

## Miami Dade College

### PHY 1005 - Physics with Applications

#### PHY 1005 3 credits

Course Description PHY 1005, Physics with Applications, is the second semester of a two semester physics without calculus sequence. This class is usually taken by students who are majoring in a program leading toward a degree in occupational therapy or physical therapy assistant. Electricity and magnetism, optics, and modern physics are studied in PHY 1005. The prerequisite for PHY 1005 is successful completion of PHY 1004 with a grade of C or better.

Pre-requisite: PHY 1004

Competency 1. The student will demonstrate a comprehension of the law of conservation of electric charge by

describing the method by which an object can be electrically charged

1. by contact.
2. temporarily by induction.
3. permanently by induction.

Competency 2. The student will demonstrate an application of the Coulomb's law by

- a) by describing the factors which determine the magnitude of the electric force between two point charges.
- b) applying Coulomb's law in solving word problems related to the electrostatic forces between charged objects.

Competency 3. The student will demonstrate a comprehension of electric field patterns and equipotential line patterns by

drawing the electric field pattern and equipotential line pattern about

1. single point charges
2. two point charges which are oppositely charged.
3. two oppositely charged parallel plates

Competency 4. The student will demonstrate an application of the concepts of electric field, electric force, electrical potential, electrical potential difference, and kinetic energy of a point charge by

solving word problems related to a point charge placed

1. near one or more other point charges
2. between two oppositely charged parallel plates of a capacitor.

Competency 5. The student will demonstrate an application of electrical resistance by

solving word problems related to variation of electrical resistance with the

1. material of the conductor
2. cross-sectional area of the conductor
3. length of the conductor.
4. temperature of the conductor

Competency 6. The student will demonstrate an application of Ohm's law by

- a) stating the correct relationship between voltage, electrical resistance and electrical current
- b) solving word problems involving Ohm's law
- c) solving word problems related to electric power, electric energy and the cost of electric energy

Competency 7. The student will demonstrate an application of Ohm's law and Kirchhoff's laws by

- a) stating Kirchhoff's laws in the student's own words
- b) solving word problems related to resistors arranged in series and parallel in an electric circuit.

Competency 8. The student will demonstrate a comprehension of the RC circuit by

- a) explaining the method by which a capacitor can be charged when connected in series with a battery and a resistor.
- b) describing how this type of circuit can be used in a heart pacemaker.

Competency 9. The student will demonstrate a comprehension of the direction of a magnetic field about current carrying wires by

using the right hand rule to predict the direction of the magnetic field produced by the current.

Competency 10. The student will demonstrate a comprehension of the magnetic field lines between the poles of bar magnets by drawing the line patterns

- a) around a single bar magnet
- b) between a magnetic north pole and a magnetic south pole.
- c) between two like poles.
- d) around a horseshoe magnet.

Competency 11. The student will demonstrate an application of the right hand rule by

- using the appropriate right hand rule to determine the direction of the force on
1. a current carrying wire in a magnetic field.
  2. a charged particle passing perpendicular through a magnetic field.

Competency 12. The student will demonstrate an application of the right hand rule by

- solving word problems related to the
1. magnitude of the force on a current carrying wire in a magnetic field
  2. motion of charged particles traveling through magnetic fields

Competency 13. The student will demonstrate a comprehension of the charge to mass ratio for an electron experiment performed J.J. Thomson by

- a) describing the apparatus and procedures used in the experiment.
- b) explaining how the Thomson's conclusions on the results of the experiment led to his model of the atom.
- c) solving word problems to determine the ratio of the charge to the mass of an electron.

Competency 14. The student will demonstrate a comprehension of Lenz's Law by

- determining the direction of induced electric current through wires
1. either moving perpendicular to a stationary magnetic field
  2. or in a changing magnetic field.

Competency 15. The student will demonstrate an application of Faraday's law by

- solving word problems related to the values of (induced) voltages and currents
1. produced in a wire moving perpendicular to a magnetic field.
  2. in a coil of wire in a changing magnetic field.

Competency 16. The student will demonstrate an application of the production of images by lenses or mirrors by

- a) drawing a ray diagram and locating the image of an object placed at some distance from a lens or mirror of known focal length.
- b) using the gaussian form of the lens and mirror equations to solve word problems related to the formation of real and virtual images.

Competency 17. The student will demonstrate an application of Snell's Law by

- a) solving problems related to the refraction of light as it passes from one substance to another.
- b) solving word problems related to total internal reflection and the critical angle of a substance.

Competency 18. The student will demonstrate an application of geometrical optics by

explaining how

- a) a converging lens produces an image on the film of a camera.
- b) a converging lens is used in a movie or slide projector to produce an image on a screen.
- c) images are produced by a microscope or refracting telescope.
- d) images are produced by a reflecting telescope.

Competency 19. The student will demonstrate an application of geometrical optics by explaining how

- a) the lens of the human eye produces an image on the retina.
- b) a converging or diverging lenses can be used to correct vision of a person who has one of the following defects
  1. nearsightedness (myopia)
  2. hyperopia (farsightedness)
  3. astigmatism

Competency 20. The student will demonstrate a comprehension of the wave theory of light by

describing and explaining in the student's own words how the following experiments support the wave theory of light.

- a) Young's double slit experiment.
- b) single slit diffraction experiment
- c) diffraction grating

Competency 21. The student will demonstrate a comprehension of electromagnetic waves by

- a) list the sections of the electromagnetic spectrum from the longest wavelength to the shortest, i. e. radio waves, microwaves, infrared light, visible light, ultraviolet light, X-rays, cosmic rays
- b) describing in the student's own words the process by which accelerated electric charges produce an electromagnetic wave.

Competency 22. The student will demonstrate a comprehension that light is a transverse electromagnetic wave by

- a) describing how polarization of light by reflection indicates that light is a transverse wave.
- b) solving word problems using Brewster's formula to calculate the angle of maximum polarization of reflected light from various substances.

Competency 23. The student will demonstrate a comprehension of X-rays by

- a) describing the experiments performed by Wilhelm Roentgen which led to their discovery.
- b) solving word problems to determine the frequency, wavelength and energy of an X-ray.

Competency 24. The student will demonstrate a comprehension of the Rutherford scattering experiment by

1. describing the apparatus and procedures used in the experiment
2. explaining how the results and conclusions drawn from the experiment led to his model of the atom.
3. solving word problems to determine the size of the nucleus of the atom.