Tennessee Science

Physics II

Matter and Its Interactions PHYS2.PS1

1. Develop models to illustrate the changes in the composition of the nucleus of an atom and the energy released during the processes of fission, fusion, and radioactive decay. PHYS2.PS1.1
2. Recognize and communicate examples from everyday life that use radioactive decay processes. PHYS2.PS1.2
3. Investigate and evaluate the expression for calculating the percentage of a remaining atom (N(t)=N0e-λt) using simulated models, calculations, and/or graphical representations. Define the half-life (t1/2) and decay constant λ. Perform an investigation on probability and calculate halflife from acquired data (does not require use of actual radioactive samples). PHYS2.PS1.3

Motion and Stability: Forces and Interactions PHYS2.PS2

1. Describe and mathematically determine the electrostatic interaction between electrically charged particles using Coulomb's law, $Fe = ke\,q1q2\,r\,2$. Compare and contrast Coulomb's law and gravitational force, notably with respect to distance. PHYS2.PS2.1

Energy PHYS2.PS3

1. Identify and calculate different types of energy and their transformations (thermal, kinetic, potential, including magnetic and electrical potential energies) from one form to another in a system. PHYS2.PS3.1
2. Investigate and evaluate the laws of thermodynamics and use them to describe internal energy, heat, and work. PHYS2.PS3.2
3. Communicate scientific ideas to describe how forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space. Explain how energy is contained within the field and how the energy changes when the objects generating and interacting with the field change their relative positions. PHYS2.PS3.3
4. Describe, compare, and diagrammatically represent both electric and magnetic fields. Qualitatively predict the motion of a charged particle in each type of field, but avoid situations where the two types of fields are combined in the same region of space. Restrict magnetic fields to those that are parallel or perpendicular to the path of a charged particle. PHYS2.PS3.4
5. Develop a model (sketch, CAD drawing, etc.) of a resistor circuit or capacitor circuit and use it to illustrate the behavior of electrons, electrical charge, and energy transfer. PHYS2.PS3.5

6 **Investigate Ohm's law (I=V/R) by conducting an experiment to determine the relationships between current and voltage, current and resistance, and voltage and resistance.** PHYS2.PS3.6

7 **Apply the law of conservation of energy and charge to assess the validity of Kirchhoff's loop and junction rules when algebraically solving problems involving multi-loop circuits.** PHYS2.PS3.7

8 **Predict the energy stored by a capacitor and how charge flows among capacitors connected in series or parallel.** PHYS2.PS3.8

Waves and Their Applications in Technologies for Information Transfer PHYS2.PS4

1 **Know wave parameters (i.e., velocity, period, amplitude, frequency, angular frequency) as well as how these quantities are defined in the cases of longitudinal and transverse waves.** PHYS2.PS4.1

2 **Describe parameters of a medium that affect the propagation of a sound wave through it.** PHYS2.PS4.2

3 **Understand that the reflection, refraction, and transmission of waves at an interface between two media can be modeled on the basis of characteristics of specific wave parameters and parameters of the medium.** PHYS2.PS4.3

4 **Communicate scientific and technical information about how the principle of superposition explains the resonance and harmonic phenomena in air columns and on strings and common sound devices.** PHYS2.PS4.4

5 **Evaluate the characteristics of the electromagnetic spectrum by communicating the similarities and differences among the different bands. Research and determine methods and devices used to measure these characteristics.** PHYS2.PS4.5

6 **Plan and conduct controlled scientific investigations to construct explanations of light's behavior (reflection, refraction, transmission, interference) including the use of ray diagrams.** PHYS2.PS4.6

7 **Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model.** PHYS2.PS4.7

8 **Obtain information to construct explanations on how waves are used to produce, transmit, and capture signals and store and interpret information.** PHYS2.PS4.8

9 **Investigate how information is carried in optical systems and use Snell's law to describe the properties of optical fibers.** PHYS2.PS4.9