Physics 2305 17 April, 2000
Quiz 14—Form A

1. Copper has a specific heat of 386 J kg^{-1} K^{-1}, and it melts at 1356 K. How much heat must a 1.0 kg sample initially at 315 K absorb to reach the melting point?

A) 0.4 kJ
B) 122 kJ
C) 402 kJ
D) 523 kJ

2. A red giant star has a typical temperature of 2800 K and a radius of roughly 100 million km. How much power does it radiate? (Assume that it's a spherical blackbody.)

A) 3.5×10^{6} W
B) 3.5×10^{12} W
C) 1.1×10^{29} W
D) 4.4×10^{29} W

Equations and constants:

$\sigma = 5.67 \times 10^{-8}$ W m^{-2} K^{-4}

$\Delta L = L\ \alpha\ \Delta T$ $\Delta V = V\ \beta\ \Delta T$ $\beta = 3\alpha$
$Q = c\ m\ \Delta T$ $Q = L\ m$
$P_r = A\ \varepsilon\ \sigma T^4$ $H = A\ \Delta T\ /\ \Sigma R$ $R = L\ /\ k$

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Quiz 14—Form B

A sample of ice is cooled from 0.0°C to −40.0°C. Its initial mass and volume are 7.34 g and 8.00 cm^{-3}.

1. Ice has an expansion coefficient of 5.1×10^{-5} K^{-1}. What is its final volume?

A) $0.02\ cm^{-3}$ C) $7.95\ cm^{-3}$
B) $0.05\ cm^{-3}$ D) $7.98\ cm^{-3}$

2. How much heat was removed from the ice? The specific heat of ice is 2220 J kg^{-1} K^{-1}.

A) 16 J C) 16 kJ
B) 650 J D) 650 kJ

Equations and constants:

$\sigma = 5.67 \times 10^{-8}\ W\ m^{-2}\ K^{-4}$

$\Delta L = L\ \alpha\ \Delta T$ $\Delta V = V\ \beta\ \Delta T$ $\beta = 3\alpha$
$Q = c\ m\ \Delta T$ $Q = L\ m$
$P_r = A\ \varepsilon\ \sigma T^4$ $H = A\ \Delta T / \Sigma R$ $R = L / k$

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Quiz 14—Form C

For both problems, assume we are dealing with a penny made of 2.5 g of pure copper.

$L_F = 207$ kJ/kg $\quad \alpha = 1.7 \times 10^{-5}\ \mathrm{K}^{-1}$
$c = 0.386\ \mathrm{kJ\ kg^{-1}\ K^{-1}}$

1. If a penny is heated to the melting point (1356 K), how much *additional* heat is needed to melt it?

A) 83 J C) 1200 J
B) 520 J D) 1300 J

2. A penny at room temperature (290 K) has a diameter of 19.05 mm. How hot would it have to be to expand by 1%?

A) 490 K C) 880 K
B) 590 K D) $T_f > 1356$ K

Equations and constants:

$\sigma = 5.67 \times 10^{-8}\ \mathrm{W\ m^{-2}\ K^{-4}}$

$\Delta L = L\ \alpha\ \Delta T \quad \Delta V = V\ \beta\ \Delta T \quad \beta = 3\alpha$
$Q = c\ m\ \Delta T \quad Q = L\ m$
$P_r = A\ \varepsilon\ \sigma T^4 \quad H = A\ \Delta T/\Sigma R \quad R = L\ /\ k$