PACE ACADEMY
PHYSICS 2
CURRICULUM GUIDE
S.Y. 2020-2021

Most Essential Learning Competencies	Science Lessons
THIRD QUARTER	
Describe using a diagram charging by rubbing and charging by induction	Lesson 1: Electrostatics
Explain the role of electron transfer in electrostatic charging by rubbing	
Describe experiments to show electrostatic charging by induction	
Calculate the net electric force on a point charge exerted by a system of point charges	Lesson 2: Coulomb's Law
Describe an electric field as a region in which an electric charge experiences a force	Lesson 3: Electric Fields
Calculate the electric field due to a system of point charges using Coulomb's law and the superposition principle	
Calculate electric flux	Lesson 4: Electric Flux and Gauss Law
Use Gauss's law to infer electric field due to uniformly distributed charges on long wires, spheres, and large plates	
Solve problems involving electric charges, dipoles, forces, fields, and flux in contexts such as, but not limited to, systems of point charges, electrical breakdown of air, charged pendulums, electrostatic ink-jet printers	*Performance Task for Lessons 1-4
Relate the electric potential with work, potential energy, and electric field	Lesson 5: Electric Potential
Determine the electric potential function at any point due to highly symmetric continuous- charge distributions	
Infer the direction and strength of electric field vector, nature of the electric field sources, and electrostatic potential surfaces given the equipotential lines	
Calculate the electric field in the region given a mathematical function describing its potential in a region of space	
Solve problems involving electric potential energy and electric potentials in contexts such as, but not limited to, electron guns in CRT TV picture tubes and Van de Graaff generators	
Deduce the effects of simple capacitors (e.g., parallel plate, spherical, cylindrical) on the capacitance, charge, and potential difference when the size, potential difference, or charge is changed	Lesson 6: Capacitors in Series and Parallel
Calculate the equivalent capacitance of a network of capacitors connected in series/parallel	

Determine the total charge, the charge on, and the potential difference across each capacitor in the network given the capacitors connected in series/parallel	
Determine the potential energy stored inside the capacitor given the geometry and the potential difference across the capacitor	
Describe the effects of inserting dielectric materials on the capacitance, charge, and electric field of a capacitor	
Solve problems involving capacitors and dielectrics in contexts such as, but not limited to, charged plates, batteries, and camera flashlamps.	*Performance Task for Lessons 5-6*
Distinguish between conventional current and electron flow	Lesson 7: Electric Current
Apply the relationship charge = current x time to new situations or to solve related problems	
Describe the effect of temperature increase on the resistance of a metallic conductor	Lesson 8: Electric Resistance
Describe the ability of a material to conduct current in terms of resistivity and conductivity	
Apply the relationship of the proportionality between resistance and the length and cross-sectional area of a wire to solve problems	
Differentiate ohmic and non-ohmic materials in terms of their I-V curves	
Differentiate emf of a source and potential difference (PD) across a circuit	Lesson 9: Electromotive Force and Potential Difference
Given an emf source connected to a resistor, determine the power supplied or dissipated by each element in a circuit	
Solve problems involving current, resistivity, resistance, and Ohm's law in contexts such as, but not limited to, batteries and bulbs, household wiring, and selection of fuses.	*Performance Task for Lessons 7-9*
Draw circuit diagrams with power sources (cell or battery), switches, lamps, resistors (fixed and variable) fuses, ammeters and voltmeters	Lesson 10: Resistors in Series and Parallel
Evaluate the equivalent resistance, current, and voltage in a given network of resistors connected in series and/or parallel	
Calculate the current and voltage through and across circuit elements using Kirchhoff's loop and junction rules (at most 2 loops only)	Lesson 11: Kirchhoff's Rules
Solve problems involving the calculation of currents and potential difference in circuits consisting of batteries, resistors and capacitors.	*Performance Task for Lessons 10-11*
Differentiate electric interactions from magnetic interactions	Lesson 12: Basics of Magnetism
Evaluate the total magnetic flux through an open surface	
Describe the motion of a charged particle in a magnetic field in terms of its speed, acceleration, cyclotron radius, cyclotron frequency, and kinetic energy	Lesson 13: Motion of Charged Particles in Electric and Magnetic Field

Evaluate the magnetic force on an arbitrary wire segment placed in a uniform magnetic field	Lesson 14: Magnetic Force of a Current-Carrying Wire
Evaluate the magnetic field vector at a given point in space due to a moving point charge, an infinitesimal current element, or a straight current-carrying conductor	Lesson 15: Biot-Savart Law
Calculate the magnetic field due to one or more straight wire conductors using the superposition principle	
Calculate the force per unit length on a current carrying wire due to the magnetic field produced by other current carrying wires	
Evaluate the magnetic field vector at any point along the axis of a circular current loop	
Solve problems involving magnetic fields, forces due to magnetic fields and the motion of charges and current carrying wires in contexts such as, but not limited to, determining the strength of Earth's magnetic field, mass spectrometers, and solenoids.	**Performance Task for Lessons 12-15*
FOURTH QUARTER	
Identify the factors that affect the magnitude of the induced emf and the magnitude and direction of the induced current (Faraday's Law)	Lesson 16: Faraday's Law
Compare and contrast electrostatic electric field and nonelectrostatic/ induced electric field	
Calculate the induced emf in a closed loop due to a time varying magnetic flux using Faraday's Law	
Describe the direction of the induced electric field magnetic field, and current on conducting/ nonconducting loop using Lenz's Law	Lesson 17: Lenz's Law
Compare and contrast alternating current (AC) and direct current (DC)	Lesson 18: AC circuits vs DC circuits
Characterize the properties (stored energy and time dependence of charges, currents, and voltages) of an LC circuit	Lesson 19: LC circuits
Relate the properties of EM wave (wavelength, frequency, speed) and the properties of vacuum and optical medium (permittivity, permeability, and index of refraction)	Lesson 20: Nature and Properties of Electromagnetic Waves
Explain the conditions for total internal reflection	Lesson 21: Interaction of Light and Matter
Explain the phenomenon of dispersion by relating to Snell's Law	
Calculate the intensity of the transmitted light after passing through a series of polarizers applying Malus's Law	
Solve problems involving reflection, refraction, dispersion, and polarization in contexts such as, but not limited to, (polarizing) sunglasses, atmospheric haloes, and rainbows	**Performance Task for Lessons 20-21*
Explain image formation as an application of reflection, refraction, and paraxial approximation	Lesson 22: Reflection and Refraction at Plane and Spherical Surfaces, and Mirrors and Image

Relate properties of mirrors (radii of curvature, focal length) to image and object distance and sizes	Formation
Determine graphically and mathematically the type (virtual/real), magnification, location, and orientation of image of a point and extended object produced by a plane or spherical mirror	
Relate properties of lenses (radii of curvature, focal length, index of refraction [for lenses]) to image and object distance and sizes	Lesson 23: Refraction at Plane and Spherical Surfaces, Thin Lenses, and Image Formation
Determine graphically and mathematically the type (virtual/real), magnification, location/ apparent depth, and orientation of image of a point and extended object produced by a lens or series of lenses	
Apply the principles of geometric optics to discuss image formation by the eye, and correction of common vision defects	Lesson 24: The Human Eye
Determine the conditions (superposition, path and phase difference, polarization, amplitude) for interference to occur emphasizing the properties of a laser as a monochromatic and coherent light source	Lesson 25: Interference and Diffraction
Relate the geometry of the two-slit experiment set up (slit separation, and screen-to-slit distance) and properties of light (wavelength) to the properties of the interference pattern (width, location, and intensity)	
Relate the geometry of the diffraction experiment setup (slit size, and screen- to-slit distance) and properties of light (wavelength) to the properties of the diffraction pattern (width, location, and intensity of the fringes)	
State the postulates of Special Relativity and their consequences	Lesson 26: Special Theory of Relativity
Apply the time dilation, length contraction and relativistic velocity addition to worded problems	
Calculate kinetic energy, rest energy, momentum, and speed of objects moving with speeds comparable to the speed of light	Lesson 27: Relativistic Dynamics
Explain the photoelectric effect using the idea of light quanta or photons	Lesson 28: The Photoelectric Effect and Determination of the Planck's Constant
Explain qualitatively the properties of atomic emission and absorption spectra using the concept of energy levels	Lesson 29: Atomic Spectra
Calculating radioisotope activity using the concept of half-life	Lesson 30: Radioactive Decay

References:

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Hewitt, P. (2009). Conceptual physics (11th ed.). Addison-Wesley.

Knight, R.D. (2007). Physics for scientists and engineers: A strategic approach with modern physics and mastering physics (2nd ed.). Benjamin Cummings.

Silverio, A. A. (2017). Exploring through life series: General physics 1. Phoenix Publishing House.

Serway, R., Faughn, J., & Vuille, C. (2009). College physics (8th ed.). Cengage Learning.
Young, H. D., & Freedman, R. A. (2012). Sears and Zemansky's University physics with modern physics (13th ed.). Pearson.

The Physics Classroom. https://www.physicsclassroom.com/

Time Allotment: Four (4) synchronous sessions (40 minutes per session); Five (5) asynchronous sessions (40 minutes per session)

Promotion/Retention:

- Assessments will be categorized as the following with the corresponding weight:
    - Short Quizzes (20%)
    - Written Outputs (35%)
    - Product and Performance Tasks (45%)
- **Short Quizzes**. These include summative assessments after every lesson, group of related lessons, or chapter.
- **Written Outputs**. These include concept maps, data recording and analyses, laboratory reports and documentations, reaction/reflection papers, article reviews, and surveys.
- **Product and Performance Tasks**. These include portfolios, investigatory projects, models and diagrams construction, prototype building, research papers, debates, designing and implementation of action plans, designing various models, doing scientific investigations, issue-awareness campaigns, laboratory activity, multimedia presentations, simulation, skills demonstration, and verification experiments.