

PHYSICS 20
COURSE OUTLINE
Fairview High School
February 2022 – June 2022

INSTRUCTOR: Mrs. A. Laue, lauea@prsd.ab.ca

RESOURCES: Pearson; PHYSICS: Pearson Education Canada, 2007
Website: PhysicsSource
Login Name: fhsphysics2030
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COURSE OVERVIEW:

Physics 20 - 5 credits Pre-requisite: Science 10

This course is the first in the Physics 20-30 academic sequence and continues the study of motion and energy using the concepts and mathematical skills introduced in Science 10. Units of study include: the study of motion (kinematics) in 1D and 2D, the causes of motion (dynamics), circular motion and gravitation, work and energy, oscillatory (simple harmonic) motion and mechanical waves.

The focus of the course is on understanding the physics principles behind the natural events that students experience and the technology that they use in their daily lives. It develops knowledge, skills, and attitudes to help students become capable of and committed to setting goals, making informed choices, and acting in ways that will improve their own lives as well as life in their communities.

PHYSICS 20 OUTLINE:

UNIT	TOPIC	CLASSES	APPROX. TIMELINE
A.	Kinematics	22	Feb. 1 – March 4
B.	Dynamics	22	March 7 – April 19
C.	Circular Motion, Work and Energy (*2 unit exams)	22	April 20 – May 20
D.	Oscillatory Motion and Mechanical Waves	19	May 24 – June 20

ASSESSMENT:

Course Work:	60%	Unit Exams (5)
	40%	Quizzes, Labs, and Assignments
Final Grade:	70%	Course Work (Unit A - D) (42% unit exams, 28% quizzes/labs/assign)
	30%	Grade on Final Exam

GENERAL EXPECTATIONS:

- **REGULAR ATTENDANCE** – Attendance is one of the most important factors for academic success. If an absence is unavoidable, it is **YOUR responsibility** to catch up on work that you missed. Please make arrangements with me or a classmate to obtain missed materials. If you miss a test due to an excused absence, you may write the test at lunch or in class on the first day back.
- **ARRIVE ON TIME** – When the bell goes, I expect you to be in your desk, with your books open, ready to start class. If lateness is unavoidable, please enter the classroom with a minimum of disruption.
- **COME PREPARED** – Please bring books, pencils, calculators, etc. to class *each* day. All calculations should be done in **pencil**. Handouts, quizzes, assignments, notes and exams are to be kept in order in a binder. These will assist you as a study guide.
- **ASSIGNMENTS** – All assignments are due at the **beginning of class**, on or before the due date.
- **WORK HABITS** – It is expected that students use class time to the best of their abilities for the whole period every class. I expect everyone to be listening when I am providing instruction. Please raise your hand and ask questions at any time during the class. Mature, respectful behaviour is a necessity for all members of the class.
- **SAFETY** – To ensure the safety of you and others, persons misbehaving or not following instructions given in the laboratory will be suspended from the laboratory and lose credit (marks) for the activity.

TEACHING METHODOLOGY:

Students will be taught through a variety of different instructional methods and strategies including, but not limited to: lecture, question and answer discussion, small group work, independent learning, individual tutorials, laboratory work, demonstrations, and technological means including the use of a Smartboard, videos, online tools, and where appropriate personal owned devices.

ELECTRONIC DEVICES:

- Cell phones and other electronic devices may only be used at times indicated by the teacher. Please refrain from using them to make calls or text message during class time. If used inappropriately, they will be placed in the main office.
- All electronic devices must be placed on the teacher's desk during quizzes/exams.

GOALS

**NO ONE CAN PREDICT TO WHAT HEIGHTS YOU CAN SOAR,
EVEN YOU WILL NOT KNOW UNTIL YOU SPREAD
YOUR WINGS.**

My goal for PHYSICS 20 is _____ %.

Course Outline:

Unit A: Kinematics – Chapter 1 & 2

General Outcome 1

Students will describe motion in terms of displacement, velocity, acceleration, and time.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–A1.1k define, qualitatively and quantitatively, displacement, velocity and acceleration
- ☐ 20–A1.2k define, operationally, and compare and contrast scalar and vector quantities
- ☐ 20–A1.3k explain, qualitatively and quantitatively, uniform and uniformly accelerated motion when provided with written descriptions and numerical and graphical data
- ☐ 20–A1.4k interpret, quantitatively, the motion of one object relative to another, using displacement and velocity vectors
- ☐ 20–A1.5k explain, quantitatively, two-dimensional motion in a horizontal or vertical plane, using vector components.

Unit B: Dynamics – Chapter 3 & 4

General Outcome 1

Students will explain the effects of balanced and unbalanced forces on velocity.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–B1.1k explain that a nonzero net force causes a change in velocity
- ☐ 20–B1.2k apply Newton's first law of motion to explain, qualitatively, an object's state of rest or uniform motion
- ☐ 20–B1.3k apply Newton's second law of motion to explain, qualitatively, the relationships among net force, mass and acceleration
- ☐ 20–B1.4k apply Newton's third law of motion to explain, qualitatively, the interaction between two objects, recognizing that the two forces, equal in magnitude and opposite in direction, do not act on the same object
- ☐ 20–B1.5k explain, qualitatively and quantitatively, static and kinetic forces of friction acting on an object
- ☐ 20–B1.6k calculate the resultant force, or its constituents, acting on an object by adding vector components graphically and algebraically
- ☐ 20–B1.7k apply Newton's laws of motion to solve, algebraically, linear motion problems in horizontal, vertical and inclined planes near the surface of Earth, ignoring air resistance.

General Outcome 2

Students will explain that gravitational effects extend throughout the universe.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–B2.1k identify the gravitational force as one of the fundamental forces in nature
- ☐ 20–B2.2k describe, qualitatively and quantitatively, Newton's law of universal gravitation

- ☐ 20–B2.3k explain, qualitatively, the principles pertinent to the Cavendish experiment used to determine the universal gravitational constant, G
- ☐ 20–B2.4k define the term “field” as a concept that replaces “action at a distance” and apply the concept to describe gravitational effects
- ☐ 20–B2.5k relate, qualitatively and quantitatively, using Newton’s law of universal gravitation, the gravitational constant to the local value of the acceleration due to gravity
- ☐ 20–B2.6k predict, quantitatively, differences in the weight of objects on different planets.

Unit C: Circular Motion, Work and Energy – Chapters 5 & 6

General Outcome 1

Students will explain circular motion, using Newton’s laws of motion.

Students will:

- ☐ 20–C1.1k describe uniform circular motion as a special case of two-dimensional motion
- ☐ 20–C1.2k explain, qualitatively and quantitatively, that the acceleration in uniform circular motion is directed toward the centre of a circle
- ☐ 20–C1.3k explain, quantitatively, the relationships among speed, frequency, period and radius for circular motion
- ☐ 20–C1.4k explain, qualitatively, uniform circular motion in terms of Newton’s laws of motion
- ☐ 20–C1.5k explain, quantitatively, planetary and natural and artificial satellite motion, using circular motion to approximate elliptical orbits
- ☐ 20–C1.6k predict the mass of a celestial body from the orbital data of a satellite in uniform circular motion around the celestial body
- ☐ 20–C1.7k explain, qualitatively, how Kepler’s laws were used in the development of Newton’s law of universal gravitation.

General Outcome 2

Students will explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–C2.1k define mechanical energy as the sum of kinetic and potential energy
- ☐ 20–C2.2k determine, quantitatively, the relationships among the kinetic, gravitational potential and total mechanical energies of a mass at any point between maximum potential energy and maximum kinetic energy
- ☐ 20–C2.3k analyze, quantitatively, kinematics and dynamics problems that relate to the conservation of mechanical energy in an isolated system
- ☐ 20–C2.4k recall work as a measure of the mechanical energy transferred and power as the rate of doing work
- ☐ 20–C2.5k describe power qualitatively and quantitatively
- ☐ 20–C2.6k describe, qualitatively, the change in mechanical energy in a system that is not isolated.

Unit D: Oscillatory Motion and Mechanical Waves – Chapters 7 & 8

General Outcome 1

Students will describe the conditions that produce oscillatory motion.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–D1.1k describe oscillatory motion in terms of period and frequency
- ☐ 20–D1.2k define simple harmonic motion as a motion due to a restoring force that is directly proportional and opposite to the displacement from an equilibrium position
- ☐ 20–D1.3k explain, quantitatively, the relationships among displacement, acceleration, velocity and time for simple harmonic motion, as illustrated by a frictionless, horizontal mass-spring system or a pendulum, using the small-angle approximation
- ☐ 20–D1.4k determine, quantitatively, the relationships among kinetic, gravitational potential and total mechanical energies of a mass executing simple harmonic motion
- ☐ 20–D1.5k define mechanical resonance.

General Outcome 2

Students will describe the properties of mechanical waves and explain how mechanical waves transmit energy.

Specific Outcomes for Knowledge

Students will:

- ☐ 20–D2.1k describe mechanical waves as particles of a medium that are moving in simple harmonic motion
- ☐ 20–D2.2k compare and contrast energy transport by matter and by waves
- ☐ 20–D2.3k define longitudinal and transverse waves in terms of the direction of motion of the medium particles in relation to the direction of propagation of the wave
- ☐ 20–D2.4k define the terms wavelength, wave velocity, period, frequency, amplitude, wave front and ray as they apply to describing transverse and longitudinal waves
- ☐ 20–D2.5k describe how the speed of a wave depends on the characteristics of the medium
- ☐ 20–D2.6k predict, quantitatively, and verify the effects of changing one or a combination of variables in the universal wave equation ($v = f\lambda$)
- ☐ 20–D2.7k explain, qualitatively, the phenomenon of reflection as exhibited by mechanical waves
- ☐ 20–D2.8k explain, qualitatively, the conditions for constructive and destructive interference of waves and for acoustic resonance
- ☐ 20–D2.9k explain, qualitatively and quantitatively, the Doppler effect on a stationary observer of a moving source.

***** This is a high-level science course. Regular attendance and consistent work habits are the key to your success. Extra help is available at noon hour/PULSE/after school, and it is your responsibility to ask. IF you do your homework, review your work, study for quizzes/exams; you should be successful in Physics 20! Your success depends on YOU!!!**

Have a great semester and have fun!© Please keep track of your marks as they will be posted weekly on PowerSchool.