

TSOKOS READING ACTIVITY

Section 2-3

1. Essential Idea:
 - a. The fundamental concept of energy lays the basis upon which much of science is built.
2. Nature Of Science:
 - a. Theories: Many phenomena can be fundamentally understood through application of the theory of conservation of energy. Over time, scientists have utilized this theory both to explain natural phenomena and, more importantly, to predict the outcome of previously unknown interactions. The concept of energy has evolved as a result of recognition of the relationship between mass and energy.
3. Theory Of Knowledge:
 - a. To what extent is scientific knowledge based on fundamental concepts such as energy?
 - b. What happens to scientific knowledge when our understanding of such fundamental concepts changes or evolves?
4. Understandings:
 - a. Kinetic energy
 - b. Gravitational potential energy
 - c. Elastic potential energy
 - d. Work done as energy transfer
 - e. Power as rate of energy transfer
 - f. Principle of conservation of energy
 - g. Efficiency
5. Applications And Skills:
 - a. Discussing the conservation of total energy within energy transformations
 - b. Sketching and interpreting force–distance graphs
 - c. Determining work done including cases where a resistive force acts
 - d. Solving problems involving power
 - e. Quantitatively describing efficiency in energy transfers
6. Guidance:
 - a. Cases where the line of action of the force and the displacement are not parallel should be considered
 - b. Examples should include force–distance graphs for variable forces
7. Data Booklet Reference:

- a. $W = Fs \cos \theta$
- b. $E_K = \frac{1}{2}mv^2$
- c. $E_P = \frac{1}{2}k\Delta x^2$
- d. $E_P = mg\Delta h$
- e. power = Fv
- f. Efficiency = $\frac{\text{useful work out}}{\text{total work in}} = \frac{\text{useful power out}}{\text{total power in}}$

8. Utilization:

- a. Energy is also covered in other group 4 subjects (for example, see: Biology topics 2, 4 and 8; Chemistry topics 5, 15, and C; Sports, exercise and health science topics 3, A.2, C.3 and D.3; Environmental systems and societies topics 1, 2, and 3)
- b. Energy conversions are essential for electrical energy generation (see Physics topic 5 and sub-topic 8.1)
- c. Energy changes occurring in simple harmonic motion (see Physics sub-topics 4.1 and 9.1)

9. Aims:

- a. Aim 6: experiments could include (but are not limited to): relationship of kinetic and gravitational potential energy for a falling mass; power and efficiency of mechanical objects; comparison of different situations involving elastic potential energy
- b. Aim 8: by linking this sub-topic with topic 8, students should be aware of the importance of efficiency and its impact of conserving the fuel used for energy production.

10. Read Pg. 79-95 in your textbook.

11. Answer the following questions:

- a. What is the definition of **work done by a force** ($W = Fs \cos \theta$)? _____

- b. What is the significance of the angle, θ , in the above equation? _____

- c. What assumption must be made in order to use the above equation? _____

- d. How can work done by a varying force and/or work done along a curved path be determined? _____

- e. What is the definition of *kinetic energy*? _____

- f. What is the *work-kinetic energy relation*? _____

- g. How do you calculate the work done in stretching a spring? _____

- h. What is the definition of *elastic potential energy*? _____

- i. What is the definition of *gravitational potential energy*? _____

- j. Explain how gravitational potential energy can be calculated using arbitrary levels. _____

- k. What is the equation used to compute *conservation of total energy*? _____

- l. What assumption is made in the above equation? _____

- m. What is total mechanical energy? _____

- n. How does work done by external forces affect the total energy of the system? _____

- o. What is the definition of *power*? _____

- p. What are the three useful formulas used to compute power? _____

- q. How can you calculate the *efficiency* of simple machines? _____

- r. What is the origin of conservation principles? _____

12. Answers may be typed or neatly printed. Drawings may be freehand, but try to make use of the ‘Shapes’ or ‘Insert Clipart’ functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, “LastnameFirstinitialPerXReadActX-X”.

13. **50% Bonus: Create a comic to illustrate one of the concepts in this lesson using the following instructions,**

- a. Go to the website http://superherosquad.marvel.com/create_your_own_comic
- b. Select “Create A Comic Strip” for a 1-3 panel comic, or “Create a Comic Book” for a 1-12 page comic book.
- c. Follow the instructions on the website to create your comic.
- d. When you are finished, select “Download”.
- e. Select “Ok”
- f. The name for your file should be, **YourNameReadingActivityX-X.pdf**. Make sure you keep the “.pdf” extension
- g. Select “Save”.
- h. If you are completing this assignment electronically, you can open the pdf file, take a snapshot of your comic, paste it at the end of this assignment and then upload to FOCUS. Otherwise, print your comic and turn in separately.