Lesson Plan

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| Subject: Physics | Grade: 11 | Course Code: SPH3U0 |
| Lesson Topic: Gravitational Energy | Duration: 90 min | Date: Nov 2, 2012 |

Pre-requisite Knowledge/Skills:

Students should:

* Be familiar with the famous five equations
* Be able to draw FBDs
* Be familiar with the work equation W = ∆E and W = F∆d

Overall Expectations:

D2: investigate energy transformations and the law of conservation of energy, and solve related problems;

D3: demonstrate an understanding of work, efficiency, power, gravitational potential energy, kinetic energy, nuclear energy, and thermal energy and its transfer (heat).

Specific Expectations:

D2.1: use appropriate terminology related to energy transformations, including, but not limited to: *mechanical energy, gravitational potential energy,* *kinetic energy, work, power, fission, fusion, heat, heat capacity, temperature,* and *latent heat*

D2.2 solve problems relating to work, force, and

displacement along the line of force [AI]

D3.2: explain the concepts of and interrelationships between energy, work, and power, and identify and describe their related units

D3.3: explain the following concepts, giving examples of each, and identify their related units: *thermal energy, kinetic energy, gravitational* *potential energy, heat, specific heat capacity, specific latent heat, power,* and *efficiency*

Agenda:

Lesson Learning Goals:

Students will be able to:

* Define potential energy such that is the energy associated with a gravitational force
* Perform calculations with gravitational energy (ranging from plug and go to more tricky problems where “work” – f\*Δd - is also involved)

Assessment – Indicators of Learning:

1. Socratic Questioning – recap of material from last class
2. Groups will work on derivation and present it on the board
3. MIP (most important point)

Accommodations and/or Modifications:

No IEPs

Resources and Materials Required/Safety Considerations:

* Whiteboard
* Homework questions

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| Time | Lesson Sequence/Instructional Strategies | Assessment Opportunities |
| 5 min | Recap:  What is energy?  (capacity to do work)  What is necessary for work to happen?  (force must displace object in same direction)  **What is work?**  **(Change in energy)**  What are the units of Work?  (J = n\*m)  What is kinetic energy?  (energy associated with motion, Ek = 1/2 mv2)  How else did we define work? (W = ΔEk = Ek2 – Ek1) | Diagnostic assessment – Socratic questioning |
| 10 min | NASA article and problem solving   * Students read the article and solve a problem dealing with kinetic energy | Circulate and see if students have any problems solving the questions |
| 5 min | Lead in to this class:  What other kinds of energy are there?  Can a falling object do work? Can it apply a force and displace an object?  What might affect how much energy an object falling would have?  If an object was heavier would it have more or less energy?  If an object was higher would it have more or less energy? |  |
| 20 min | Group Derivation of Potential Energy Formula  Recall how we solved for kinetic energy last time   * Derive what you think would be the formula for potential energy * Some “tips” to get you started * Post drawing on the board with forces acting on the object * Remind students that W = ΔE * Find the work done by gravity and that will be the change in the potential energy * Call the height at the top h2 and the height at the bottom h1 | Students will use what they know from the last discussion of kinetic energy in order to find gravitational potential energy |
| 5 min | Discussion of Potential Energy   * Add anything that the students missed about deriving the formula for potential energy |  |
| 5 min | Units of Gravitational Energy   * Use the units we have previously to find the units of gravitational energy and solve for them | What are the units of mass, what are the units of g what are the unit of height. Show how this leads to N\*m and then J |
| 10 min | Sample Problems 1-2   * Sample problem 1 finding gravitational potential energy at the top of the CN tower relative to the ground * Sample problem 2 finding gravitational potential energy relative to two different points on the CN tower | Check in with students frequently to make sure everyone is following along with each of the steps. Have students put up the solutions on the board |
| 15 min | Taboo/Charades/Mind Map   * Have students try to guess different kinetic energy/gravitational potential energy/work terms without using certain words * Have students draw a mind map about the connection between everything they have learned so far relating to kinetic energy/potential energy and work * Have students act out different terminology and try to have the class guess what concept they are trying to act out |  |
| 10 min | Consolidation/Summary  What have you learned today (MIP)   * W = ΔEp = mgh2 – mgh1 * Ep = mgh * Units of potential energy * How to use potential energy to solve problems in finding speed etc...   Homework? | Students will pair up. Each pair will provide one point that they learned today |
| Applying Learning in Class/At Home  Homework on kinetic energy | | |