Subject: physics ***curriculum National***

Grade10: العاشر الأساسي

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P01	القانون العام للمرايا **The curved mirror formula**	▪ يستنتج عملياً القانون العام للمراياالمنحنية ▪ يميّز بين الرموز الواردة في القانون العام للمرايا ▪ يحل امثلة حسابية على القانون العام للمرايا ▪ Derive the formula for curved mirrors ▪ Recognize and use signs for convex and concave focal length and real and virtual images. ▪ Work on Applications of curved mirrors.	▪ التعلم المبني على النشاط -تنفيذ النشاط الوارد في الكتاب المدرسي. ▪ التدريس المباشر ▪ استخدام السبورة والطباشير لكتابة القانون العام وتوضيح دلالات الرموز الواردة فيه وحل امثلة الكتاب بمشاركة الطلبة. ▪ العمل في مجموعات: توزيع اوراق عمل تتضمن مسائل وتمارين على القانون العام للمرايا ▪ Many practical activities to find the focal length of concave mirrors and properties of images formed by both types of mirrors. . ▪ Direct teaching using the chalk and talk way to explain what symbols	▪ الكسور (جمع/ طرح) Fractions : adding and subtracting	حساب البعد البؤري لمرآة كروية / صناعة الأجهزة التي تحتوي مرايا كروية To calculate the focal length of the concave /convex mirror / Industry of devices using spherical mirrors

			stand for and solve the text book examples ▪ Work in groups, handle worksheets with examples and exercises the solve problems using the general mirror formula .		
P02	قانون سنل للانكسار Snell's law for refraction	▪ يطبق قانون سنل في حل مسائل حسابية ▪ يستخدم قانون سنل لتتبع مسار شعاع ضوئي بين وسطين أو أكثر ▪Draw the path of the rays as they are refracted between two media label angle of incidence and angle of refraction for parallel side rectangle, prism, different media ▪Apply Snell's law to solve mathematical problems . ▪ Use Snell's law to track light path passing through a boundary between two or more different isotropic media	▪التدريس المباشر: العمل في الكتاب المدرسي ▪ استخدام السبورة والطباشير لحل - الأمثلة الواردة في الكتاب على السبورة ومناقشة الطلبة في كل خطوة. ▪العمل في مجموعات: ▪توزيع أوراق عمل تتضمن تمارين إضافية، ومناقشة المجموعات في الحلول. ▪استخدام التكنولوجيا /استخدام الحاسوب لعرض القرص المدمج"أنا أحب الفيزياء" ▪ Direct teaching ▪ Use the examples in the textbook to practice on solving problems and discuss steps. ▪ Work in groups, solving additional examples, and discus the solutions of each group.	▪ العمليات الحسابية الأساسية (/قسمة/ضرب) ▪ النسب المثلثية : الجيب ، جيب التمام ▪ الكسور العشرية(ضرب/قسمة) ▪ Basic math skills such as adding and multiplying , ▪ The Trigonometric functions ▪ Sine, cosine ▪ Decimal fractions multiplying and division	حساب معامل انكسار المواد مثل الأحجار الكريمة To calculate the index of refraction of the gems.

			▪ <u>**Using technology: use software " I love physics"**</u>		
P03	الانعكاس الكلي الداخلي والزاوية الحرجة **Total internal reflection** and the critical angles	▪ يحسب الزاوية الحرجة باستخدام قانون سنل ▪ يوضح المقصود بالانعكاس الكلي الداخلي ▪ يبين شروط حدوث الانعكاس الكلي الداخلي ▪ Define the critical angle ▪ State the condition when this critical angle applied. ▪ Calculate ▪ State some applications for total internal reflections.	▪ التعلم المبني على النشاط: تنفيذ النشاط الوارد في الكتاب المدرسي ▪ استخدام السبورة لكتابة العلاقة الرياضية الخاصة بالزاوية الحرجة ▪ استخدام السبورة والطباشير لتوضيح أمثلة الكتاب ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وتمارين على الدرس ▪ استخدام الحاسوب لعرض القرص المدمج"أنا أحب الفيزياء" ▪ Many practical in refraction can be done in the lab. ▪ Use black board to explain the mathematical related to critical angle. ▪ Explain the text book examples ▪ Worksheets related to the topic in groups. ▪ Use the PC to show and use the CD " I <u>**love**</u> physics"	▪ العمليات الحسابية الأساسية (/قسمة/ضرب) ▪ النسب المثلثية : الجيب، جيب التمام ▪ الكسور العشرية (ضرب/قسمة) ▪ Basic math skills such as adding and multiplying , ▪ The Trigonometric functions ▪ Sine, cosine ▪ Decimal fractions multiplying and division	- الطب: المنظار الليفي - تكنولوجيا الاتصالات: الألياف البصرية - ظاهرة السراب الصحراوي والسراب القطبي Medicine : Fiber endoscope CT: fiber optics, The phenomenon of the desert mirage Polar mirage

P04	القانون العام للعدسات **<u>The lenses formula</u>**	▪ يستنتج عملياً القانون العام للعدسات ▪ يميّز بين الرموز الواردة في القانون العام للعدسات ▪ يحل امثلة حسابية على القانون العام للعدسات ▪ Derive practically the general lens formula. ▪ Distinguish the symbols appear in the general Law of lenses including the sign for convex and concave focal length and the sign for real and virtual image. ▪ Solve problems related to the general lens formula.	▪ التعلم المبني على النشاط : تنفيذ النشاط الوارد في الكتاب المدرسي. ▪ التدريس المباشر استخدام السبورة والطباشير لكتابة القانون العام وتوضيح دلالات الرموز الواردة فيه وحل امثلة الكتاب بمشاركة الطلبة. ▪ العمل في مجموعات: توزيع اوراق عمل تتضمن مسائل وتمارين على القانون العام للعدسات ▪ Much practical work can be conducted here including activities mentioned in the text book. ▪ Direct teaching to write and explaining the general law of the lenses, and what the symbols used stand for and solve problems with the students., ▪ Distribute work sheets including problems and examples to solve as an application.	▪ الكسور (جمع/ طرح) Fraction, multiplication and subtraction.	- صناعة أجهزة بصرية(مجهر، تلسكوب، كاميرا، منظار) - حساب البعد البؤري لعدسة كروية . Industry of making optical devices such as microscopes, telescopes , cameras and binoculars Calculation of the focal length of the spherical lenses

P05	قانون كولوم Coulomb's law	▪ يطبق قانون كولوم في حل مسائل حسابية State Coulombs law Apply mathematical problems on Coulomb's law when the charges are on one line or on triangle shapes or rectangle (2 dimensions) .	▪ استخدام السبورة والطباشير لتوضيح أمثلة الكتاب ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وتمارين على الدرس ▪ Use the blackboard to explain the text book examples. ▪ Group work to solve a series of examples and questions.	▪ تحويل الكميات الفيزيائية من وحدة قياس لأخرى ▪ التعامل مع الأسس (ضرب/ جمع) ▪ العمليات الحسابية (ضرب، قسمة، التربيع، الجذر التربيعي) ▪ Converting of physical quantities from one unit to another Use prefix for µC or nC charge unit. ▪ Dealing with exponentials multiplying and adding. ▪ The mathematical skills; multiplying , dividing , square , square root	تفسير التركيب البلوري والتركيب الجزيئي للذرات خلايا التحليل الكهربائي ▪ Explain the crystal and molecular structure of atoms ▪ Electrolysis cells
P06	المجال المغناطيسي الناشيء عن مرور تيار في ملف دائري	▪ يصف شكل المجال المغناطيسي الناشيء في ملف دائري يحمل تياراً	▪ التعلم المبني على النشاط تنفيذ النشاط الوارد في الكتاب المدرسي	▪ رسم شكل المجال Mapping the	صناعة أجهزة مختلفة مثل : جهاز الرنين المغناطيسي Making of devices such

	Mapping The magnetic field that is produced as a result of electric current in a circular coil	▪ يطبق قاعدة قبضة اليد اليمنى لتحديد اتجاه المجال المغناطيسي. ▪ Describe the magnetic field that develops as a result of circular coil carrying an electric current (Solenoid). ▪ Use the right hand Fleming rule to identify the magnetic field direction	▪ العمل في مجموعات: توزيع أوراق عمل تتضمن تمارين على الدرس ▪ Activity based learning Practical demonstration in the lab to see the magnetic field, ▪ Apply the activities suggested in the text book . ▪ Work in groups to solve worksheets related to the topic.	shape of field. (curved)	as Magnetic resonance imaging
P07	قانون لنز Lenz's law for electromagnetic induction	▪ يذكر نص قانون لنز ▪ يستخدم قانون لنز وقاعدة كف اليد اليمنى لتحديد اتجاه التيار الحثي في الدارة الكهربائية ▪ Explain what electromagnetic induction means. ▪ State the factors that affect the induced current. ▪ State Lenz's law. ▪ Use Lenz's law and the right hand Fleming rule to identify the induced electric induced current in a circuit.	▪ حل المشكلات والاستقصاء: تنفيذ النشاط العملي الوارد في الكتاب المدرسي ▪ استخدام السبورة والطباشير لتوضيح أمثلة الكتاب ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن تمارين على الدرس ▪ Use technology There are many good animations to explain Lens rule. ▪ Problem solving and investigation. ▪ Apply all the activities mentioned in the text book. ▪ Use the black boards to	▪ لا يوجد ▪ N/A	المولدات الكهربائية Generators

			explain the examples ▪ Work in groups to solve additional problems in worksheets.		

Subject: physics ***curriculum National***

Grade11 : الحادي عشر

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P08	تحليل المتجهات Resolving vectors into two components.	▪ يحلل متجهاً إلى مركبتين متعامدتين ▪ Resolve the vector into two perpendicular components determine the resultant of adding vectors by magnitude and direction. ▪ Introduce scalar and vector quantity. ▪ Use a scale method to draw a resultant of adding two vectors	▪ التدريس المباشر: -استخدام لوح الرسم البياني لتوضيح المحاور الأربعة ورسم المتجهات. -استخدام السبورة والطباشير لتوضيح كيفية تحليل المتجه- حل أمثلة الكتاب على السبورة ومناقشة الطلبة في كل خطوة. ▪ العمل في مجموعاتتوزيع اوراق عمل تتضمن تمارين على الدرس ▪ Direct teaching; use the graph board (coordinate systems) to elaborate on the four axis and drawing vectors.	▪ استخدام المنقلة ▪ مبرهنة فيثاغورس ▪ الاقترانات المثلثية (الجيب، جيب التمام، الظل) ▪ العمليات الحسابية الأساسية (ضرب/ جمع ...) ▪ Use of the protractor ▪ Pythagorean theorem ▪ Trigonometric	علم هندسة الجزيئات الهندسة الصناعية Molecular engineering Industrial engineering.

		graphically. Subtracting two vectors graphically and by coordinate system	▪ Use the black board to explain how to resolve analyze a vector. ▪ Solve the text book questions. ▪ Discuss with the students the steps, ▪ Group work: distribute worksheets to solve questions.	functions Sine, Cosine, Tan. ▪ Basic mathematical process. Addition and multiplication	
P08	محصلة متجهين أو أكثر Resultant of two or more vectors.	▪ يجد محصلة متجهات عدّة تحليلياً ▪ Determine the resultant of two or more vectors by component method (mathematical analysis) and graphically by drawing those head to tail.	▪ التدريس المباشر: -استخدام لوح الرسم البياني لتوضيح كيفية ترتيب المتجهات وإيجاد محصلتها.ب استخدام السبورة والطباشير لتوضيح كيفية حساب المحصلة لعدد من المتجهات - حل أمثلة الكتاب على السبورة ومناقشة الطلبة في كل خطوة. ▪ العمل في مجموعات توزيع اوراق عمل تتضمن تمارين على الدرس. ▪ Direct teaching; use the graph board (coordinate system) to elaborate on how to arrange vectors and find resultants graphically. ▪ Use the blackboard to explain how to find the resultant vector for	▪ استخدام المنقلة ▪ مبرهنة فيثاغورس ▪ الاقترانات المثلثية (الجيب، جيب التمام، الظل) ▪ العمليات الحسابية الأساسية (ضرب/ جمع ...) ▪ تحديد الزاوية المرجعية بالنسبة لمجور السينات الموجب ▪ Use of the protractor ▪ Pythagorean theorem ▪ Trigonometric functions Sine, Cosine, Tan.	علم هندسة الجزيئات الهندسة الصناعية Molecular engineering Industrial engineering

			number of vectors by component method. ▪ Solve the textbook questions. ▪ work in groups to solve problem provided on worksheets	▪ Basic mathematical process. Addition and multiplication ▪ Identify the angle of reference for the positive x-axis	
P10	القانون الثاني لنيوتن Newton's second Law	▪ يرسم مخطط الجسم الحرّ ▪ يذكر نص القانون الثاني لنيوتن ▪ يكتب الصيغة الرياضية لقانون نيوتن الثاني ▪ يطبق قانون نيوتن الثاني في حل مسائل حسابية مستخدماً مخطط الجسم الحرّ. ▪ Draw a free body diagram. ▪ State the Newton's second Law. ▪ Write the mathematical formula for Newton's second law. ▪ Apply Newton's second Law using component method to solve mathematical problems.	▪ التعلم المبني على النشاط: عمل مجسم يبين مخطط الجسم الحرّ لحالة معيّنة. ▪ استخدام السبورة لكتابة نص قانون نيوتن الثاني ▪ استخدام السبورة لحل أمثلة الكتاب بمشاركة الطلبة. ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وتمارين إضافية على القانون. ▪ Activity base learning; make a model showing the free body diagram for cases such incline, forces on a car, pulley systems elevators….. ▪ Use of the black board to write the statement of the law and explain the	▪ العمليات الحسابية الأساسية (جمع/طرح/قسمة/ضرب) ▪ مهارات تحليل المتجهات (السابق) ▪ مهارات إيجاد محصلة متجهين أو أكثر (السابق) ▪ Basic mathematical process. Addition, subtraction, division, and multiplication ▪ Skills of resolving vectors into two	- حركة المصاعد - حركة الأجسام المختلفة على أسطح أفقية/ مائلة (حركة السيارات/ القطارات/ ..) Elevators, Moving objects on different surfaces horizontal and inclined (movement of wheels and trains….etc.)

			mathematical formula of Newton's second Law. ▪ Solve the textbook questions. ▪ Work in groups to solve problems provided on worksheets..	components analyzing vectors. ▪ Skills of analyzing two or more vectors.	
P11	انتقال الحرارة بالتوصيل / الثبات الحراري transfer of heat by Conduction/ thermal equilibrium	▪ يفسّر المقصود بالثبات الحراري ▪ يطبق مبدأ الثبات الحراري في حل مسائل حسابية متنوعة ▪ Explain what is meant by thermal equilibrium , ▪ Calculate thermal equilibrium concept on various mathematical problems.	▪ استخدام السبورة والطباشير لتوضيح وحل الأمثلة ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وتمارين إضافية. ▪ Many ideas for experiment work here. ▪ Use of the blackboard to elaborate and solve problems and examples. ▪ Work in groups to solve additional problems.	▪ العمليات الحسابية الأساسية (جمع/طرح/قسمة/ضرب) Basic mathematical process. Addition, subtraction, division, and multiplication	إيجاد معاملات التوصيل لمواد مختلفة (الصناعة) Find the conduction indexes for different substances (in industry)
P12	قاعدة أرخميدس Archimedes principle	▪ يستخدم قاعدة أرخميدس في تفسير ظواهر طبيعية ▪ يحل مسائل حسابية تطبيقاً على قاعدة أرخميدس مستخدماً مخطط الجسم الحرّ. ▪ Use Archimedes principle to explain some natural phenomena. ▪ Solve mathematical	▪ التعلم المبني على النشاط: إجراء تجارب بسيطة على أجسام طافية ومغمورة في الماء ▪ التدريس المباشر : استخدام السبورة والطباشير في حل امثلة الكتاب ▪ العمل في مجموعات / أوراق عمل تتضمن تمارين على قاعدة أرخميدس ▪ Activity based learning: apply all the experiment	▪ الجمع / الطرح ▪ حساب محصلة متجهين او أكثر ▪ Addition and subtraction ▪ Calculate a resultant of two vectors or more.	- السفن / الغواصات / المناطيد Boats, submarines, balloons.

		problem applying Archimedes Principle using the free body diagram.	about floating and immersed objects in water. ▪ Direct teaching: use of the black board to solve examples and questions of the textbook. ▪ Work in groups to solve problems about Archimedes Principle.		

Subject: physics ***curriculum National***

Gra e:12 الثاني عشر العلمي

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P13	التدفق الكهربائي وقانون غاوس	▪ يوضح المقصود بالتدفق الكهربائي ويعبّر عنه بصيغة رياضية.	▪ التدريس المباشر: -العمل في الكتاب المدرسي: توجيه الانتباه إلى الأشكال الموضحة للتدفق	▪ العمليات الحسابية الأساسية(جمع/طرح/قسمة /ضرب)	▪ لحساب المجالات الكهربائية

	Electric flux and Gauss law	▪ يحسب المجال الكهربائي لتوزيعات متصلة ومتماثلة من الشحنات مستخدماً قانون غاوس ▪ To explain what is meant by electric flux and how it is expressed mathematically. ▪ Calculate the electric field for different connected and identical distributions of charges using Gauss law.	الكهربائي. -استخدام السبورة والطباشير لكتابة الصيغة الرياضية للتدفق - حل أمثلة الكتاب على السبورة ومناقشة الطلبة في كل خطوة. -حل أسئلة وزارية بمشاركة الطلبة على السبورة. ▪ التعلم الذاتي -توزيع ورقة عمل لكل طالب تتضمن تمارين إضافية على الموضوع. ▪ Direct teaching ▪ Using the text books and diagrams to explain the electric flux. ▪ Use of black board to explain the mathematical formula of the Gauss Law ▪ And solving the textbook examples and discus each step, ▪ Practice other Questions. ▪ Distrusted more worksheets with examples to be solved	▪ معرفة قوانين المساحة لأشكال ومجسّمات هندسية منتظمة (اسطوانة/كرة/دائرة ...) ▪ معرفة قوانين الحجوم لمجسمات مختلفة. ▪ Basic mathematical skills: addition, subtraction, division, and multiplication. ▪ Area rules for different shapes and three-dimensional Objects such as cylinder, sphere, circle …etc. ▪ Volumes rules for different three dimensional objects. ▪ Simple integration can be introduced.	لموصلات منتظمة (كرة/ اسطوانة) To calculate the electric fields for conductors with regular shapes (cylinder, sphere)
P14	توصيل المواسعات	▪ يميز بين توصيل المواسعات على التوالي وتوصيلها على التوازي	▪ التدريس المباشر: -العمل في الكتاب المدرسي: توجيه	▪ العمليات الحسابية الأساسية	في الدارات الكهربائية والإلكترونية لتخزين

	Capacitors Combinations capacitance	▪ يحسب المواسعة المكافئة لمجموعة من المواسعات الموصولة على التوالي وعلى التوازي ▪ يحسب الشحنة الكلية لمجموعة مواسعات ▪ Explain why capacitors are used. ▪ State the law for capacitance, and the Farad unit. ▪ Distinguish the way capacitors are connected in parallel or in series. ▪ Calculate the equivalent capacitor for a group of capacitors that are connected parallel or series. ▪ Calculate the total charge for a group of capacitors.	الانتباه إلى الأشكال الموضحة لتوصيل المواسعات. -عرض دارة كهربائية تتضمن مجموعة من المواسعات. -استخدام السبورة والطباشير لاشتقاق العلاقة الرياضية الخاصة بتوصيل المواسعات على التوالي/ التوازي - حل المثال الوارد في الكتاب على السبورة ومناقشة الطلبة في كل خطوة. -حل أسئلة وزارية بمشاركة الطلبة على السبورة. ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن تمارين إضافية، ومناقشة المجموعات في الحلول. ▪ Direct teaching: use the text book, and draw students' attention to the book figures for capacitors connection. ▪ Show an electric circuit that has multiple capacitors. ▪ Use blackboard to derive the mathematical relation for capacitors connected in parallel and series ▪ Solve the example in the text book discussing each	(جمع/طرح/قسمة/ضرب) ▪ جمع الكسور ▪ Basic mathematical skills: addition , subtraction , division , and multiplication ▪ Fraction addition	الشحنة الكهربائية (دارات الإرسال والاستقبال في الإذاعة والتلفاز) It is used in the circuit to store electric charge, such as transmitting and receiving circuits in radio and TV stations.

			step. ▪ Solve additional past questions. ▪ Using group work solves additional questions on worksheets.		
P15	قاعدة كيرتشوف الثانية Kirchhoff's second Rule for circuits	▪ يذكر نص قاعدة كيرتشوف الثانية. ▪ يحسب التغيرات في الجهد عبر أجزاء دارة كهربائية حسب قاعدة كيرتشوف الثانية. ▪ State Kirchhoff’s second Rule ▪ Calculate the changes in the voltage through the circuit according to Kirchhoff’s Rule for series and parallel resistors connection ▪ Rules for voltage and current in the circuit..	▪ التعلم المبني على النشاط: تنفيذ النشاط الوارد في الكتاب المدرسي ▪ استخدام السبورة لكتابة نص قاعدة كيرتشوف الثانية بالكلمات ▪ عرض لوحة تبين القواعد المتبعة لحساب التغيرات في الجهد عبر أجزاء الدارة الكهربائية ▪ استخدام السبورة لحل أمثلة الكتاب بمشاركة الطلبة. ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وزارية وتمارين إضافية على القاعدة. Activity base learning : apply the activities in the text book, Use of the black board to write the Kirchhoff’s second Rule. Show a diagram explaining rules used to calculate changes in the voltage through the electric circuit. Use the black board to solve	▪ العمليات الحسابية الأساسية (جمع/ طرح/قسمة/ضرب) ▪ Basic mathematical skills : addition , subtraction , division , and multiplication	الدارات الكهربائية Electric circuits

			the mathematical problems with students. Group work to solve questions on worksheets.		
P16	القوة الدافعة الكهربائية الحثية وقانون فارادي Electromotive force and Faraday's law	▪ يشتق علاقة لحساب القوة الدافعة الكهربائية الحثية المتولدة في موصل يتحرك بسرعة ثابتة في مجال مغناطيسي منتظم. ▪ يشتق قانون فارادي في الحث الكهرمغناطيسي ويذكر نصّه. ▪ يطبق العلاقة الرياضية الخاصة بالقوة الدافعة في حل مسائل ▪ يطبق فانون فارادي في حل مسائل ▪ Explain what magnetic flux and magnetic flux density mean. ▪ Derive a formula for magnetic flux ▪ Define the Tesla and Weber ▪ Derive a mathematical relation to calculate the induced EMF in a conductor moving at a constant speed in a regular magnetic field. ▪ Derive faraday's law of induction of electromagnetic and state it.	▪ استخدام السبورة لرسم الأشكال الواردة في الكتاب ▪ استخدام السبورة والطباشير لتوضيح الاشتقاق وحل الأمثلة ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وزارية وتمارين إضافية على القوة الدافعة وقانون فارادي. ▪ Use the blackboard to draw figures from the textbook ▪ Explain the derivation of the mathematical relation and solving questions. ▪ Work in groups to solve question related to the EMF and Faraday's Law.	▪ العمليات الحسابية الأساسية (جمع/طرح/قسمة/ضرب) ▪ Basic mathematical skills: addition, subtraction, division, and multiplication. ▪ Simple derivation can work here.	- جهاز تنظيم ضربات القلب - الميكروفون ذي الملف المتحرك - شمعة الاشتعال في المركبات. Pacemaker. Microphone with a mobile coil The agitation in a vehicles

		▪ Apply the mathematical equation of EMF in solving problem and to apply Faraday’s Law.			
P17	مفهوم النسبية Concept of Relativity	▪ يوضح مفهوم النسبية ▪ Explain relativity concept general relativity or special relativity.	▪ الحوار والمناقشة ▪ Discussion and debate	▪ الجمع / الطرح ▪ Addition and subtraction	مواقع وحركة الأجسام المختلفة Locations of different objects.
P18	نموذج بور لذرة الهيدروجين Bohr model of the Hydrogen atom	▪ يذكر فروض بور الأربع المتعلقة بذرة الهيدروجين ▪ يذكر المآخذ على نموذج بور الذري. ▪ يفسّر ظاهرة الأطياف الخطية بالاعتماد على نموذج بور . ▪ State the idea of quantization of energy level. ▪ State the four hypothesize Bohr stared in relation to hydrogen atom ▪ State the drawbacks about Bohr model failure of Bohrs model. ▪ Explain linear spectrums depending on Bohr model emission and absorption spectrum of Hydrogen atom. ▪ Solve wavelength of the	▪ الحوار والمناقشة ▪ استخدام السبورة والطباشير لتوضيح الاشتقاقات وحل أمثلة الكتاب ▪ العمل في مجموعات: توزيع أوراق عمل تتضمن أسئلة وزارية تمارين إضافية على الدرس. ▪ Discussion and debate ▪ Use of blackboard to clarify the derivations and solve problems. ▪ Work in groups, with help of worksheets. ▪ Students can see the emission line spectrum for H, Ar, Hg	▪ العمليات الحسابية الأساسية (جمع/طرح/قسمة/ضرب) ▪ Basic mathematical skills : addition , subtraction , division , and multiplication	إعطاء تصوّر لتركيب الذّرّة(لفترة سابقة من الزمن) Give a Visualization about the atom structure (during the last period of time)

		Photon produced by jumping the electron from one energy level to another.			

Subject: Physics curriculum: IG : O-level.
Grade/Grades 9-10

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P19	Density	▪ Comparing the densities of two different materials. ▪ Study the relation between density and volume for a fixed mass.	▪ Ask the students which is heavier 1kg of wood or 1kg of iron? The answer should be, they have the same weight. ▪ Explain the idea that mass is how much material is there in the object, regardless of its volume.	Simple maths including division.	Measure the density of a piece of plasticine.

			Ask a student to carry two different objects of the same volume but of different materials, let us say iron and wood. Why is there a difference in the weights? Iron has more material although same volume, this means that iron is denser, containing more material per unit volume.		
P20	Moments	▪ Understanding the concept of moments. ▪ Differentiating between a force and its moment.	▪ Explain the meaning of the moment as the turning effect of a force around a fixed point called the fulcrum/pivot. ▪ Visit a playground and use a see-saw with two students of similar weights, balance the two students by asking them to sit at same distance. ▪ Now start changing the positions of the students and see how increasing the distance from the fulcrum increases the moment of the weight of the student. ▪ Ask heaviest student on	Multiplication, and cross multiplication.	Try to balance a piece of know mass by an eraser, and use suitable measurements to find the weight of the rubber eraser.

			the pivot of the see-saw and ask him to balance the lightest student from his position, this would be impossible as the weight of the heavy student will NOT have any moment as the distance is zero. So moment is not a force, it is one of the effects a force may have.		
P21	FREE falling.	▪ Understanding that an object that is falling freely means that the only force acting on it is its weight, all other forces including air resistance are negligible. ▪ Understanding the fact that if two objects are falling FREEly under gravity from the same height will reach the ground level exactly at the same time as they will be accelerating at a constant fixed acceleration called the "acceleration of free fall".	▪ For this part we have to use relatively dense objects so that air resistance will not have a significant effect on the demonstration, such as a metallic ruler and a student's bag, note that the two objects are of different weights, and both of them are heavy enough to neglect the effect of air resistance. ▪ You can either drop both objects at the same time or let the students see that they are reaching the ground at the same time. Or to let the students drop each object alone and	Statistics skills: -Calculating the mean/average of several time readings. Practical skills: - Using a stop-watch as accurately and precisely as possible to measure the time of fall.	

			measure several times the time needed for each object to reach the ground.		
P22	Studying the effect of air resistance.	▪ Understanding that air resistance is a resistive force that will always slow down OR reduce the acceleration of a moving object. ▪ Discussing the factors affecting the air resistance.	▪ Drop an A4 sheet of paper which is folded to produce a small object several times and measure the time needed for the folded paper to reach the ground in each time. ▪ Repeat the same procedure but using an unfolded A4 sheet of paper. ▪ Compare between the times measured in each case.	Calculating the mean/average.	Pointing at the fact of the need to reduce the surface area of the bike rider in order to reduce the air resistance acting on him. Making sure to let the student know the importance of closing the window while doing chemical experiments including very light elements (powder), as the air resistance will have a great effect on it.
P23	Specific heat capacity.	▪ Understanding the concept of the specific heat capacity. ▪ Understanding the difference between materials with respect to their specific heat capacity.	▪ Heat up two different objects of the same material but of different masses for the same difference in temperature, using an electrical heater of known power (in order to be able to calculate the energy supplied by the heater (energy=Power x time)). ▪ Divide the energy used for	Calculating the energy supplied using simple multiplication. Normalizing the values of the energy once per unit mass and once per unit temperature, using division.	Ask the students to discuss the importance of water having a relatively high specific heat capacity, and its importance for living beings.

			each object and divide it by its mass… what can you conclude? Yes this is the meaning of specific heat capacity. ▪ Now repeat the experiment but using same material and same mass, but for different rises in temperatures, and divide the energy by the rise in temperature. (in this case the student can understand that S.H.C is defined per unit mass and 1 degree increase in temperature).		
P24	Vibrations of particles in a wave.	▪ Understanding that a wave is needed to transfer energy but it doesn't transfer material.	▪ Bring 2 big containers and fill them with water, put a cork in the middle of each container. ▪ Ask two students to start hitting the surface of the water, and see which of them will let the cork reach the other end of the container first. ▪ The students will discover that the corks are not moving forward, they are only vibrating at their	N/A	Make a node on a rope which is attached at one end to a fixed wall. Start shaking the rope so as to make a transverse wave, ask the student to draw the shape of the rope at different intervals of time, and specify the position of the node in each drawing and comment on its position.

			places, showing that the water underneath the corks is not moving with the wave.		
P25	Nuclear decay.	▪ Understanding the concept of half-life, as it is the average time needed for half the radioactive nuclei to decay.	▪ Ask all the students in the classroom to get a coin. ▪ Ask the students to stand up and flip the coin. ▪ All those who get a head must sit, and the number of students remaining stood must be counted. ▪ Let those student who remained stood flip their coins again, and again if anyone gets a head must sit down. ▪ Repeat the same game until all the students sit down (or at most one student remains up) ▪ Plot number of students standing up against flipping trial.	Plotting graphs: ▪ Making equal divisions on the y-axis and x-axis. ▪ Plotting readings correctly.	
P26	Centre of mass.	▪ Finding the position of the centre of mass of a lamina, and discussing the stability of the object with respect to the position of its centre of mass.	▪ We need a piece of corrugated sheet that is cut into any shape, let us first start with one that has at least one straight edge that is to be used as the base of the lamina in the	N/A	Ask the students to do the same experiment, but in groups, while each group having a lamina of different heights and bases, and let them discuss the effect of

			further investigation about stability. ▪ Attach the lamina loosely to a pin, add a piece of string with a small load to the pin, and draw a line on the lamina underneath the taught string, call this line "vertical 1", repeat the same procedure, but from a different point, that is attach the lamina to the pin but from another point (that does NOT lie on vertical 1). Call the second line "vertical 2". ▪ The centre of mass of the lamina is the point of intersection between the two lines (verticals 1 and 2). ▪ To discus stability, draw a line between the centre of mass of the lamina and one of the corners of the base of the lamina. ▪ Now put the lamina on a ramp that can be adjusted for different angles of elevation. ▪ Find the angle at which		changing these dimensions on the position of the centre of mass, and hence on the stability of the lamina.

			the lamina will tilt or be at the point of tilting around the corner to which the line was drawn. ▪ The lamina loses its stability at that angle.		
P27	Newton's first law.	▪ Understanding the real meaning of Newton's first law, and understanding that if anyone is sitting in a moving car, then he will be moving at the same speed of the car (the student usually thinks that if he is SITTING in a moving car, then he is stationary).	▪ For this lesson, I expect that the rule must be stated at the beginning of the lesson, and the student should discuss what they understood from the text of the rule. ▪ A question such as, what will happen if while you are standing in a bus, 1 meter away from the last seat, and you jump in the bus, will you hit those students sitting on the last seat? ▪ A practical demonstration, or a video showing this circumstance would be really clear for the students to understand that the boy will not hit those on the last seat, because when the standing student jumped he was moving at the same speed of the bus,	N/A	A question related to the sudden stop of the bus could be given to the students, to discuss what will happen to the standing student if the bus will stop all at once. Their discussion should be related to Newton's first law, and not only to their experience in riding buses.

			so he will depart exactly at the same position from where he jumped. ▪ The demonstration could be repeated several times from different distances from the last seat to prove that the 1 meter left at the beginning was not too much away from the last seat.		
P28	Transferring internal energy from one place to another by convection.	▪ The student should understand that convection is the method by which internal energy can be transferred in a fluid in an upwards direction, due to the change in density of the heated fluid.	▪ A group work should be really beneficial, the student should get a relatively big beaker, fill it with water, and put a drop of ink on one side of the beaker, start heating the beaker from underneath the drop of ink, and notice the path traveled by the ink as the water is heated. ▪ Relate the path traveled to the changes in density of the water as it is heated.	N/A	Students can be grouped into groups and asked to give examples where transferring of internal energy by convection takes place in our daily life, such as installing the radiator at the bottom half of the room, sea and land breezes…etc.

Subject: Physics ***curriculum: IG : A-level***
Grade/Grades:11-12

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P29	Projectiles.	- to demonstrate the effect of the projection angle with the horizontal range reached by the projected object.	- to start with, a guessing question may be suggested, such as, what is the angle at which max range could be achieved. - An experiment including an object that is projected up a short adjustable inclined surface (with a known angle), can be repeated using a suitable technique to maintain same initial speed,	Solving quadratic equations. Simplifying trigonometric ratios and identities.	Can be applied in the physical education class, while throwing the basketball, and noting the angle at which the ball reaches maximum range.

			and the horizontal range is measured. Repeat the experiment several times for angles between 0 and 90, and record the angle at which maximum range occurred. - mathematical proof should be given to the students showing that the angle at which maximum range occurs is 45		
P30	Friction	▪ Discussing the effect of friction as a resistive force opposing the motion of objects, and studying the relation between friction and the normal contact force acting by the ground on the object.	▪ Explaining the frictional force on a large scale as the contact force between small spikes on the surfaces of the two objects, by modeling the surfaces of two objects by a wooden board hammered by several pins, and the other surface can be the ground,		
P31	Tensile force.	▪ Discussing the meaning of tensile forces, and comparing the elasticity of different materials.	▪ Usually it is difficult to show the elasticity of a metal wire such as a copper wire, so it would be easier and nicer for the students to use a candy to demonstrate what happens to a wire when it is	Drawing graph, and sketching best fit line.	N/A

			stretched.		
P32	Circular motion.	- factors affecting the magnitude of the centripetal force.	▪ Discussing the factors affecting the force needed to keep a stone attached to a string rotating in a circular motion, each time change one of the following variables: Mass of the stone, speed of rotation, and the length of the string. ▪ Sketch graphs relating force and the quantity that is changing each time, the force can be measured by replacing the string by a spring balance.	Sketching curves.	Ask the student to do a research about the separation method used to separate the constituents of blood, called "Centrifuging process", and how is the centripetal force is applied in this process.
P33	Hooke's law	▪ Young modulus calculation	▪ It is really important to discuss the difference between young modulus and stiffness. ▪ Stiffness should be calculated for two different pieces of strings of different lengths and cross sectional areas but of the same material, by finding the average force needed to extend the string by a unit of length.	Simple calculations involving division. But good experience of using the micrometer screw gauge and the vernier caliber.	Research or discussion of the importance of choosing a suitable material of suitable young modulus when designing spare parts for the human body such as an artificial leg.

			▪ Now the young modulus is to be calculated by dividing the average force by the cross sectional area, and dividing the length by the extension, and finally dividing the answers by each other, this would give the young modulus. ▪ Compare between the young modulus of both strings.		
P34	harmonics	▪ Understanding the meaning of resonance and the successive harmonics.	▪ Understanding resonance using a mechanical wave in a rope that is performing a standing wave, different harmonics must also be demonstrated by increasing the frequency of vibration gradually.	N/A for this level of education.	Students may apply and try to hear different notes in the music class, using a wind instrument such as a flute, and a stringed instrument such as a guitar.
P35	Electrical circuits.	▪ Explaining the meaning of resistance of a component, and understanding the effect of connecting resistors in series and in parallel.	▪ Explain the direct proportionality between the potential difference and current passing through an ohmic resistor. ▪ Using real life situations to describe what is happening in a wire, such as comparing the wires by	▪ Simple calculations, and plotting graphs accurately in order to discuss the direct proportionality between voltage and current	N/A

			streets, coulombs by cars, resistors by streets of high friction, switches as red lights when opened and green lights when closed, and the battery as a gas station that is visited whenever the fuel in the car (energy per coulmb) is completely consumed. ▪ The resistance of two resistors in series must be greater than any of the two resistors because the cars (coulombs) must pass through both resistors (streets). ▪ The resistance of the two resistors connected in parallel must be less than the resistance of any of the two resistors, because the cars will pass through the two streets simultaneously but not through both streets, reducing the time needed for all the cars to pass through the streets.	(Ohm's law).	
P36	Doppler effect.	▪ Explaining the change in frequency caused by the	▪ Differentiating between transmitting a wave from	N/A	Researches or discussions may be

		relative movement between the transmitter and the receiver of the wave.	a stationary source to a stationary receiver and transmitting a wave from a relatively moving transmitter and/or receiving it by a relatively moving receiver.		asked from the students about the applications done on the idea of the Doppler effect, such as for medical purposes (sonar imaging, measuring the speed of flow of blood, measuring the heart beats of a fetus its mother's womb), and in real life situations such as the concept of the radars used to detect the speed of cars in streets.
P37	Lenz's law	▪ Understanding that the potential difference induced by the change in magnetic field around a conductor is induced such that it opposes the change causing it.	▪ Releasing a magnet in a metallic cylindrical tube and in a plastic cylindrical tube of similar dimensions. ▪ Measure the average time needed for the magnet to fall through the tubes and comparing these times with each other, and relating the difference to the effect of the induced potential difference. ▪ Compare the effect described as Lenz's law with Newton's third law.	N/A	N/A

P38	Constructive and destructive interferences.	▪ Explaining the difference between different types of interference.	▪ Use a ripple tank to produce two water waves of the same frequency (coherent waves), and show the students what does a constructive interference mean, and what does a destructive interference mean.	Some triginomtrical skills to measure the path difference between two coherent waves and predicting whether a constructive interference or a destructive interference will occur.	Explaining some applications on different types of interferences such as in a microwave oven, and reading the data from a compact disc.

Subject :Physics IB S-Level
Grade: 11-12

Code	Top/ Concept	*Objectives*	*Strategies*	*Math skills needed*	
P39	Topic 1: Physics and Physical measurements. 1.1 The realm of Physics Order of magnitude.	- State and compare quantities to the nearest order of magnitude. - State the ranges of magnitude of distances, masses and times that occur in the universe, from smallest to greatest. - Estimate approximate values of everyday quantities to one or two significant figures and/or to the nearest order of magnitude.	- Animation showing different sizes from too small to too big. - Video of universe showing how large it is. - List of some known quantity to be memorized by the students diameter of earth, average distance between the earth and the moon, weight of an apple, mass of an elephant, time of heart beat, mass of the electron, proton,….. -Focus through the course of different quantities to be memorized by the student. - Conduct an experiment to see the dimension of a sample in a microscopic slide and a telescope for stars. - research of tiny object dimension and far away object dimension.	- Scaling when using large power and small power(scale up or down). - Calculation of power of 10	*1-Worksheet to give estimation of order of magnitude for different samplest.* *2-Quiz.* *3- Worksheet of the video.* *4- Oral questions during the class.* *- Geology finding mountains distances dimensions, - nanotechnology how fast the signals transfers.* *-Nuclear Physics dimensions of atoms.*
P40	Topic 1.2 Measurements and uncertainty.	- State values in scientific notation and in multiples of units with appropriate prefixes.	-Explain that changing big unit to small unit we ÷ and big unit to small unit we X. - Conduct an experiment to	- Cross multiply - Division using calculators.	- *Worksheets using different sciences.* - *Quizzes*

			measure the density of solids and liquids using different units conversion.		- *Test* *-Nanotechnology dimensions of apparatus used..* *Biology sizes of species on slides* *-astronomy distances from galaxies.*
P41	1.3 Vectors and scalars	-Determine the sum or difference of two vectors by a graphical method. -Resolve vectors into perpendicular components along chosen axes.	- Explain Scaling and how to connect head to tail vector presentation. - Give different examples of adding vectors with different angles. - Explain component method of Sin and cos. - Practice solving questions for different angle in the xy Plane.	- Scientific calculator (trigonometry). 2- Scaling. - Simple drawing.	*1- This worksheet ideas linking all the vector topics in Physics.* *2- Tests.* *Engineering basic tools in measurements.* *Mathematics basic in tregonometery.*
P42	*Topic 2 Mechanics* Forces and dynamics (momentum as a vector quantity)	- Define *linear momentum* and *impulse*. - Determine the impulse due to a time-varying force by interpreting a force–time graph. - State the law of conservation of linear momentum. - Solve problems involving momentum and impulse. - Solve problems involving momentum, work, energy and	- Focus on that momentum is <u>A VECTOR</u> quantity always asks about direction. - Show different calculation examples of different collision entangled, different direction. - Present animation of trolleys in collision. - Conduct an experiment to show law of conservation of	- simple multiplication - Addition - Simple division. - Vector.	*1-Worksheet connecting different topics on Physics..* *2-Quiz.* *3- Worksheet of the animation.* *4- Oral questions during the class.* *Industry Manufacturing cars to*

		power.	momentum. - Conduct an experiment to show efficiency during collision. - Research on safety during car collision.		*avoid crushes of cars during collisions and engineering safety issues.*
P34	**2.4 Uniform circular motion**	- Apply the expression for centripetal acceleration -Identify the force producing circular motion in various situations. -Solve problems involving circular motion.	- Give different examples of circular motions. - Derive the formula for orbital velocity. _ Derive the periodic time using the formula for constant speed. - Conduct an experiment to study factors affecting the centripetal force. - Conduct an experiment to find the mass of an object moving in a circle.	- Derivation by linking two equations. - Simple mathematical operations. - Squaring.	*1-Worksheet connecting two topics.* *2-Quiz.* *3- Worksheet of the video.* *4- Oral questions during the class.* *Industry satalite materials* *Astronomy time speed on the orbit.*
P44	Topic 3: Thermal physics **3.2 Thermal properties of matter**	-Define *specific heat capacity* and *thermal capacity*. -Solve problems involving specific heat capacities and thermal capacities. -Define *specific latent heat*. -Solve problems involving specific latent heats.	- Explain the stages of energy released when melted ice changed to vapor. - Microscopic explanation is needed for latent heat. - Perform an experiment to find the specific heat capacity of water. - Perform an experiment to find specific latent heat of vaporization of water. - Explain the graph of tem	- Use addition, multiplication and division using calculator. - Use applying equations.	*1-Worksheet.* *2-Quiz.* *3- Tests connecting two topics together, for example momentum and thermal.* *Industry designing thermostat…..* *Chemistry chemical properties.*

			vs time for melting ice.		*Geology melting iceberg.*
P45	Topic 4: Oscillations and - Kinematics of simple Harmonic motion.	-Define the terms *displacement*, *amplitude*, *frequency*, *period* and *phase difference*. -Define *simple harmonic motion* (*SHM*) and state the defining equation as $a=-\omega^2 x$. - Solve problems using the defining equation for SHM. - Apply the equations $v=v_0\sin\omega t$, $v=v_0\cos\omega t$, $v=\pm\omega\sqrt{(x_0^2-x^2)}$, $x=x_0\cos\omega t$ and $x=x_0\sin\omega t$ as solutions to the defining equation for SHM. - Solve problems, both graphically and by calculation, for acceleration, velocity and displacement during SHM.	- Let SL students memorize the sin, cos order for the three quantities displacement, velocity and acceleration. - Give examples to explain the definition of SHM for pendulum and springs. - Animation to show the displacement acceleration relationship. - Apply the formula through different examples. - Graphical animation to show the changing of sin,cos relation graphs. - Conduct an experiment to prove the relation between acceleration and displacement. - Research on resonance in real life.	- Use scientific calculators for sin, cos. Trigonometry. - Memorizing the sin, cos order for the displacement, velocity and acceleration. - - memorize the sin, cos graphical presentation.	*1-Worksheet.* *2-Quiz.* *3 Oral questions during the class.* *4- Worksheet about the animation* *Industry Engineering especially manufacturing buildings, cars...to avoid resonance.*
P46	- Energy changes during simple harmonic motion.	- Describe the interchange between kinetic energy and potential energy during SHM. - Apply the expressions $E_K=\frac{1}{2}m\omega^2(x_0^2-x^2)$ for the kinetic	- Revise law of conservation of energy but using new formula. - Show animation for the ke and Pe graphs.	- Squaring - Multiplications - simple addition and subtraction using scientific	*1-Worksheet.* *2-Quiz.* *3- Oral questions during the class.* *4- Worksheet about the*

		energy of a particle undergoing SHM, $E_T = \frac{1}{2}m\omega^2 x_0^2$ for the total energy and $E_P = \frac{1}{2}m\omega^2 x^2$ for the potential energy. - Solve problems, both graphically and by calculation, involving energy changes during SHM.	- Solve many questions on board for many different situation. - Let the students work individually to improve there weakness. - Explain spring situation with simple momentum collision.	calculator.	*animation* *- Engineering especially manufacturing buildings, cars...to avoid resonance.*
P47	4 4.4 Wave Characteristics	-Describe waves in two dimensions, including the concepts of wave fronts and of rays. - Describe the terms crest, trough, compression and rarefaction.	-Demonstrate the ripple tank experiment showing reflection, refraction and diffracted wave fronts. - Draw wave fronts showing the normal and the direction of the incident ray perpendicular. - Showing animation of the wave fronts.	- Use scientific calculator to find sin, cos of the angle. - Skills of measuring angles using protractors.	*1-Tsets* *2- Worksheets.* *3Drawing on the board.* *- Sailing diffraction of waves at boundaries* *- Industry to design suitable boats for refraction reflection of signals to measure bed sea.*
P48	4.5 Wave properties	-State the principle of superposition and explain what is meant by constructive interference and by destructive interference. -State and apply the conditions for	- Show animation showing the superposition principal. - Define interference of the wave. - Compare between constructive and destructive interference by showing	- Use tracing and measuring angles. - Simple equations.	*1- Test connecting mechanics and waves ideas.* *2- Worksheet on the animation.* *3- Tests.*

		constructive and for destructive interference in terms of path difference and phase difference. - Apply the principle of superposition to determine the resultant of two waves.	interfering of crests and trough waves. - Demonstrate interference on the ripple tank. - Calculate the frequency of the wave in the ripple tank by experiment. -		*-Industry of sound interference waves.* *-Sailing diffraction of waves at boundaries.*
P49	Topic 5Electric current 5.1 -electric circuits	- Define *electromotive force* (*emf*). - Describe the concept of internal resistance. - Describe a potential divider. - Explain the use of sensors in potential divider circuits. Solve problems involving electric circuits.	- Apply the formula emf= Ir + IR - Draw this equation graphically and focus that even though this is voltage, current relation but it is different than Ohms law - Explain the function of non- Ohmic relation like LDR and NTC and how it changes voltage with light and temp. - Conduct an experiment to find voltage drop across LDR and thermistor. - Design an experiment to determine the factors affecting the resistance of a wire. - Conduct an experiment to calculate the internal resistance of a dry cell. - Research of application of non- ohmic relation in real life.	- Linear graph relation with slope and intercept. - simple calculation of +x and division.	*1-Worksheet.* *2-Quiz.* *3- Tests* *4- Oral questions during the class* *Nanotechnology how electronics are working..* - *Electrical engineering producing an efficient dry cells,* - *Nursing sensors used in hospitals,*

P50	Topic 6: Field and forces 6.2 Electric force and field:	-State Coulomb's law. -Define *electric field strength*. -Determine the electric field strength due to one or more point charges. -Solve problems involving electric charges, forces and fields.	- Understanding that each charge has an effect of a force which is represented by an arrow on a given charge. - Practice solving when charges aligned on one line, triangle and rectangle. - Conduct an experiment to show the shape of electric field around parallel plates.	- Resolve of the force component of cos, sin. Trigonometry. - Use multiplication and division using scientific calculator.	*1-Worksheet ideas of connecting mechanics with static electricity is needed. .* *2-Quiz.* *3- Tests* *4- Oral questions during the class* - *Industry Designing roads for friction, designing fuel cars, to minimize friction.*
P51	**6.3 Magnetic force and field**	-Determine the direction of the force on a charge moving in a magnetic field. -Define the *magnitude* and *direction* of a magnetic field. -Solve problems involving magnetic forces, fields and currents.	- Apply FLHR for a wire in a magnetic field. - Design an experiment to determine the factors affecting the magnetic force on the wire. - Practice applying the magnetic force formula and applying the hand rule. - Showing animation for dc motor to apply FLHR.	- Flexible hand to apply FLHR. - Simple mathematical calculation using calculators.	*1- Test linking electricity and magnet ideas.* *2- Worksheets.* *3- Sheet on animation shown in the data show.* *-Industry to design efficient motors.* - *Electrical engineering efficient electrical devices.*
P52	Topic 8: Energy, power and climate change **8.2 World energy sources**	-Define the *energy density* of a fuel. -Discuss how choice of fuel is influenced by its energy density.	- Understanding the definition of energy density. - Critical thinking why do we use petrol as a fuel for cars.	- Simple calculators to find an answer for the equations.	*1-Test showing link between Physics and chemistry.* *2- Worksheet.*

			- Design an experiment for energy density of a fuel. - Research of fossil fuel energy. - Debate are you with nuclear energy or against?		*3- Oral questions.* *-Industry which fossil fuel is more efficient.* *-Chemistry which fossil fuel is more efficient.*
P53	**8.5 Greenhouse effect**	-Define *surface heat capacity Cs*. -Solve problems on the greenhouse effect and the heating of planets using a simple energy balance climate model. -State the Stefan–Boltzmann law and apply it to compare emission rates from different surfaces.	- Explain why iceberg are melting. - Show video presentation of the poles and how they are melting. - Practice solving questions showing the link between thermal capacity and surface heat capacity. - Explain what is the difference between global warming and green house effect. - Debate about industry and CO_2	- Derivation of formula of specific heat capacity and surface heat capacity. - Simple equation and calculators.	*1- Worksheet linking the Albedo of earth to thermal energy topic.* *2- Worksheet.* *3- Worksheet on the video.* *- Chemistry , Chemical engineering to calculate heat absorption and level of sea rised.* *- Social studies to places affected by global worming.* *Geology to places affected by global how people live there.*
P54	Astrophysics **E3 Stellar distances**	-Define the *parsec*. -Describe the stellar parallax method of determining the distance to a star. -Solve problems involving stellar parallax.	- NASA is presenting many concepts through interview with Astronomists - Explain parallax using fingers and eye. - Practice solving questions in calculations.	-Radian angle is applies here - Link between radian and degree. - Trigonometry especially tan. - Calculation using	*1- Worksheet from the animation.* *2- Tests* *3- Group discussion about a career in the future.*

		-Describe the apparent magnitude scale. -Define *absolute magnitude*. -Solve problems involving apparent magnitude, absolute magnitude and distance. Solve problems involving apparent brightness and apparent magnitude.	- differentiate between apparent brightness and absolute brightness. - Distinguish between apparent brightness and apparent magnitude. -Showing animation of binary stars. - Research about methods used to measure how far the stars away from us.	scientific calculators. - Log equation and use it from the calculators	- *Astronomy to measure how far the stars away from us,* - *Scientists properties of good scientist.* - *Industry produce good telescopes for measurements.*

Subject : Physis ***Curriculum IB: HL***

Grade/grades 11- 12

code	Topic / concept	Objectives	Strategies	Math skills used/ needed	Application /or integration; 1- in the same subject; 2- in other subjects
P55	Topic 1: Physics and Physical measurements. 1.1 The realm of Physics Order of magnitude.	- State and compare quantities to the nearest order of magnitude. - State the ranges of magnitude of distances, masses and times that occur in the universe, from smallest to greatest. - Estimate approximate values of everyday quantities to one or two significant figures and/or to the nearest order of magnitude.	- Animation showing different sizes from too small to too big. - Video of universe showing how large it is. - List of some known quantity to be memorized by the students diameter of earth, average distance between the earth and the moon, weight of an apple, mass of an elephant, time of heart beat, mass of the electron, proton,….. -Focus through the course of different quantities to be	- Power of 10 multiplication, division, addition and subtraction. - Rounding to find an appropriate number in calculation.	1-Worksheet multiple choice of estimating order of magnitude. 2-Quiz. 3- Worksheet of the video. 4- Oral questions during the class. -Geology in estimation dimension or height of mountain, -nanotechnology in estimation the speed of

			memorized by the student. - Searching the net finding some dimension using the order of magnitude.		moving signals . Nuclear Physics diameter of atom or nucleus..
P56	Topic 1.2 Measurements and uncertainty.	- State values in scientific notation and in multiples of units with appropriate prefixes.	-Explain that changing big unit to small unit we ÷ and big unit to small unit we X. - Explain SI units and how to relay always on them. - Conduct an experiment to measure using vernier caliber and ruler.	- Cross multiply - Division using calculators. - Finding variable from equation.	- Worksheets. - Quizzes - Test -Nanotechnology sizes of apparatus there -Biology using nm, μm of any species -astronomy the distances between galaxies.
P57	*Topic 2 Mechanices* Forces and dynamics (momentum as a vector quantity)	- Define *linear momentum* and *impulse*. - Determine the impulse due to a time-varying force by interpreting a force–time graph. - State the law of conservation of linear momentum. - Solve problems involving momentum and impulse. - Solve problems involving momentum, work, energy and power.	- Focus on that momentum is A VECTOR quantity always asks about direction. - Show different calculation examples of different collision entangled, different direction. - Present animation and video of trolleys in collision. - Conduct an experiment to prove law of conservation of momentum.	- simple multiplication - Addition - Simple division. - Using vector signs.	1-Worksheet using different situation and applying vectors.. 2-Quiz. 3- Worksheet of the video. 4- Oral questions during the class. 5- Worksheet about the animation. - Industry Manufacturing cars and engineering on how tough the cars should be and cars safety.

P58	Topic 4: Oscillations and waves: - Kinematics of simple Harmonic motion.	-Define the terms *displacement*, *amplitude*, *frequency*, *period* and *phase difference*. -Define *simple harmonic motion* (*SHM*) and state the defining equation as $a = -\omega^2 x$. - Solve problems using the defining equation for SHM. - Apply the equations $v = v_0 \sin \omega t$, $v = v_0 \cos \omega t$, $v = \pm \omega \sqrt{(x_0^2 - x^2)}$, $x = x_0 \cos \omega t$ and $x = x_0 \sin \omega t$ as solutions to the defining equation for SHM. - Solve problems, both graphically and by calculation, for acceleration, velocity and displacement during SHM.	- Give examples to explain the definition of SHM for pendulum and springs. - Animation to show the displacement acceleration relationship. - Apply differentiation to show the relation between displacement, velocity and acceleration. -Practice solving questions and finding maximum speed, and acceleration. - Graphical animation to show the changing of sin,cos relation graphs. - Perform experiment to draw a graph for SHM definition. - Design an experiment to find a factor affecting the period of pendulum.	- Use scientific calculators for sin, cos. - Apply differentiation for the sin, cos in order for the displacement, velocity and acceleration. -- memorize the sin, cos graphical presentation.	1-Worksheet in connecting two topics idea, mechanics and SHM. 2-Quiz. 3-Oral questions during the class. 4- Worksheet about the animation - Engineering especially Industry manufacturing buildings, cars... for shock absorbers, bridges, building planes, to avoid vibration and resonance.
P59	- Energy changes during simple harmonic motion.	- Describe the interchange between kinetic energy and potential energy during SHM. - Apply the expressions $E_K = \frac{1}{2} m\omega^2 (x_0^2 - x^2)$ for the kinetic energy of a particle undergoing SHM, $E_T = \frac{1}{2} m\omega^2 x_0^2$ f	- Revise law of conservation of energy but using new formula. - Show animation for the ke and Pe graphs. - Solve many questions on board for many different situation.	- Squaring - Multiplications - simple addition and subtraction using scientific calculator.	1-Worksheet. 2-Quiz. 3- Oral questions during the class. 4- Worksheet about the animation

		for the total energy and $E_P = \frac{1}{2}m\omega^2x^2$ for the potential energy. - Solve problems, both graphically and by calculation, involving energy changes during SHM.	- Let the students work individually to improve there weakness. - Perform experiments for series and parallel springs.		- Engineering especially Industry manufacturing buildings, cars... to avoid resonance.
P60	Topic 6: Field and forces 6.2 Electric force and field:	-State Coulomb's law. -Define *electric field strength*. -Determine the electric field strength due to one or more point charges. -Solve problems involving electric charges, forces and fields.	- Understanding that each charge has an effect of a force which is represented by an arrow on a given charge. - Practice solving when charges aligned on one line, triangle and rectangle. - Perform an experiment to find the shape of the electric field around different shapes.	- Resolve of the force component of cos, sin. Trigonometry. - Use multiplication and division using scientific calculator.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class -Industry Designing roads for friction, designing fuel cars, to avoid static electricity. -Engineering and design and technology to avoid lightning..
P61	Topic 9: Motion in fields 9.2 Gravitational field, Potential and energy	-Define *gravitational potential* and *gravitational potential energy*. - State and apply the expression for gravitational potential due to a point mass.	-Understand that this is a scalar quantity Not a vector like field and force. - Improve students' skills in finding the potential by graphs of potential versus distance by practice many	-Analysis the graph by finding points from the graph. - Applying the math for calculating the formula for the potential.	1-Worksheet both written and concept questions. 2-Quiz. 3- Tests 4- Oral questions during the class

		- State and apply the formula relating gravitational field strength to gravitational potential gradient. - Determine the potential due to one or more point masses. - Describe and sketch the pattern of equipotential surfaces due to one and two point masses. - Derive an expression for the escape speed of an object from the surface of a planet. - Solve problems involving gravitational potential energy and gravitational potential.	questions. - Use animation to explain equipotential lines. - Practice on board calculating Pe from equipotential lines. - Derive the escape velocity from law of conservation of energy. - Research on how they put a satellite on its orbit by calculating energy.	-Derivation of more than one equation together. - Finding the gradient of a point.	-Industry strong materials to form satellite from and avoid friction with air. -Astronomy to calculate the appropriate position for the satellites according to its energy., -Design and technology for shapes of rockets..
P62	9.3 Electric field, Potential and energy. 9.4 Orbital motion	- Define *electric potential* and *electric potential energy*. - State and apply the expression for electric potential due to a point charge. - State and apply the expression for electric potential due to a point charge. - State and apply the formula relating electric field strength to electric potential gradient. - Determine the potential due to one or more point charges. - Derive Kepler's third law.	- Understand that electric potential is a scalar quantity not like force and electric field. - Explain that the potential at a point is a scalar addition of all the point charges at the region. - Derive orbital velocity, Kepler's 3rd law. - Focus of the existence of more than one field in the questions applied like gravity with electricity.	- Applying the math for calculating the formula for the potential. - Derivation of more than one equation together.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class -Designing roads for friction, to avoid static electricity, -Engineering and design and Technology for

					appropriate materials in space.
P63	Topic 11: Wave phenomena 11.1 Standing (stationary) waves	-Describe the nature of standing (stationary) waves. -Discuss the modes of vibration of strings and air in open and in closed pipes. -Solve problems involving standing waves.	- Explain the main idea of superposition principal to form standing waves. - Draw the harmonics for open and closed pipes and calculate the frequencies knowing the length of the pipe. - Show animations of instruments of open and closed pipes showing how standing waves are produced in order to form sounds. - Explain the connection of resonance Phenomena. - Perform an experiment to see standing waves using a tension rod connecting to ac circuit. - Perform an experiment to calculate speed of sound in air using standing waves.	- Simple math calculations using calculators. - Drawing sin waves to present the wave.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class Industry Music notes in musical instruments, - Manufacturing of planes, bridge, buildings to avoid resonance.
P64	11.2 Doppler effect	-Apply the Doppler effect equations for sound. Solve problems on the Doppler effect for sound. -Solve problems on the	- Explain the relative velocity with respect to a frame of reference. - Derive the two formulas for the case of moving source and moving observer.	- Derivation where use more than one formula. - Simple calculation applying the formula.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class 5- worksheet of

		Doppler effect for electromagnetic waves using the approximation -Outline an example in which the Doppler effect is used to measure speed.	- Draw wave front for the two cases moving source and moving observer. - Show animation on Doppler effect using different situation.		animation. Industry trying to minimize frequency changes by manufacturing.
P65	11.5 Polarization	- Outline qualitatively the action of liquid-crystal displays (LCDs).	-Showing animation on how the two mirrors work with polarized material. - Explain the work for polarized material. - Demonstration of the Polaroid and the analyzer. - Conduct an experiment to calculate the polarization angle. - Design an experiment to study a way of polarization. - Show animation on how polarization by reflection occurs. - Research on application of polarization on real life situation.	- Trigonometry. tan	- Oral questions during the class Industry in designing TV, LCD, Computer LCD and Calculator LCD - design and technology perform appropriate material for these instruments.
P66	Topic 12: Electromagnetic induction	- Define *magnetic flux* and *magnetic flux linkage*. - Describe the production of an	- Present animation showing the flux idea in different examples.	- Derivation - differentiation. - Simple	1-Worksheet. 2-Quiz. 3- Tests

	12.1 Induced electromotive force	induced emf by a time-changing magnetic flux. - State Faraday’s law and Lenz’s law. - Solve electromagnetic induction problems.	- Derive emf for wire in different way. - Show animation showing lenz rule in a coil and explain the – ve sign in Faradays law.	calculations using formula. - Imagination	4- Oral questions during the class -Industry to avoid induction for planes cars designing. -Electrical Engineering to avoid induction for electricity at home
P67	12.2 Alternating current	-Describe the emf induced in a coil rotating within a uniform magnetic field. - Explain the operation of a basic alternating current (ac) generator. - Discuss what is meant by the root mean squared (rms) value of an alternating current or voltage. -Discuss what is meant by the root mean squared (rms) value of an alternating current or voltage. -Solve problems using peak and rms values.	- Show animation of how to apply fleming RHR for the ac generator. - Show animation on different graph formation for flux, emf and power using sin, cos. - Explain the meaning of rms and why its important in ac current. - Design an experiment to find factors affecting the flux of a wire. - Animation to show how the generators work using sin cos graphs. - Practice solving questions of finding flux for different situation.	-Graphing for sign cos. Trigonometry. -square roots - Simple calculations. - Scientific calculators.	1-Worksheet showing connection with mechanics and this topic. 2-Quiz. 3- Oral questions during the class -Industry to use ac instruments when ac current is used. - Electrical Engineering in calculation of ac electricity from power stations.
P68	Topic 13: Quantum physics and nuclear	- Explain the origin of atomic energy levels in terms of the “electron in a box” model.	- Explain with animation what is this model and why it is important in quantum	- Simple mathematical calculation for	1-Worksheet connecting to or more topic together.

	physics 13.1 Quantum physics	- Outline the Schrdinger model of the hydrogen atom. - Outline the Heisenberg uncertainty principle with regard to position–momentum and time–energy. - Outline an experiment to verify the de Broglie hypothesis.	Physics. - Simple idea of what is Schrdinger model. Showing animation. - Probability of finding electron in an energy level. - Explain what wave - particle duality mean is. - Outline the experiment for debroglie. - Practice solving questions on debroglie showing wave particle duality idea.	Heisenberg equation applying the formula - Concept of probability.	2-Quiz. 3- Tests 4- Oral questions during the class Genetics (biology), genetic engineering.
P69	13.2 Nuclear physics	- State the radioactive decay law as an exponential function and -- define the *decay constant.*	- Derive formula for decay law. - What is activity. - Draw a graph for Log. - Explain the importance of decay constant for the element. - Debate about nuclear energy in a country.	-Simple idea of what is probability. . - Exponential and simple integration. - Log graph.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class Genetics (biology), genetic engineering.
P70	Topic 14: Digital technology 14.1 Analogue and digital signals	-Explain how interference of light is used to recover information stored on a CD. -Solve problems on CDs and DVDs related to data storage capacity.	- Show animation for CD, DVD and different storage systems. - Apply constructive and destructive interference for edges. - Research about laser and its property in reading	- Simple mathematical operations involve +, X and division.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class 5- worksheet of animation. -Industry, how sensitive

			computer instrument. - Discuss the important of CD in now day life.		the laser used for interference. -nanotechnology Computer Science, data storage computer
P71	14.2 Data capture; digital imaging using charge-coupled devices (CCDs)	-Describe the structure of a charge-coupled device (CCD). -Explain how incident light causes charge to build up within a pixel. -Outline how the image on a CCD is digitized. -Discuss the effects of quantum efficiency, magnification and resolution on the quality of the processed image. -Solve problems involving the use of CCDs.	- Present CCD as animation to simplify the new idea. Link the resolution of stars to the resolution between two pixels. - Explain pixels and there importance for resolution. - How to form a clear image using a simple lens and apply it to the pixel. - Research about resolution.	- Simple mathematical operations involve +, X and division.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class 5- worksheet of animation. Computer Science, computer uses LCD screens engineering is it a good for screen technology.
P72	Electromagnetic waves G6 Thin-film interference Parallel films	-State the condition for light to undergo either a phase change of π, or no phase change, on reflection from an interface. -Describe how a source of light gives rise to an interference pattern when the light is reflected at both surfaces of a parallel film. -State the conditions for constructive and destructive interference.	- Give simple examples from real life to show what thin film is. - Explain in Phase and out of phase by drawing crests and troughs. - Show animations for thin films by single and different colors. - Understand the difference between air wedge and thin films.	- simple calculations applying the equations.	1-Worksheet. 2-Quiz. 3- Tests 4- Oral questions during the class 5- Worksheet of animation. Industry Engineering (roads) oil films on streets

		-Explain the formation of coloured fringes when white light is reflected from thin films, such as oil and soap films. -Describe the difference between fringes formed by a parallel film and a wedge film. -Solve problems involving parallel films.	- Design an experiment to find factors affecting the formation of thin film.		-Optics blooming of lenses