

Tick one box per statement: ☐ not yet ☐ nearly ☐ confident. / /

9. Thermodynamics

9.1 Kinetic Theory of Temperature and Pressure

- ☐☐☐ Describe the pressure a gas exerts on its container in terms of atomic motion within that gas.
- ☐☐☐ Describe the temperature of a system in terms of the atomic motion within that system.

9.2 The Ideal Gas Law

- ☐☐☐ Describe the properties of an ideal gas.

9.3 Thermal Energy Transfer and Equilibrium

- ☐☐☐ Describe the transfer of energy between two systems in thermal contact due to temperature differences of those two systems.

9.4 The First Law of Thermodynamics

- ☐☐☐ Describe the internal energy of a system.
- ☐☐☐ Describe the behavior of a system using thermodynamic processes.

9.5 Specific Heat and Thermal Conductivity

- ☐☐☐ Describe the energy required to change the temperature of an object by a certain amount.
- ☐☐☐ Describe the rate at which energy is transferred by conduction through a given material.

9.6 Entropy and the Second Law of Thermodynamics

- ☐☐☐ Describe the change in entropy for a given system over time.

10. Electric Force, Field, and Potential

10.1 Electric Charge and Electric Force

- ☐☐☐ Describe the electric force that results from the interactions between charged objects or systems.
- ☐☐☐ Describe the electric and gravitational forces that result from interactions between charged objects with mass.
- ☐☐☐ Describe the electric permittivity of a material or medium.

10.2 The Process of Charging

- ☐☐☐ Describe the behavior of a system using conservation of charge.

10.3 Electric Fields

- ☐☐☐ Describe the electric field produced by a charged object or configuration of point charges.
- ☐☐☐ Describe the electric field generated by charged conductors or insulators.

10.4 Electric Potential Energy

- ☐☐☐ Describe the electric potential energy of a system.

10.5 Electric Potential

- ☐☐☐ Describe the electric potential due to a configuration of charged objects.
- ☐☐☐ Describe the relationship between electric potential and electric field.

10.6 Capacitors

- ☐☐☐ Describe the physical properties of a parallel-plate capacitor.

10.7 Conservation of Electric Energy

- ☐☐☐ Describe changes in energy in a system due to a difference in electric potential between two locations.

11. Electric Circuits

11.1 Electric Current

- ☐☐☐ Describe the movement of electric charges through a medium.

11.2 Simple Circuits

- ☐☐☐ Describe the behavior of a circuit.

11.3 Resistance, Resistivity, and Ohm’s Law

- ☐☐☐ Describe the resistance of an object using physical properties of that object.
- ☐☐☐ Describe the electrical characteristics of elements of a circuit.

11.4 Electric Power

- ☐☐☐ Describe the transfer of energy into, out of, or within an electric circuit, in terms of power.

11.5 Compound DC Circuits

- ☐☐☐ Describe the equivalent resistance of multiple resistors connected in a circuit.
- ☐☐☐ Describe a circuit with resistive wires and a battery with internal resistance.
- ☐☐☐ Describe the measurement of current and potential difference in a circuit.

11.6 Kirchhoff’s Loop Rule

- ☐☐☐ Describe a circuit or elements of a circuit by applying Kirchhoff’s loop rule.

11.7 Kirchhoff’s Junction Rule

- ☐☐☐ Describe a circuit or elements of a circuit by applying Kirchhoff’s junction rule.

11.8 RC Circuits RC

- ☐☐☐ Describe the equivalent capacitance of multiple capacitors.
- ☐☐☐ Describe the behavior of a circuit containing combinations of resistors and capacitors.

12. Magnetism and Electromagnetism

12.1 Magnetic Fields

- ☐☐☐ Describe the properties of a magnetic field.
- ☐☐☐ Describe the magnetic behavior of a material as a result of the configuration of magnetic dipoles in the material.
- ☐☐☐ Describe the magnetic permeability of a material.

12.2 Magnetism and Moving Charges

- ☐☐☐ Describe the magnetic field produced by moving charged objects.
- ☐☐☐ Describe the force exerted on moving charged objects by a magnetic field.

12.3 Magnetism and Current-Carrying Wires

- ☐☐☐ Describe the magnetic field produced by a current-carrying wire.
- ☐☐☐ Describe the force exerted on a current-carrying wire by a magnetic field.

12.4 Electromagnetic Induction and Faraday’s Law

- ☐☐☐ Describe the induced electric potential difference resulting from a change in magnetic flux.

13. Geometric Optics

13.1 Reflection

- ☐☐☐ Describe light as a ray.
- ☐☐☐ Describe the reflection of light from a surface.

13.2 Images Formed by Mirrors

- ☐☐☐ Describe the image formed by a mirror.

13.3 Refraction

- ☐☐☐ Describe the refraction of light between two media.

13.4 Images Formed by Lenses

- ☐☐☐ Describe the image formed by a lens.

14. Waves, Sound, and Physical Optics

14.1 Properties of Wave Pulses and Waves

- ☐☐☐ Describe the physical properties of waves and wave pulses.

14.2 Periodic Waves

- ☐☐☐ Describe the physical properties of a periodic wave.

14.3 Boundary Behavior of Waves and Polarization

- ☐☐☐ Describe the interaction between a wave and a boundary.

14.4 Electromagnetic Waves

- ☐☐☐ Describe the properties of an electromagnetic wave.

14.5 The Doppler Effect

- ☐☐☐ Describe the properties of a wave based on the relative motion between the source of the wave and the observer of the wave.

14.6 Wave Interference and Standing Waves

- ☐☐☐ Describe the net disturbance that occurs when two or more wave pulses or waves overlap.
- ☐☐☐ Describe the properties of a standing wave.

14.7 Diffraction

- ☐☐☐ Describe the behavior of a wave and the diffraction pattern resulting from a wave passing through a single opening.

14.8 Double-Slit Interference and Diffraction Gratings

- ☐☐☐ Describe the behavior of a wave and the diffraction pattern resulting from the wave passing through multiple openings.

14.9 Thin-Film Interference

- ☐☐☐ Describe the behavior of light that interacts with a thin film.

15. Modern Physics

15.1 Quantum Theory and Wave-Particle Duality

- ☐☐☐ Describe the properties and behavior of an object that exhibits both particle-like and wave-like behavior.

15.2 The Bohr Model of Atomic Structure

- ☐☐☐ Describe the properties of an atom.

15.3 Emission and Absorption Spectra

- ☐☐☐ Describe the emission or absorption of photons by atoms.

15.4 Blackbody Radiation

- ☐☐☐ Describe the electromagnetic radiation emitted by an object due to its temperature.

15.5 The Photoelectric Effect

- ☐☐☐ Describe an interaction between photons and matter using the photoelectric effect.

15.6 Compton Scattering

- ☐☐☐ Describe the interaction between photons and matter using Compton scattering.

15.7 Fission, Fusion, and Nuclear Decay

☐☐☐ Describe the physical properties that constrain the behavior of interacting nuclei, subatomic particles, and nucleons.

☐☐☐ Describe the radioactive decay of a given sample of material consisting of a finite number of nuclei.

15.8 Types of Radioactive Decay

☐☐☐ Describe the processes by which individual nuclei decay.