Study Guide

AP Physics - C **Mr. Butler**

Potential Energy and Energy Conservation

The student should know or be able to do the following:

1. **Describe gravitational potential energy and apply its formula to determine the GPE and/or change in the GPE of an object or system.**
2. **Distinguish between mechanical and non-mechanical energy and determine the total mechanical energy of a system.**
3. **State the law of energy conservation, apply it to determine the values of energy forms or other physical quantities in an energy system and account for the energy change effects of other forces in an energy system.**
4. **Determine the work done by gravity in moving an object along a curved path and the change in the resulting GPE of the system.**
5. **Use calculus methods to integrate a force function to determine the work done and evaluate if the force is conservative or nonconservative.**
6. **Apply Hooke's law to determine restoring force, spring constant and displacement for an ideal mass-spring system.**
7. **Describe elastic potential energy and apply its formula along with Hooke's law to determine the work done by the restoring force and the change in EPE.**
8. **Distinguish between *conservative* and *nonconservative* forces and describe the effect of the work done by each in an energy system and with respect to representing them using a potential energy function.**
9. **Apply the energy conservation law correctly in cases involving all forms of energy; both mechanical and non-mechanical.**
10. **Describe the *restoring force* and *force constant* and use Hooke's Law to determine the elastic potential energy of a mass-spring system.**
11. **Correctly apply the energy conservation law and the equivalence given by the Work-Energy Principle to situations involving energy systems.**
12. **Use integration methods to determine the work done for an object moving along a curved path.**
13. **Using the calculus method of partial differentiation, derive an expression for the force in unit vector notation from its potential energy function. Apply the Del operator ∇ to determine the *Gradient* of *U*.**
14. **Interpret energy diagrams involving potential energy functions and their corresponding force functions to determine *stable* and *unstable* equilibrium points, critical points, turning points and potential energy wells.**
15. **Using calculus methods, evaluate potential energy functions and their corresponding force functions to determine *stable* and *unstable* equilibrium points, critical points, turning points and force and potential energy values.**

NOTE: Review diagrams, graphs, worksheets, applets/films, and handout materials.