Vocabulary GAME

- **Student A and Student B**
- **One student will read a definition and the other student should guess what is the word for this definition .**
- **Each students has 2 definitions**
- **This words are base on the QUIZLET send for homework**

A, B, C, D Cards

A	B	C	D

In the Periodic Table elements are arranged in order of?

A. Atomic mass
B. Atomic number
C. Density
D. Boiling point

Neutral atoms of an element contain?

A. Equal numbers of protons and neutrons
B. Equal numbers of electrons and neutrons
C. Equal numbers of protons and electrons
D. Equal numbers of protons, neutrons and electrons

A vertical collection of elements in the Periodic Table are called?

A. Groups
B. Periods
C. Columns
D. Gases

A horizontal collection of elements in the Periodic Table are called?

A. Groups
B. Periods
C. Rows
D. Gases

In the Periodic Table gases occur?

A. On the left
B. On the left and middle
C. On the right and middle
D. On the right

In the Periodic Table metals occur?

A. On the left
B. On the left and middle
C. On the right and middle
D. On the Right

The Group 7 Elements are also called?

A. The halogens
B. The transition elements
C. The alkali metals
D. The noble gases

The Group 1 Elements are also called?

A. The halogens
B. The transition elements
C. The alkali metals
D. The noble gases

In the Periodic Table metals get more reactive going towards?

A. Top left
B. Top right
C. Bottom left
D. Bottom right

Which of these electron arrangements could be a noble gas?

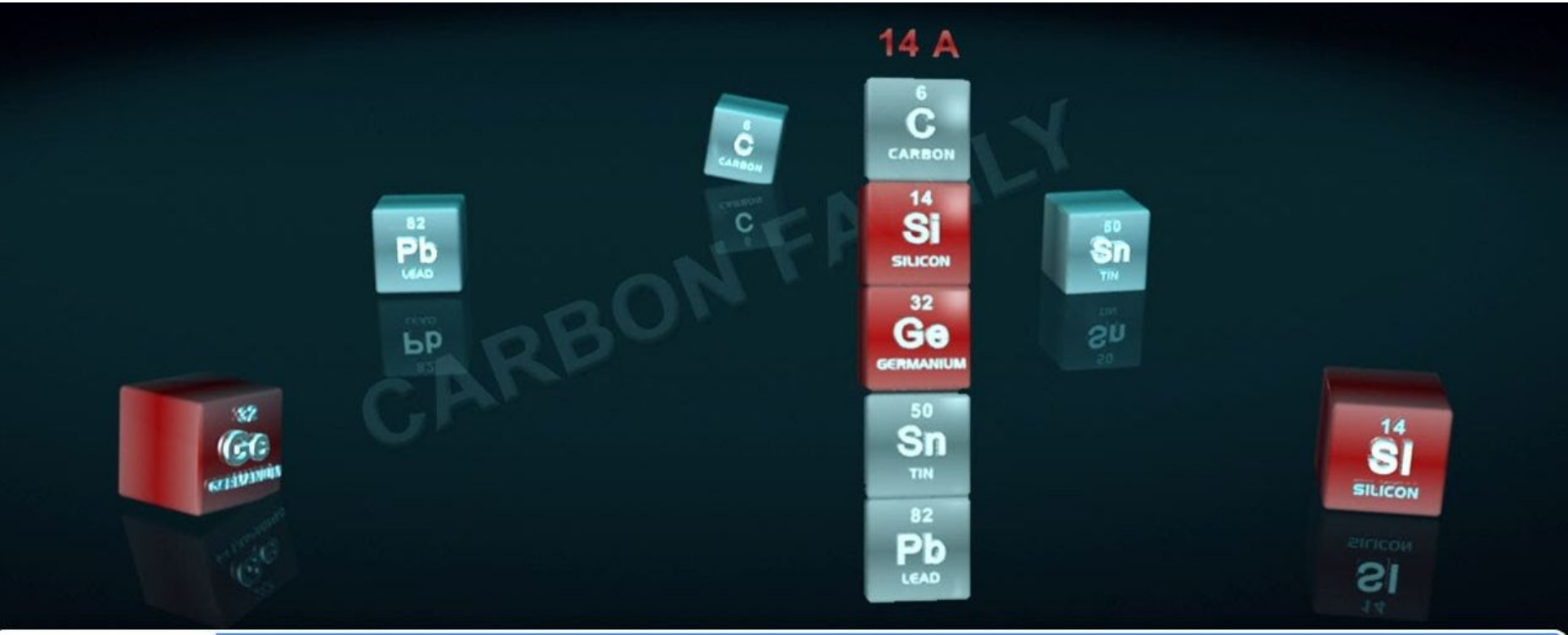
A. 2.1,
B. 2.5
C. 2.7
D. 2.8

Which of these electron arrangements could be a halogen?

A. 2.1,
B. 2.5
C. 2.7
D. 2.8

Topic: Group 14

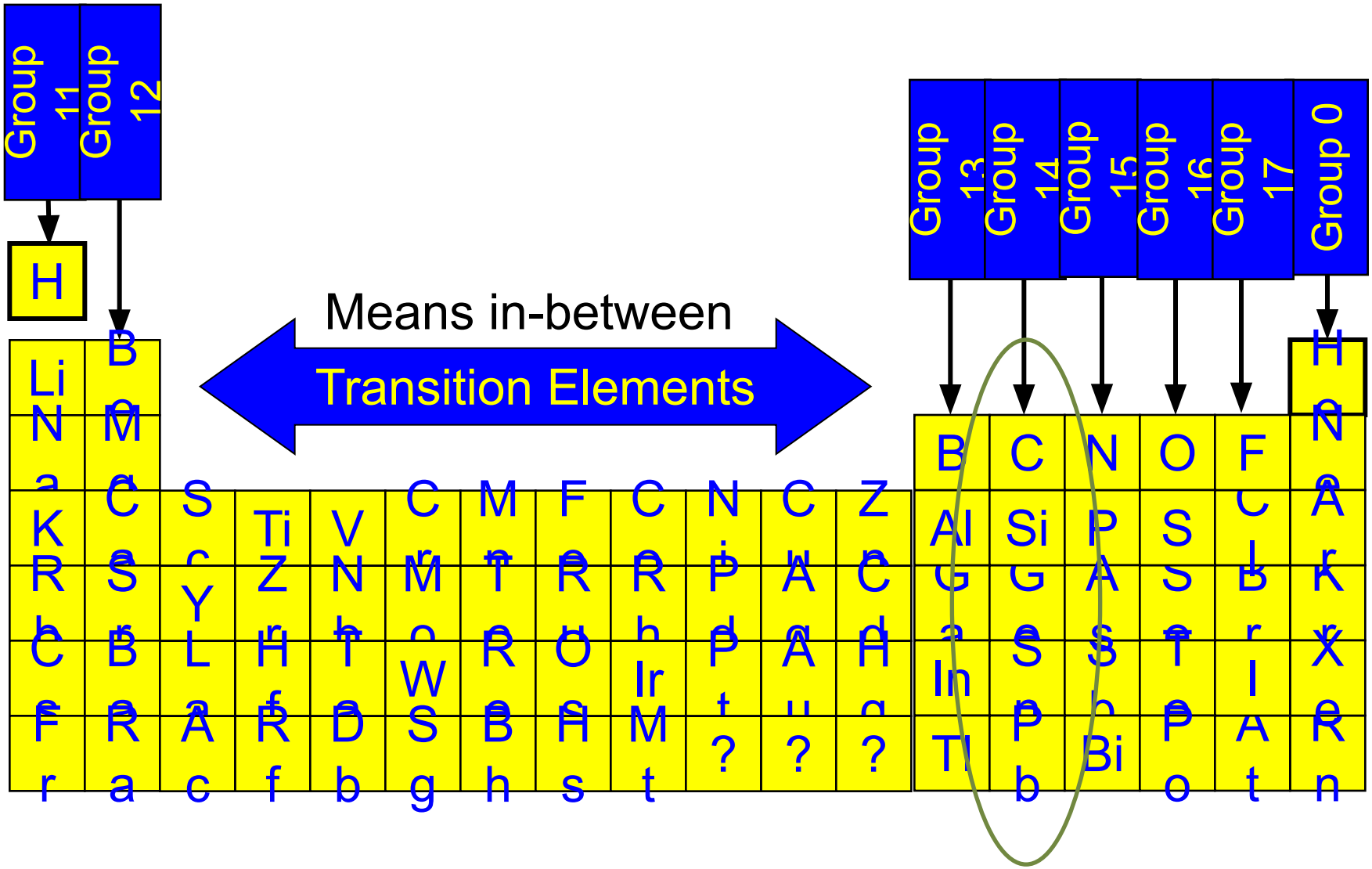
- Recognise trends in chemical and physical properties down the group
- Be able to explain the shapes of the molecules of compounds



CARBON FAMILY

Groups – columns of elements

Downward columns are called **groups.**



GROUP 14

☐---------- Carbon

☐ ---------- Silicon

☐---------- Germanium

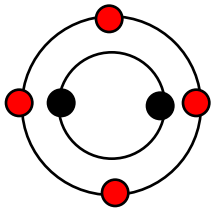
☐ ---------- Tin

☐ ---------- Lead

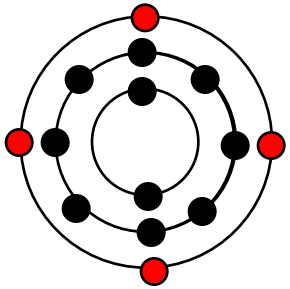
Group 14 Elements

The elements at the top of Group 4 are non-metals. They bond covalently, i.e. by sharing electrons with another atom.

4



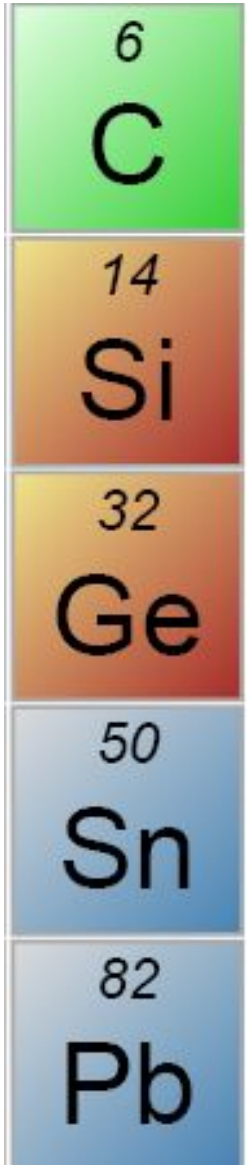
2,4



2,8,4

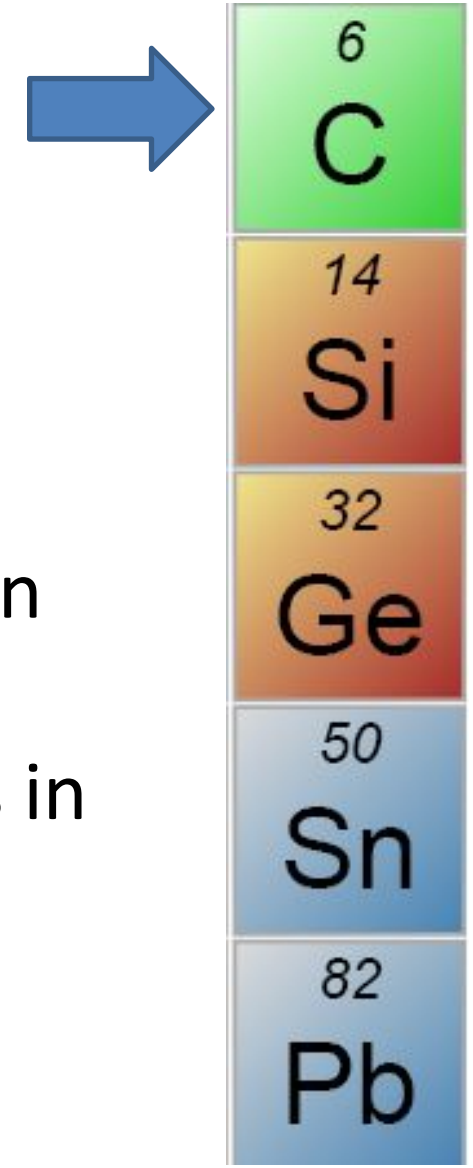
The Carbon Family

- Nonmetal (carbon)
- 2 metalloids (silicon and germanium)
- 2 metals (tin and lead)
- Each of these elements has four outermost electrons.
- Metallic nature of the elements increases from top to bottom.
- The elements have less in common physically and chemically than do the members of most other families of elements.



CARBON

- It has 6 electrons.
- Life on Earth would not exist without carbon.
- Except for water, most of the compounds in your body contain carbon.
- Reactions that occur in the cells in your body are controlled by carbon compounds!

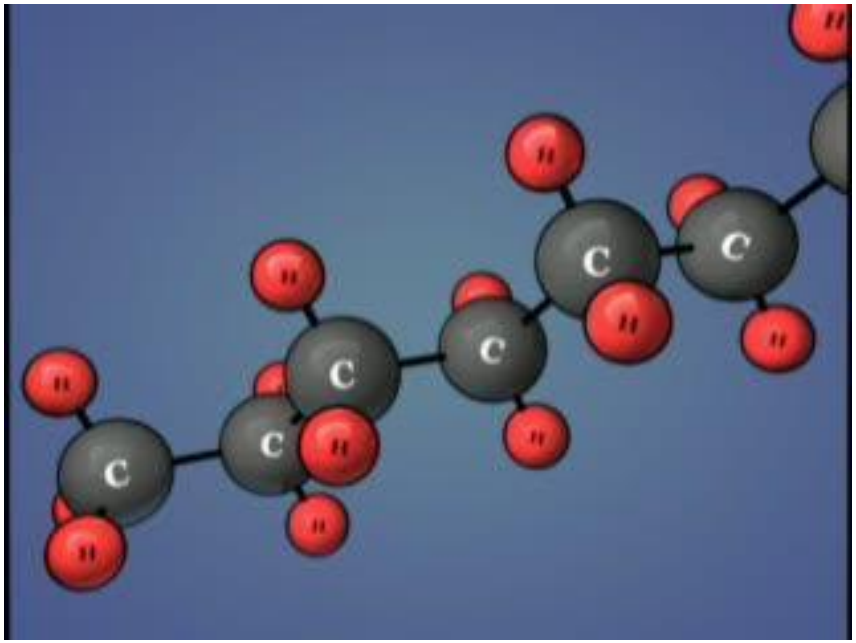


Example

http://www.youtube.com/watch?v=wmC8Dg4n-ZA&feature=channel

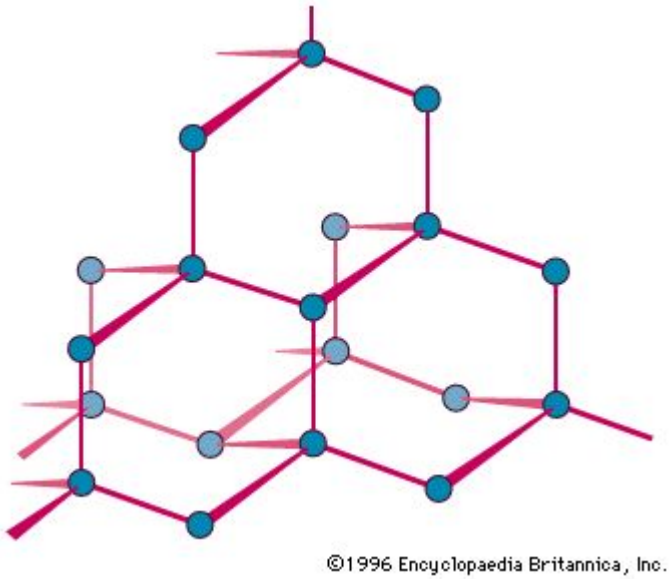
- Carbon powder

Carbon Compounds



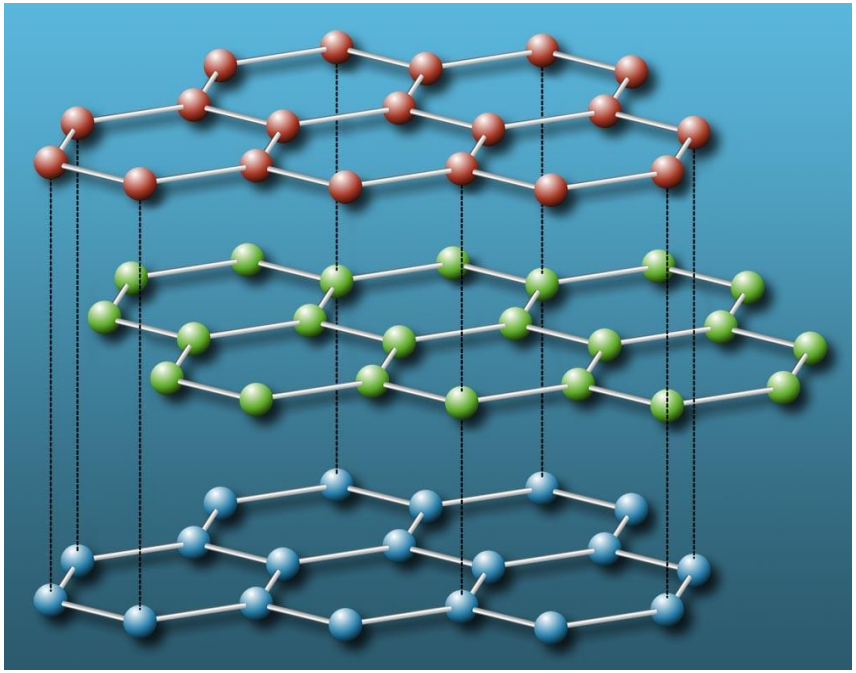
Diamond

- Carbons are bonded via sp^3 hybridization to 4 other carbon atoms forming a giant network covalent compound.



Graphite

- Carbon atoms are bonded via sp2 hybridization.
- Carbon atoms form sheets of six sided rings with p-orbitals perpendicular from plane of ring.

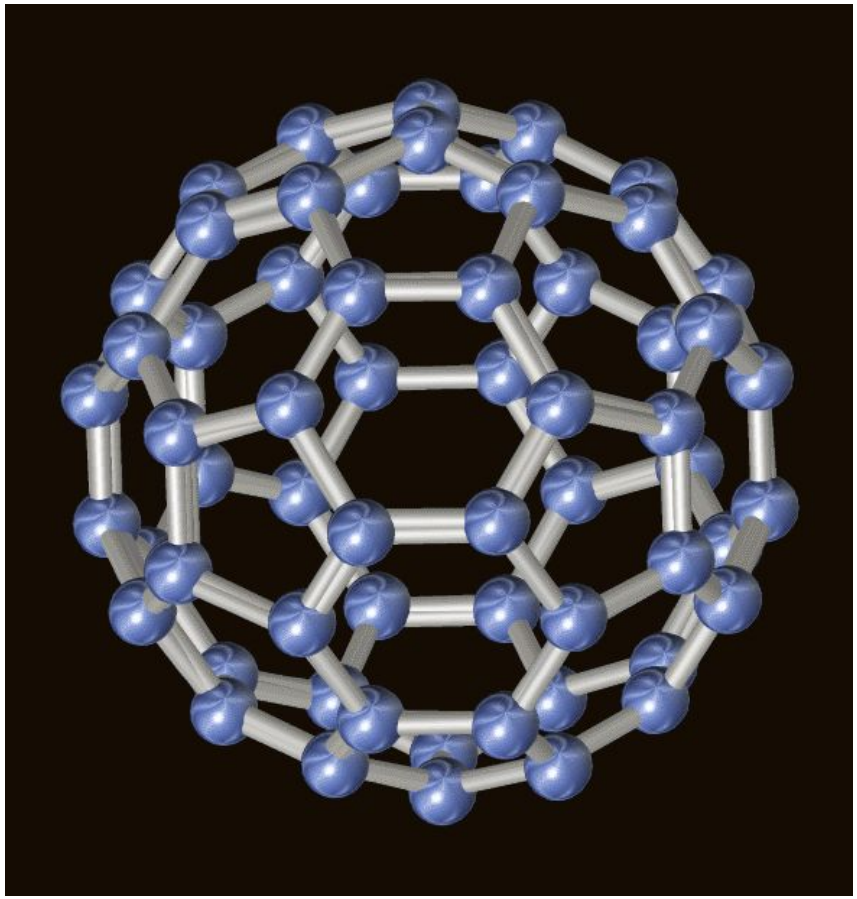


Fullerenes

- Buckyballs: spherical
- Nanotubes: tube shaped
- Both have very interesting properties
  - Super strong
  - Conduct electricity and heat with low resistance
  - Free radical scavenger

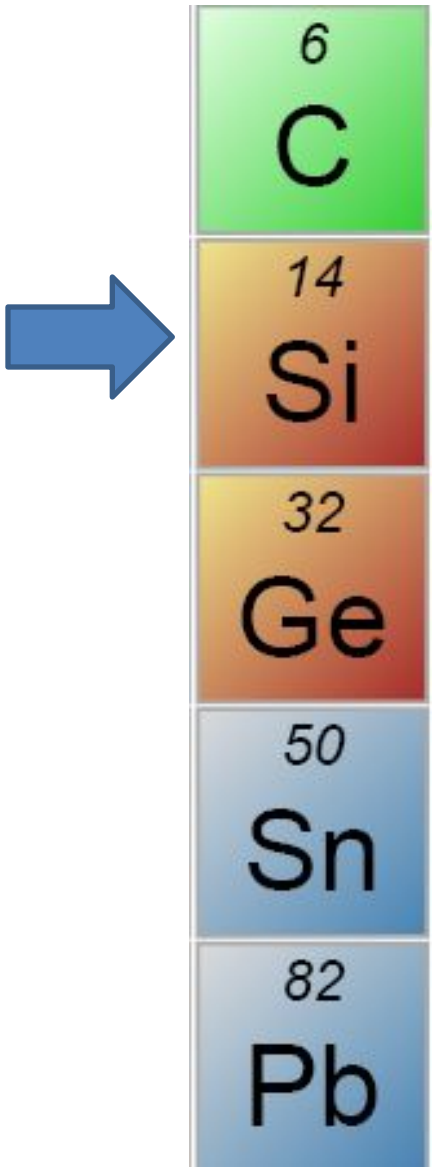
Buckyballs

- Carbon atoms bond in units of 60 atoms (C-60) forming a structure similar to a soccerball with interlocking six sided and five sided rings.
- sp^2 hybridization
- Extra p-orbitals form pi bonds resulting in
  - Electrical conductivity
  - Stronger covalent bonds, therefore stronger materials

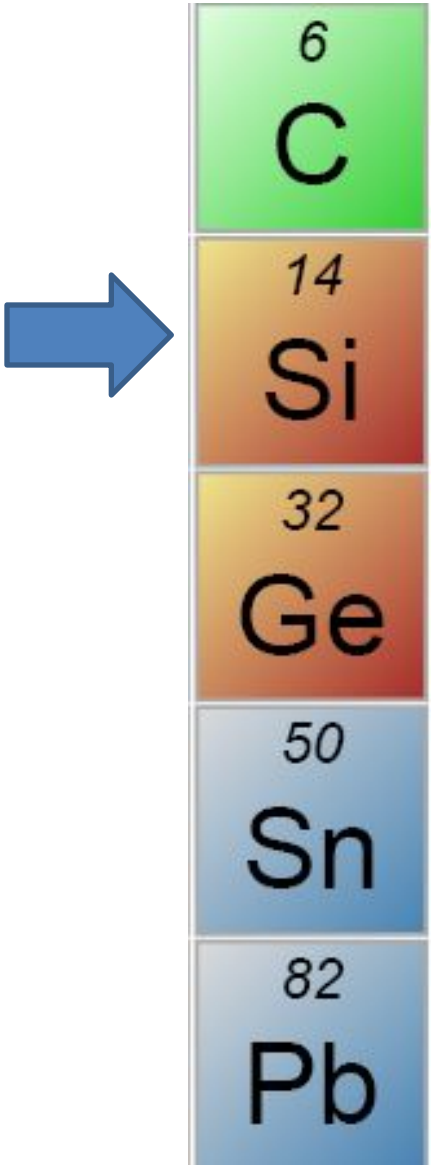


Silicon

- It has 14 electrons.
- The second most abundant element in Earth's crust.
- Silicon is found at silicon dioxide in quartz rocks, sand, and glass.



- Silicon is the eighth most common element in the universe by mass.
- Pure silicon is a dark gray solid with the same crystalline structure as diamond. Its chemical and physical properties are similar to this material.



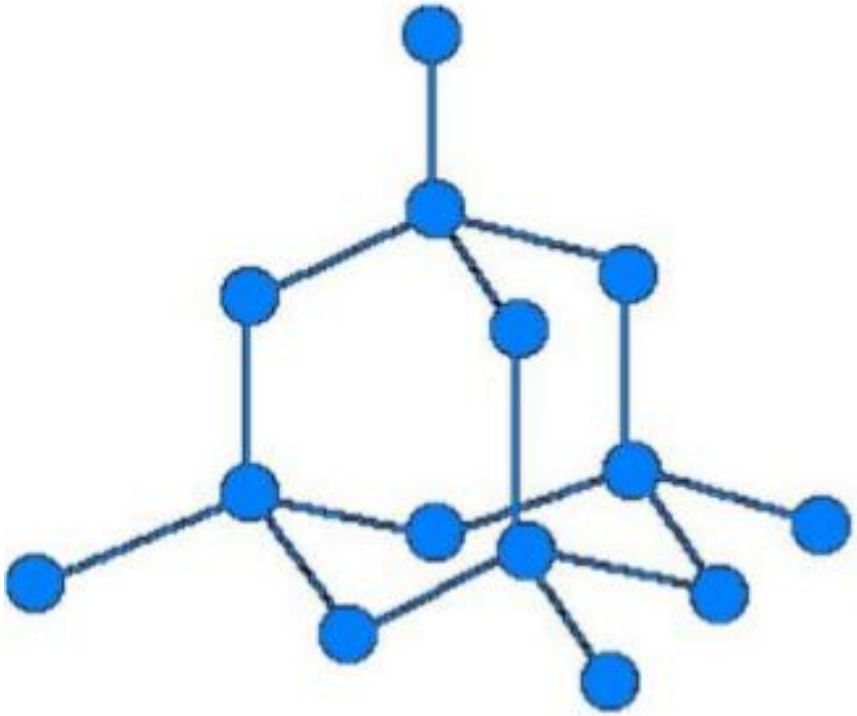
Example

http://www.youtube.com/watch?v=a2aWO5cL410

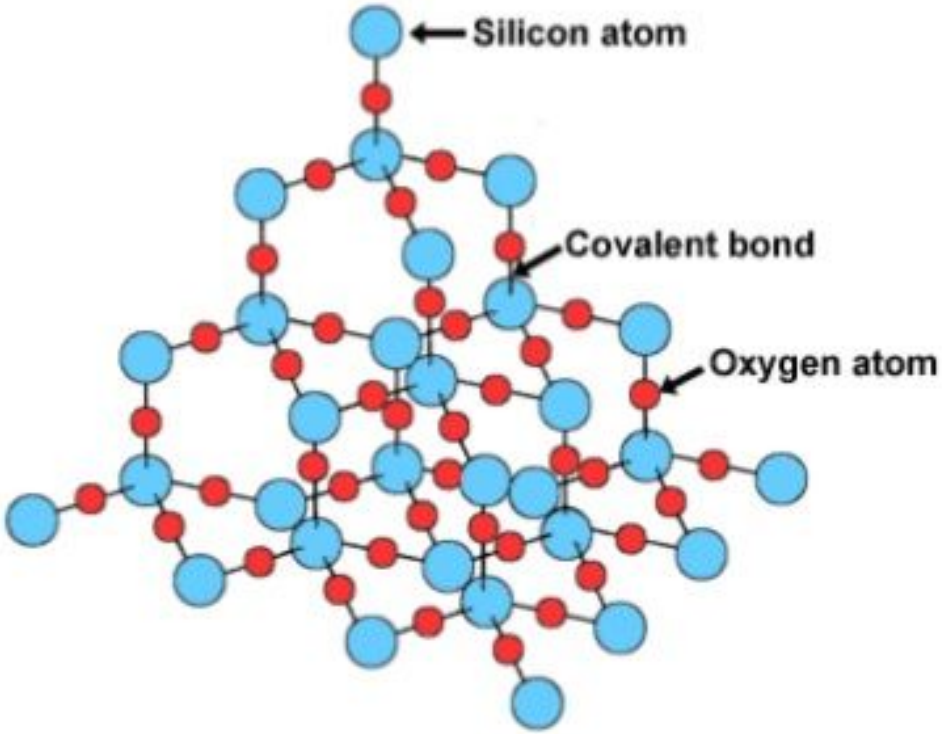
more on macromolecules

Pure silicon and silicon dioxide (quartz) have similar structures to diamond.

Silicon

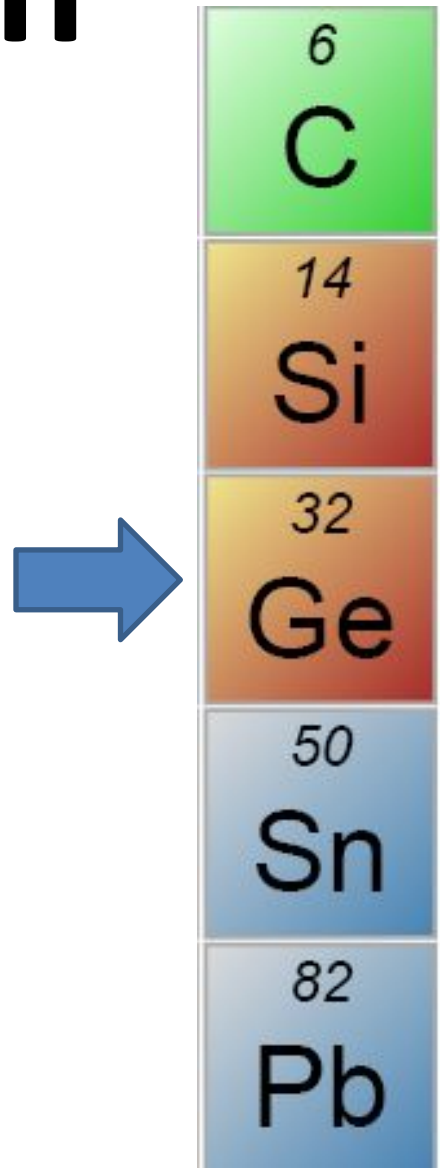


Silicon Dioxide

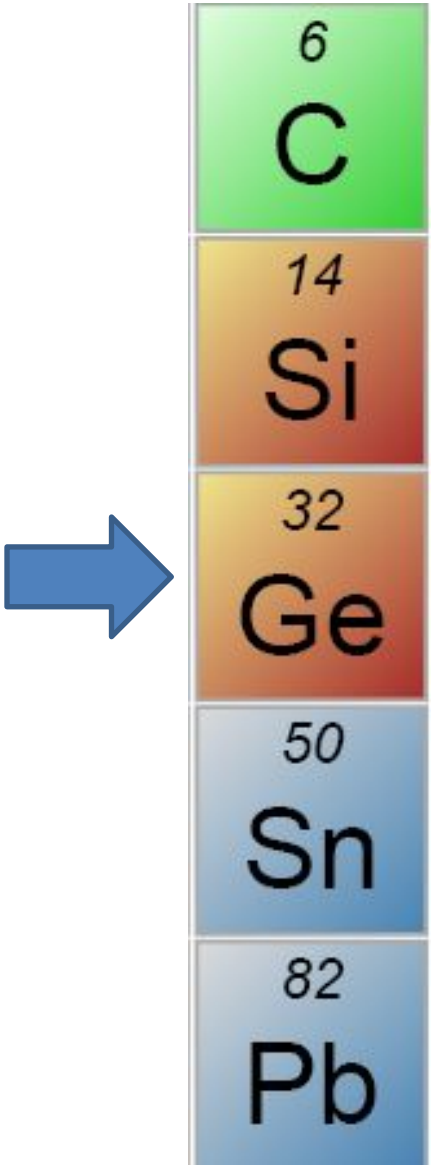


Germanium

- It has 32 electrons.
- It is a shiny, hard, grayish-white metalloid in the carbon group.
- It is found in soil and plants.



- When it reacts with another substance, it loses one of the 4 electrons in its outmost shell, which leaves an empty space known as a positive hole.
- The positive hole creates a kind of a positive-charge "trap" that invites another electron to fill it.



Example

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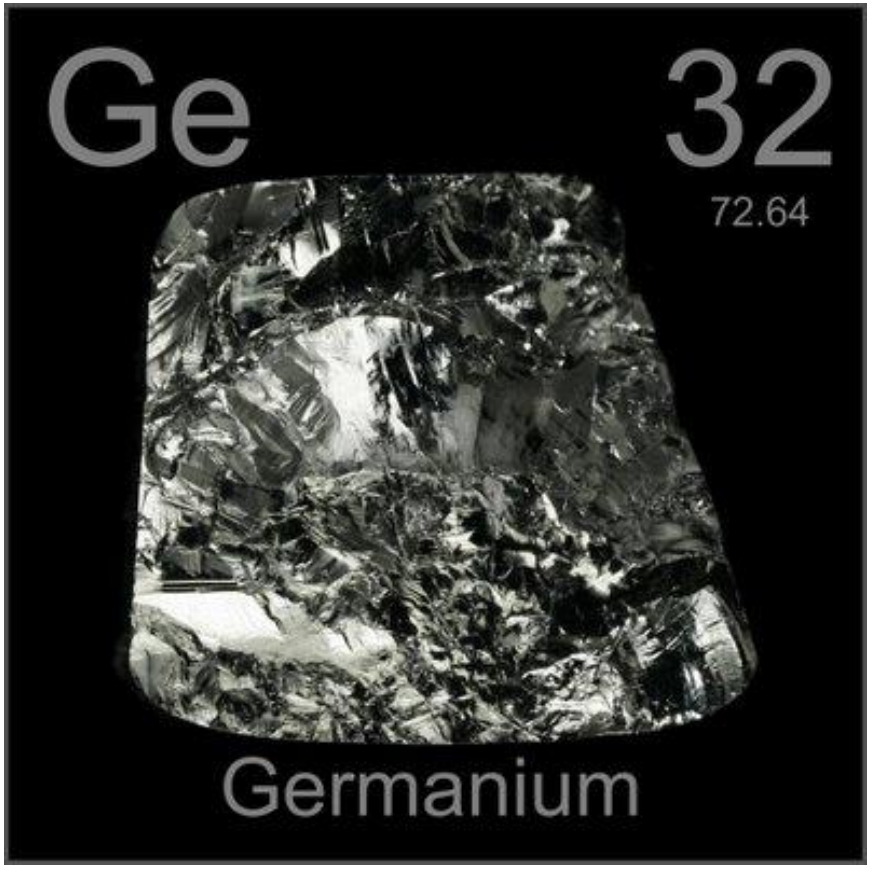
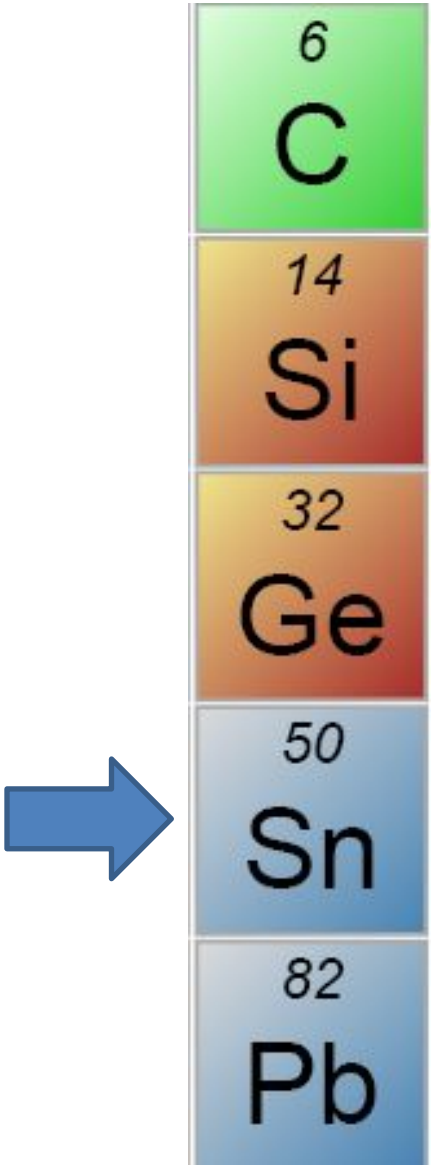
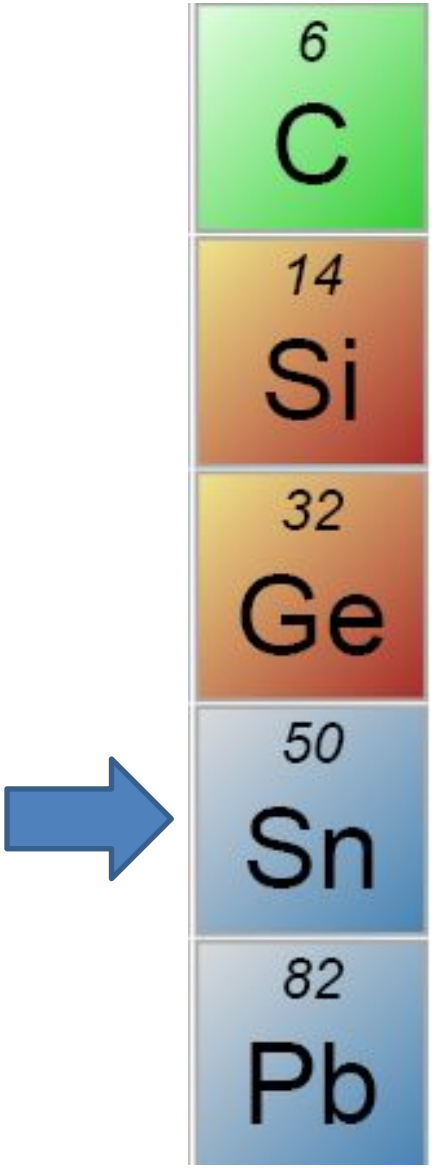


Tin

- It has 50 electrons.
- Tin shows chemical similarity to both neighboring elements, germanium and lead.
- Tin is a soft, flexible, silvery-white metal.
- Tin is mainly applied in various organic substances.



- The organic tin bonds are the most dangerous forms of tin for humans.
- Organic tins can spread through the water systems when adsorbed on sludge particles.
- They are known to cause a great deal of harm to aquatic ecosystems, as they are very toxic to fungi and algae.



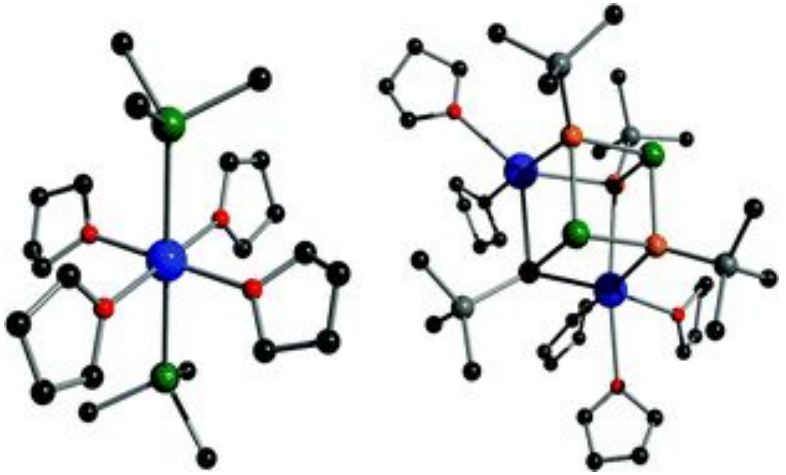
Example

http://www.youtube.com/watch?v=KJIUuO1b1fQ

http://www.youtube.com/watch?v=qEwCPJOP0Mg

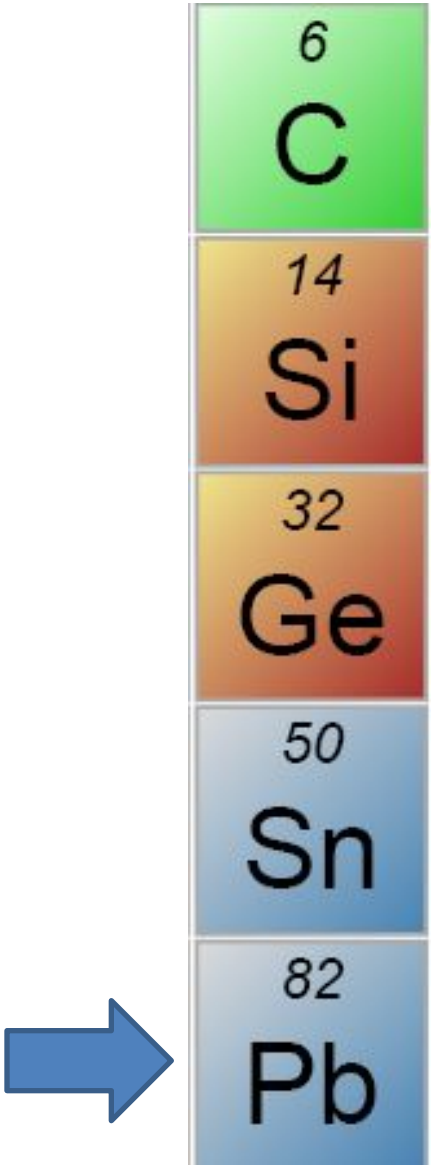
Tin Metal

Tin bonds

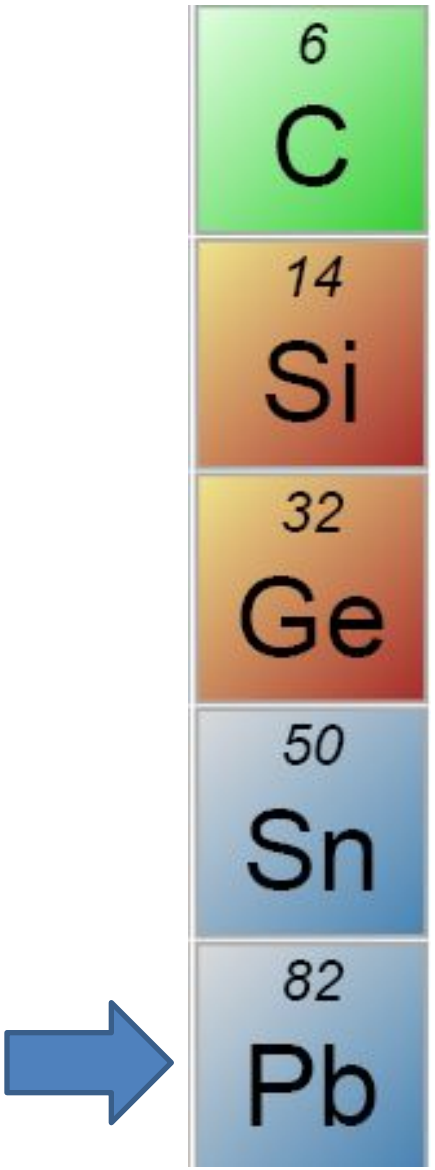


Lead

- It has 82 electrons.
- Lead has long been recognized as a harmful environmental poison.
- Lead is a soft, malleable poor metal.
- It is also counted as one of the heavy metals.



- Lead is a poisonous substance to animals. It damages the nervous system and causes brain disorders.
- Lead poisoning has been recognized from ancient Rome, ancient Greece, and ancient China.



Example

http://www.youtube.com/watch?v=nK8VZ3Aqwpo&feature=related

- Pure lead

Lead poisoning in KZ

> “It was a real smog ... Black smoke. I didn’t understand. My throat started to sting. I quickly went home and closed all the windows.”
>
> Local resident

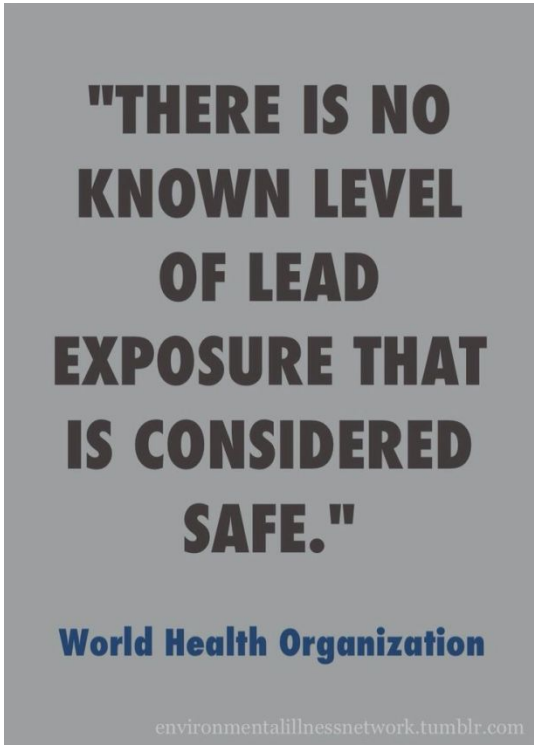
In 2010, local families switched on their TV sets and learned that the dilapidated plant was to re-open.
A company called Kazakhmys, the country's largest copper producer of Lead.

Announced at a ceremony in Shymkent to mark the start of the project that it would be running the operation.

The decision was taken that Kazakhmys will itself take on the operational and financial management of the lead smelter in order to avoid losses and make the maximum possible profit, Kazakhmys executive director of metallurgy, Yerzhan Ospanov, told a local TV crew.

Lead poisoning in KZ

There is no acceptable level for lead in the body, according to the World Health Organisation.



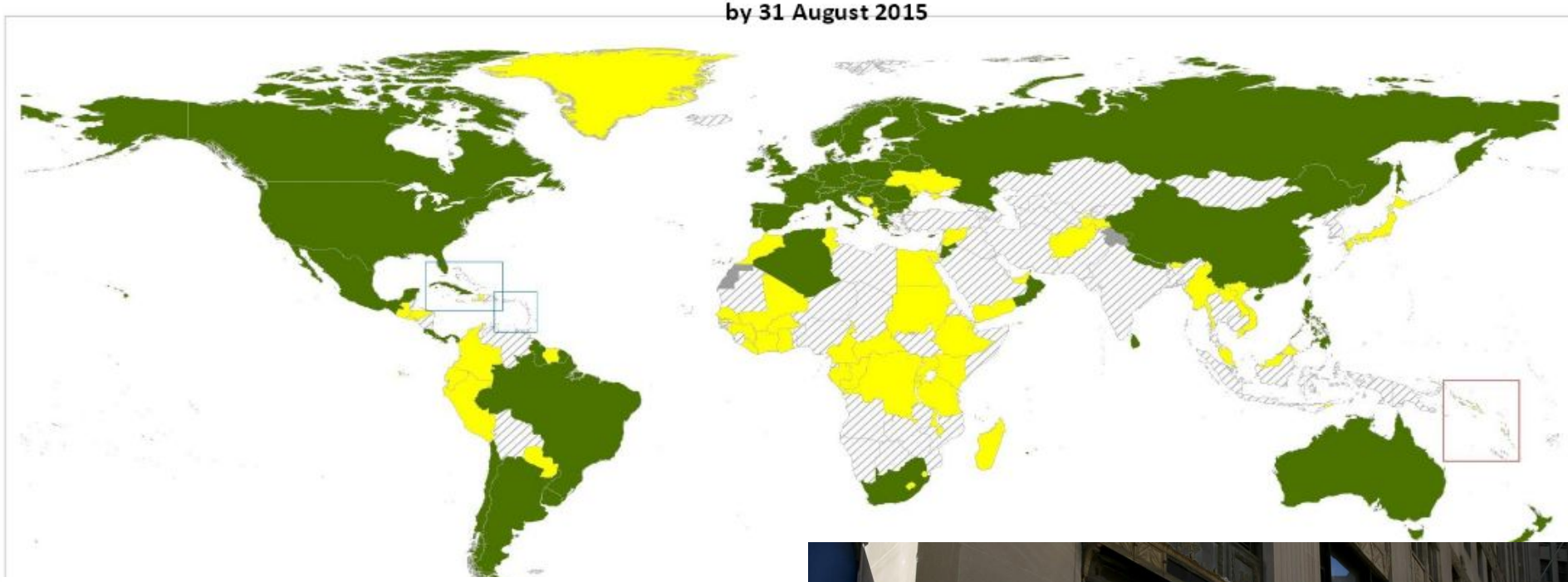
Lead paint or **lead-based paint** is paint containing lead. As pigment, lead(II) chromate ($PbCrO_4$, "chrome yellow"), Lead(II,IV) oxide, (Pb_3O_4, "red lead"), and lead(II) carbonate ($PbCO_3$, "white lead") are the most common forms.

Lead is added to paint to speed up drying, increase durability, maintain a fresh appearance, and resist moisture that causes corrosion.

https://www.youtube.com/watch?v=kDUB_xQkbaU

Lead in Paints

Figure 1: Countries that have in place legally-binding controls on lead in paint – based on information received from governments by 31 August 2015



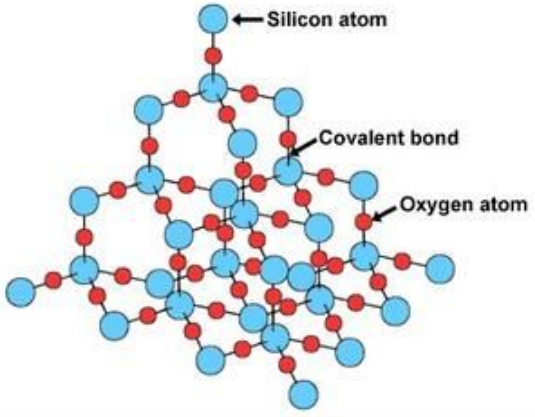
https://www.youtube.com/watch?v=br1acRXJfoY

Silicon carbide

- It is a compound of silicon and carbon.
- It is extremely hard.

The structures of carbon dioxide and silicon dioxide

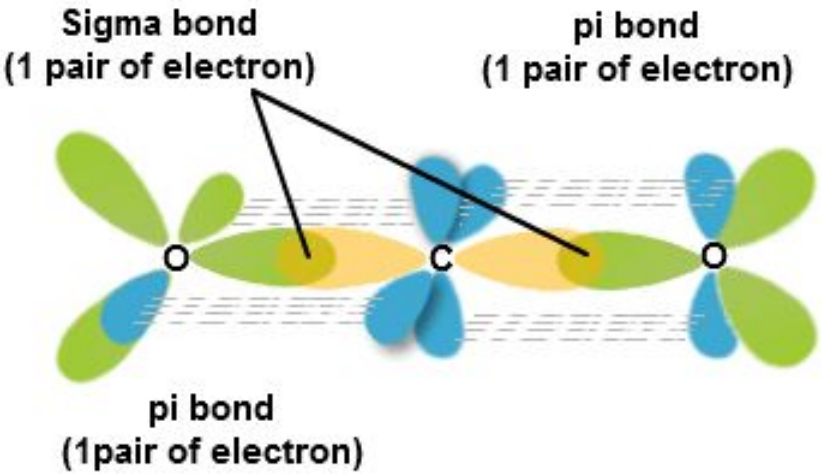
- There is an enormous difference between the physical properties of carbon dioxide and silicon dioxide (also known as silicon(IV) oxide or silica). Carbon dioxide is a gas whereas silicon dioxide is a hard high-melting solid. The other dioxides in Group 4 are also solids.



- This obvi s a diffe e between carbon dioxide and the dioxides of the rest of the Group.

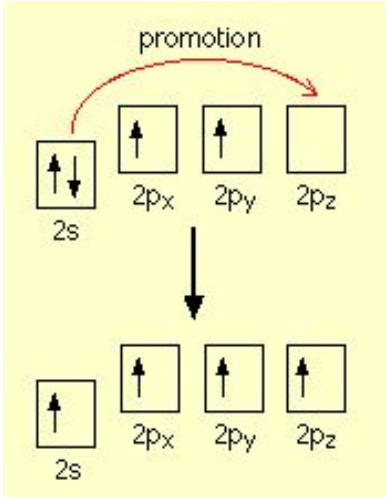
The structure of carbon dioxide

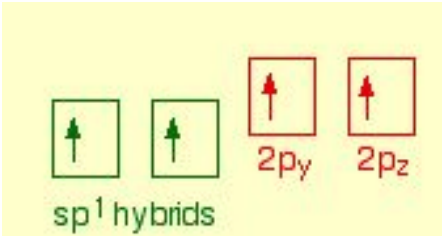
- The fact that carbon dioxide is a gas means that it must consist of simple molecules. Carbon can form simple molecules with oxygen because it can form double bonds with the oxygen.

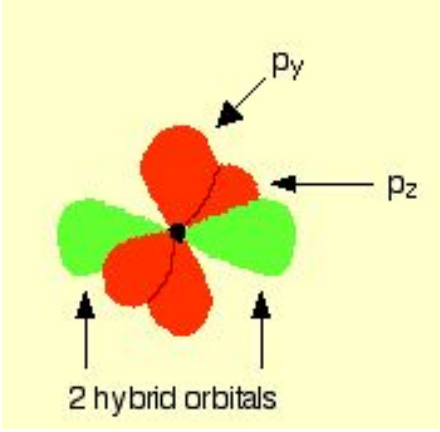


- None of the other elements in Group 4 form double bonds with oxygen, and so that forces completely different structures on them.

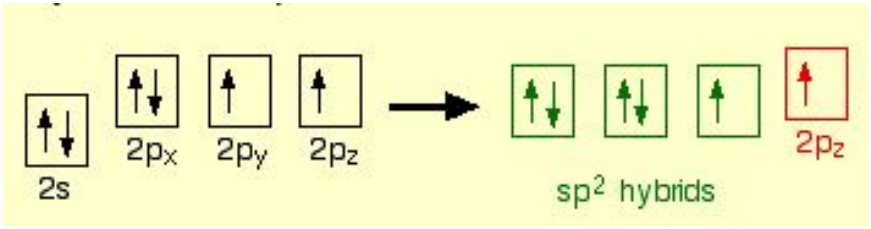
Carbon

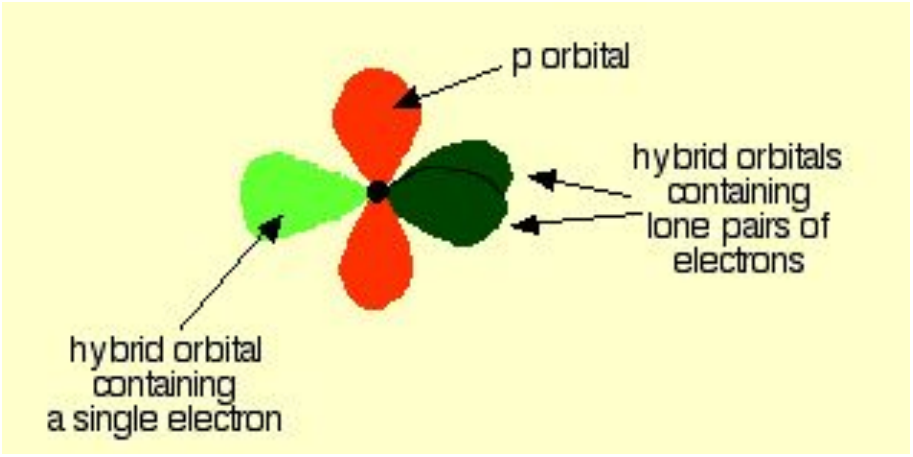


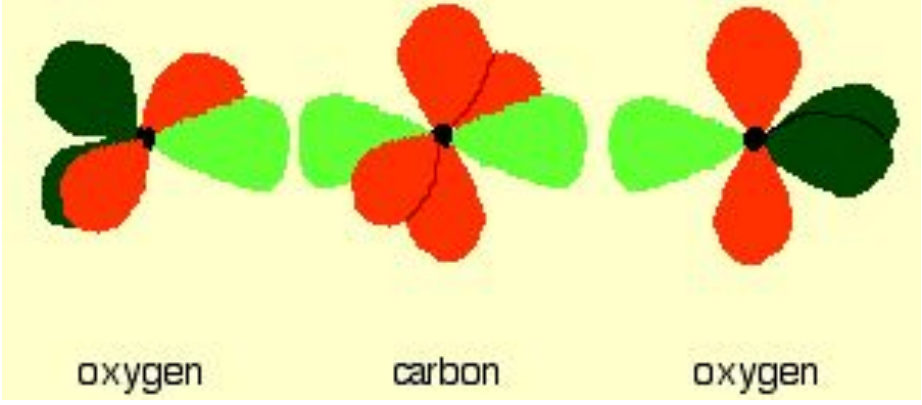


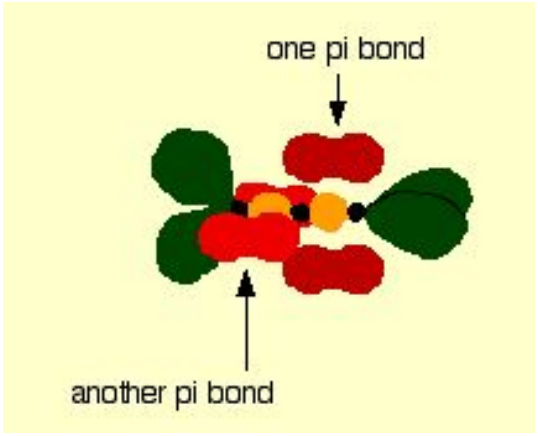


Oxygen









The structure of silicon dioxide

Silicon doesn't double bond with oxygen.

Silicon atoms are bigger than carbon. That means that silicon-oxygen bonds will be longer than carbon-oxygen bonds.

This is based on a diamond structure with each of the silicon atoms being bridged to its other four neighbours via an oxygen atom .

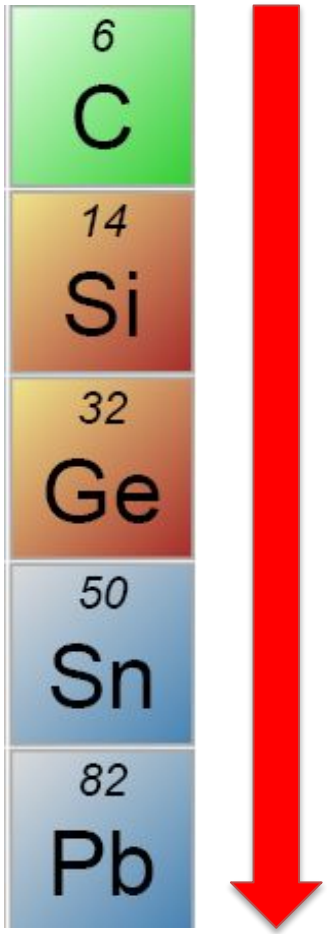
This means that silicon dioxide is a giant covalent structure. The strong bonds in three dimensions make it a hard, high melting point solid.

The acid-base behaviour of the Group 4 oxides

- The oxides of the elements at the top of Group 4 are acidic, but acidity of the oxides falls as you go down the Group.

- An oxide which can show both acidic and basic properties is said to be ***amphoteric***.

- The trend is therefore from acidic oxides at the top of the Group towards amphoteric ones at the bottom.



Towards the bottom of the Group, the oxides become more basic - although without ever losing their acidic character completely.

PROPERTIES GROUP 14

Elements	Conductivity	Explanation
C diamond graphite	poor good	- no free electrons - all used for bonding. - one electron per carbon is not used for bonding and joins delocalised cloud.
Si	semiconductor	
Ge	semiconductor	
Sn	good	metallic bonding - delocalised electron cloud
Pb	good	metallic bonding - delocalised electron cloud

Group work / Stations

1.Each group will make poster fc
a station .

2. Then all the station will be glu
around the class room.

3. Each student will answer the
questions individually in the wor
sheet with the help of the
stations made by each group.

How Well Did I do Today, _____?

By _____

Did I focus and get my work done?  (responsible)	☺	😐	☹
Did I cooperate with the teacher and others?  (respectful)	☺	😐	☹