Heat Transfer and Thermal Equilibrium

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Thermal energy transfers as heat from a warmer object to a cooler one when they are in thermal contact. Assume negligible heat exchange with the room in the models below.

1 A 55 °C sample is placed in contact with a 20 °C sample. What is the direction of net heat transfer at first?

(1) From the 20 °C sample to the 55 °C sample

(2) From the 55 °C sample to the 20 °C sample

(3) Equally in both directions so neither changes

(4) No transfer can occur while the temperatures differ

2 Two objects in contact have reached the same temperature. Explain what happens to net heat transfer between them. [1]

Answer and work

_____

_____

3 Two objects have different masses and reach thermal equilibrium together. Which quantity must be the same for both?

(1) Mass

(2) Specific heat capacity

(3) Temperature

(4) Total internal energy

4 In an insulated model, a hot sample loses 240 J of heat to a cooler sample. Explain how much heat the cooler sample gains. [1]

Answer and work

_____

_____

A Warm Sample in a Water Bath

Use the information below to answer the questions.

A warm solid and a cooler water bath exchange heat in an insulated container. The measurements are rounded to the nearest degree.

Time (min)	Solid temperature (°C)	Bath temperature (°C)
0	70	20
1	51	26
2	37	30
4	32	32

5 At which listed time do the readings first show the same temperature?

(1) 0 min

(2) 1 min

(3) 2 min

(4) 4 min

6 Calculate the temperature change of the solid and of the bath from 0 to 4 minutes. Include the signs. [1]

Answer and work

7 At 2 minutes, which direction is net heat transfer still expected to occur?

(1) From the bath to the solid

(2) From the solid to the bath

(3) From the room to both samples

(4) No net transfer occurs.

8 Explain why the solid and bath can have unequal temperature changes even when the heat lost by one equals the heat gained by the other. [1]

Answer and work