Questions

# Chapter 18
# Temperature, Heat, and the First Law of Thermodynamics

# 18-5 The Celsius and Fahrenheit scales
## M1-062

A temperature difference of 25 K is equal to:

A) a difference of 25 on the Fahrenheit Scale.
B) a difference of 30 on the Celsius Scale.
C) a difference of 30 on the Kelvin Scale.
D) a difference of 45 on the Fahrenheit Scale.
E) a difference of 45 on the Celsius Scale.

Answer D

# 18-5 The Celsius and Fahrenheit scales
## M1-042

A bottle of soft drink is placed in a refrigerator and left there until its temperature drops by 15 K from its original value. What is the corresponding change in temperature on the Fahrenheit scale?

A)27 Fahrenheit degrees.
B)59 Fahrenheit degrees.
C)-31 Fahrenheit degrees.
D)8.3 Fahrenheit degrees.
E)258 Fahrenheit degrees.

Answer A

# 18-5 The Celsius and Fahrenheit scales
## M1-041

It is recommended to use a new temperature scale called Z. On Z scale, the boiling point of water is 65.0 degrees Z and the freezing point is -15.0 degrees Z. To what temperature on the Fahrenheit scale would a temperature of -100 degrees Z correspond? [Note: both scales are linear]

A)-110 Degrees Fahrenheit.
B)-100 Degrees Fahrenheit.
C)-159 Degrees Fahrenheit.
D)-15 Degrees Fahrenheit.
E)+15 Degrees Fahrenheit.

Answer C

# 18-6 Thermal Expansion
## M1-062

A metal rod has a length of 7.30 m at 15 °C and a length of 7.40 m at 95 °C. What is the temperature of the rod when its length is 7.21 m?

A) 10 °C
B) -23 °C
C) -57 °C
D) 7 °C
E) 2 °C

Answer C

# 18-6 Thermal Expansion
## M1-061

A steel rod is 4.000 cm in diameter at 35 °C. A brass ring has an inner diameter of 3.992 cm at 35 °C. At what common temperature will the brass ring slide onto steal rod? $(\alpha_{steel} = 11\times10^{-6}\ \mathrm{K}^{-1},\ \alpha_{brass} = 19\times10^{-6}\ \mathrm{K}^{-1})$

A) 321 0C
B) 251 0C
C) 216 0C
D) 286 0C
E) 35 0C

Answer D

# 18-6 Thermal Expansion
## M1-042

An iron ball has a diameter of 6.00 cm and is 0.01 cm larger than the diameter of a brass ring. Both are at a temperature of 20 degrees Celsius. To what temperature should the brass ring be heated so that the ball just passes through the hole? [The coefficient of linear expansion of brass = $1.9 \times 10^{-5}\ K^{-1}$]

A) 590 degrees Celsius.
B) 108 degrees Celsius.
C) 430 degrees Celsius.
D) 165 degrees Celsius.
E) 32 degrees Celsius.

Answer B

# 18-8 The Absorption of Heat by Solids and Liquids
## M1-062

100 g of ice at 0 °C is mixed with 100 g of water at 70 °C, what is the final temperature of the mixture?

A) 22 °C
B) 100 °C
C) 0 °C
D) 36 °C
E) 15 °C

Answer C

# 18-8 The Absorption of Heat by Solids and Liquids
## M1-061

What mass of steam initially at 100 °C should be mixed with 160 g of ice at 0 °C in a thermally insulated container to produce liquid water at 40 °C.

A) 16 g
B) 32 g
C) 13 g
D) 36 g
E) 98 g

Answer B

# 18-8 The Absorption of Heat by Solids and Liquids
## M1-061

A 20-kg block of copper is dropped and falls 122 m. Calculate the raise in the temperature of the block if all the potential energy lost in the fall is converted to heat. [The specific heat of copper = 386 J/kg.K]

A) 4.2K
B) 1.6 K
C) 1.3 K
D) 3.1 K
E) 9.8 K

Answer D

# 18-8 The Absorption of Heat by Solids and Liquids
## M1-042

A person wants to cool 0.3 kg of water that is initially at 30 degrees Celsius by adding ice initially at -25 degrees Celsius. How much ice should he add so that the final temperature will be 0 degrees Celsius with all the ice melted?
[For ice, use the specific heat = 2.1x103 J/ (kg*K), and heat of fusion = 3.3x105 J/kg].

A) 1.2 g.
B) 11 g.
C) 43 g.
D) 22 g.
E) 99 g.

Answer E

# 18-8 The Absorption of Heat by Solids and Liquids
## M1-041

Fifty grams of ice at zero degrees Celsius is placed in a thermos bottle containing 100 grams of water at 6.0 degrees Celsius. How many grams of ice will melt?

a) 17 grams.
b) 2.0 grams.
c) 50 grams.
d) 7.5 grams.
e) 3.5 grams.

Answer D

# 18-10 First Law of Thermodynamics
## M1-042

In a PV diagram, a system of an ideal gas goes through the process shown in Figure 3. How much heat is absorbed after the system goes through this cycle 10 times. [Take P= 1.0 Pa and V= 1.0 m3].

a) 20 Joules.
b) 25 Joules.
c) 15 Joules.
d) 5 Joules.
e) 2 Joules.

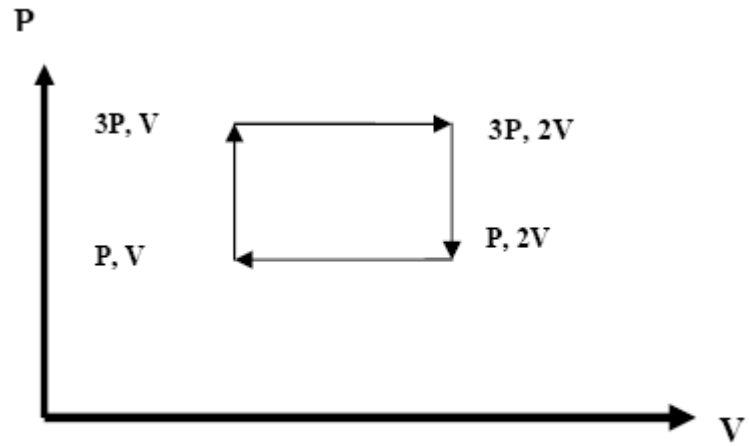



Figure 3

Answer A

# 18-10 First Law of Thermodynamics
## M1-041

A cylinder with a frictionless piston contains 0.2 kg of water at 100 degrees Celsius. What is the change in internal energy of water when it is converted to steam at 100 degrees Celsius at constant pressure of 1 atm.

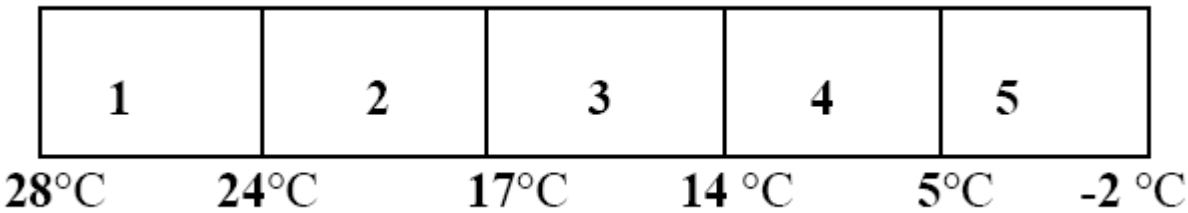
[Density of steam = 0.6 kg/m3, water = 103 kg/m3]

a) 418 kJ.
b) 452 kJ.
c) 333 kJ.
d) 226 kJ.
e) 113 kJ.

Answer A

# 18-12 Heat Transfer Mechanisms
## M1-062

The Figure shows five slabs of different materials with equal thickness and same cross sectional area, placed side by side. Heat flows from left to right and steady state temperatures are given at the interfaces. Which slab has largest thermal conductivity?

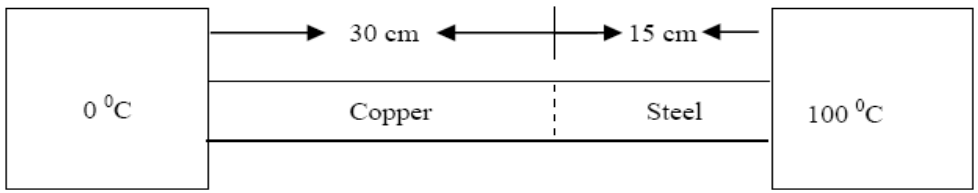



A) 1
B) 5
C) 4
D) 2
E) 3

Answer E

# 18-12 Heat Transfer Mechanisms
## M1-061

The following figure shows a steel bar 15 cm long welded end to end to a copper bar 30 cm long. Each bar has a square cross section of 2.2 cm2 on a side. The free end of steel is maintained at 100 °C and the free end of copper is maintained at 0.0 °C. Find the temperature at the junction of the two bars? (Kstee l= 50.2 W/mK, Kcopper=385 W/mK)




A) 21 °C
B) 26 °C
C) 50 °C
D) 35 °C
E) zero

Answer A