The study of change

Chemistry :Is the study the behavior سلوك of matter .

Chemistry :Is the study the behavior of atoms and molecules .

✍ **علم الكيمياء** : هو العلم الذي يهتم بدراسة المادة وتحولاتها .

Matter(المادة) : Anything with Mass and volume.

✍ **المادة** : هي أي شيء له كتله وحجم .

Atom : Sub microscopic particles that are building block of matter .

✍ **الذرة** : هي وحدة بناء المادة .

Molecules :Composed of at least two atoms .(may be element or compound).

✍ **الجزيء** : هو اتحاد بين ذرتين أو اكتر .

1.. ..... Is the scientific that study behavior سلوك of matter :

a- Biology b- physics c- chemistry d- English

2. Anything with mass and volume is called ..... :

a- love b- light c- matter d- fear

3 . ..... Is building block of matter

a- cell b- atom c- matter d- None of these

للإطلاع

Some Elements and their symbols

Name	الاسم	Symbol	Name	الاسم	Symbol
Oxygen	أكسجين	O	Barium	باريوم	Ba
Hydrogen	هيدروجين	H	Bromine	بروم	Br
Fluorine	فلور	F	Tungsten	تنجستين	W
Sulfur	كبريت	S	Iodine	يود	I
Silicon	سيليكون	Si	Potassium	بوتاسيوم	K
Carbon	كربون	C	Arsenic	زرنيخ	As
Calcium	كالسيوم	Ca	Iron	حديد	Fe
Copper	نحاس	Cu	Mercury	زئبق	Hg
Cobalt	كوبلت	Co	Magnesium	ماغنسيوم	Mg
Chlorine	كلور	Cl	Silver	فضه	Ag
Aluminum	الومنيوم	Al	Gold	ذهب	Au
Lead	رصاص	Pb	Phosphorus	فسفور	P
Platinum	بلاتين	Pt	Nitrogen	نيتروجين	N
Manganese	منجنيز	Mn	Nickel	نيكل	Ni
Tin	قصدير	Sn	Sodium	صوديوم	Na
Zinc	خارصين	Zn	Chromium	كروم	Cr

Measurement and Units

Volume

Graduated cylinder

المخبار المدرج

Mass

Balance

الميزان

Temperature

Thermometer

الترمومتر

حفظ

SI Units : International System of Units.

- used for commerce and science around the world .

حفظ

TABLE 1.2 SI Base Units

Base Quantity	Name of Unit	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electrical current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

⦸**Candela** : is not commonly used in chemistry .

1. The SI Unit of mass is :

a- pound b - kilogram c-gram d- mole

2. The kg is the SI Unit of :

a- length b- mass c-temperature d-current

3. The energy unit in the SI unit system is

a- Pa b- J c- N d- W

4. Which of the following is not an SI base unit?

a-kilometer b- kilogram c-second d- Kelvin

5. The SI unit of temperature is……

a- K b- °C c- °F d- t

6 . All of the following are SI units, except :

a- kg b- s c- mol d- min

7. Which of the following is SI base unit of time?

a- year b- second c- hour d- meter

Prefixes with SI Units

حفظ

1 Tera	T	10^{12}
1 Giga	G	10^{9}
1 Mega	M	10^{6}
1 Kilo	K	10^{3}
1 hecto	h	10^{2}
1 deca	da	10
1 deci	d	10^{-1}
1 centi	C	10^{-2}
1 milli	m	10^{-3}
1 micro	μ	10^{-6}
1 nano	n	10^{-9}
1 Pico	P	10^{-12}
1 Fimto	f	10^{-15}
1 Atto	a	10^{-18}

1. ..... is the abbreviation for the prefix mega.

a- k b-m c- M d- n

2. The following prefix 10^{-3} means

a-kilo b-deci c-centi d-milli

1. The SI prefix mega and micro represent , respectively :

a- 10^{-9} and 10^{6} b-10^{6} and 10^{-9} c- 10^{6} and 10^{-6} d- 10^{3} and 10^{-6}

Prefix ⟷ Unit

☚ المسائل نوعين : ✌ prefix to unit والعكس . ✌ prefix to prefix .

Prefix ⟷ Unit

☚ لو أتذكر في المسألة مقطع واحد فقط من مقاطع الجدول السابق تكون دي النوع الأول (مباشرة) .

1. **The number of nano –seconds (ns) which is equivalent to 120 second is :**

a- $\underline{1.2\times10^{11}}$ b- 1.2×10^{-11} c- 1.2×10^{14} d- 1.2×10^{8}

☚ في المسألة مقطع واحد وهو nano يبقا دي مسألة prefix to unit . كيف نحل ؟؟ !!

✌ تكتب ال انت حفظه من الجدول حق المقطع nano كالاتي :

☚ **1 nano second ⟶ 10^{-9} second من الجدول**

✌ بعد كده نزل المعطيات من المسألة تحت second :120 وتحت المطلوب (دائما) nano secondX

☚ 1 nano second ⟶ 10^{-9} second من الجد ول

X second ⟶ 120 second

☚ طريفين في وسطين تجيب المجهول .

➢ **x =** $\frac{120}{10^{-9}}$ $= 1.2 \times 10^{11}$ **nano-second**

2. How many meters are in 6 Km ?

a- 6×10^{3} b- 4×10^{-6} c- 3×10^{-6} d- 3×10^{6}

☚ في المسألة مقطع واحد وهو Kilo يبقا دي مسألة prefix to unit والعكس . كيف نحل ؟؟ !!

👍 تكتب ال انت حفظهان الجدول حق المقطع Kilo كالاتي :

☚ **1 Kilometer ⟶ 10^{3} meter من الجدول**

✌ بعد كده نزل المعطيات من المسألة تحت Km: 6 وتحت المطلوب (دائما) meterX :

☚ 1 Kilo meter ⟶ 10^{3} meter من الجدول

6kilo meter ⟶ x meter

☚ طريفين في وسطين تجيبي المجهول .

➢ **x = 6×10^{3} meter**

3. What is 22.6 m when converted to decimeters?

a- 0.226 dm b- 2.26 dm c- 226 dm d- 2.26×10^{-3}

1 d.m ⟶ 10^{-1} m (من الجدول)

x d.m ⟶ 22.6 m

☚ **x = $\frac{22.6}{10^{-1}}$ = 226 dm**

Prefix ⟷ prefix

1. 6.0 kg is how many microgram?

a- 6.0×10^{6} µm b- 1.7×10^{-7} µm c- 6.0×10^{9} µm d-1.7×10^{-4} µm

في المسألة مقطعين وهو Kiloو micro دي مسألة 2 prefix . كيف نحل ؟؟ !!

6 Kilo gram **?? micro**gram

$6 \times 10^{3} \times 10^{6}$ ← (نعكس اشارة prefix حق المجهول)

(نضرب كله) ←

$= 6 \times 10^{9}$ micro gram

2. The diameter of an atom(قطر ذره) is approximately 1×10^{-7} mm.

What is this diameter when expressed in nanometers?

(a) 1×10^{-18} nm (b) 1×10^{-15} nm (c) 1×10^{-9} nm (d) 1×10^{-1} nm

في المسألة مقطعين وهو nanoو milli يبقا دي مسألة prefix to prefix . كيف نحل ؟؟ !!

1×10^{-7} **mille** meter **??** **nano**meters

$1 \times 10^{-7} \times 10^{-3} \times 10^{9}$ ← (نعكس اشارة prefix حق المجهول)

(نضرب كله) ←

$= 1 \times 10^{-1}$ nm

3. What is 25.4 mg when converted to kilograms? (prefix - prefix)

a-2540 kg b-2.54 x10^{-5} kg c-2.54 kg d- 2.54 x 10^{4} kg

☚ **في المسألة مقطعين وهو kilo و milli يبقا دي مسألة prefix to prefix . كيف نحل ؟؟ !!**

25.4 mille gram ?? Kilogram

25.4 × 10^{-3} × 10^{-3} (نعكس اشارة prefix حق المجهول)

= **2.54 x10^{-5} Kilogram**

4. The largest value القيمة الأكبر among the following is :

a- 0.02 mm b- 2 µm c- 200 nm d-2000 pm

☚ في السؤال ده بتحولي كل المعطيات (الاختيارات) إلي وحدة واحدة وهي المتر .. وبعدها تقدري تحكمي مين أكبر قيمة .

☚ لما نفس الفكرة تيجلكم تضربوا الرقم المعطي في الوحدة حقه في كل اختياري.

A - 0.02 mm = 0 .02 × **10^{-3}** = 2 × 10^{-5} m

B - 2 µ m = 2 × **10^{-6}** = 2 × 10^{-6} m

C- 200 nm = 200 × **10^{-9}** = 2 × 10^{-7} m

D- 2000 pm = 2000 × **10^{-12}** = 2 × 10^{-9} m

Density Calculations حسابات الكثافة للمادة

☺ **Density:** Is the amount of matter in a given amount of space.

☚ الكثافة (d): هي كتلة وحدة الحجوم من المادة . (الكثافة = $\frac{\text{الكتلة } m}{\text{الحجم } v}$).

☺ SI derived unit for density is **$kg/m^3 \equiv g/cm^3$ (g/ml) .**

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

1. **Bromine is are liquid at 25^0 C .Its density is 3.12 g/Cm^3. what the volume of 28.1 g liquid bromine ?**

a-87.7 Cm^3 b- 0.111 Cm^3 c- 9.01 cm^3 d- 28.1 m

☚ D = 3.12 g/Cm^3 , m = 28.1 g

➢ $D = \frac{m}{V}$ ☚ $V = \frac{m}{d}$

☚ $V = \frac{28.1}{3.12} = 9.01\ cm^3$ (ml) .

2. The density of mercury is 13.6 g /Cm^3 . How many Liters dose 251 g of Hg occupy ?

a- 18.5 L b- 54.9 L c-1.85 d-5.42 L

☛ D = 3.16g/Cm^3 , m = 251 g , V= ??

➢ $D=\frac{m}{V}$ ➢ $V=\frac{m}{d}$

☛ **V = $\frac{251}{13.6}$ = 18.5 cm^3 (ml) = 18.5**

Temperature Scales

There are three temperature scales, their units are:

- **Degrees Celsius ^0C** ☛ **Scale 0 → 100**
- **Degrees Fahrenheit ^0F** ☛ **Scale 273 → 373**
- **Kelvin K** ☛ **Scale 32→ 212**

$^oK = {}^oC + 273.15$

$C = K - 273.15$

$$\frac{C^0}{5} = \frac{(F^0 - 32)}{9}$$

1. Lead melts at 601 .0 ^{0}c .what the temperature is this in ^{0} F ?

a-320 F^0 b- 365 F^0 c-1.050 F^0 d- 1114 F^0

$$\frac{C^0}{5} = \frac{(F^0 - 32)}{9}$$

$$\frac{601}{5} = \frac{(F^0 - 32)}{9}$$

$$F^0 = 1114$$

2. Ammonia boils at -33.4°C. What temperature is this in °F?

a. -60.1°F b. -92.1°F c. -28.1°F d. 13.5°F

3. the melting point of sulfur is 113 ^{0}c . what temp is This in K^0 ?

☛ $K = C^0 + 273 = 113 + 273 = 386\ ^0K$

4. Convert 77 ^{0} K to degrees

☛ $C^0 = K - 273 = 77 - 273 = -196\ ^0c$

5. Which of the following is the lowest possible temperature ?

a- -273.5 K b- -273.15 ^{0}C c- 273.15 K d- 0 ^{0}C

SI derived units

✌ Volume الحجم

m^3 : cubic meter Cm^3 : cubic centimeter dm^3 : cubic deci meter .

☚ أولا وحدات نفس بعض (حفظ) :

$mL = Cm^3$

$Liter = dm^3$

☛ convert 100 liter to cubic deci meter (dm^3) :

Answer : 100 liter = 100 dm^3

☚ ثانيا تحويلات الحجم (حفظ) :

$1\ m^2 = 10^4\ cm^2$

$1\ m^3 = 10^6\ cm^3$ (mL)

☜ **A liter :** is the volume occupied by one cubic decimeter.

$1\ m^3 = 10^3$ liter (dm^3)

1 liter = 10^3 cm^3 (ml)

1. How many cubic centimeters are there in exactly one cubic meter?

a- 1×10^{-6} cm^3 b- 1×10^{-3} cm^3 c- 1×10^{-2} cm^3 <u>d- 1×10^{6} cm^3</u>

2 . How many liter are there in 100 mL ?

1 Liter ⟶ 10^3 mL

X liter ⟶ 100 mL

$$X = \frac{100}{10^3} = 0.1 \text{ mL}$$

2 . How many cubic meter are there in 100 L ?

$1m^3$ ⟶ 10^3 Liter

X m^3 ⟶ 100 liter

X = 0.1

3 . convert 5 cubic meter to ml

$1m^3$ ⟶ 10^6 ml

5 m^3 ⟶ x ml

X = 5×10^6 ml

State of matter حالات المادة

☺ Gases الغازات ☺ Liquids السوائل ☺ solids الجوامد

Solid state	Liquid state
1. Atoms and molecules close together . (Little freedom of motion)	1. Atoms and molecules close together (But not held – free move to each other)
2. Have a definite volume .	2. Have a definite volume .
3. Have a definite shape .	3. Have No a definite shape .
3. solid may be : **crystalline or amorphous .**	3 . Water , alcohol and gasoline .

crystalline solid : A solid in which atoms or molecules have patterns long –range older (ترتيب منتظم) .

(geometric pattern) **Ex :** **(table salt - diamond)**

Amorphous solid : A solid in which atoms or molecules do not have any long –range older (ترتيب منتظم) .

Ex : **(glass – plastic - Charcoal)**

Gases state

1 . Atoms and molecules have a lot of space between them .

2 . Gas assume the shape and volume of the container .

2 . Gas can be **compressible** .

3. **Examples** of gases in room temperature : Helium , nitrogen and carbon dioxide .

1. Which of the following is a crystalline solid ?

a-diamond b-glass c- plastic d-CO_2

2. Which of the following is a crystalline solid ?

a-table salt b-glass c- gasoline d-CO_2

3. Sodium chloride considered …….. solid material

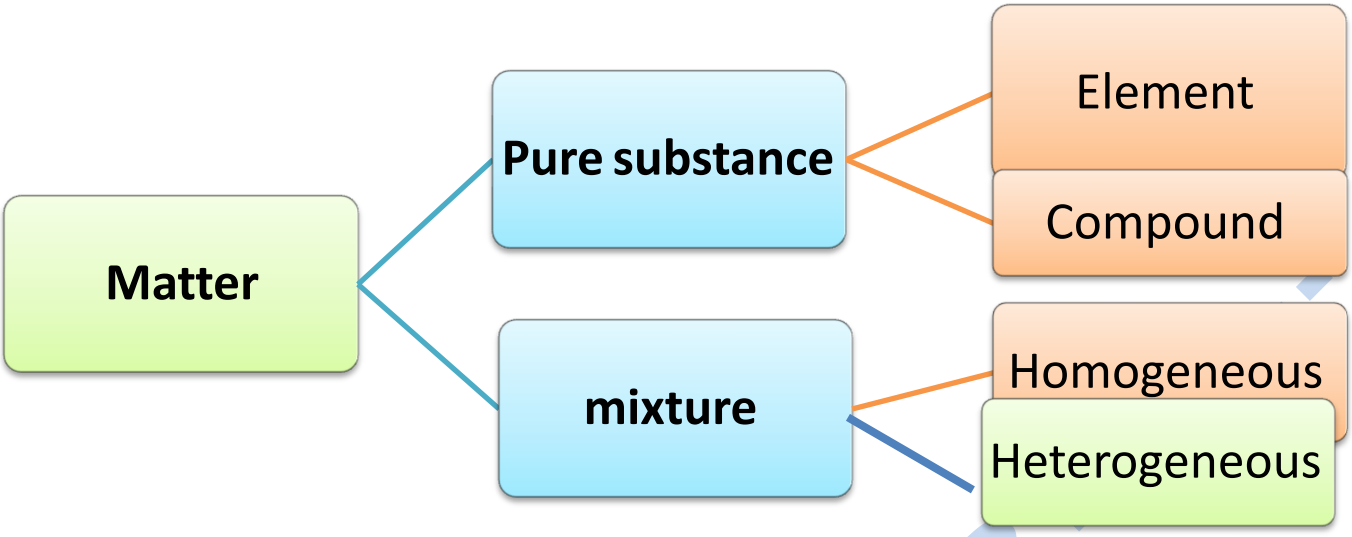
a-crystalline b-amorphous c- liquid d-gas

4. Which of the following is a amorphous solid ?

a-plastic b-glass c- both a , b d-None

5. Which of the following is a liquid in room temperature ?

a-gasoline b- sodium c- nitrogen d-hydrogen



Pure Substance may be :

Element

- Substance cannot chmically broken into simpler substance .
- **EX : Ag** : gold , **O** : oxygen .
- **Ex : He** : helium .

أي مادة تتكون من نوع واحد فقط من الذرات .

Compound

- composed of atoms of two or more elements .
- Can be separated chemically .
- **Ex** : water (H_2O) .

أي مادة تتكون من اكثر من نوع من الذرات مرتبطة كيميائيا

Mixture : mix between Two substance at least but **do not combine comically .**

Homogeneous

- Mixtures that are made up of only one phase . **(uniform)**
- **sugar in water , air , tea with sugar .**

مخلوط متجانس تكون أجزائه واحدة

Heterogeneous

- Mixtures that are made up of more than one phase .
- **sand in water , fruit salad , wet sand .**

مخلوط غير متجانس تختلف أجزائه عن بعضها

1- Which of the following is an element :

a - water b- oxygen c- sugar d- carbon dioxide

2 . Which of the following is an element?

a- Sweat b- Vegetable soup c- air d- Helium

3. Which of the following is a compound?

a- iron b- ammonia c- cobalt d- gold

4 . Water is an example of a:

a - compound b- heterogeneous mixture

c- element d-homogeneous mixture

5- The examples of pure substances.

a- wet sand b- water with sugar c-Air d- water

6. Carbon dioxide considered as

a. Homogenous mixture of gases b. Heterogeneous mixture of gases

c. element d. pure substance

7- The examples of Homogeneous substances.

a- wet sand b- water with sugar c- Air d- water

8. Which of the following is a homogenous mixture?

a- wet sand b- vegetable soup c- blood d- sugar with water

9. Which of the following is a homogenous mixture?

a- wet sand b- Hydrogen c- salt d- tea with sugar

10. Sugar with tea is an example of :

a-substance b-heterogeneous mixture

c-element d-homogeneous mixture

11.All of the following considered homogeneous mixture except

a-tea with sugar b-sugar with water

c-oil with water d-lemon Juice

Changing of matter

Chemical Change	Physical change
Changes the composition or identity of the substances . ✎ يحدث تغير في تركيب المادة Reaction . ☛ Corrosion , oxidation . ☛ Burning ☛ Bleaching , Flaming . (Burring of gasoline gas) ☛ Rusting of iron	**Does not change the composition** or identity of a substance ✎ لا يحدث تغير في تركيب المادة . ☛ ice melting , boiling . ☛ salt dissolving in water . ☛ color , density . ☛ **Evaporation تبخر**

1 . All of the followings are physical changes, except ماعدا

a- Evaporation of rubbing alcohol
b- Forming of frost on cold night
c- Burning of lamp oil
d- Smell of gasoline

2. The bleaching of hair with H_2O_2 is a .....

a- physical change
b- chemical change
c- physical property
d- none of them

3 . Burning of lamp oil is :

a- physical change b- chemical change

c- physical property d- none of them

4 . Rusting of iron is considered as :

a- physical change b- chemical change

c- physical property d- none of them

5 . Forming of frost البرد is considered as :

a- chemical change b- physical change

c- chemical property d- none of them

6- Which of the following considered physical changes

a- burning of lamp oil b- bleaching of clothes with chlorine

c- the evaporation تبخر of acetone d- iron rusts

7-All of the followings are physical changes, except

a- odor رائحة of paint thinner b- shining of gold and silver

c- the evaporation تبخر of acetone d- tendency of ethyl alcohol to burn

8- In the following list, only ..... is not an example of a chemical change.

a- burning a plastic water bottle b-the production of hydrogen gas from water

c- the tarnishing of a copper penny d- forming of frost on cold night

Energy: fundamental part of physical and chemical change

The first principle :

Any chemical reaction mass is neither created nor destroyed .

The mass of the reactant is equal to the mass of products

Reactant 1 + Reactant 2 ⟶ Product

Total mass (Energy) = Total mass (Energy)

Example :

$$CaO + CO_2 \longrightarrow CaCO_3$$

56.08 g 44.00 g 100.0 g

The second principle :

System with high potential energy tend to change in ways that lower their potential energy .

(System (the weight) contain less potential energy become more stable) .

*** What is 0.000000027 expressed in scientific notation?**

a- 2.7×10^{8} b - 2.7×10^{-7} c- 27×10^{-9} d- 2.7×10^{-8}