Chemistry
CH1 : Energy and Chemical Change ***Teacher: Majdi Mohamed***
Section 1 :Energy ***Grade: 12 ADV***

* Energy is the ability to do work or produce heat.

* Chemical potential energy is energy stored in a substance because of its composition.

* Kinetic energy is energy of motion.

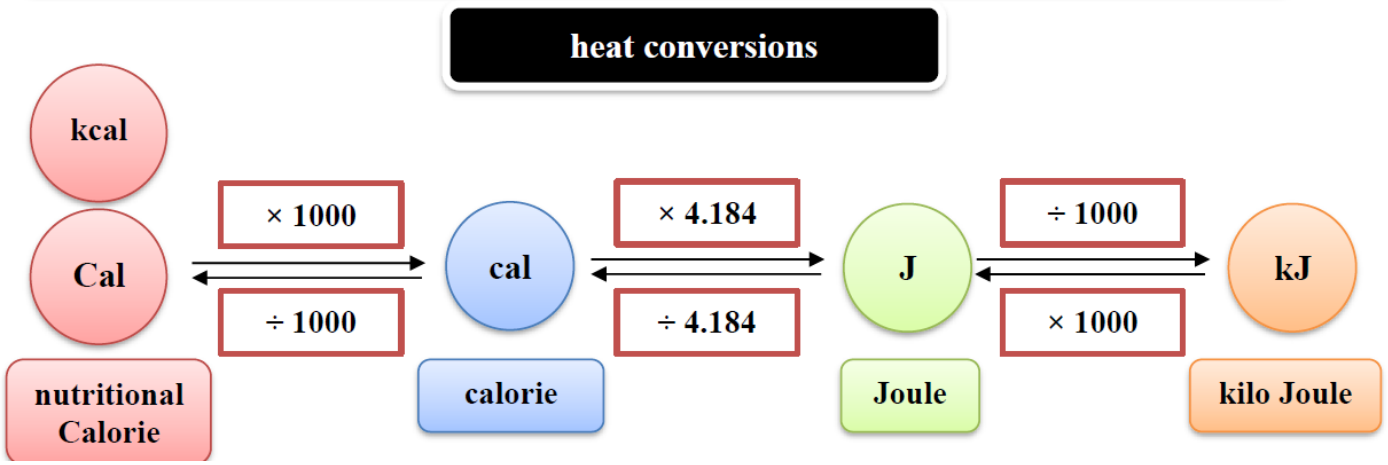
* The law of conservation of energy in any chemical reaction or physical process, energy can be converted from one form to another, but it is neither created nor destroyed. This is also known as the first law of thermodynamics.

* Heat is a form of energy that flows from a warmer object to a cooler object.

* A calorie is the amount of energy required to raise the temperature of one gram of pure water by one degree Celsius.

* Joule is the SI unit of heat and energy.

* The specific heat of a substance is the amount of heat required to raise the temperature of one gram of that substance by one degree Celsius.



1- A breakfast consisting of cereal and milk contains 230 Cal. Express this energy in J.

1 Cal = 1000 cal

a- 962.32 J b- 54.97 c- 962320 d- 54971.31

Step ① 230 Cal = 230 × 1000 = 230 000 cal

Step ② $230\,000\ cal \times \frac{4.184\ J}{1\ cal} = 962320\ J$

2- An exothermic reaction releases 86.5 kJ. How many kiloçalories of energy are released?

kJ → kcal J → cal 1 K = 1000

a- 207 b- 20.67 c- 2.07 d- 84.6

$86.5\ kJ \times \frac{0.2390\ kcal}{kJ} = 20.67\ kcal$

3- A food item contains 124 Kcal. How many calories (cal) are in this food item?

a- 29.6 b- 519 c- 0.124 d- 124000

kcal → cal (× 1000)

1 Cal = 1 kcal

Equation for Calculating Heat

$$q = c \times m \times \Delta T$$

quantity		unit	sign
symbol	meaning		
q	heat	J	+ or –
c	specific heat	J/(g.°C)	+
m	mass	g	+
ΔT	change in temperature	°C	+ or –

$\Delta T = T_f - T_i$

4- If the temperature of a 0.500 Kg sample of liquid water is raised 2.00°C, how much heat is absorbed by the water? The specific heat of liquid water is 4.184 J/(g·°C).

$0.5\ Kg \times 1000 = 500\ g$

$q = C \times m \times \Delta T$

$= 4.184 \times 500 \times 2 = 4184\ J$

$20 \rightarrow 22$

$40 \rightarrow 42$

5- If the temperature of 34.4 g of ethanol increases from 25.0°C to 78.8°C, how much heat has been absorbed by the ethanol? **$C_{ethanol} = 2.44\ J/(g\ .°C)$**

$q = C \times m \times \Delta T$

$q = 2.44 \times 34.4 \times (78.8 - 25) = 4515.7\ J$

6- A 4.50-g nugget of pure gold absorbed 276 J of heat. The initial temperature was 25.0°C. What was the final temperature? C gold = 0.129 J/g. ^{0}C

$q = C \times m \times (T_f - T_i) =$

$276 = 0.129 \times 4.50 (x - 25)$

$x = T_f = 500.45\ ^\circ C$

$q = C\,m\,\Delta T$

$\Delta T = \frac{q}{C \times m}$

$T_f - T_i = \frac{q}{C \times m} \rightarrow T_f = \frac{q}{C \times m} + T_i$

7- Calculate the amount of heat absorbed when 5.50 g of aluminum is heated from 25.0 ^{0}C to 95.0 ^{0}C. The specific heat of aluminum is 0.897 J/g. ^{0}C

$q = C \times m \times \Delta T$

$= 0.897 \times 5.50 \times (95 - 25)$

$= 345.3\ J$

8- A 4.50-g nugget of pure gold absorbed 276 J of heat. The initial temperature was 25.0 ^{0}C. What was the final temperature? The specific heat of gold 0.129 J/g. ^{0}C.