattice vibration and transfer by electrons				
	4.8.3	Recognise convection as an important method of thermal transfer in fluids				
	4.8.4	Relate convection in fluids to density changes				
	4.8.5	Describe experiments to illustrate convection				
	4.8.6	Identify infra-red radiation as part of the electromagnetic spectrum				
	4.8.7	Recognise that thermal energy transfer by radiation does not require a medium				
	4.8.8	Describe the effect of surface colour (black or white) and texture (dull or shiny) on the emission, absorption and reflection of radiation				
	4.8.9	Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-red radiation				

Grade 9 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**pages**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
4.8 Thermal Processes	4.8.10	Understand that the amount of radiation emitted depends on the surface temperature and surface area of a body				
	4.8.11	Explain everyday applications and consequences of conduction, convection and radiation				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics		**Learning Outcomes**	**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
Unit 1: Magnetism and Electricity						
1.1 Magnetism	1.1.1	Describe the forces between magnets, and between magnets and magnetic materials	200-203	224-233	146-149	Drawing magnetic field lines around bar magnets
	1.1.2	Distinguish between magnetic and non-magnetic materials				
	1.1.3	Distinguish between the magnetic properties of soft iron and steel				
	1.1.4	Describe methods of magnetization, to include stroking with a magnet, use of d.c. in a coil				
	1.1.5	Describe methods of demagnetization, to include hammering, heating and use of a.c. in a coil				
	1.1.6	Distinguish between the permanent magnets and the electromagnets				
	1.1.7(s)	Draw the pattern of magnetic field lines around a bar magnet				
	1.1.8(s)	Describe an experiment to identify the pattern of magnetic field lines, including the direction				
	1.1.9	Explain that magnetic forces are due to interactions between magnetic fields				
1.2 Static electricity	1.2.1	Recall that there are positive and negative charges	172-176	234-343	150-156	Determine the electrostatic charge using electroscope
	1.2.2	State that unlike charges attract and that like charges repel				
	1.2.3	Describe simple experiments for the production and detection of electrostatic charges				
	1.2.4	State that charging a body involves the addition or removal of electrons				
	1.2.5	Distinguish between electrical conductors and insulators and give typical examples				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
1.2 Static electricity	1.2.6	State that charge is measured in coulombs				
	1.2.7	Describe the structure and the uses of electroscope				
	1.2.8	Describe the method of charging by induction				
	1.2.9	Define earthing				
	1.2.10	Define an electric field as a region in which an electric charge experiences a force				
	1.2.11	State that the direction of an electric field at a point is the direction of the force on a positive charge at that point				
	1.2.12	Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates				
1.3 current	1.3..1	State that current is related to the flow of charge	178-179	244-259	157-158	Measure current in simple circuits
	1.3..2	Distinguish between the direction of flow of electrons and conventional current				
	1.3..3(s)	Use an ammeter (both analogue and digital) to measure current				
	1.3..4	Use the equation I = Q / t				
	1.3..5	Name the unit of current				
1.4 Potential difference and electromotive force	1.4.1	Define the potential difference (p.d.) across a circuit component	180-181	244-259	162-166	Measure P.d in simple circuits
	1.4.2	State that the potential difference (p.d.) across a circuit component is measured in volts				
	1.4.3	Recall that 1 V is equivalent to 1 J / C				
	1.4.4	State that the e.m.f. of an energy supplied by a source in driving charge round a complete circuit and is measured in volts				
	1.4.5(s)	Use a voltmeter (both analogue and digital) to measure p.d.				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
1.5 Resistance	1.5.1	State that resistance = p.d. / current	182-185	244-259	167-171	Determine the resistance using a V vs. I graph
	1.5.2	Use the equation R = V / I				
	1.5.3	Name the unit of resistance				
	1.5.4	State Ohm's law				
	1.5.5(s)	Design an experiment to calculate the resistance from current-voltage graph				
	1.5.6(s)	Explain the current-voltage graph for an ohmic resistor and a filament lamp				
	1.5.7	Relate (without calculation) the resistance of a wire to its length, diameter, material and temperature (the factors effecting resistance)				
1.6 Electrical energy and power	1.6.1	Define the electric power as the rate at which energy transformed (power=Energy transformed/time)	192-193	244-259	177-179	
	1.6.2	Use the equations P = IV and E = Ivt				
	1.6.3	State the Unit of power				
1.7 Electrical circuits	1.7.1	Draw circuit diagrams containing sources, switches, resistors (fixed and variable), heaters, thermistors, light-dependent resistors, lamps, ammeters, voltmeters, galvanometers, magnetising coils, transformers, bells, fuses, relays and diodes	178, 183, 188-195	260-270, 273-275	158-161, 180-184	Determine the properties of circuits (series and parallel)
	1.7.2	Recall that the current at every point in a series circuit is the same				
	1.7.3	Use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply				
	1.7.4	Calculate the effective (total) resistance of two resistors in series				
	1.7.5(s)	Design an experiment to calculate the effective resistance of two resistors in series				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
1.7 Electrical circuits	1.7.6	Use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit				
	1.7.7	State that, for a parallel circuit, the current from the source is larger than the current in each branch				
	1.7.8	Recall that p.d across each component in parallel circuit is the same				
	1.7.9	State that the combined resistance of two resistors in parallel is less than that of either resistor by itself				
	1.7.10	Calculate the equivalent resistance of two resistors in parallel				
	1.7.11(s)	Design an experiment to calculate the equivalent resistance of two resistors in parallel				
	1.7.12	State the advantages of connecting lamps in parallel in a lighting circuit				
	1.7.13	State the hazards of: – damaged insulation – overheating of cables – damp conditions				
	1.7.14	Explain fuses and circuit breakers				
	1.7.15	Explain the benefits of earthing metal cases				
1.8 Electromagnetic effects	1.8.1	Show that a conductor moving across a magnetic field or a changing magnetic field linking with a conductor can induce an e.m.f. in the conductor	212, 216, 219-221	281-306	200-208	Electromagnetic induction experiment
	1.8.2(s)	Demonstrate electromagnetic induction with an experiment				
	1.8.3	State the factors affecting the magnitude of an induced e.m.f.				
	1.8.4	Distinguish between direct current (d.c.) and alternating current (a.c.)				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 1						
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
1.8 Electromagnetic effects	1.8.5	Explain the structure of a rotating-coil generator with slip rings				
	1.8.6	Describe the working principle of generator				
	1.8.7	Sketch a graph of voltage output against time for a simple a.c. generator				
	1.8.8	Describe the basic transformer with a soft-iron core				
	1.8.9	Describe the principle of operation of a transformer				
	1.8.10	Understand the terms step-up and step-down				
	1.8.11	Use the equation (Vp / Vs) = (Np / Ns)				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics		**Learning Outcomes**	**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
Unit 2: Waves						
2.1 General wave properties	2.1.1	Understand that waves transfer energy without transferring matter	124-131	200-213	106-112	Study the wave properties using the ripple tank
	2.1.2	Demonstrate wave motion by vibration in ropes and springs and water waves				
	2.1.3	Distinguish between transverse and longitudinal waves				
	2.1.4	Use the term wave front				
	2.1.5	Give the meaning of speed, frequency, wavelength and amplitude				
	2.1.6	Use the equation $v = f\lambda$				
	2.1.7	Describe how waves can undergo: – reflection at a plane surface – refraction due to a change of speed				
	2.1.8	Demonstrate reflection and refraction in water waves				
	2.1.9	Describe how waves can undergo: – diffraction through a narrow gap – diffraction at an edge				
	2.1.10	Demonstrate diffraction in water waves				
	2.1.11	Describe how wavelength and gap size affects diffraction through a gap				
	2.1.12	Describe how wavelength affects diffraction at an edge				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 2							
Subtopics		**Learning Outcomes**		**Page**			**Practical activities**
				Oxford	**Cambridge**	**Hodder**	
2.2 Light	2.2.1 Reflection of light	2.2.1.1	State the properties of light: – straight lines – transfers energy – travel through empty space – has a speed of 300,000km/s	144-149	178-199	113-121	Verify the law of reflection
		2.2.1.2	Describe the formation of an optical image with its characteristics by a plane mirror				
		2.2.1.3	Demonstrate law of reflection by plane mirrors				
		2.2.1.4(s)	Draw ray diagram for reflection by plane mirrors				
		2.2.1.5	Define: incident ray, reflected ray, normal, angle of incident and angle of reflection				
		2.2.1.6	Use the law angle of incidence = angle of reflection				
	2.2.2 Refraction of light	2.2.2.1(s)	Demonstration law of the refraction of light by rectangular glass block	150-155	178-199	122-128	
		2.2.2.2	Use the terminology for the angle of incidence i and angle of refraction r				
		2.2.2.3	Use the equation sin i / sin r = n				
		2.2.2.4	Define refractive index in terms of angle of incidence and angle of refraction				
		2.2.2.5	Define refractive index n in terms of speed (n=speed of light in air/speed of light in medium)				
		2.2.2.6	Describe total internal reflection				
		2.2.2.7	Give the meaning of critical angle				
		2.2.2.8	Use n = 1 / sin c				
		2.2.2.9	Explain the action of optical fibres in medicine and communications technology				
		2.2.2.10	Describe the dispersion of light from glass prism including the seven colours of the spectrum in their correct order				
		2.2.2.11	Describe a single frequency light means monochromatic				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 2							
Subtopics		**Learning Outcomes**		**Page**			**Practical activities**
				Oxford	**Cambridge**	**Hodder**	
2.2 Light	2.2.3 Thin lenses	2.2.3.1	Distinguish between converging and diverging lenses in term of: – shape – light pass	156-159	178-199	129-134	Describe the nature of an image formed by convex lens experimentally (one position is enough)
		2.2.3.2	Use the terms principal focus and focal length				
		2.2.3.3	Describe the standard rays by drawing in a ray diagram				
		2.2.3.4	Draw ray diagrams for the formation of a real image by a single lens				
		2.2.3.5	Draw ray diagrams for the formation of images by a convex lens				
		2.2.3.6	Describe the nature of an image using the terms enlarged/same size/diminished ,upright/inverted and real image/ virtual image				
		2.2.3.7	Draw ray diagrams for the formation of images by a concave lens				
2.3 Electromagnetic spectrum		2.3.1	Describe the main features of the electromagnetic spectrum in order of wavelength and frequency	162-165	214-222	135-139	
		2.3.2	State that the speed of electromagnetic waves in a vacuum is 3.0×10^8 m / s and is approximately the same in air				
		2.3.3	State applications of each region in electromagnetic spectrum				
		2.3.4	Understand the safety issues regarding microwaves and X-rays				
2.4 Sound		2.4.1	State the features of sound waves	132-139	166-177	140-144	Design an experiment to determine the speed of sound in air
		2.4.2	Describe the production of sound by vibrating sources				
		2.4.3	Describe the longitudinal nature of sound waves and compression and rarefaction				
		2.4.4	Describe an echo of sound				
		2.4.5	Use the equations: speed=distance travelled/ time taken, speed=frequency × wavelength				
		2.4.6	State the factors that effect the speed of sound (temperature and material)				
		2.4.7	Relate the loudness and pitch of sound waves to amplitude and frequency				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 2						
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
2.4 Sound	2.4.8	State that the approximate range of audible frequencies for a healthy human ear is 20 Hz to 20 000 Hz				
	2.4.9	Define the term ultrasound				
Unit 3: Atomic physics						
3.1 Atomic model	3.1.1	Describe the structure of an atom in terms of a positive nucleus and negative electrons	244-245	308-317	239-244	
	3.1.2	Describe the composition of the nucleus in terms of protons and neutrons				
	3.1.3	State the features of protons, neutrons and electrons (charge, mass)				
	3.1.4	Use the term atomic number (proton number) Z				
	3.1.5	Use the term mass number (nucleon number) A				
	3.1.6	Use the term nuclide and the notation $^{A}X_{z}$				
	3.1.7	Explain the term isotope				
3.2 Radioactivity	3.2.1	Define background radiation	246-253	318-335	230-237	
	3.2.2	Identify α, β and γ-emissions by: – their nature – their relative ionising effects – their relative penetrating abilities –their deflection in electric fields and in magnetic fields (β+ are not included)				
	3.2.3	Give examples of practical applications of α, β and γ-emissions				
	3.2.4	Describe the detection of α-particles, β-particles and γ-rays (Geiger-Muller tube)				
	3.2.5	Define radioactive decay				
	3.2.6	State that during α- or β-decay the nucleus changes to that of a different element				
	3.2.7	Calculate half-life from data or decay curves				

Grade 10 (Bilingual) Physics - Learning outcomes Semester 2							
Subtopics	**Learning Outcomes**		**Page**			**Practical activities**
			Oxford	**Cambridge**	**Hodder**	
3.2 Radioactivity	3.2.8	Describe the effects of ionising radiations on living things				
	3.2.9	Describe how radioactive materials are handled, used and stored in a safe way				

Yearly plan

Semester 1 (YEAR 9)	Semester 2 (YEAR 9)	Semester 1 (YEAR 10)	Semester 2 (YEAR 10)
1. Measurements and motion 1.1 Length and time 1.2 Mass and weight 1.3 Density 1.4 Scalars and vectors 1.5 Motion 1.6 Momentum 2. Forces 2.1 Newton's laws of motion 2.2 Turning effect of force	3. Work and energy 3.1 Work 3.2 Energy 4. Thermal physics 4.1 Molecular model 4.2 Evaporation 4.3 Gas laws 4.4 Thermal expansion of solids, liquids and gases 4.5 Measurement of Temperature 4.6 Thermal capacity (Heat capacity) 4.7 Melting and boiling 4.8 Thermal processes	1.Magnetism and Electricity 1.1 Magnetism 1.2 Static electricity 1.3 Current 1.4 Potential difference and electromotive force 1.5 Resistance 1.6 Electrical energy and power 1.7 Electrical circuits 1.8 Electromagnetic effects	2. Waves 2.1 General wave properties 2.2 Light 2.3 Electromagnetic spectrum 2.4 Sound 3. Atomic physics 3.1 Atomic model 3.2 Radioactivity

Resources for teachers to upgrade their knowledge and skills

Teacher support	http://www.cie.org.uk/teaching-and-learning/ *www.phet.colorado.edu/* www.gradegorilla.com/
How to teach	https://www.international.heacademy.ac.uk/
Past paper resource	http://papers.xtremepapers.com/CIE/Cambridge%20IGCSE/ *www.s-cool.co.uk/*
Teaching strategies	http://www.teachthought.com/pedagogy/instructional-strategies/50-teaching-strategies-to-jumpstart-your-teacher-brain/

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2. Cambridge IGCSE physics syllabus (0625). 2014. Cambridge International Examinations, United Kingdom. www.cie.org.uk
3. Cambridge IGCSE Physics, third edition, Heather Kennett and Tom Duncan. Hodder education, 2014.
4. Cambridge IGCSE Physics, second edition, David Sang. Cambridge University Press. 2014
5. Complete physics for Cambridge IGCSE, third edition, Stephen Pople, Oxford University Press, 2014.
6. Essential knowledge and skill statements. www. bradford-pathways.org.uk
7. https://education.ohio.gov/getattachment/Topics/Teaching/Educator-Evaluation-System/How-to-Design-and-Select-Quality-Assessments/DOK-Compared-to-Blooms-Taxonomy.pdf.aspx
8. https://www.csun.edu/science/ref/reasoning/questions_blooms/blooms.htmlPhysics Syllabus, Caribbean Examinations Council, Caenwood Centre, Jamaica, 2013. www.cxc.org.
9. Oxford AQA International GCSE Physics Syllabus (9203). 2015. Version 1.0. Oxford International AQA Examinations, United Kingdom. oxfordaqaexams.org.uk
10. Science/physics Standards in Qatar. Ministry of education and higher education, Qatar. http://www.edu.gov.qa.

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End of Chemistry Syllabus