DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

TSOKOS READING ACTIVITY

Section 9-1

1. Essential Idea: The solution of the harmonic oscillator can be framed around the variation of kinetic and potential energy in the system.

2. Nature Of Science:

    a. Insights: The equation for simple harmonic motion (SHM) can be solved analytically and numerically. Physicists use such solutions to help them to visualize the behaviour of the oscillator. The use of the equations is very powerful as any oscillation can be described in terms of a combination of harmonic oscillators. Numerical modelling of oscillators is important in the design of electrical circuits.

3. Understandings:

    a. The defining equation of SHM

    b. Energy changes

4. Applications And Skills:

    a. Solving problems involving acceleration, velocity and displacement during simple harmonic motion, both graphically and algebraically

    b. Describing the interchange of kinetic and potential energy during simple harmonic motion

    c. Solving problems involving energy transfer during simple harmonic motion, both graphically and algebraically

5. Guidance: Contexts for this sub-topic include the simple pendulum and a mass-spring system.

6. Data Booklet Reference:

    a. $\omega = \frac{2\pi}{T}$

    b. $a = \omega^2 x$

    c. $x = x_0 \sin \omega t \; ; x = x_0 \cos \omega t$

    d. $v = \omega x_0 \cos \omega t \; ; v = -\omega x_0 \sin \omega t$

    e. $v = \pm\omega\sqrt{(x_0{}^2 - x^2)}$

    f. $E_K = \frac{1}{2}m\omega^2(x_0{}^2 - x^2)$

    g. $E_K = \frac{1}{2}m\omega^2 x_0{}^2$

    h. Pendulum: $T = 2\pi\sqrt{\frac{l}{g}}$

    i. Mass-spring: $T = 2\pi\sqrt{\frac{m}{k}}$

7. Utilization:

   a. Fourier analysis allows us to describe all periodic oscillations in terms of simple harmonic oscillators. The mathematics of simple harmonic motion is crucial to any areas of science and technology where oscillations occur

   b. The interchange of energies in oscillation is important in electrical phenomena

   c. Quadratic functions (see Mathematics HL sub-topic 2.6; Mathematics SL sub-topic 2.4; Mathematical studies SL sub-topic 6.3)

   d. Trigonometric functions (see Mathematics SL sub-topic 3.4)

8. Aims:

   a. Aim 4: students can use this topic to develop their ability to synthesize complex and diverse scientific information

   b. Aim 6: experiments could include (but are not limited to): investigation of simple or torsional pendulums; measuring the vibrations of a tuning fork; further extensions of the experiments conducted in sub-topic 4.1. By using the force law, a student can, with iteration, determine the behaviour of an object under simple harmonic motion. The iterative approach (numerical solution), with given initial conditions, applies basic uniform acceleration equations in successive small time increments. At each increment, final values become the following initial conditions.

   c. Aim 7: the observation of simple harmonic motion and the variables affected can be easily followed in computer simulations

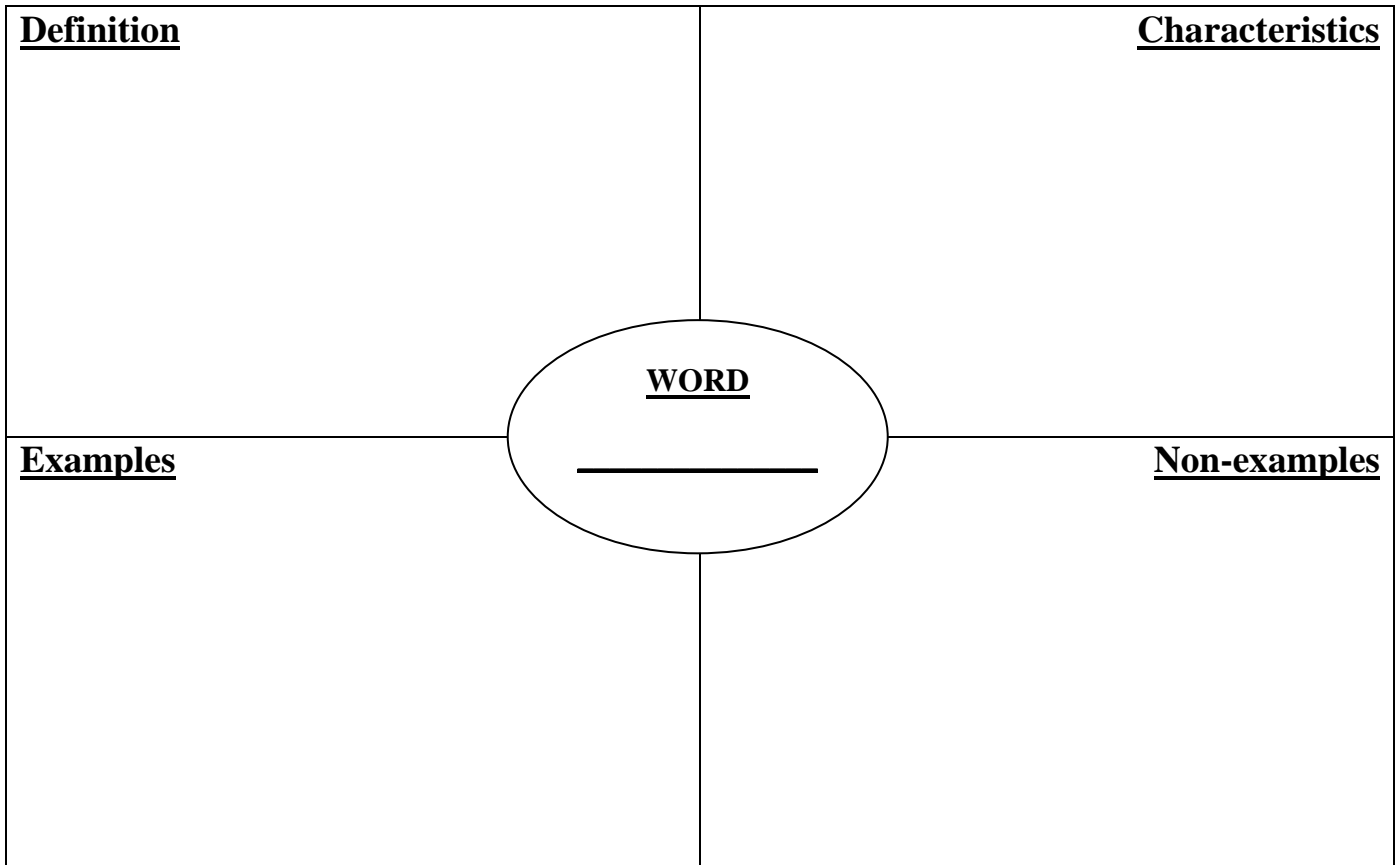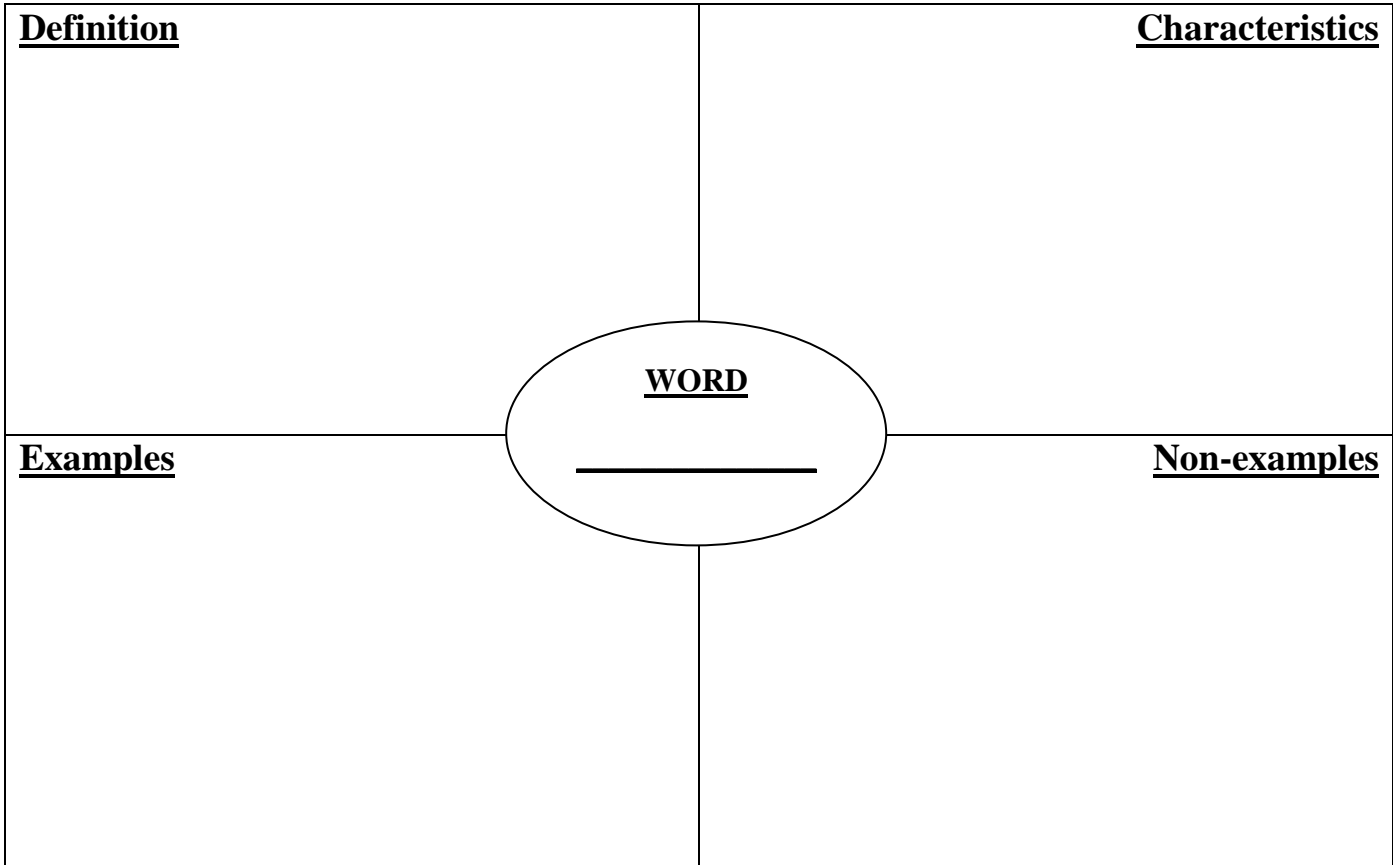9. Read section 9-1, pg. 346-358, in your textbook.

10. Choose one of the following activities and apply it to each of the terms listed in "Terms" below:

   a. Write a definition for each of the terms listed below.

   b. Write a poem that incorporates all of the terms listed below (*Bonus points for iambic pentameter or haiku. Points taken away if the poem contains the word "Nantucket"*).

   c. Take notes on the section using the Cornell Notetaking system. You must cover all the terms and concepts listed below.

   d. Develop a quiz of at least 10 questions covering the most important topics in the required reading. They can be multiple choice, true/false, short answer, fill-in-the blank, essay, or any combination of the previous. Creative or thought-provoking questions are encouraged. Humerous questions are also encouraged, BUT are accepted only in ADDITION TO the 10 serious ones. Secondary skills I would also *like* you to work on include:

      i. Use of Microsoft Equations to write equations.

      ii. Use of the outline functions of MS Word to make sequentially numbered questions and sub-questions.

      iii. Diagrams or shapes to accompany your quiz questions for clarification. Use of MS Shapes function or Insert Clipart is highly encouraged.

      iv. Using underlining in conjunction with the tab functions to make fill-in-the blank questions.

      v. Use of textboxes to create an area for name, date and period.

      vi. Creating a boxed heading using the border function.

      vii. Creating a logo of your own design (Devil Physics is already taken) with a picture or clipart and creative font.

> viii. Items a-g above are not required for your grade, but offer an excellent opportunity to improve your computer skills for use in future assignments/projects/activities.

   e. Draw a picture that adequately explains each term listed below to someone who is learning English as a second language.

   f. Describe a situation for each term listed below in which you personally experienced the term in action.

   g. Describe a scenario or write a story correctly using all of the terms listed below.

   h. Create a diagram showing how the terms listed below are related to each other.

   i. Use the attached Frayer Model worksheets to explore the terms listed below.

   j. Choreograph an interpretive dance explaining the terms listed below.

   k. Create an entire meal using dishes that portray the characteristics of the terms below.

   l. Create and film an instructional video explaining the terms below. You may do this option in groups of up to 4 people. If you do this option, you will be provided extra time, but it must be turned in prior to the test day. If the video is well done, you may be awarded bonus points.

11. Terms:
   a. Angular Frequency

   b. Period

   c. Restoring Force

   d. Simple Pendulum

   e. Amplitude

   f. Speed and Maximum Speed

   g. Acceleration and Maximum Acceleration

   h. Energy In Simple Harmonic Motion

12. This assignment 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".

Definition

Characteristics

WORD

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Examples

Non-examples

Definition

Characteristics

WORD

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Examples

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