DEVIL PHYSICS
BADDEST CLASS ON CAMPUS

TSOKOS READING ACTIVITY
Option B-2A (5 Points)

1. Essential Idea: The first law of thermodynamics relates the change in internal energy of a system to the energy transferred and the work done. The entropy of the universe tends to a maximum.

2. Nature Of Science:

   a. Variety of perspectives: With three alternative and equivalent statements of the second law of thermodynamics, this area of physics demonstrates the collaboration and testing involved in confirming abstract notions such as this.

3. International-Mindedness: The development of this topic was the subject of intense debate between scientists of many countries in the 19th century.

4. Understandings:

   a. The first law of thermodynamics

   b. The second law of thermodynamics

   c. Entropy

   d. Cyclic processes and pV diagrams

   e. Isovolumetric, isobaric, isothermal and adiabatic processes

   f. Carnot cycle

   g. Thermal efficiency

5. Applications And Skills:

   a. Describing the first law of thermodynamics as a statement of conservation of energy

   b. Explaining sign convention used when stating the first law of thermodynamics a Q U W = _+

   c. Solving problems involving the first law of thermodynamics

   d. Describing the second law of thermodynamics in Clausius form, Kelvin form and as a consequence of entropy

   e. Describing examples of processes in terms of entropy change

   f. Solving problems involving entropy changes

   g. Sketching and interpreting cyclic processes

   h. Solving problems for adiabatic processes for monatomic gases using pV 53 = constant

   i. Solving problems involving thermal efficiency

6. Guidance:

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a. If cycles other than the Carnot cycle are used quantitatively, full details will be provided

b. Only graphical analysis will be required for determination of work done on a pV diagram when pressure is not constant

7. Data Booklet Reference:

a. $Q = \Delta U + W$

b. $U = \frac{3}{2} nRT$

c. $\Delta S = \frac{\Delta Q}{T}$

d. $pV^{\frac{5}{3}} = constant$ (for monatomic gases)

e. $W = p\Delta V$

f. $\eta = \frac{useful\ work\ done}{energy\ input}$

g. $\eta_{Carnot} = 1 - \frac{T_{cold}}{T_{hot}}$

8. Utilization:

a. This work leads directly to the concept of the heat engines that play such a large role in modern society

b. The possibility of the heat death of the universe is based on ever-increasing entropy

c. Chemistry of entropy (see Chemistry sub-topic 15.2)

9. Aims:

a. Aim 5: development of the second law demonstrates the collaboration involved in scientific pursuits

b. Aim 10: the relationships and similarities between scientific disciplines are particularly apparent here

10. Read Option B text pages 19-26, in your textbook.

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

a. First law of thermodynamics - _____

_____

b. Second Law of Thermodynamics - _____

c. Internal energy of a gas - _____

_____

d. Average kinetic energy of a molecule equation - _____

e. Boltzmann constant (variable, value and units) - _____

f. Equation for change in internal energy of a gas due to a change in temperature - _____

_____

g. System - _____

h. Open system - _____

i.   Closed system **-** _____

j.   Isolated system - _____

_____

k.   Thermodynamic process - _____

_____

l.   State function ('Hilary party' is not an acceptable answer) - _____

_____

_____

m.   Isovolumetric (isochoric) process - _____

_____

_____

n.   Isobaric process - _____

_____

_____

o.   Adiabatic process - _____

_____

p.   Isothermal process - _____

_____

q.   Total work (graphical analysis) - _____

_____

r.   Net work ('the system school computers are tied into' is not an acceptable answer) - _____

_____

_____

_____

s.   Positive ΔQ - _____

t.   Negative ΔQ - _____

u.   Positive ΔW - _____

v.   Negative ΔW - _____

w.   Positive ΔU - _____

x.   Negative ΔU - _____

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".