

PHYSICS 1B TEST FOUR

PLEASE EXPLAIN LOTS!!!!!!!!!!!!!!!!!!!!!!

1. TEMP AND BRIDGES

If a 1,200 meter bridge is built at a temperature of 21 centigrade, how many meters must be allowed for thermal contraction when the temperature goes to -15 degrees?

ALPHA=11E-6 1/DEGREES CENTIGRADE

$$1,200 \cdot (21 + 15) \cdot 11E-6$$

A. .175, B. .29, C. (.475), D. .524, E. 1.42

2. ISOTHERM

Show that the work done expanding an ideal gas along an isotherm is given by: $w = nRT \ln(v_2/v_1)$.

3. SPACE RADIATOR

Heat is to be conducted along a 11 m long insulated copper bar from a spaceship's reactor to a radiator at the surface. The radiator has a surface area of 22 square meters, an emissivity .31, and a surface temperature of 1,200 K. What cross section, square meters, is required for the copper bar if a temperature drop of 100 C is allowed along the bar? Thermal conductivity: about 400 watts m/(m square C). Radiation constant=5.67 E-8 watts/(square meter K to the fourth)

$$22 \cdot 11 \cdot .31 \cdot 5.67E-8 \cdot 1,200^4 / 400 / 100$$

A. 80.3, B. 107, C. 162, D. (221), E. 495

4. COPPER-STEEL STRESS

Steel and copper rods of the same diameter are placed end-to-end between rigid supports. Find the stress, cgs, if the temperature is raised 120 C. Lengths: cu 36 cm, steel 28 cm. Y's: cu 1.1E12 dy/sq cm, steel 2.0E12 dy/sq cm. Coef. of thermal expansions: cu 1.7E-5 1/C, steel 1.2E-5 1/C.

$$2E12 \cdot 1.1E12 \cdot 120 \cdot (28 \cdot 1.2E-5 + 36 \cdot 1.7E-5) / (28 \cdot 1.1E12 + 36 \cdot 2E12)$$

A. 7.86 E8, B. 1.68 E9, C. (2.16 E9), D. 2.49 E9, E. 6.4 E9

5. NEWCOMB ENGINE

To warm up a Newcomb engine to 86C steam at 500C is injected into a cylinder is made of iron at a temperature of 11C. There is 180g of ice at 0C also. How many grams of steam are needed to end the iron and resulting water at 86C? Specific Heat: Steam 0.1, water 1 cal/gC Heat of vaporization water 540 cal/g Heat of fusion water 79 cal/g.

$$(110 \cdot 79 + 110 \cdot 86 + 180 \cdot 1 \cdot (86 - 11)) / (.5 \cdot (500 - 100) + 540 + (100 - 11) \cdot 0.1)$$

A. 6.58, B. (25.9), C. 6,380, D. 8,900, E. 18,100

6. ADIABATIC WORK

How much work (calories) is involved in the adiabatic expansion of 120 moles of an ideal gas from 55 to 660?

$$120 \cdot 5 \cdot (660 - 55)$$

A. 69,800, B. 97,900, C. 220,000, D. 298,000, E. (363,000)

shall I go on? [YES]