Name: _____ Period: _____

Instructor: Mr. Rodriguez Total Score:_____/0

Final Exam Review

Conceptual Physics A
Fall 2024

Learning Standard 3.1

The Law of Conservation of Energy

Key Concepts

- Understand the law of conservation of energy: energy cannot be created or destroyed, only transferred or transformed.
- Know the SI units of energy (Joules, J).

Practice

- Define and explain the law of conservation of energy.
- Identify different types of energy (kinetic, potential, chemical, etc.) and how energy is converted in systems like:
  - Speakers
  - Solar panels
  - Engines
  - Flashlights
  - Bow and arrow
  - Turbines
- Example question: How does a flashlight convert energy?

Application

Relate energy transformations on Earth to the Sun as the primary energy source and how humans, animals, plants, and fossil fules play into that network.

Learning Standard 3.2

Problem Solving via Conservation of Energy

Key Concepts

- Use the conservation of energy principle (e.g. potential energy turning into kinetic energy or vice versa) to solve problems.
- Understand energy relationships in motion, for example the kid on the swing problem from class.

Practice

- Derive the minimum maximum height that a roller skater will go up a ramp given that their starting speed is $v = 10\,\mathrm{m/s}$ and neglecting friction and air resistance.
- Work through problems involving:
  - Gravitational potential energy ($PE = mgh$)
  - Kinetic energy ($KE = \frac{1}{2}mv^2$)

Application

Interpret how increasing speed or energy affects motion, especially in systems where energy transforms from potential to kinetic or vice versa.

Learning Standard 3.3

Power and Generators

Key Concepts

- Understand power as the rate of energy transfer ($P = \frac{\Delta E}{\Delta t}$).
- Calculate potential energy and power for systems like hydroelectric turbines.

Practice

- Calculate gravitational potential energy for falling water (e.g., Niagra Falls) using $PE = mgh$.
- Determine the theoretical power output of water flow and relate it to powering devices (e.g., number of 20 W light bulbs).

Application

Solve real-world problems involving power generation and energy efficiency. Example problem: The water at Niagara Falls flows from a height of 50 m and 5.0×10^5 kg of water flows over the falls every second. Assume 85 percent of the gravitational potential energy of the water is converted into electrical power by a hydroelectric turbine. What is the usable power of this system in Watts?

Learning Standard 3.4

Energy and Automobile Safety

Key Concepts

- Understand kinetic energy and how it relates to velocity ($KE = \frac{1}{2}mv^2$).
- Analyze work and force in stopping a car ($W = Fd$).

Practice

- Calculate the initial kinetic energy of a car given mass and velocity.
- Determine stopping distance when a constant force is applied.
- Explore the effects of changing the speed on kinetic energy and stopping distance.

Application

Discuss the relationship between speed, kinetic energy, and crash severity. Example question: If speed triples, by what factor does stopping distance increase?