

Chemical Compounds in Cells

What are cells made of?

- What are elements and compounds?
- What compounds do cells need?



I will be able to:

- Identify the main compounds that are important in cells
- I will be able to relate the parts of a sandwich to chemical compounds of life

Open Ended Question

K

List one thing that you included in the "K" column of your KWL chart

Open Ended Question

W

List one thing that you included in the "W" column of your KWL chart

What are elements and compounds?

Element – any substance that cannot be broken down into simpler substances

Four important elements for cells and our bodies:

- Carbon – C
- Nitrogen – N
- Oxygen – O
- Hydrogen – H

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H Hydrogen																	2 He Helium
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Cesium	56 Ba Barium	57-71 Lanthanide Series	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89-103 Actinide Series	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Uut Ununtrium	114 Fl Flerovium	115 Uup Ununpentium	116 Lv Livermorium	117 Uus Ununseptium	118 Uuo Ununoctium

Legend: Alkali Metal, Alkaline Earth, Transition Metal, Basic Metal, Semimetal, Nonmetal, Halogen, Noble Gas, Lanthanide, Actinide

The smallest unit of an element is a particle called an **atom**

Draw It

Circle the four of the important elements found in our bodies.

Periodic Table of the Elements

1 1A 1A	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A	
1 H Hydrogen 1.008																		2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180	
11 Na Sodium 22.990	12 Mg Magnesium 24.305	3 III B 3B	4 IV B 4B	5 V B 5B	6 VI B 6B	7 VII B 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948	
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.933	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.972	35 Br Bromine 79.904	36 Kr Krypton 84.90	
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.29	
55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine 209	86 Rn Radon 222.018	
87 Fr Francium [223]	88 Ra Radium 226.025	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium [288]	114 Fl Flerovium [289]	115 Uup Ununpentium [288]	116 Lv Livermorium [293]	117 Uus Ununseptium [294]	118 Uuo Ununoctium [294]	
		57 La Lanthanum 138.906	58 Ce Cerium 140.115	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.966	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967		
		89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]		

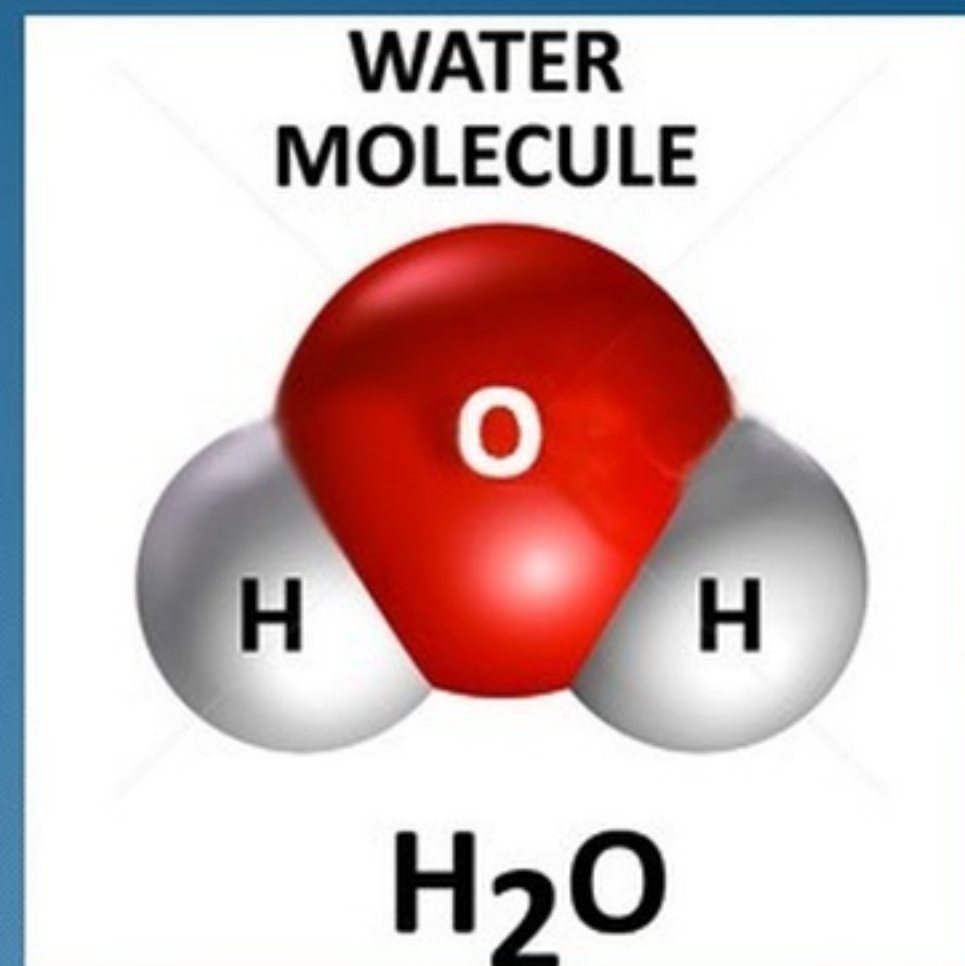
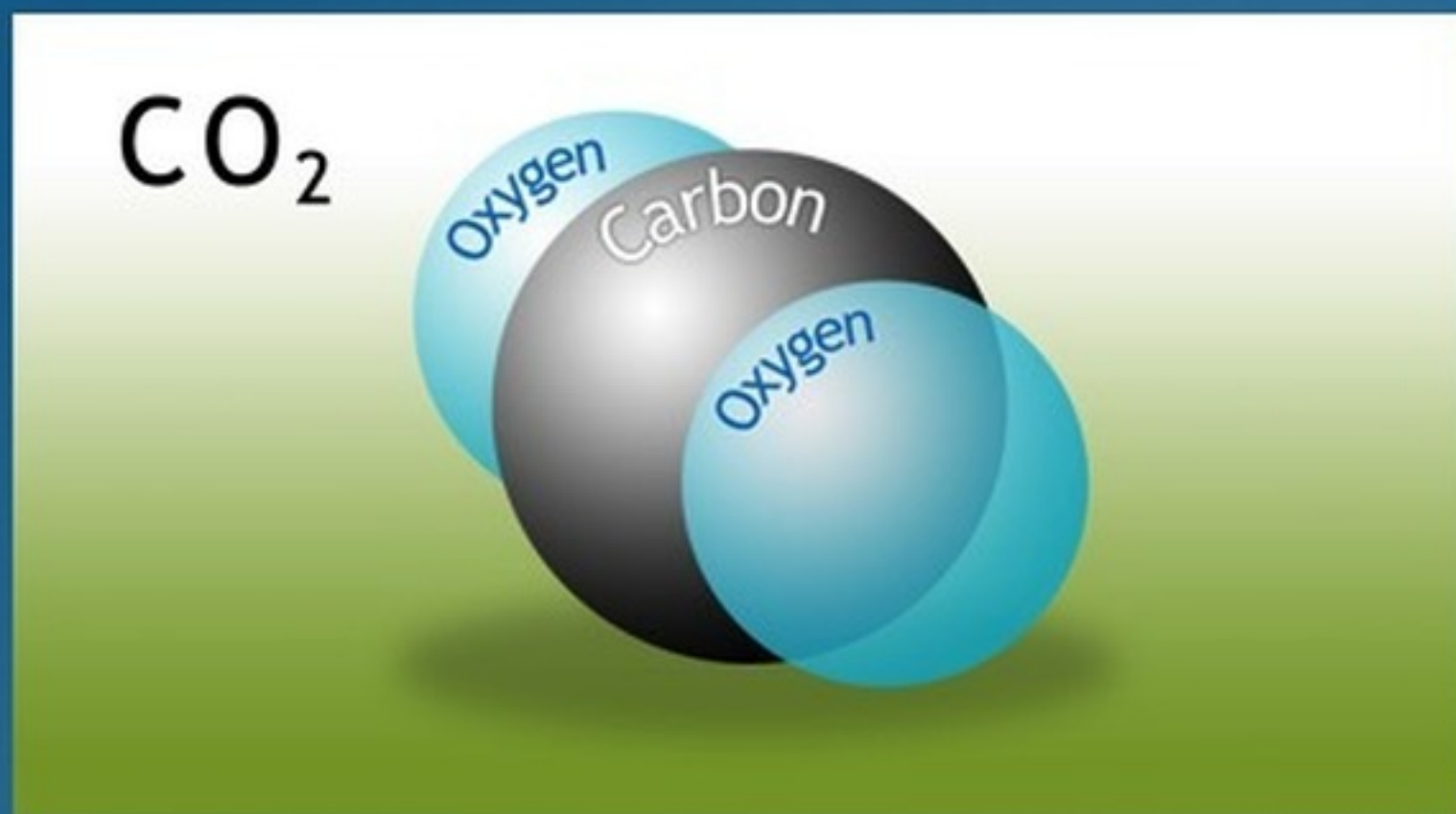
Alkali Metal
Alkaline Earth
Transition Metal
Basic Metal
Semimetal
Nonmetal
Halogen
Noble Gas
Lanthanide
Actinide

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What are elements and compounds?

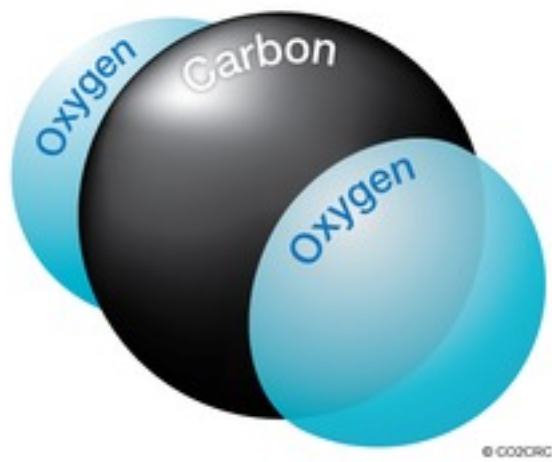
When two or more elements combine chemically they form a **COMPOUND**

- Most elements in living things occur in the form of compounds



The smallest unit of many compounds is a **molecule**

Quiz



How many atoms are in this compound?

1

2

3

4

What compounds do cells need?

Organic compounds – compounds that contain carbon

- **Carbohydrates**
- **Lipids**
- **Proteins**
- **Nucleic Acids**



Inorganic compounds – compounds that don't contain carbon

- **Water**
- **Sodium**

Many of these compounds are found in the foods you eat



Poll

What element do organic compounds contain that most inorganic compounds do not?

- Carbon
- Oxygen
- Calcium
- Hydrogen

Carbohydrates: energy-rich organic compounds made of the elements carbon, hydrogen, and oxygen

SUGARS



STARCHES



When you eat these food, your body breaks down the starch into glucose, a sugar your cells can use to get energy.

- When is sugar produced in the plant cell?
 - During the food making process called photosynthesis.
- What are starches?
 - Starches are many sugars strung together.
 - Called complex carbohydrates
 - When we eat carbs our bodies break them down into glucose (sugar).
- What do plant cells use starch for?
 - To store excess energy
- What is the starch that makes up plant cell walls called?
 - Cellulose
- Where else in the cell will you find carbohydrates?
 - In the cell membrane



Lipids- energy- rich organic compounds made mostly of carbon, hydrogen, and oxygen

FAT
OIL
WAX

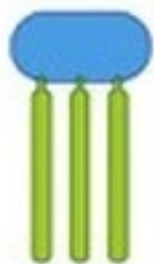


TYPICAL FEATURES OF LIPIDS

- Non-polar molecules that do not dissolve in water
- Greasy to the touch
- Significant source of energy storage

THREE TYPES OF LIPIDS

FATS



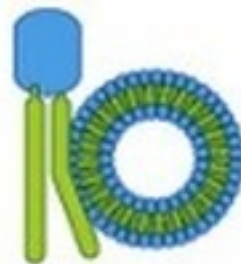
FUNCTION
Long-term energy storage and insulation

STEROLS



FUNCTION
Regulate growth and development

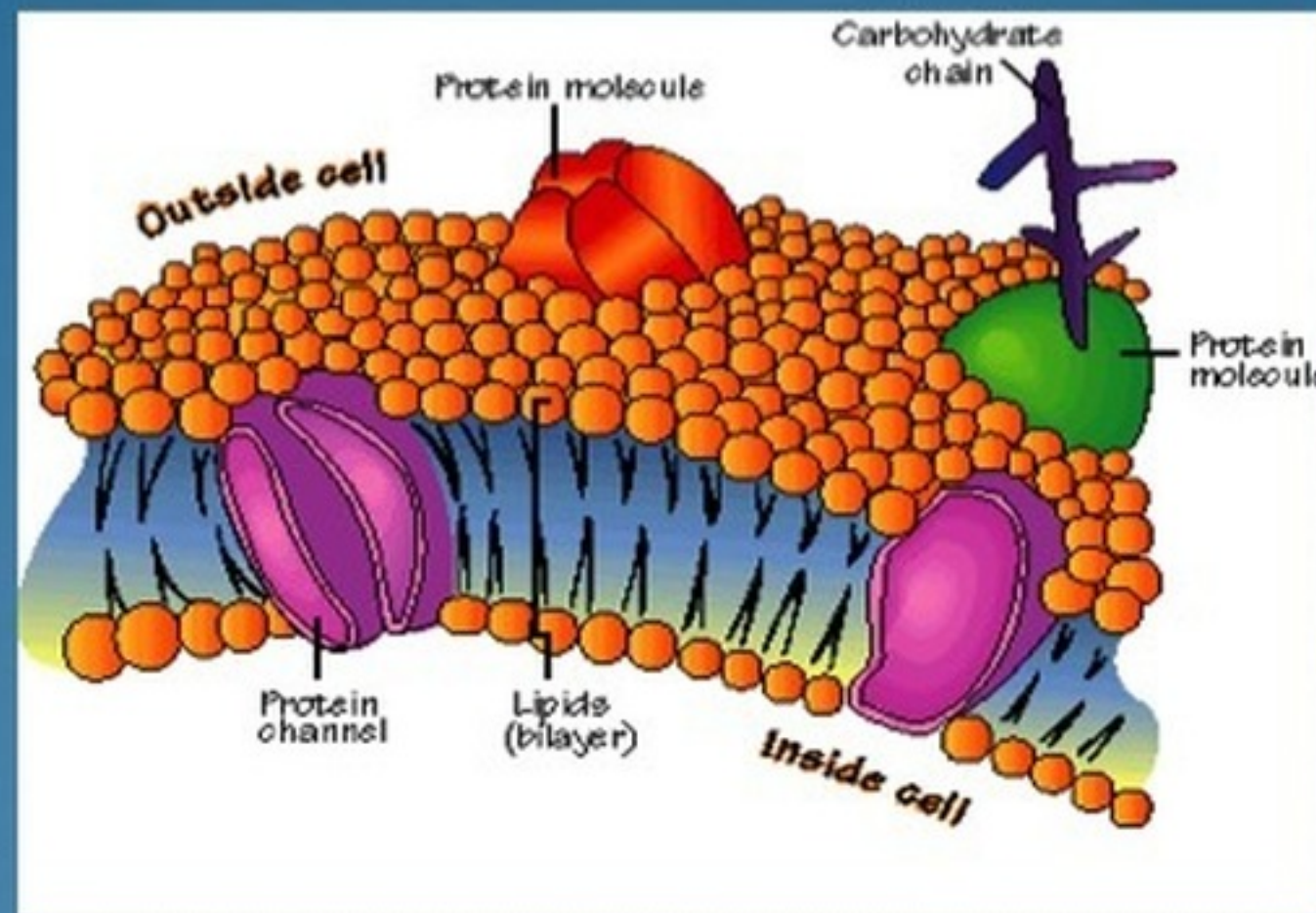
PHOSPHOLIPIDS



FUNCTION
Form the membranes that enclose cells

Cells store energy from fats for later use

- How are lipids different from carbohydrates in terms of stored energy?
 - They store even more energy.
- What cell part is composed of mostly lipids?
 - The cell membrane



Protein – large organic molecules made of carbon, hydrogen, oxygen, nitrogen, and in some cases sulfur



All proteins are made of 20 different amino acids linked in different orders

Proteins –

- Form part of the cell's membrane
- Make up part of the organelles within a cell

Proteins are used to build cells, act as hormones & enzymes, and do much of the work in a cell

ENZYME – a protein that speeds up chemical reactions in living things

What would happen if we did not have enzymes in our cells?

Many of the essential chemical reactions in our cells would take too long or not occur at all.



Example of an enzyme in action

- Enzymes in saliva speed up digestion.

Draw It

Circle all of the examples of a carbohydrate



NUCLEIC ACIDS – very long organic molecules, made of carbon, oxygen, hydrogen, nitrogen, and phosphorus

CONTAIN THE INSTRUCTIONS THAT CELLS NEED TO CARRY OUT ALL THE FUNCTIONS OF LIFE

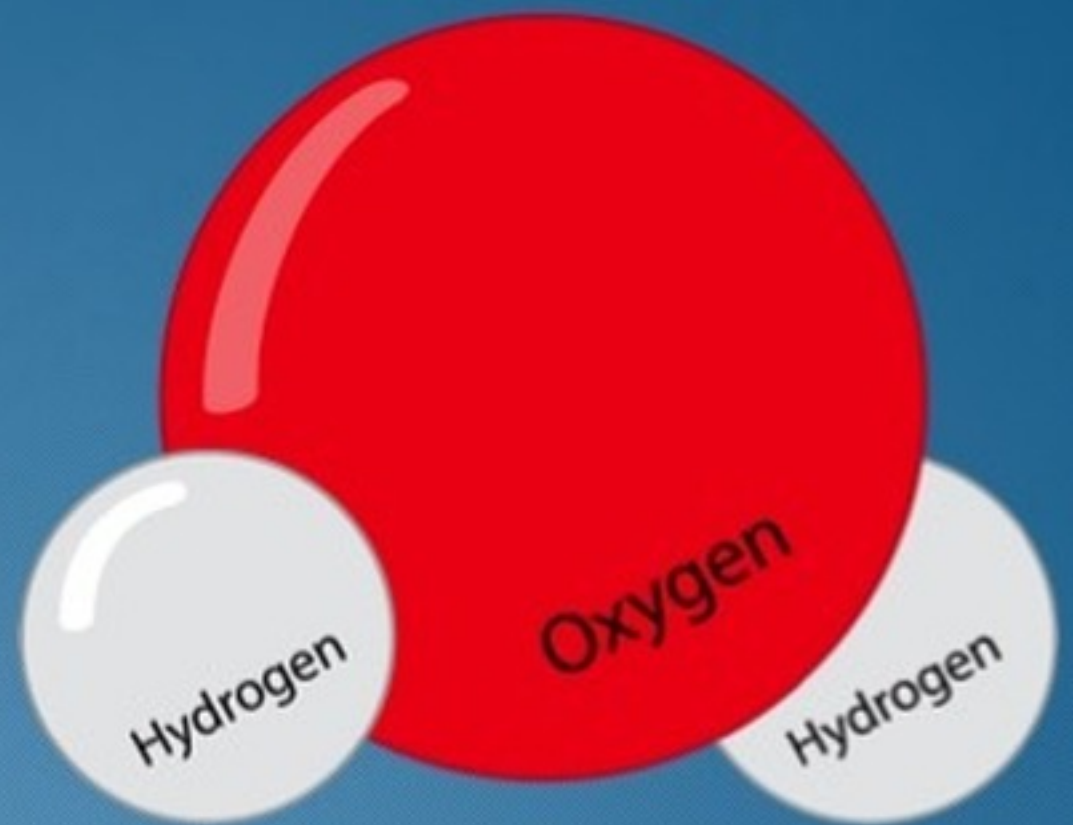


DNA- one kind of nucleic acid, the genetic material that carries information about an organism and is passed from parent to offspring



WATER – inorganic compound, H₂O

- Takes part in many chemical reactions in cells
- Helps cells to keep their shape
- Keeps the temperature of cells from changing rapidly
- Carries substances into and out of cells



Without water, life as we know it would not exist on Earth!

Poll



Which organic chemical compound stores energy and is used by some animals during the winter months?

Carbohydrate

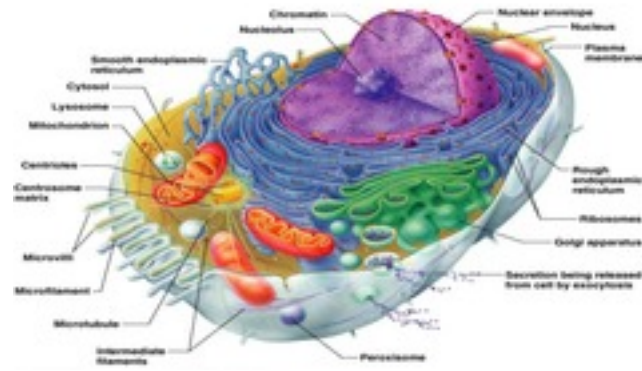
Protein

Lipid

Water

Poll

Structure of a Generalized Cell



What inorganic chemical compound is important for life to function as we know it?

Carbohydrate

Sulfur

Water

Lipid

Open Ended Question

Create a question that you think your classmates should be able to answer after this lesson. (Some of these may be shared!)