The specific heat of plastic is 50 times greater than the specific heat of lead, 10 times greater than the specific heat of stone, and 1.5 times greater than the specific heat of water. If the samples of plastic, lead, stone, and water have identical masses and identical starting temperatures, and are given identical increases in energy of 1,000 J, which sample will end up with the highest temperature?

A. plastic
B. lead
C. stone
D. water
E. None of the Above

SOLUTION

$$Q = c * m * \Delta t,$$

in it Q is the heat energy, J;
c_1 is the specific heat of plastic J/(g*°C);
c_2 is the specific heat of lead J/(g*lead°C);
c_3 is the specific heat of stone J/(g*°C);
c_4 is the specific heat of water J/(g*°C);

m is the mass of the substance, g;
Δt_1 is the change temperature of plastic in °C;
Δt_2 is the change temperature of lead in °C;
Δt_3 is the change temperature of stone in °C;
Δt_4 is the change temperature of water in °C;

$$\Delta t_1 = Q/(c_1 * m),$$
$$\Delta t_2 = Q/(c_2 * m),$$
$$\Delta t_3 = Q/(c_3 * m),$$
$$\Delta t_4 = Q/(c_4 * m),$$

$$\Delta t_1 : \Delta t_2 : \Delta t_3 : \Delta t_4 = \frac{1,000}{c_1 * m} : \frac{50 * 1,000}{c_1 * m} : \frac{10 * 1,000}{c_1 * m} : \frac{1.5 * 1,000}{c_1 * m} = 1 : 50 : 10 : 1.5,$$

$\Delta t_2 > \Delta t_3 > \Delta t_4 > \Delta t_1$

the change temperature of lead is 50 times greater of plastic;
the change temperature of stone is 10 times greater of plastic;
the change temperature of water is 1.5 times greater of plastic.

$$\Delta t = t_{end} - t_{start}$$
$$t_{end} = t_{start} + \Delta t,$$
$$t_{start1} = t_{start2} = t_{start3} = t_{start4}$$

then $t_{2end} > t_{3end} > t_{4end} > t_{1end}$

ANSWER:B.

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