

تلخيص درس الطاقة



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ⇨ المناهج الإماراتية ⇨ الصف الحادي عشر المتقدم ⇨ كيمياء ⇨ الفصل الأول ⇨ ملفات متنوعة ⇨ الملف

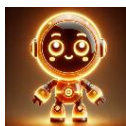
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منهج انجليزي ا ملخصات وتقارير ا مذكرات وبنوك ا الامتحان النهائي للمدرس

المزيد من مادة
كيمياء:

إعداد: Mouad

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة كيمياء في الفصل الأول

أسئلة وزارية في الوحدة الأولى الطاقة والتغيرات الكيميائية

1

تلخيص الدرس الثاني الحرارة انسباير - 2 lesson 14 module heatinspire

2

تجميعية مراجعة صفحات الكتاب وفق الهيكل الوزاري نظام حديث ثلاثة مواد

3

حل مراجعة نهائية وفق الهيكل الوزاري الجديد منهج انسباير

4

مراجعة نهائية وفق الهيكل الوزاري الجديد منهج انسباير

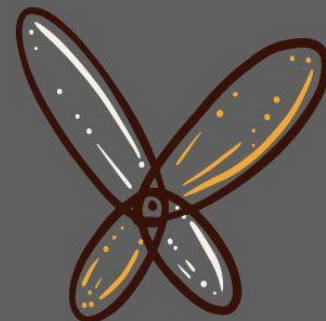
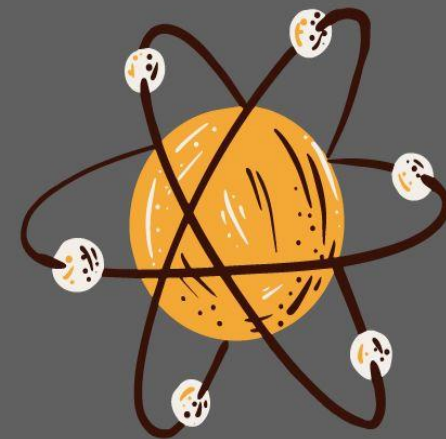
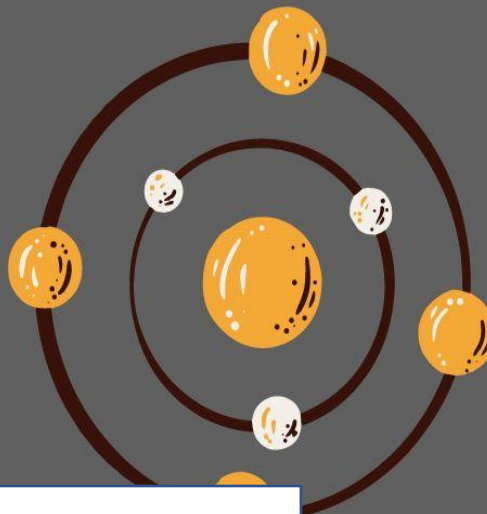
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CHEMISTRY



EasyChemistry4all by Mr. Mouad

مناهج دولة الإمارات

عام، متقدم ونخبة 9،10،11،12

00971557903129

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Inspire Chemistry

Module 14_Lesson 1: “Energy”

Outcomes:

After this lesson I can:

- ▶ Define energy.
- ▶ ^{تفرق} Distinguish between potential and kinetic energy.
- ▶ Relate chemical potential energy to the heat lost or gained in chemical reactions.
- ▶ Calculate the amount of heat absorbed or released by a substance as its temperature changes.

Part 1

Learning objectives:



- Define Energy, Potential Energy and Kinetic Energy and chemical potential .
- State the law of conservation of energy.
- Compare and contrast temperature and heat.

المحرارة
درجة الحرارة

BIG Idea Chemical reactions
usually absorb or release energy.

متصل

تطلق

Focus Question

What is energy?

<https://www.youtube.com/watch?v=dmcevC55K3s>

New Vocabulary

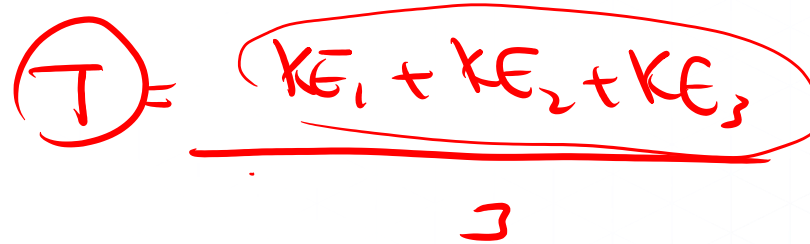
- ☐ Energy ✓
- ☐ Law of conservation of energy
- ☐ Chemical potential energy
- ☐ Heat ✓
- ☐ Endothermic ✓
- ☐ Exothermic
- ☐ calorie ✓
- ☐ Joule ✓
- ☐ Specific heat ✓

Review Vocabulary

temperature: a measure of the average
kinetic energy of the particles in a sample
of matter.



A hand-drawn diagram showing three particles, represented by dots, enclosed in a rectangular box. Above the top-left dot is the label KE_2 , above the top-right dot is KE_1 , and below the bottom-center dot is KE_2 .

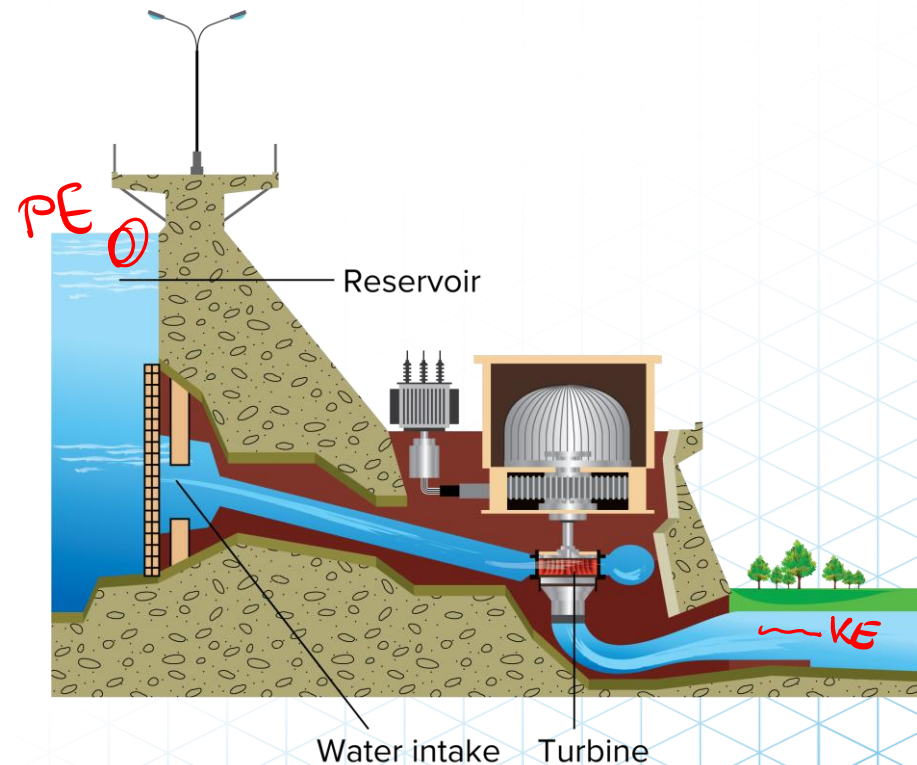


A hand-drawn formula for temperature. A circle containing the letter T is followed by an equals sign. The right side of the equation is the sum $KE_1 + KE_2 + KE_3$, which is enclosed in an oval. Below this oval is a horizontal line, and under the line is the number 3, representing the average.

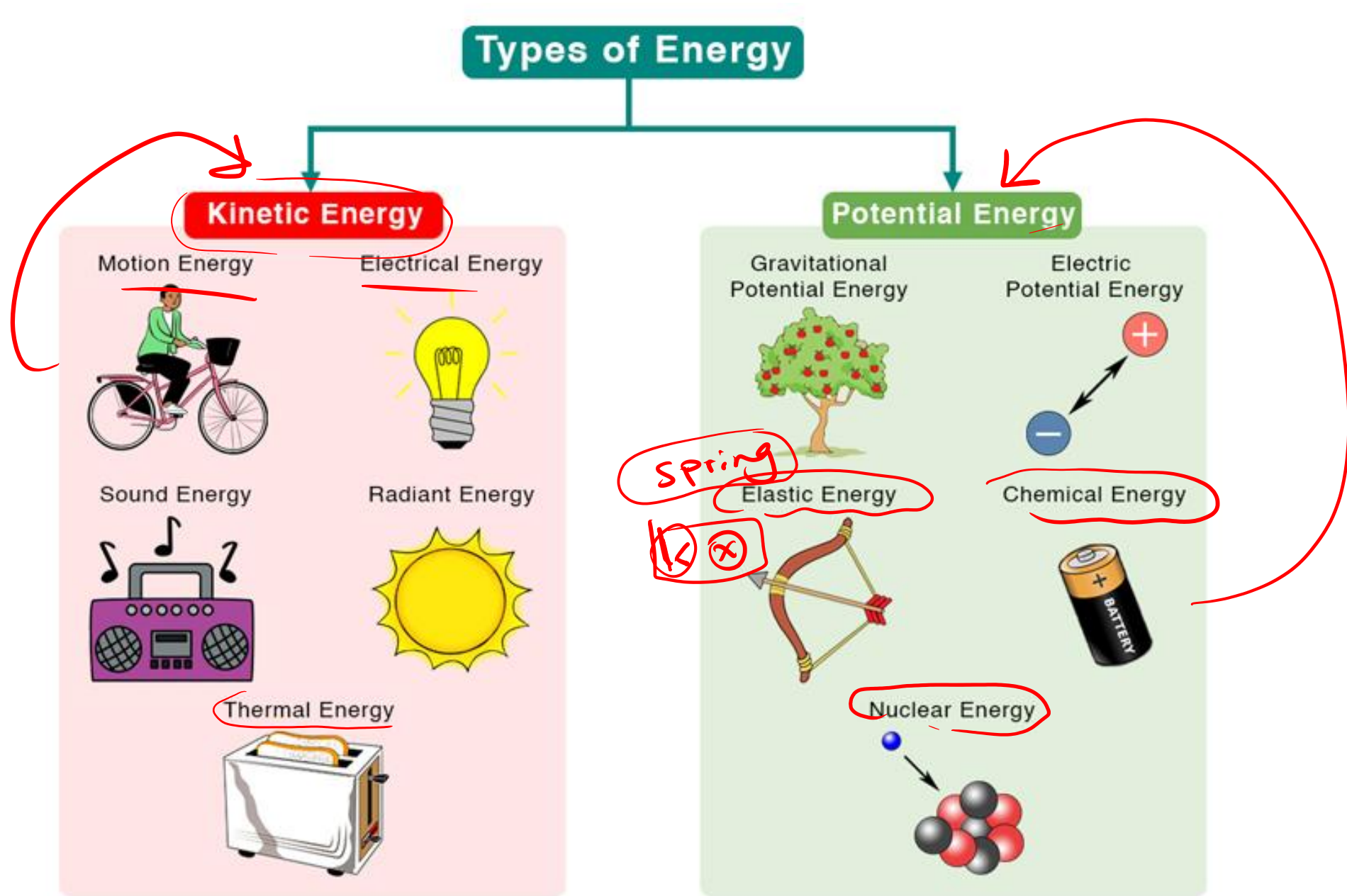
- Define Energy, Potential Energy and Kinetic Energy and chemical potential .

The Nature of Energy

- Energy** is the ability to **do work** or **produce heat**.
- Energy exists in **two basic forms**: **potential energy** and **kinetic energy**.
الطاقة الكامنة / الوضع
طاقة الحركة
- Potential energy (PE)** is energy due to the composition (تكوين) or position of an object.
- Kinetic energy (KE)** is energy of motion.



- Define Energy, Potential Energy and Kinetic Energy and chemical potential .



- Define Energy, Potential Energy and Kinetic Energy and chemical potential .

Quiz

1. What are two basic forms of energy?

 potential and electrical

 potential and kinetic **CORRECT**

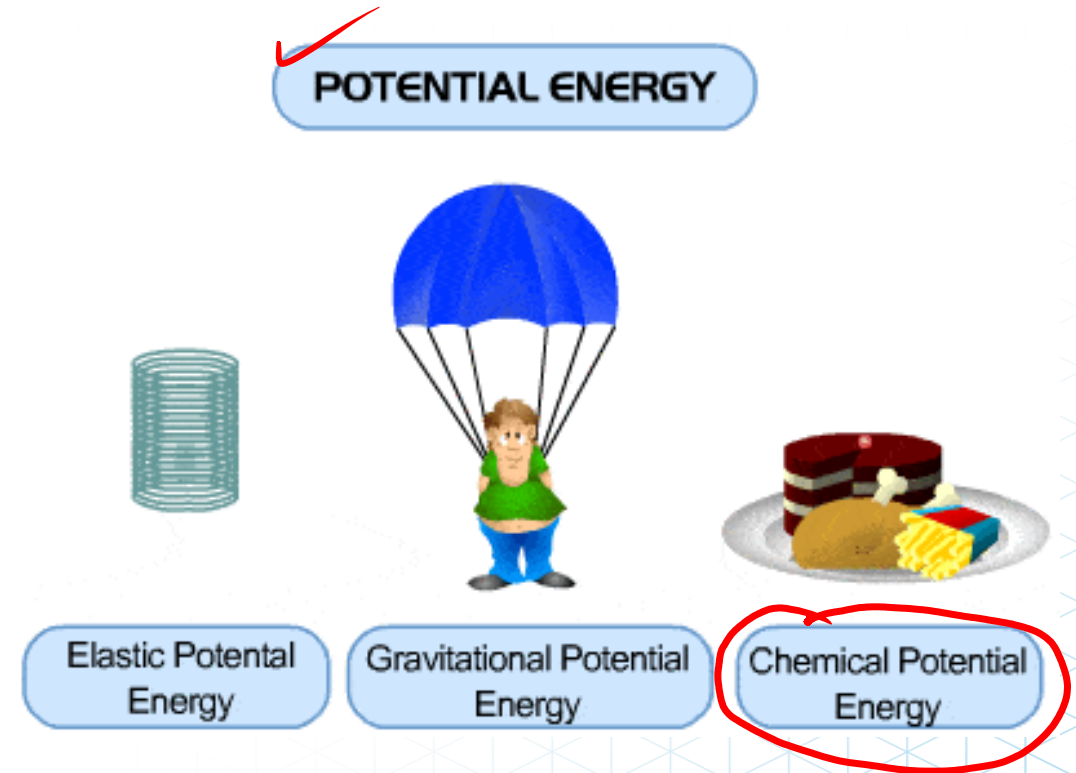
 kinetic and electrical

 kinetic and thermal

- Define Energy, Potential Energy and Kinetic Energy and chemical potential.

The Nature of Energy

- Chemical systems contain both kinetic energy and potential energy.
 $KE \propto T$
- The kinetic energy** of a substance is directly related to the **constant random motion** of its representative particles and is proportional to temperature.
- The potential energy** of a substance depends on its composition. the type of atoms, the number and type of chemical bonds, and how the atoms are arranged.

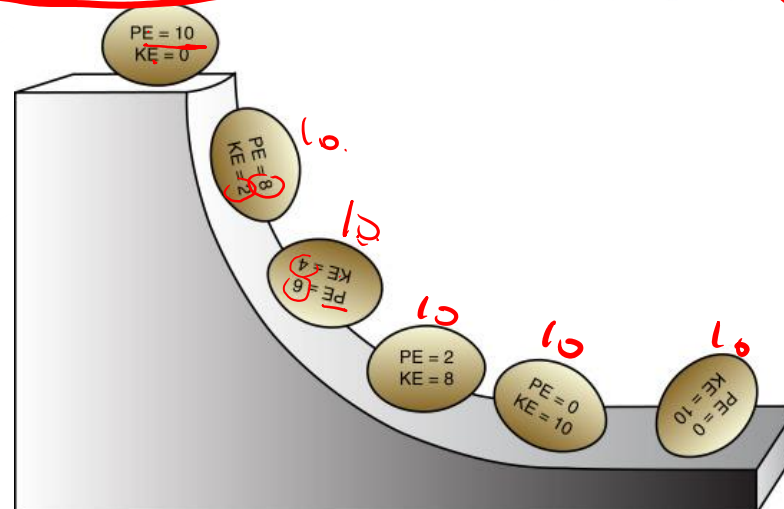
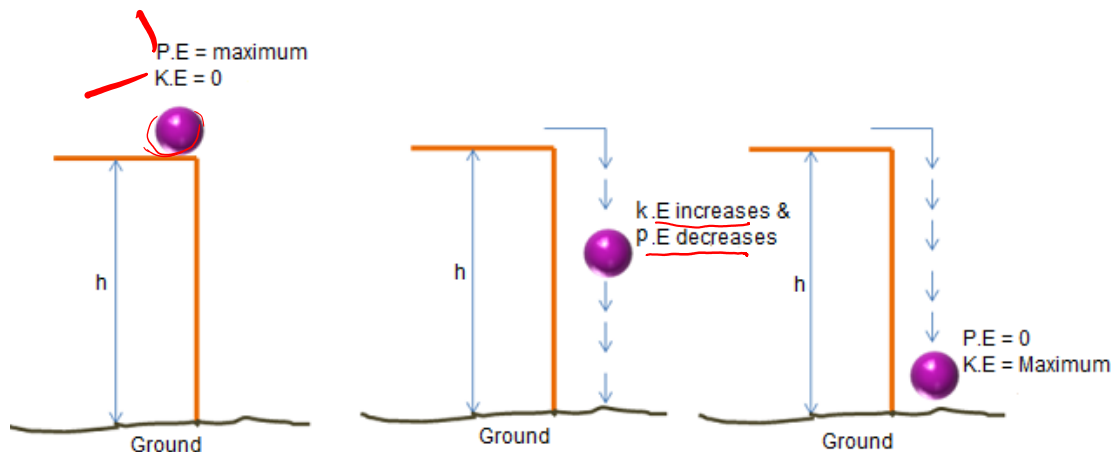


- State the law of conservation of energy.

The Nature of Energy

قانون حفظ الطاقة

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



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$$PE + KE = 10 \text{ J}$$

$$PE + KE = 10 \text{ J}$$

$$PE + KE = 10 \text{ J}$$

What can you say about the value of KE + PE in every position? Is it changing?

No, their sum is constant (doesn't change)

- State the law of conservation of energy.

Energy Conversion



Chemical



Mechanical



Chemical



Light



Electrical



Light



Chemical



Mechanical



Light



Chemical



Electrical



Heat

Energy Conservation

< 3/7 >

Energy Conversion

Energy Conversions

Energy can be converted from one form into a more useful form. Many items that we use rely on energy conversions.

<https://edushare.moe.gov.ae/Uploads/Resources/78e0121d-a7a5-4ea3-aff5-c8f6c5f155db/767204/index.html>

Page 3



Quiz

2. Which of the following best describes the law of conservation of energy?



It states that energy is neither created nor destroyed but can be transformed.



It is the first law of thermodynamics.



It states that energy cannot be converted from one form to another. ^{تحويل}



Both A and B are true.

CORRECT

Define Energy, Potential Energy and Kinetic Energy and chemical potential

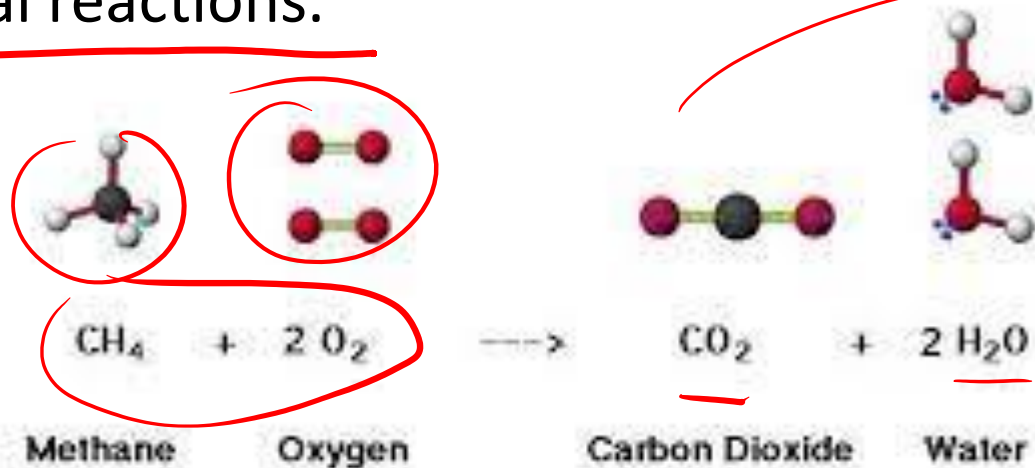
The Nature of Energy

طاقة الوضع الكيميائية

- Chemical potential energy** is energy stored in a substance because of its **composition** (تكوين):

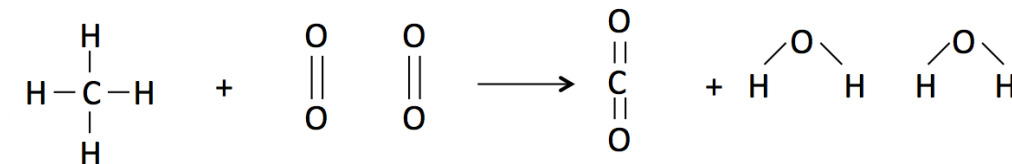
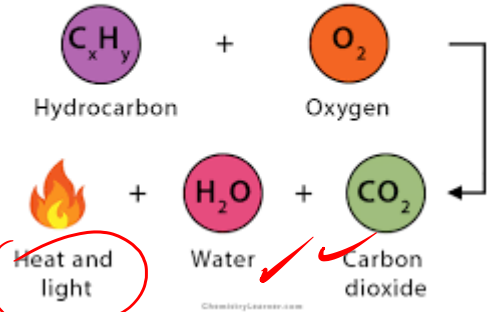
- ☐ the **type of atoms**.
- ☐ the **number and type of chemical bonds**,
- ☐ and **how the atoms are arranged**.

- Chemical potential energy plays an important role in chemical reactions.



Hydrocarbon Combustion Reaction تفاعل

Combustion Reaction



Quiz

3. Which of the following best describes chemical potential energy?

 It is energy a substance has due to the charge of its electrons. ~~X~~

 B It is energy stored in a substance because of its composition. ✓ **CORRECT**

 It is energy a substance has due to the ^{KE}motion of its particles. ~~X~~

 It is energy stored in a substance due to its ability to undergo chemical reactions. ~~X~~

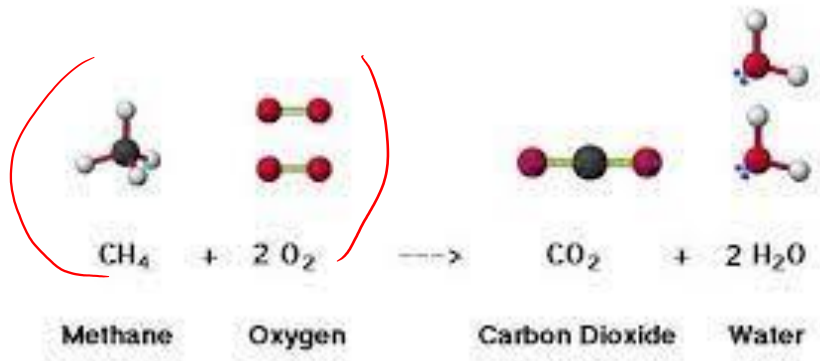
Which of the following gas stoves is hot? Why?



Is energy “heat” produced in this chemical reaction? How do you feel it?



Yes. We feel it through the high temperature.



Combustion Reaction

- Compare and contrast temperature and heat

The Nature of Energy

الحرارة

- **Heat** is energy that is in the process of flowing from a warmer object to a cooler object.

- The symbol q is used to represent heat.

$q \rightarrow$ heat (type of Energy)



Energy Cold water = hot water

Part 2



Learning objectives:

- **Perform** interconversion ^{تحويل} between units of temperature and heat.
- **Describe** the relationship between the specific heat capacity of a substance and the resistance to change in temperature.
- **Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

$$\begin{array}{ccc} \text{L} & & \text{L} \\ T_i = 25^\circ\text{C} & \leftarrow & T_f = 50^\circ\text{C} \\ & \text{Energy} = ? & \end{array}$$

What are the used
units to measure
heat “q”?

(Energy)

Measuring Heat

- A **calorie** (cal) is defined as the amount of energy required to raise the temperature of one gram of pure water by one degree Celsius (1°C).

- The energy content of food is measured in nutritional Calories.

- 1 nutritional Calorie equals 1000 calories, or 1 kilocalorie (kcal).

Joule $\Rightarrow$ Physics

$T_i = 25^{\circ}\text{C}$
1g
pure water
Energy
heat it up
 $T_f = 26^{\circ}\text{C}$
1g
pure water

$1000 \text{ m} = 1 \text{ km}$
 $1000 \text{ cal} = 1 \text{ kcal}$
 $\downarrow$
 $= 1 \text{ Calorie}$

Kilo "k"
 $= 1000$

- Perform interconversion between units of temperature and heat.

Measuring Heat

- A **joule** (J) is the SI unit of heat and energy.
- A joule is equivalent to 0.2390 calories.

Table 1 Relationships Among Energy Units	
Relationship	Conversion Factors
<u>1 J = 0.2390 cal</u>	$\frac{1 \text{ J}}{0.2390 \text{ cal}}$ $\frac{0.2390 \text{ cal}}{1 \text{ J}}$
<u>1 cal = 4.184 J</u>	$\frac{1 \text{ cal}}{4.184 \text{ J}}$ $\frac{4.184 \text{ J}}{1 \text{ cal}}$
<u>1 Calorie = 1 kcal</u>	$\frac{1 \text{ Calorie}}{1000 \text{ cal}}$ $\frac{1000 \text{ cal}}{1 \text{ Calorie}}$

- Perform interconversion between units of temperature and heat.

Quiz

main "International system of Units"

4. Which of the following is the SI unit for energy and heat?

 nutritional Calorie

 calorie

 kilocalorie

 D joule **CORRECT**

- Perform interconversion between units of temperature and heat.

CONVERT ENERGY UNITS

IN-CLASS EXAMPLE

Use with Example Problem 1.

Problem

A breakfast of cereal, orange juice, and milk might contain 230 nutritional Calories.

Express this energy in joules.

KNOWN

amount of energy = 230 Calories

UNKNOWN

amount of energy = ? J

SOLVE FOR THE UNKNOWN

Convert nutritional Calories to calories.

- Apply the relationship 1 Calorie = 1000 cal.

$$230 \text{ Calories} \times \frac{1000 \text{ cal}}{1 \text{ Calorie}} = 2.3 \times 10^5 \text{ cal}$$

Convert calories to joules.

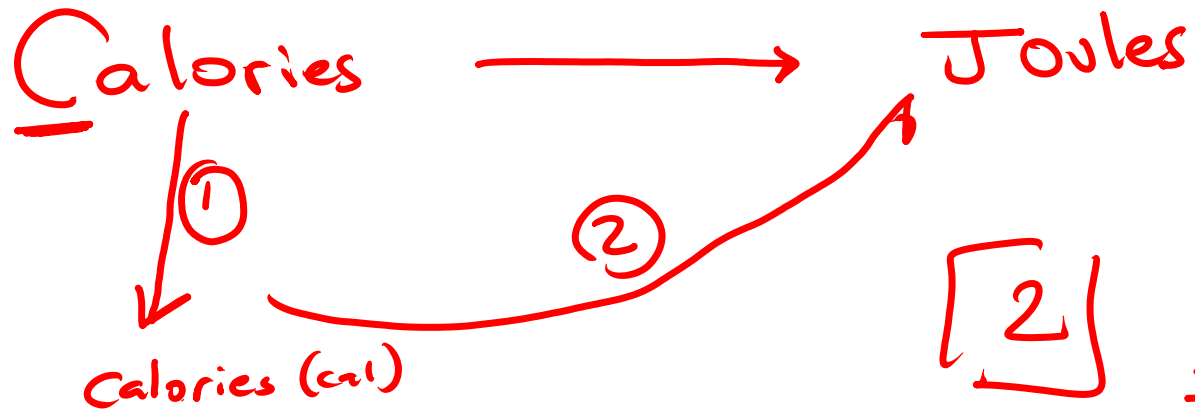
- Apply the relationship 1 cal = 4.184 J.

$$2.3 \times 10^5 \text{ cal} \times \frac{4.184 \text{ J}}{1 \text{ cal}} = 9.6 \times 10^5 \text{ J}$$

- Perform interconversion between units of temperature and heat.

Known: 230 Calories

Unknown: J ??



[1]

$$1 \text{ Calories} = 1000 \text{ cal}$$
$$230 \text{ Calories} = ? \text{ cal}$$

$$\Rightarrow 230 \times 1000$$

$$= \boxed{230000 \text{ cal}}$$

[2]

$$\text{cal} \rightarrow \text{J}$$

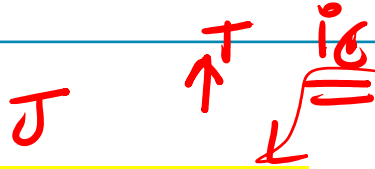
$$1 \text{ cal} = 4.184 \text{ J}$$
$$230000 \text{ cal} = ? \text{ J}$$

$$230000 \times 4.184$$

$$= \boxed{962320 \text{ J}}$$

$$= 9.6 \times 10^5 \text{ J}$$

Specific Heat



- The **specific heat** of any substance is the amount of heat required to raise the temperature of one gram of that substance by one degree Celsius.
- Because different substances have different compositions, each substance has its own specific heat.
- Some objects require more heat than others to raise their temperatures.

$$\begin{array}{l} X^{25^{\circ}\text{C}} \\ \frac{1000\text{ J}}{\rightarrow 26^{\circ}\text{C}} \end{array}$$

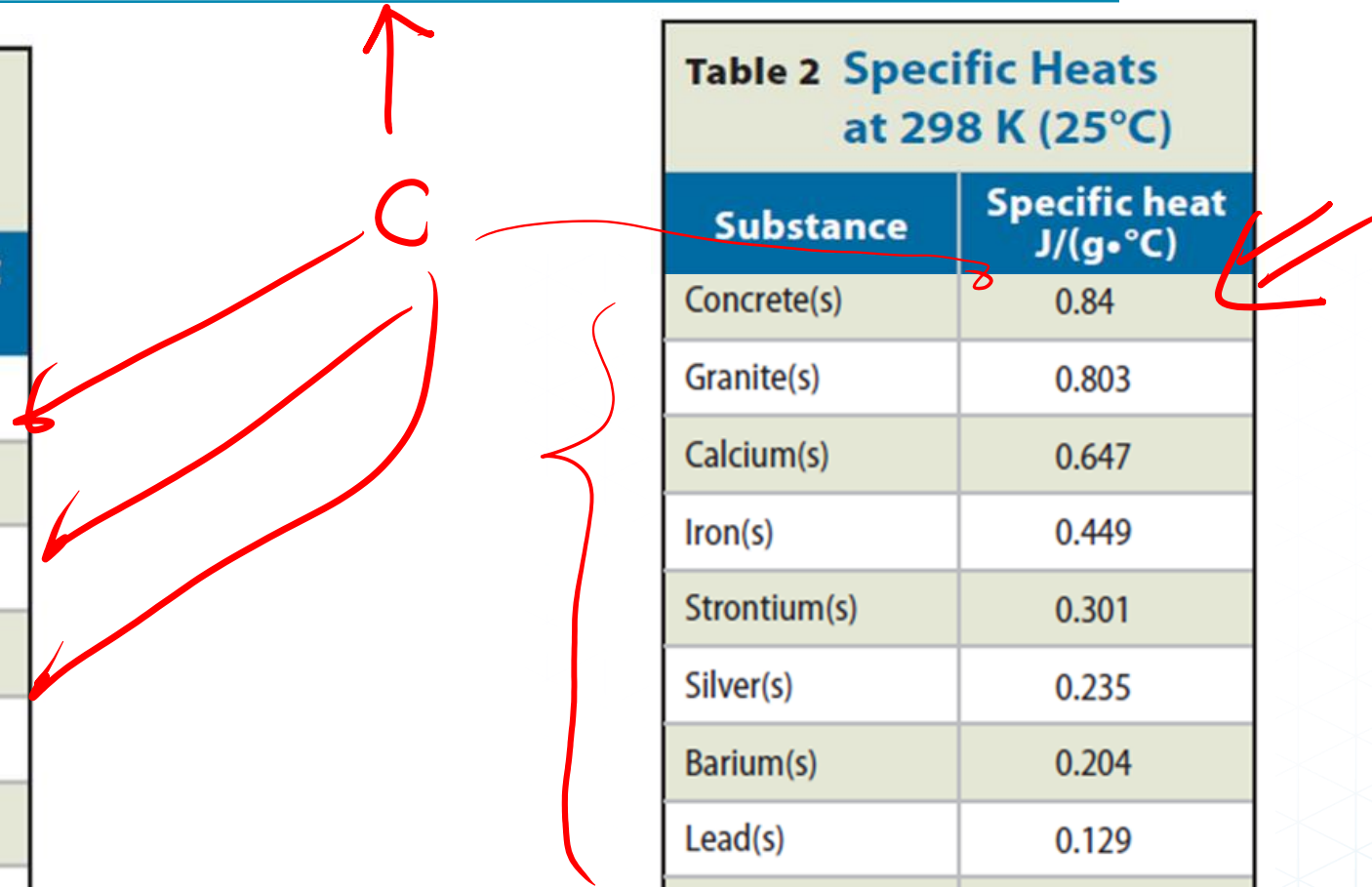
$$\begin{array}{l} Y^{25^{\circ}\text{C}} \\ \frac{2500\text{ J}}{\rightarrow 26^{\circ}\text{C}} \end{array}$$

- **Describe** the relationship between the specific heat capacity of a substance and the resistance to change in temperature.

Specific Heat

Table 2 <u>Specific Heats</u> at 298 K (25°C)	
Substance	Specific heat J/(g·°C)
Water(l)	4.184
Ethanol(l)	2.44
Water(s)	2.03
Water(g)	2.01
Beryllium(s)	1.825
Magnesium(s)	1.023
Aluminum(s)	0.897

Table 2 <u>Specific Heats</u> at 298 K (25°C)	
Substance	Specific heat J/(g·°C)
Concrete(s)	0.84
Granite(s)	0.803
Calcium(s)	0.647
Iron(s)	0.449
Strontium(s)	0.301
Silver(s)	0.235
Barium(s)	0.204
Lead(s)	0.129
Gold(s)	0.129



- **Describe** the relationship between the specific heat capacity of a substance and the resistance to change in temperature.

Specific Heat

Which substance will resist (تقاوم) the change in temperature when heated **more than the other:**

Concrete or Silver. Why? Concrete

Because the specific heat of concrete is higher. Concrete needs 0.84 J to heat up 1 gram by 1 °C.

However, Silver needs only 0.235 J to heat up 1 gram by 1 °C

(1g) concrete
0.84 J
+ 1°C

(1g) silver
0.235 J
+ 4°C

$$\frac{0.84}{0.235} \approx 4$$

Table 2 Specific Heats at 298 K (25°C)

Substance	Specific heat J/(g·°C)
Concrete(s)	0.84
Granite(s)	0.803
Calcium(s)	0.647
Iron(s)	0.449
Strontium(s)	0.301
Silver(s)	0.235
Barium(s)	0.204
Lead(s)	0.129
Gold(s)	0.129

- Describe the relationship between the specific heat capacity of a substance and the resistance to change in temperature.

Think Critically!

The specific heat of concrete is **0.84 J/(g · °C)**, so 1 g of concrete absorbs 0.84 J when its temperature increases by 1°C.

Imagine that the temperature of a 5 Kg of concrete increased by 6 °C.
How much heat did it absorb?

Hint: Use the specific heat.

Handwritten notes and calculations:

5000g (written above 5 Kg)

$T_f - T_i = 6 = \Delta T$ (written above 6 °C)

$(0.84\text{J}) \quad 1\text{g} \rightarrow 1^\circ\text{C}$

$(??\text{J}) \quad (5000\text{g}) \rightarrow 6^\circ\text{C}$

Handwritten formula and calculation:

$$Q = c \times m \times \Delta T$$
$$Q = 0.84 \times 5000 \times 6 = \boxed{} \text{ J}$$

- **Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

Specific Heat

The following **equation** can be used to **calculate heat absorbed and released**.

Equation for Calculating Heat

$$\underline{q} = c \times m \times \underline{\Delta T}$$

Handwritten notes:
- q : heat
- c : specific heat
- m : mass (g)
- ΔT : $T_f - T_i$

q represents the heat absorbed or released.
 c represents the specific heat of the substance.
 m represents the mass of the sample in grams.
 ΔT is the change in temperature in $^{\circ}\text{C}$, or $T_{\text{final}} - T_{\text{initial}}$.

The quantity of heat absorbed or released by a substance is equal to the product of its specific heat, the mass of the substance, and the change in its temperature.

- **Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

Quiz

5. Which of the following is the equation for calculating heat?

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

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

 $q = c \times \Delta T$

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

- **Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

CALCULATE SPECIFIC HEAT

IN-CLASS EXAMPLE

Use with Example Problem 2.

Problem

In the construction of bridges and skyscrapers, gaps must be left between adjoining steel beams to allow for the expansion and contraction of the metal due to heating and cooling. [The temperature of a sample of iron with a mass of 10.0 g changed from 50.4°C to 25.0°C with the release of 114 J. What is the specific heat of iron?]

- **Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

CALCULATE SPECIFIC HEAT

IN-CLASS EXAMPLE

Use with Example Problem 2.

Problem

In the construction of bridges and skyscrapers, gaps must be left between adjoining steel beams to allow for the expansion and contraction of the metal due to heating and cooling. [The temperature of a sample of iron with a **mass of 10.0 g** changed from **50.4°C** to **25.0°C** with the **release of 114 J**. What is the **specific heat** of iron?]

$$q = -114 \text{ J} \quad \text{KNOWN} \quad \text{فقدت}$$

$$\checkmark \text{ energy released} = 114 \text{ J} \quad T_i = 50.4^\circ\text{C} \quad \Delta T = T_f - T_i$$

$$\text{mass of iron} = 10.0 \text{ g Fe} \quad T_f = 25.0^\circ\text{C} \quad 25 - 50.4$$

UNKNOWN

$$\text{specific heat of iron } c = ? \text{ J/(g} \cdot ^\circ\text{C)} \quad (+)$$

$$= -25.4^\circ\text{C}$$

SOLVE FOR THE UNKNOWN

Calculate ΔT .

$$\Delta T = 50.4^\circ\text{C} - 25.0^\circ\text{C} = +25.4^\circ\text{C}$$

- State the equation for calculating heat.

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

- Solve for c.

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

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

CALCULATE SPECIFIC HEAT

IN-CLASS EXAMPLE

SOLVE FOR THE UNKNOWN (continued)

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

- Substitute $q = 114 \text{ J}$, $m = 10.0 \text{ g}$, and $\Delta T = 25.4^\circ\text{C}$.

$$c = \frac{114 \text{ J}}{(10.0 \text{ g})(25.4^\circ\text{C})}$$

- Multiply and divide numbers and units.

$$c = \underline{0.449 \text{ J/(g}\cdot^\circ\text{C)}}$$

Iron

- Calculate** the amount of heat absorbed or released by a substance as its temperature changes.

4. 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? **The specific heat of ethanol = 2.44 J/(g °C)**

9

Known

$$m = 34.4 \text{ g} \quad \checkmark$$

$$T_i = 25.0^\circ\text{C} \quad \checkmark$$

$$T_f = 78.8^\circ\text{C} \quad \checkmark$$

$$c = 2.44 \text{ J/(g }^\circ\text{C)} \quad \checkmark$$

$$\Delta T = T_f - T_i = 78.8 - 25 = 53.8^\circ\text{C}$$

Unknown

Heat absorbed (q)?

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

$$\begin{aligned} q &= 2.44 \text{ J/(g} \cdot ^\circ\text{C)} \times 34.4 \text{ g} \times 53.8^\circ\text{C} \\ &= \underline{4.52 \times 10^3 \text{ J}} \end{aligned}$$

Section Summary

■ Energy is the capacity to do work or produce heat.

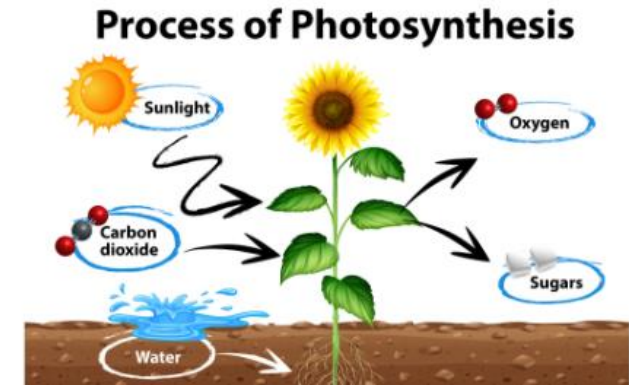
■ Chemical potential energy is energy stored in the chemical bonds of a substance by virtue of the arrangement of the atoms and molecules.

■ Chemical potential energy is released or absorbed as heat during chemical processes or reactions.

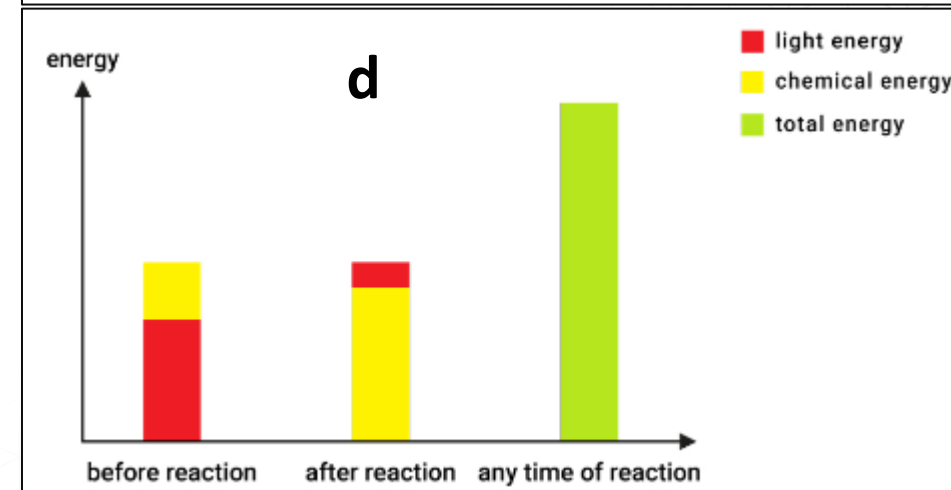
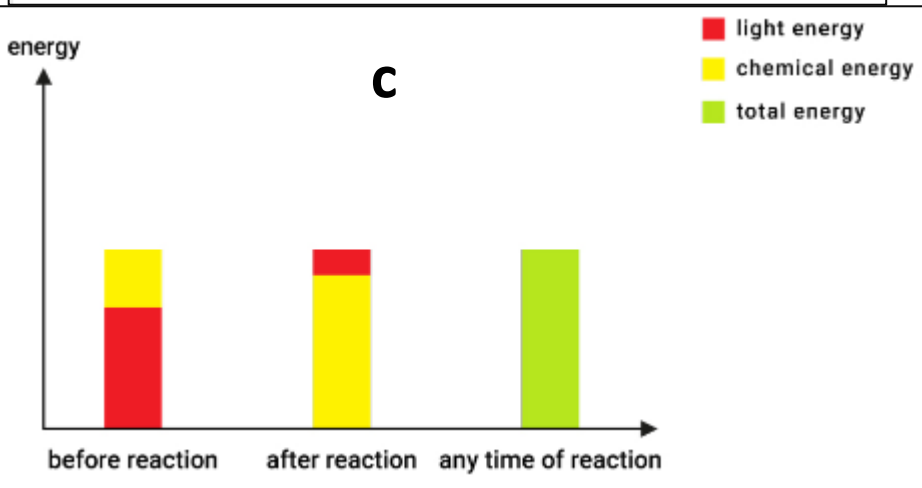
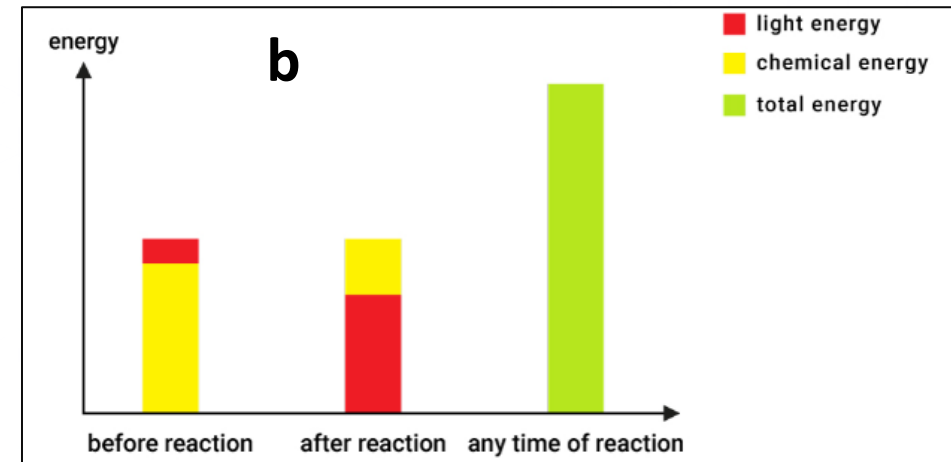
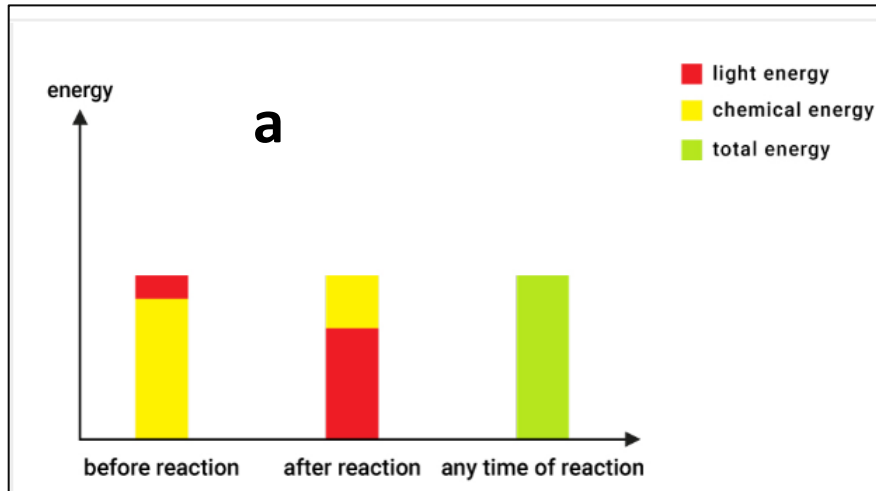
Select the correct answer.

"Critical thinking"

In a process called photosynthesis, green plants convert light energy from the Sun into chemical energy stored in sugars ($C_6H_{12}O_6$). The bonds in a glucose molecule are weaker than those in water and carbon dioxide.



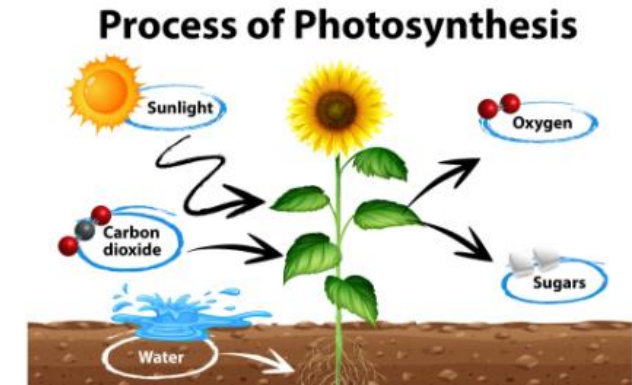
Which graph represents the energy transformation during photosynthesis?



Select the correct answer.

"Critical thinking"

In a process called photosynthesis, green plants convert light energy from the Sun into chemical energy stored in sugars ($C_6H_{12}O_6$). The bonds in a glucose molecule are weaker than those in water and carbon dioxide.



Which graph represents the energy transformation during photosynthesis?

