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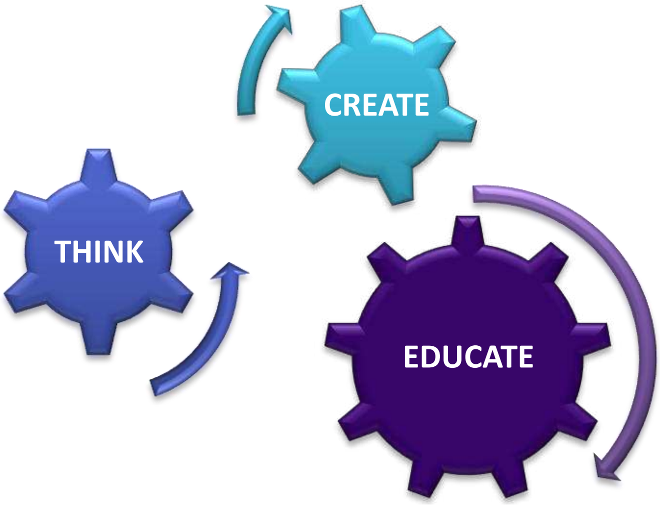
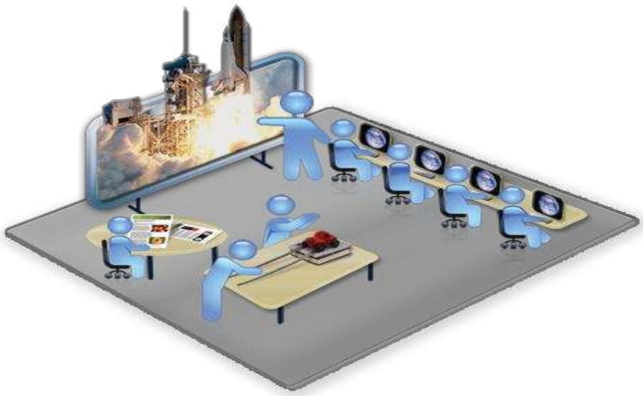


UNIT WISE SAMPLE OF SUGGESTIVE ACTIVITIES
CLASS XI CHEMISTRY



Venue

शिक्षा एवं प्रशिक्षण आंचलिक संस्थान , चंडीगढ़

Zonal Institute of Education & Training , Chandigarh

UNIT 1: SOME BASIC CONCEPTS OF CHEMISTRY [Periods allotted = 14]

“Anything worth measuring is worth measuring well.”

Key Concepts

I. SI Base units & Scientific Notations

II. Laws of Chemical Combination

III. Classification of Substances

IV. Mole Concept

V. Concentration Terms

VI. Balancing Chemical Equations

Aims & Objectives

The students will be able to :

- grasp the significant point of references for basic chemistry.
- describe the importance of scientific measurements to the study of chemistry.
- differentiate between base and derived units of measurement.
- know how can different kinds of matter be classified to help scientists learn about their properties.
- know how are compounds, elements, mixtures, and pure substances related to each other.
- explain the characteristics of three states of matter.
- verify the practical applications of Laws of Chemical Combinations.
- Understand that Mole is a quantity as well as a number.
- conceptualize the number of particles (atoms , ions & molecules) in relation to the atomic mass , formula unit weight & molar mass)
- do mass- mol & mass – volume conversions.
- know about different concentration terms viz: Molality & Molarity .

Essential Question

- Why is it important to have internationally standardized & recognized units ?
- In what different ways chemical reactions follow Laws of chemical combination ?
- How “Avogadro’s Number” facilitated to solve the problem of finding absolute masses of the atoms?

Procedure Methodology - Suggestive Activities :

C.1 SI Base units & Scientific Notations

- Viewpoints of students on the importance of scientific measurements to the study of chemistry.

- Group wise discussion on Chemistry as a subject and as a central science discipline.
- Drafting handouts on comparison between base and derived units of measurement using specific physical quantities.
- Exercise flash cards –

  Sample 1. – Fill in the Blanks

S I BASE UNITS		
Quantity	Name	Symbol
Length		m
Mass	kilogram	
Time	second	s
	kelvin	K
Amount of Substance	Mole	
S I DERIVED UNITS		
Derived Quantity	Name	Symbol
Area		m^2
Volume	cubic meter	
	meter per second	ms^{-1}
acceleration	meter per second square	
Wave number		m^{-1}

Sample 2 SIGNIFICANT FIGURES Work Sheet
– Fill in the Blanks

i) All non-zero digits are _____________

ii) Zeros _________________ the first non-zero digit are not significant

iii) Zeros between two ______________ digits are significant.

iv) Zeros at the _______________ of the number are significant provided they are on the right side of the decimal point. But, if otherwise, the zeros are not significant.

v) An electron's mass in scientific notation is written as 9.1093822 x _____ kg.

- Let the students watch Significant Figures Game

2 Significant Figures Game .ppsx

C.2 Laws of Chemical Combination

- Guiding Steps for Problems

Conservation of Mass
$\text{Mass}_{\text{Reactants}} = \text{Mass}_{\text{Products}}$

- Demonstration by students on Law of conservation of mass

Melting Ice – Activity :

- Place a glass measuring cup of water, with a chunk of ice floating in it.
- Point out the fact that most of the ice sits under the water, and only a small amount sticks up, above the surface.
- Ask the students, what they thought was going to happen to the level of water, in the bowl, as the ice melted.
  Would the water level rise, stay the same, or go down ?
  They all will guess the water level would rise.
- Wait & watch
- After the ice melts completely , students can verify the Law of Conservation of Mass.
- An interactive study : Laws of conservation of mass & definite proportions "Dalton's Play House"

http://www.visionlearning.com/en/library/Chemistry/1/Early-Ideas-about-Matter/49

Activity on Law of constant composition

- Investigative activity :

Apparatus

0.1 M silver nitrate
0.1 M sodium chloride
0.1 M lead nitrate
0.1 M sodium iodide
0.1 M iron (III) chloride
0.1 M sodium hydroxide
9 large test tubes & 3 pipettes

Reactions to be performed

- *Reaction 1:* Prepare three test tubes with 5 ml, 10 ml and 15 ml of silver nitrate respectively. Using a clean pipette add 5 ml of sodium chloride to each one and observe what happens.
- *Reaction 2:* Prepare three test tubes with 5 ml, 10 ml and 15 ml of lead nitrate respectively. Using a clean pipette add 5 ml of sodium iodide to each one and observe what happens. Write a balanced equation for this reaction.
- *Reaction 3:* Prepare three test tubes with 5 ml, 10 ml and 15 ml of sodium hydroxide respectively. Add 5 ml of iron(III) chloride to each one and observe what happens.

Observation & Conclusion

Regardless of the amount of reactants added, the same products, with the same compositions, are formed (i.e. the precipitate observed in the reactions). However, if the reactants are not added in the correct ratios, there will be un reacted reactants that will remain in the final solution, together with the products formed.

C.3 Classification of Substances

- ICE BREAKING ACTIVITY : Collection of sample of substances used in day to day life & classifying these using the hand outs i)

Matter
Everything that has mass and occupies space
Three states: a solid, a liquid, or a gas.

- **Mixtures**
  Substances which have been combined such that each substance retains its own chemical identity.
  May be separated into pure substances
- **Pure Substances**
  The same composition throughout
  Composition stays constant during a change of phase (going from a solid to a liquid to a gas or vice-versa)

ii)

MIXTURES

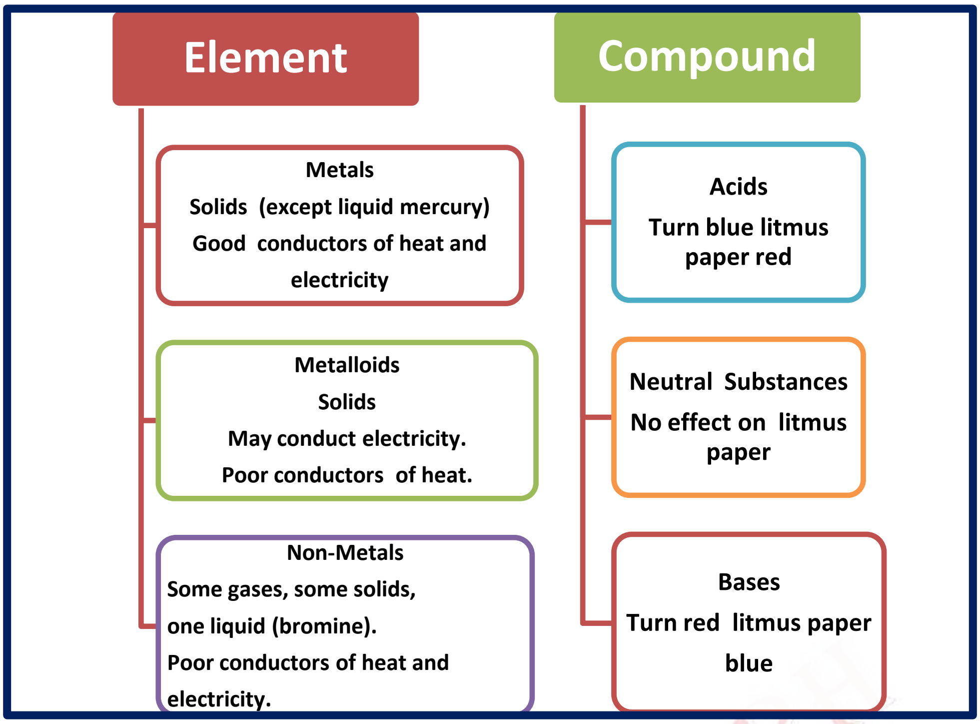
- **Homogeneous Mixtures**
  The same composition throughout.
  Components are indistinguishable.
  Composition can be varied.
  Homogeneous mixtures are solutions.
- **Heterogeneous Mixtures**
  Not the same composition throughout.
  Components are distinguishable.
  Composition can be varied.

iii)

PURE SUBSTANCE

- **Elements**
  There are 88 naturally occurring elements. There are 118 current elements in the periodic table.
- **Compounds**
  Contain two or more elements combined in definite proportions

iv)



- This activity will make learners able to classify matter as a Pure Substance or as a Mixture. If they classify the substance as a pure substance and mixture, they can further able to classify the substance as a Homogeneous mixture or a Heterogeneous mixture.

Materials: Ten vials of matter each containing ONLY:

1. Cupric Acetate
2. Cupric Acetate & Water (& H_2O)
3. Distilled Water (H_2O)
4. Glucose ($C_6H_{12}O_6$)
5. Glucose & Water ($C_6H_{12}O_6$ & H_2O)
6. Gravel & Water (Gravel & H_2O)
7. Gravel & Zinc (Gravel & Zn)
8. Salt (NaCl)
9. Salt & Water (NaCl & H_2O)
10. Starch & Water ($(C_6H_{11}O_5)_n$ & H_2O)

Procedure:

1: Obtain one of the 10 vials listed above.

2: Look at the vial closely, read its contents, and decide whether the vial contains a Pure Substance or a Mixture.

3: Dependent on your answer to (2) above, decide whether the contents fall into one of the following three categories: Element / Compound, Homogeneous mixture or a Heterogeneous mixture.

4: Create a table similar to the one shown below to summarize your results for all ten vials. Include a column to give a reason for your placement of the contents of each vial. Give your table a title.

5: Repeat steps 1 to 3 for all 10 vials.

VIAL NUMBER	Qualitative Observations (Colour , State etc.)	Pure Substance OR Mixture	Element / Compound OR Homogeneous Mixture OR Heterogeneous Mixture	Reason for Classification

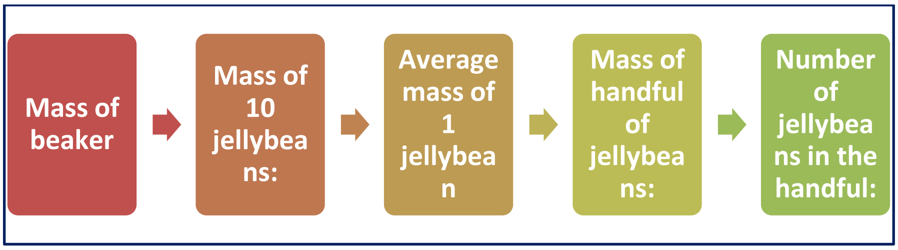
C.4 Mole Concept

- The mole is a common misconception that students seem to have when it is first introduced so this activity has been designed for students to grasp a solid understanding about what it is.
  - Having a hands on activity where students can physically weigh out there "particles" and using math to figure out their "unknown samples" aid helps students grasp this concept.
  - Having student first design their own 'new unit of measurement' and do sample problems in relation to it will help that understand that the mole is the exact same thing, just much larger.
  - Students can do this in pairs or they can do it on their own. It is a simple enough task that they could carry out on their own.

- **Activity :** Counting particles by mass and converting to Moles.

  Materials : Jelly beans , Beaker , Mole worksheets , Balance

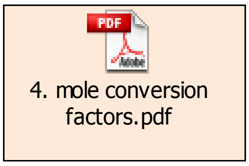
  - Weigh a clean, dry beaker on the balance and record the mass of the balance in the flowchart below
  - Count out 10 jellybeans and place them in the beaker and weigh them. Record the mass of the jellybeans in the flowchart
  - Calculate the average mass of **one** jellybean and record in the flowchart
  - Take a random handful of jellybeans without counting them out and weigh and record the mass
  - Using the average mass of one, calculate how many jellybeans you had in your handful
  - Now count your jellybeans and see if your calculations match.



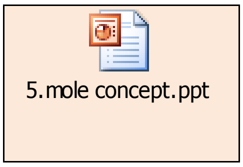
- Make them repeat this activity with different samples like candies
- Let them have 12 jelly beans / candies in their hand & they will immediately identify the unit as Dozen & know that it is the unit of measurement of *anything* that contains 12 items.
- In chemistry there is a unit of measurement call the ***mole***. A mole is the unit of measurement of *anything* that contains 6.02 x 10^{23} items (602,000,000,000,000,000,000,000 items). This number is known as ***Avogadro's number***.

- Mole Exercises

- Mole Conversion Factors Handout



- Mole Concept Power Point Presentation



- Survey Activity : To analyze processes in the home, the workplace, and the environmental sector that use chemical quantities and calculations, and assess the importance of quantitative accuracy in industrial chemical processes.
- Celebration of National Mole Day. It is recognized every year on October 23rd from 6:02 a.m. to 6:02 p.m. to commemorate Amedeo Avogadro's number (6.02 X 10^23), which is an international measuring unit in chemistry .

C.5 Concentration Terms

➢ **Student activity** : Concept of concentration & dilution

In this activity they will make two different salt solutions. If you do not have a balance to obtain the mass of salt that you use, use the data that 1 teaspoon of salt weighs 4.5 grams.

Part 1: Make solutions

Make three solutions of salt and water as follows:

Solution 1:

Measure the mass of one teaspoon of salt

Put 250 ml of distilled water into a beaker or a glass

Add the salt to water in the beaker and stir until the salt dissolves.

Solution 2:

Measure the mass of a half a teaspoon of salt

Put 250 ml of distilled water into a beaker or a glass

Add the salt to the water in the beaker and stir until the salt dissolves

Solution 3:

Measure the mass of a half a teaspoon of of salt

Put 125 ml of distilled water into a beaker or a glass

Add the salt to the water in the beaker and stir until the salt dissolves

Part 2: Analysis

1. Write a statement describing the strengths of these solutions using the terms dilute and/or concentrated.
2. Calculate the concentration of each solution in grams/l.

➢ Handouts on Molarity , Molality & Mole fraction formulas.

➢ Worksheets on Practice problem.

➢ Activity on Limiting Reagent

Demo: Introduction to Limiting Reagent

Purpose: This simple demo will introduce students to the idea that one of the reactants is usually in short supply, so is the "limiting reagent" for a particular chemical reaction. The two different scenarios in the demo help students understand that the same reactant is not always the "limiting reagent". You need to consider the ratio of reactants before deciding which one is the limiting factor.

Materials:

-candle

-matches

-large glass beaker or jar

Safety Issues:

-ensure quick access to a fire extinguisher

-tie hair back with an elastic and tuck in loose clothing

-make sure match is completely out before disposing in garbage can!

Directions:

- Set up candle, matches, and large beaker on workbench.
- Ask students if they can recall what limiting and excess reagents are.

Scenario 1

Light candle and place on workbench with open access to the room. Discuss a potential chemical equation for the combustion reaction of the candle with oxygen in the air (can provide chemical equation for wax, but students should be aware that oxygen is a reactant and that carbon dioxide and water are produced- as an extension, can have students balance this equation).

[Write on board]

$C_{25}H_{52}$ (Wax) + $O_2 \rightarrow CO_2 + H_2O$

Balanced equation:

$C_{25}H_{52} + 38\ O_2 \rightarrow 25\ CO_2 + 26\ H_2O$

Ask students if this reaction will continue forever, or if one of the reactants will run out (candle will run out). Since the candle gets used up first and there is plenty of oxygen left in the atmosphere (we can still breathe!), the candle is the "limiting reagent".

Scenario 2

Pose scenario of covering candle with large beaker. How does this change the amount of reactants available to undergo combustion? (Oxygen supply is now limited). Ask students which of the reactants will be used up first- how will we be able to tell? (When run out of oxygen, flame will go out and some of the candle will be left over).

Cover candle with beaker and observe what happens (candle will go out). Therefore oxygen is now the "limiting reagent".

Summary

Bring student attention to the fact that in one case the candle was the limiting reagent, and in the other case oxygen was the limiting reagent- this shows that one particular substance is not always the limiting factor in a chemical reaction.

Secondly, bring up the point that you need to look at the ratio of reactants to see how many of each need to interact for the reaction to occur. Can get this information from the balanced chemical equation (ie. need 38 oxygen molecules to react with one molecule of wax in this combustion reaction).

concentration terms.pdf

C.6 Balancing Equations

- Handout of Tips & Tricks of Balancing Chemical equations

Balancing Chemical Equations.pdf

Learning outcomes

- ✓ Understand the meaning, importance and scope of chemistry
- ✓ Appreciate the need for chemistry in our day-to-day lives
- ✓ List the characteristics of three physical states of matter
- ✓ Recapitulate that matter can be classified into elements, compounds and mixtures
- ✓ Know the S.I. units of base physical quantities
- ✓ Convert S.I. units into other units and vice versa
- ✓ Represent a number in scientific notations
- ✓ Appreciate the need for significant figures
- ✓ State various laws of chemical combination namely Law of conservation of mass, Law of definite proportions, Law of multiple proportions, Gay Lussac's law of gaseous volumes, Avogadro law
- ✓ Understand the principles underlying these laws
- ✓ Appreciate the importance of these laws in chemistry
- ✓ Understand the evolution of Dalton's atomic theory from the laws of chemical combination
- ✓ Solve problems based on laws of combination
- ✓ Recall the terms atomic mass, average atomic mass, molecular mass and formula mass
- ✓ Differentiate between empirical formula and molecular formula of a compound

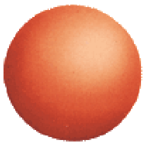
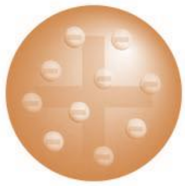
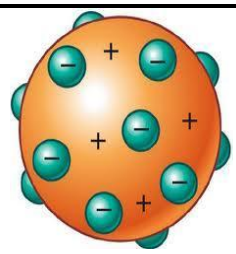
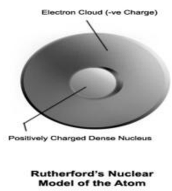
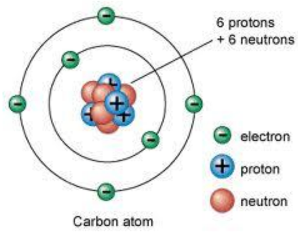
References

- http://serc.carleton.edu/sp/process_of_science/examples/conservation_mass.html
- https://wiki.rockwallisd.org/groups/rcarnahan/wiki/29480/Mole_Concept1111113_and_Chapter_9_Stoichiometry_127_213.html
- http://education-portal.com/academy/lesson/calculating-molarity-and-molality-concentration.html#lesson
- http://dwb4.unl.edu/Chem/CHEM869A/CHEM869AMats/Molarity.pdf

Sample Suggestive Activities from CLASS XI & XII UNITS

CLASS XI - UNIT 2 STRUCTURE OF ATOM

Contribution to the Atomic theory Timeline- Box SORT out

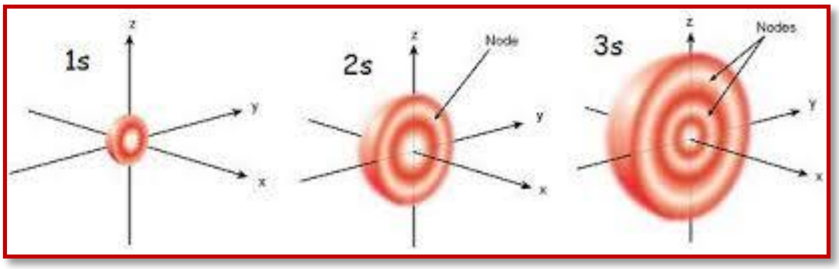
SCIENTIST	PROPOSED MODEL OF ATOM
1. DEMOCRITUS Greek philosopher (400 B.C)  More than 2400 years ago, he named the smallest piece of matter "ATOMOS ," meaning "not to be cut."	Atoms were small, hard particles that were all made of the same material but were different shapes and sizes. Atoms were infinite in number, always moving and capable of joining together
2. John Dalton English Chemist [proposed atomic theory in 1803]  	He proposed the Atomic theory of matter based on his experimental observations. First recorded evidence that atoms existed. Using his theory, Dalton rationalized the various laws of chemical combination
3.Joseph John Thomson British Physicist and Nobel laureate  Discovered electrons in 1897. Showed us that the atom can be split into even smaller parts. His discovery was the first step towards a detailed model of atom	**PLUM –PUDDING MODEL** 
4. Eugene Goldstein a German physicist 	
5.Sir Earnest Rutherford Nobel prize 1908 	
6. James Chadwick English Physicist & Nobel laureate 	

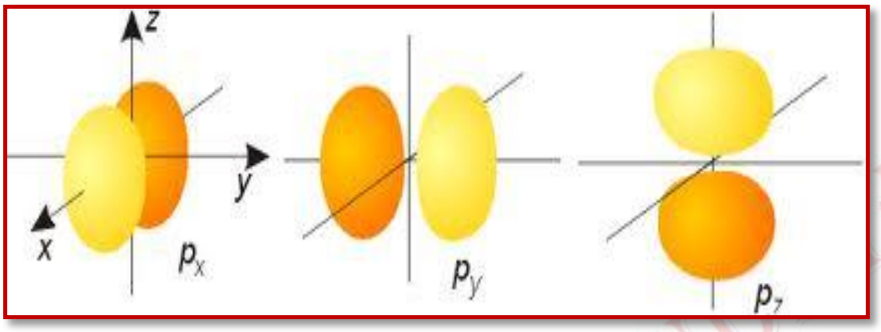
ORBITALS – HANDOUTS

Orbitals are regions around the atom where the electron has a high probability of being found. Orbitals of electrons in atoms differ in size shape and orientation.

The state of an electron in any atom is defined by certain permissible values of energy and angular momentum, which describe its location with respect to its nucleus and its energy level. These permissible states are called orbitals and are expressed by a set of four numbers 'n', 'l', 'm' and 's' called quantum numbers. These numbers serve as the signature of the electrons, uniquely describing its position in the atom.

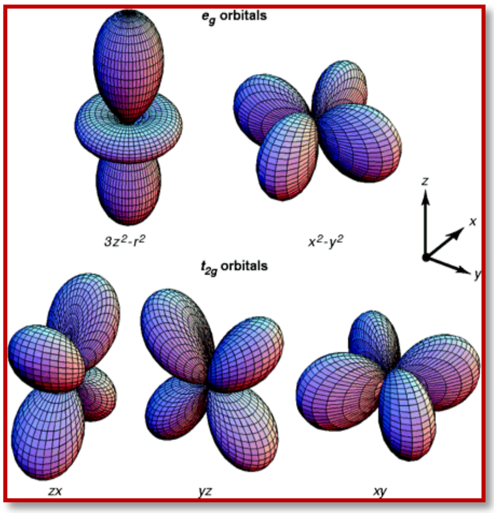
s orbitals

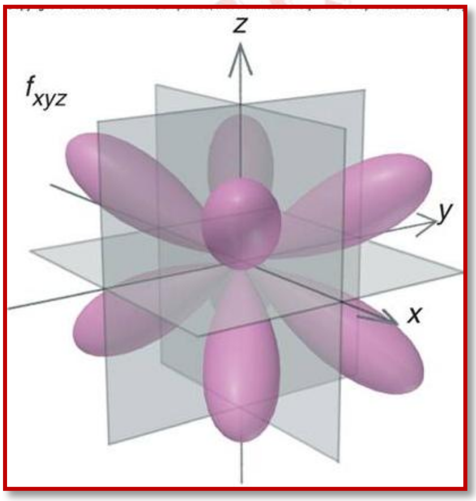




p orbitals

d orbitals



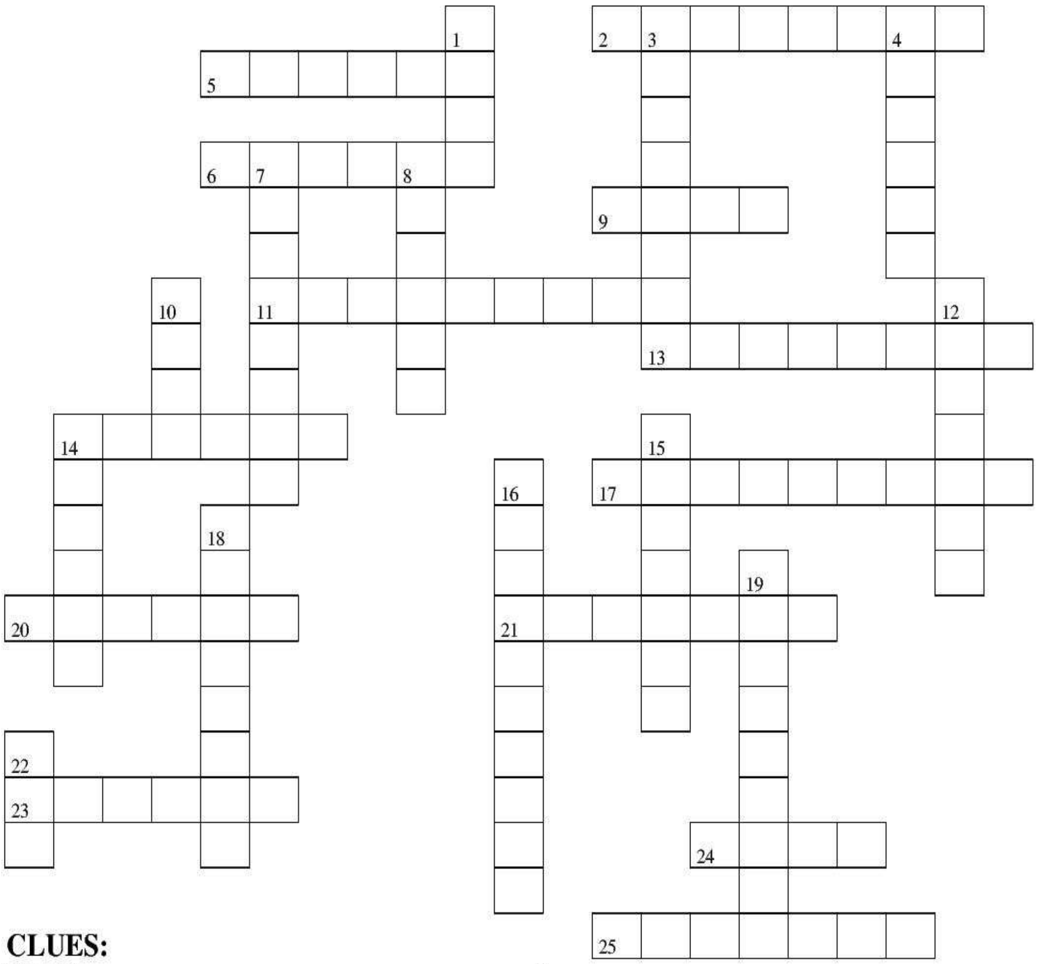


f orbitals

CLASS XI - UNIT 3 CLASSIFICATION OF ELEMENTS & PERIODICITY IN PROPERTIES

Periodic Table Puzzle

Name ____________________



CLUES:

Down:

1. I have 26 protons.
3. I am not really an alkali metal, but since I have only 1 electron I behave like them.
4. I am a metal with 28 electrons.
7. I am a member of the boron family and am the most abundant metal in the Earth's crust.
8. I am a gas with 8 protons and 8 neutrons.
10. I am a member of the carbon family often mistaken for the end of your pencil.
12. I am a metal that is liquid at room temperature.
14. My atomic number is 47 and I am used to make photographic film.
15. I have 20 neutrons and am found in your teeth and bones.
16. I am a member of the nitrogen family with 16 neutrons.
18. I am a gas with a mass number of 19.
19. I am the first element in the fourth period used in making fertilizer.
22. You can find me in the carbon family in the fifth period.

Across:

2. My atomic mass is 35.453.
5. I have 2 electrons in the first shell, 8 in the second shell, and 6 in the third shell.
6. I am the head of the carbon family known as the "basis of life".
9. My atomic number is 79.
11. I am a transition metal with 25 electrons.
13. I make up 78% of the air and am found in the 15th group.
14. I am a silvery white metal used to make salt.
17. I am a member of the alkaline earth metals used to make fireworks and medicines.
20. I am a noble gas with 2 electrons.
21. I am the 2nd most abundant element in the Earth's crust and have 14 neutrons.
23. I am a member of the halide family with an atomic number of 53.
24. I am a transition metal with 30 electrons useful in making paint.
25. I am the only element in the halide family that is a liquid.

Answer Key

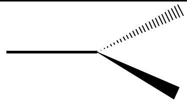
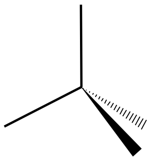
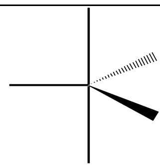
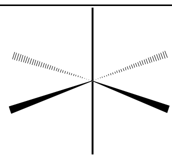
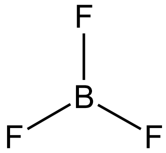
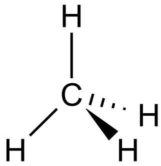
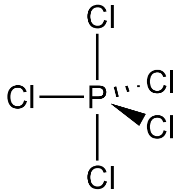
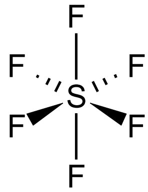
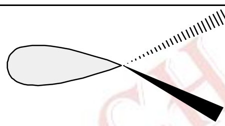
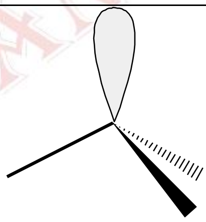
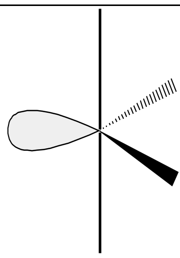
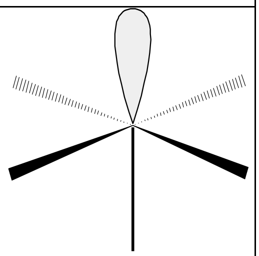
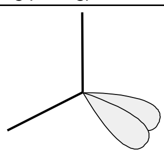
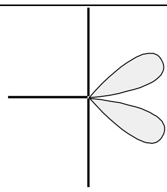
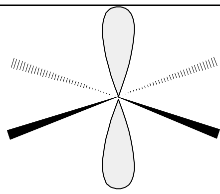
Down:

1. IRON - I have 26 protons.
3. HYDROGEN - I am not really an alkali metal, but since I have only 1 electron I behave like them.
4. NICKEL - I am a metal with 28 electrons.
7. ALUMINUM - I am a member of the boron family and am the most abundant metal in the Earth's crust.
8. OXYGEN - I am a gas with 8 protons and 8 neutrons.
10. LEAD - I am a member of the carbon family often mistaken for the end of your pencil.
12. MERCURY - I am a metal that is liquid at room temperature.
14. SILVER - My atomic number is 47 and I am used to make photographic film.
15. CALCIUM - I have 20 neutrons and am found in your teeth and bones.
16. PHOSPHORUS - I am a member of the nitrogen family with 16 neutrons.
18. FLUORINE - I am a gas with a mass number of 19.
19. POTASSIUM - I am the first element in the fourth period used in making fertilizer.
22. TIN - You can find me in the carbon family in the fifth period.

Across:

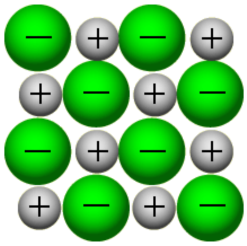
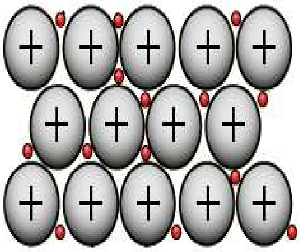
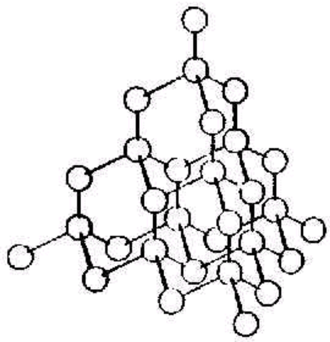
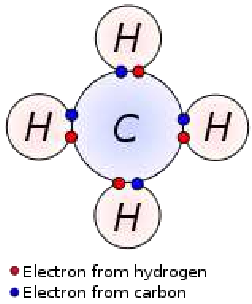
2. CHLORINE - My atomic mass is 35.453.
5. SULFUR - I have 2 electrons in the first shell, 8 in the second shell, and 6 in the third shell.
6. CARBON - I am the head of the carbon family known as the "basis of life".
9. GOLD - My atomic number is 79.
11. MANGANESE - I am a transition metal with 25 electrons.
13. NITROGEN - I make up 78% of the air and am found in the 15th group.
14. SODIUM - I am a silvery white metal used to make salt.
17. MAGNESIUM - I am a member of the alkaline earth metals used to make fireworks and medicines.
20. HELIUM - I am a noble gas with 2 electrons.
21. SILICON - I am the 2nd most abundant element in the Earth's crust and have 14 neutrons.
23. IODINE - I am a member of the halide family with an atomic number

CLASS XI UNIT 4 - CHEMICAL BONDING & MOLECULAR STRUCTURE

Electron pairs	**2**	**3**	**4**	**5**	**6**
Basic shape					
Example	Cl—Be—Cl				
Other examples	CO_2 , NO_2^+, HCN	CH_3^+,	SiH_4, NH_4^+, $AlCl_4^-$, PCl_4^+		PCl_6^-
Name of structure	linear	trigonal planar	tetrahedral	trigonal bipyramidal	octahedral
Bond angle(s)	180	120	109.5	120/90	90
One lone pair					
Name		angular	trigonal byramidal		square pyramid
Examples		CCl_2,	NH_3, PH_3, H_3O^+, CH_3^-, NF_3,	SF_4,	ClF_5,
Two lone pairs					
Name			angular	T-shaped	square planar
Examples			H_2O, NH_2^-, ClF_2^+, Cl_2O	ClF_3, SF_3^-, BrF_3,	XeF_4, BrF_4^-,

Some Boxes may be left blank for students to fill up.

CLASS XI UNIT 5 - STATES OF MATTER

Metallic Bonding	Giant Ionic Structure	Simple covalent structure	Giant covalent structure
			
Positive ions surrounded by a 'sea' of delocalised electrons	Regular 3D arrangement of positive and negative ions	Isolated molecules with weak forces between molecules	Repeating 3D structure with strong bonds between atoms
Strong attraction between ions and delocalised electrons	Strong electrostatic attraction between positive and negative ions	Strong bonds between atoms, electrons are shared	Strong bonds between atoms, electrons are shared
High melting points, almost all are solids at room temp	High melting points, always solid at room temp	Low melting points, gases and liquids at room temp	High melting points, always solid at room temp
Conduct electricity	Don't conduct electricity	Diamond	Conduct heat
Most don't conduct electricity (except graphite)	Conduct electricity when molten and in solution	Regular crystal arrangement	Regular crystal arrangement
Sodium chloride	Iodine	Sodium	Malleable

Some Boxes may be left blank for students to fill up.

INVESTIGATING GAS LAWS

To understand gas laws based on their relationships to temperature, pressure and volume.

1. Add about 10mL of water to a 50mL Erlenmeyer flask. Place a small balloon over the opening of the flask and place the flask on the hot plate (hot plate should be set to 8) until the water boils. When the balloon performs its trick, remove it soon after so that you don't get scalded with hot water!

    a Observe and record what you see.

    b.What happens to the balloon?

    c.Circle the variables you are dealing with: temperature pressure volume

    d.Complete this : As ____________________ increases, ________________ increases.

    e.The relationship between these variables is ___________________ (direct, inverse)

2. Place a marshmallow in a syringe. Push and pull the syringe and observe what happens to the marshmallow.

    a.When I push the syringe, the marshmallow ____________________.

    b.When I pull the syringe, the marshmallow _____________________.

    c.Circle the variables you are dealing with: temperature pressure volume

    d.Complete this: As ___________________increases, __________________decreases.

    e.The relationship between these variables is ____________________(direct, inverse)

3. Demo: A small amount of water is placed at the bottom of a pop can and placed on a hot plate until the water is boiling. The can is then flipped into a bucket of ice water.

    a.Observe and record what you see.

    b.What happened to the can?

    c.Circle the variables you are dealing with: temperature pressure volume

FINAL QUESTION: On the back page!

The final question is intended to be completed individually (i.e. On your OWN!)

4. After doing some research, answer the following questions:

    a.Which law do you think was demonstrated in question one?

    b.Which law was demonstrated in question two?

    c.Complete this: The relationship between the variables in question three was ___________________ (direct, inverse). (As __________________ decreased, ______________________ decreased). This demonstrates __________________ Law.

http://serc.carleton.edu/sp/mnstep/activities/35031.html

CLASS XI UNIT 6 - THERMODYNAMICS

CARD SORT GAME

Enthalpy change of formation	ΔH_f	This is the enthalpy change when 1 mole of a compound is formed from its elements in their standard state under standard conditions
Bond dissociation enthalpy	ΔH_{diss}	This is the enthalpy change when all the bonds of the same type in 1 mole of gaseous molecules are broken
Enthalpy change of atomisation of an element	ΔH_{at}	This is the enthalpy change when 1 mole of gaseous atoms is formed from an element in its standard state
Enthalpy change of atomisation of an compound	ΔH_{at}	This is the enthalpy change when 1 mole of a compound in its standard state is converted to gaseous atoms
First ionisation enthalpy	ΔH_{ie1}	This is the enthalpy change when 1 mole of gaseous 1+ ions is formed from 1 moles of gaseous atoms
Second ionisation enthalpy	ΔH_{ie2}	This is the enthalpy change when 1 mole of gaseous 2+ ions is formed from 1 moles of gaseous 1+ ions
First electron affinity	ΔH_{ea1}	This is the enthalpy change when 1 moles of gaseous 1- ions is made from 1 mole of gaseous atoms
Second electron affinity	ΔH_{ea2}	This is the enthalpy change when 1 mole of gaseous 2- ions is formed from 1 moles of gaseous 1- ions
Enthalpy change of hydration	ΔH_{hyd}	This is the enthalpy change when 1 mole of aqueous ions is formed from gaseous ions
Enthalpy change of solution	$\Delta H_{solution}$	This is the enthalpy change when 1 moles of solute is dissolved in sufficient solvent that no further enthalpy change occurs on further dilution

Practical chemistry **APPLICATIONS OF EXOTHERMIC REACTIONS**

You have been given three chemicals (calcium chloride, calcium oxide and calcium carbonate.) Which would be the best one to use in a hand warmer for a group of students who want to camp at the top of a big, cold mountain? Find out and make one for them!

ACTIVITY 1

Plan a fair test to find out which reacts with water to produce the biggest temperature change. Write key notes about how to make it a fair test below.

ACTIVITY 2

Do your experiment. Record the mass of solid used, the volume of water used and the change in temperature over a time period.

ACTIVITY 3

Design your hand warmer (on the reverse.)

ACTIVITY 4

Make your hand warmer (if there is time.)

CLASS XI UNIT 7 - EQULIBRIUM

Equilibrium Traffic Lights

Use traffic light cards (red = false; amber = don't know; green = true) or body motions (arms out either side= true; shrugged shoulders = don't know; arms out to left = false)

At dynamic equilibrium…

- No reactions are happening (F)
- The concentrations of the substances don't change (T)
- The rate of the forward reaction equals the rate of reaction (T)
- Increasing pressure favors the side with fewer molecules (T)
- A catalyst affects the position of equilibrium (F)
- If conditions are changed, the system will try to restore the original conditions(T)
- An increase in temperature will move the equilibrium to the endothermic reaction (T)
- The amount of product equals the amount of reactant (F)
- If a reactant is removed, the equilibrium shifts to make more of that reactant (T)

For the cases below, use traffic light cards (red = left; amber = don't know; green = right), or ask for a wave from the left or right hand to indicate the answer.

SO_2 (g) + ½ O_2 (g) ⇆ SO_3 (g) ΔH = -98 kJ/mol
Increasing temperature favors…(L)
Decreasing temperature favors…(R)
Increasing the pressure favors…(R)
Decreasing the pressure favors…(L)
Increasing the [SO_2]…(R)
Increasing the [SO_3]…(L)
C_2H_4 (g) + H_2O (g) ⇆ C_2H_5OH (g) ΔH = - 46 kJ/mol

Increasing the temperature favors…(L)
Decreasing the temperature favors…(R)
Increasing the pressure favors…(R)
Decreasing the pressure favors…(L)
Increasing the [C_2H_4]…(R)
Decreasing the [C_2H_4]…(L)

http://www.sharemylesson.com/teaching-resource/Acid-and-Alkali-review-Millionaire-3011432/

CLASS XI UNIT 8 - REDOX REACTIONS

Making Electricity

Electricity passing along metal wires is a flow of electrons.

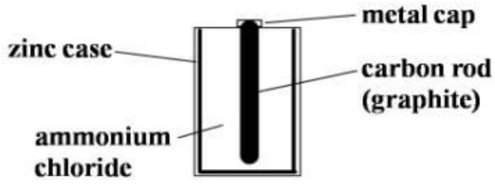
In a cell/battery, electricity comes from a **chemical reaction**

chemical energy → electrical energy.

Cells/batteries need replaced as the chemicals are being used up in the reaction to supply electricity.

Some cells/batteries are **rechargeable**, e.g. nicad cells (nickel-cadmium cells) and the lead-acid battery used in cars/vans/buses.

Dry Cells

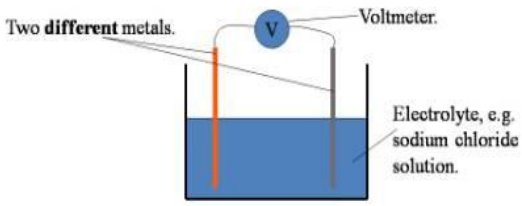


The ammonium chloride in the cell is an example of an **electrolyte.**

The purpose of the **electrolyte** is to **complete the circuit.**

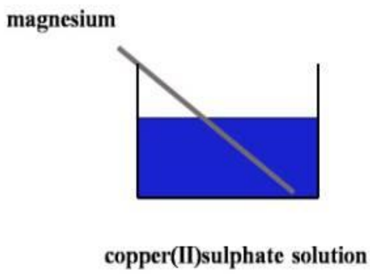
Electricity can be produced by connecting **different** metals together (with an electrolyte) to form a **cell**.

Different pairs of metals connected in a cell give **different voltages.** This enables us to construct an **electrochemical series**



Displacement reactions.

When a piece of magnesium metal is added to a solution of copper (II) sulfate, the blue color of the solution fades and the magnesium is covered with a brown solid.



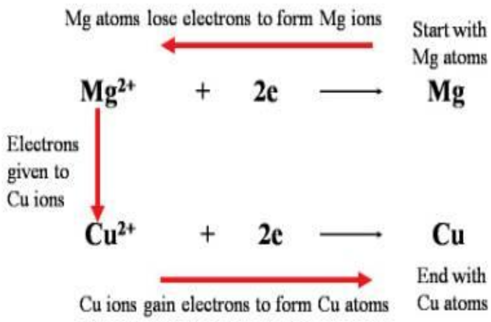
Magnesium is **higher** in the electrochemical series than copper.

Magnesium **gives electrons** to the copper ions.

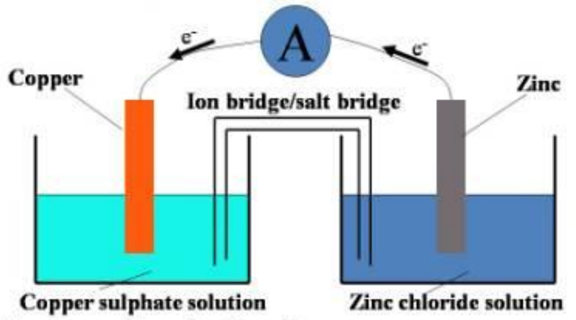
The copper ions gaining these electrons **form copper atoms** (brown solid).

The magnesium atoms lose electrons to form colorless ions which dissolve in the solution.

Ion-electron equations can be used to show the reaction (use page 7 of data booklet).

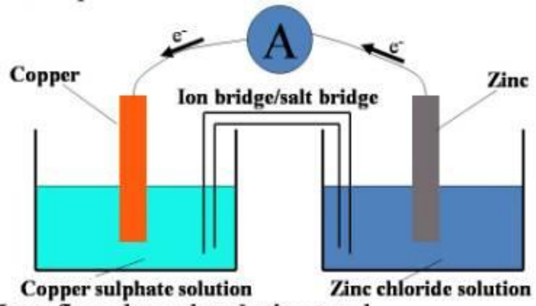


Electricity can be produced by connecting two **different** metals in **solutions of their metal ions.**



Electrons flow in the **wires** from the metal **high** in the electrochemical series **to the lower metal.**

The purpose of the "**ion bridge**" ("**salt bridge**") is to **complete the circuit**.



Ions flow through **solutions** and **through the ion bridge/salt bridge.**
The movement of ions through the ion bridge completes the circuit.

Oxidation and Reduction

OIL RIG

oxidation is loss reduction is gain

OF ELECTRONS

Oxidation is a loss of electrons by a reactant in any reaction.

Reduction is a gain of electrons by a reactant in any reaction.

Oxidation and Reduction

In a redox reaction, reduction and oxidation go on together.

REDOX

reduction oxidation

- **A metal element reacting to form a compound is an example of oxidation.**
- **A compound reacting to form a metal element is an example of reduction.**

CLASS XI UNIT 9 – HYDROGEN

To investigate the chemical action of soap vs. detergents in hard water and the use of a precipitation reaction to soften hard water.

PART I: SOAP VS. DETERGENT IN HARD WATER

- Add 100 mL of distilled (soft) water to a 250 mL beaker. Then add 2.0 g of magnesium sulfate, $MgSO_4$, and stir. Label this beaker hard water. You now have prepared a stock solution of hard water.
- Arrange three test tubes in a test-tube rack. Half-fill the first test tube with distilled water (soft water). Half-fill the second tube with tap water. Half-fill the third with hard water from the stock solution.
- Using a metal spatula, add a pea-sized sample of solid soap from a bar of commercial hand soap to each of the three test tubes. (Caution: Remember after shaking several times to stop, release the pressure, re-stopper, and shake.) Stopper and shake the first test tube. Ten shakes is adequate. On your data sheet record the height of suds in the test tube as measured with a centimeter scale. Draw a picture of the test tube; record all your observations in the picture.
- Repeat Step 3 for the other two test tubes. Shake each test tube in an identical manner.
- Dump and rinse the test tube containing the soap.
- Repeat Steps 2 and 3, but use a pea-sized sample of a commercial detergent instead of the soap.
- Dump and rinse the test tubes containing the detergent.
- Repeat Steps 2 and 3 using 20 drops (approximately 1.0 mL) of a commercial hair shampoo in each of the three water samples.
- Dump and rinse the test tubes containing the shampoo.

PART II: EMULSIFYING TEST

- Place four test tubes in a test-tube rack. Half-fill each with hard water.
- Add 3.0 mL of cooking oil to each of the four tubes.
- Add nothing to Tube 1, add a pea-sized sample of hand soap to Tube 2, a pea-sized sample of detergent to Tube 3, and 20 drops of shampoo to Tube 4.
- Stopper and shake all tubes in an identical manner. Return the tubes to the test tube rack.
- On your data sheet draw a picture of the four test tubes; record all your observations in the picture.
- Dump and wash out the test tubes as directed by your teacher.

PART III: SOFTENING HARD WATER BY PRECIPITATION

- Obtain a 2.0 g sample of sodium carbonate, Na_2CO_3. Add it to the hard water remaining in the 250 mL beaker.
- Place the beaker and contents on a hot plate. Heat and stir for 5 min.
- Remove the beaker and allow it to cool.
- When the beaker is cool enough to handle, separate the solid precipitate from the liquid using a filtering apparatus or centrifuge, as directed by your teacher.

- Half-fill a clean test tube with the clear filtrate. Add a pea-sized sample of solid hand soap to the test tube, stopper, and shake.
- Record your observations.
- Dispose of the filter paper and solid as directed by your teacher.
- Clean up your bench area and return all materials to their proper places.
- Wash hands thoroughly before leaving the laboratory.

Data Analysis, Concept

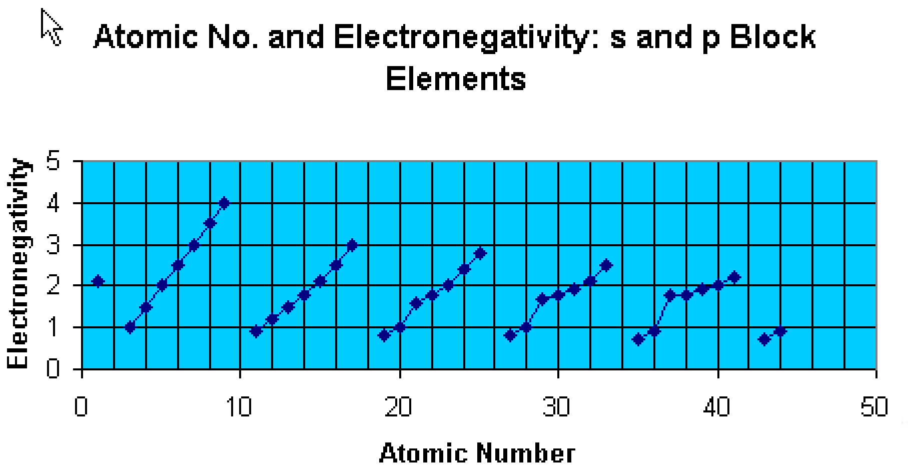
- Name the cation and anion added to the distilled water in Part I.
- Which ion is responsible for creating hard water in this activity? Support your answer with observations you recorded throughout the activity and those demonstrated in class.
- Did the hard water look different than the soft water?
- Based on your data, does soap work better in soft or hard water?
- Based on your observations, which works better in hard water -- soap or detergent?
- From your data, would you conclude that shampoo is more like a soap or a detergent? Explain your answer.
- According to this investigation, would the tap water used be classified as soft or hard water? Justify your answer.
- What effect did addition of sodium carbonate (washing soda) have on the hardness of the water? Explain.
- Was the filtrate hard or soft?
- Based on class demonstration and your data, complete the following chemical equation for the reaction between magnesium sulfate and sodium carbonate solutions.
- MgSO4(aq) + Na2CO3(aq)-->
- If you need help, ask your teacher for assistance. (Data Check: Obtain your teacher's initials.)
- What is the solid in the filter paper? Identify it by name and formula.
- Which cleaning agent worked best to disperse (emulsify) the oil in the hard water? Justify your answer.
- What was the most interesting thing you learned in this activity?

http://chemmovies.unl.edu/chemistry/labs/LABS12.html

CLASS XI UNIT 10 & 11 s & p BLOCK ELEMENTS

Electro negativity Trends

Chemistry teachers often ask students to prepare handdrawn and time consuming graphs of properties such as electro negativity and atomic number. In this activity, students use an Excel spreadsheet containing atomic number and electronegativity data to study the relationship between the periodic table position of an element and its electronegativity



Teacher will provide the Chem Data in a spreadsheet containing the following information for all elements in the periodic table

Atomic symbols

Group location - Group elements: groups 1, 2, 13-14

Group number

Element name

Atomic number

Atomic mass

Melting point and boiling point

Electronegativity value

First ionization energy

Covalent atomic radius

Graphs of atomic number and electronegativity for s- and p-block elements on the periodic table will be prepared quickly using the Excel spreadsheet graphing program. Periodic trends for electronegativity may be deduced from examination of the graphs .

Spreadsheets allow students to create quickly multiple graphical representations of data and focus their classroom time and energies on the analysis of the graphical trends depicted, rather than on the tedious task of graphing by hand.

Once they have the data in your spreadsheet, they are ready to create a graph of the relationship between atomic number and electronegativity.

The first task involves selecting only the elements in the s and p blocks of the periodic table to simplify the trends.

Analyzing Graph

- What trend exists between electronegativity values and atomic numbers within a group of elements on the periodic table?

As the atomic number increases, the electronegativity decreases within a group. As the atomic number increases, the electronegativity increases within a period.

- How does the trend in the halogen elements (group 17) compare to the alkali metals in group 1?

The electronegativity values of the halogen elements are much higher than the alkali metals, but both groups show that as the atomic number increases, the electronegativity decreases within a group.

- How is electronegativity used by chemists to predict bonding styles for elements on the periodic table.

The greater the difference in electronegativity between two elements, the more polar the chemical bond formed between them. Differences in electronegativity can be used to predict ionic, polar covalent, and nonpolar covalent bonding styles.

Assessment Strategy

Arrange a group of elements in order of increasing electronegativity using the periodic table only. [If the concept of polarity has already been introduced, students could use predicted electronegativity values to rank the polarity of chemical bonds.]

Arrange the following elements in order of increasing electronegativity using the periodic table: phosphorus, sodium, chlorine, aluminum. Explain your reasoning.

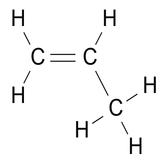
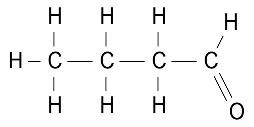
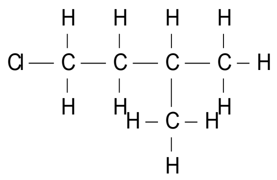
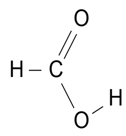
Using a periodic table, decide which of the following chemical bonds you would expect to be the most polar? The least polar? C-N or C-O? Explain why

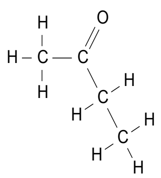
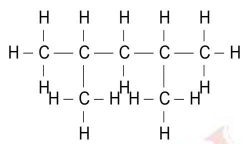
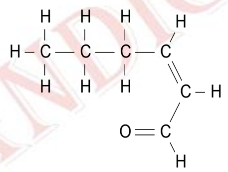
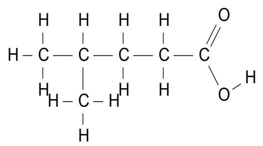
http://www.teacherlink.org/content/science/instructional/activities/electronegativity/Electronegativity-print.PDF

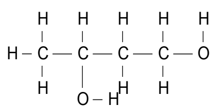
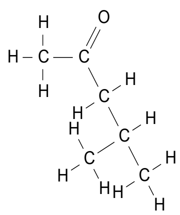
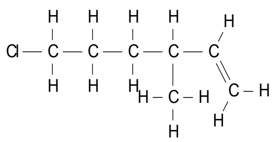
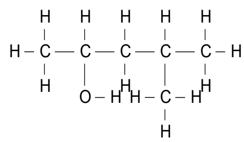
CLASS XI UNIT 12 – ORGANIC CHEMISTRY BASIC PRINCIPLES

Task

For each of the molecules below a) state the name of the molecule and b) state the functional group(s) present

CLASS XI UNIT 13 - HYDROCARBONS

WHO AM I ?

Methane	**Ethane**
I am a colourless, odourless gas. I am a hydrocarbon with only one carbon atom. I am the principal component of natural gas, At room temperature, I am a gas less dense than air. I am used directly to heat homes and commercial buildings	I am a colourless, odourless gas. I am a chemical compound with formula C_2H_6. I am isolated on an industrial scale from natural gas, and as a byproduct of petroleum refining. My chief use is as petrochemical feedstock for ethylene production.
Propane	**Butane**
I am a three-carbon alkane, normally a gas, but compressible to a transportable liquid. I am derived from other petroleum products during oil or natural gas processing. I am commonly used as a fuel for engines, barbecues, and home heating systems.	I am an unbranched alkane with 4 carbon atoms and a formula of $CH_3CH_2CH_2CH_3$. I am a highly flammable, colourless, odourless, easily liquefied gas.
Pentane	**Hexane**
I am a saturated hydrocarbon. I have a molecular formula of C_5H_{12}. I am a component of some fuels and am employed as a specialty solvent in the laboratory. My properties are very similar to those of butane and hexane. I exist in three structural isomers.	Hexane is an alkane hydrocarbon with the structural formula $CH_3(CH_2)_4CH_3$. My isomers are largely unreactive, and are frequently used as an inert solvent in organic reactions because they are very non-polar. They are also common constituents of gasoline and glues used for shoes, leather products, and roofing.
Heptane	**Octane**
I am a saturated hydrocarbon with 7 carbon atoms. I am a colourless liquid. I am undesirable in petrol, because I burn explosively, causing engine knocking, as opposed to branched-chain octane isomers, which burn more slowly and give better performance	I am a hydrocarbon with 8 carbon atoms and 18 hydrogen atoms. I am a colourless liquid. I have 18 structural isomers and am used as a fuel.
Nonane	**Decane**
I am a saturated hydrocarbon and at room temperature am a colourless liquid. I contain 9 carbon atoms and am an ingredient in kerosene.	Decane is an alkane hydrocarbon with the chemical formula $CH_3(CH_2)_8CH_3$. 75 isomers of decane exist, all of which are flammable liquids. Decane is one of the components of gasoline (petrol). Like other alkanes, it is nonpolar and therefore will not dissolve in polar liquids such as water.

SONG MEET THE ALKENES

They're a hydrocarbon family From the Cracking process
They are made from very long alkanes
That's right – they contain a double bond
Plastics are made from them, what a wand!

Alkenes Meet the Alkenes
Alkene, there's no need to feel down
I said alkene, if you're hanging around
You don't need to
Stay there free and unbound
Cos you've got a dou-ble-bond

Alkene, you can quickly react
With bromine water
Or even polymerise
And you're made from cracking…

Let's hear it for CnH2n
Come on let's hear it for CnH2n
They are made from cracking
At high T and with P
And we love these mo-no-mers

Assessment

- What is a hydrocarbon?
- What happens during cracking?
- Draw ethene
- Draw poly(ethene)
- Is ethene saturated or unsaturated? Why?
- What happens to bromine water when you add an alkene?
- What is the general formula for the alkenes?
- What is a monomer?
- What is a polymer?
- What conditions are needed for cracking?

http://www.sharemylesson.com/teaching-resource/Alkenes-Karaoke-6053621/

CLASS XI UNIT 14 - ENVIRONMENTAL CHEMISTRY

Consequences of Acid Rain

Step 1

Instruct pupils, in pairs, to carry out a simple practical to test the pH of distilled water, rainwater, water containing dissolved carbon dioxide, and water containing dissolved sulphur dioxide.

Tell them to rank the samples according to pH, with the weakest acid first. Construct a simple results chart then write up a summary practical.

Practical write up: Title:

Aim:

Apparatus:

Method

Conclusion:

Therefore we now know that although all rainwater looks alike it can be very different.

Step 2

What effect do you think that different rainwater strengths might have on

(1) Farmer's fields in the countryside.
(2) Forests (optional-Show picture of acid deforestation in Sweden-explain pollution is not of Sweden's causing but they have to deal with it)
(3) Lakes
(4) Buildings
(5) Statues

<u>Practical aspect</u>

We are going to test prepared acid rain on a variety of building materials-

- Which one appears to be affected least? How did you assess this?
- Which one appears to be affected most? What signs showed you this?
- Class discussion/vote: Which material would you use for building your dream house and why?

Resources

Samples of distilled water, rainwater, water with dissolved carbon dioxide and water with dissolved sulphur dioxide, liquid UI and color charts (one set per pair)

Access to 0.005M acid (labeled acid rain), 1 g pieces of limestone, sandstone, slate, chalk, magnesium, zinc, marble, pipette, spotting tile (one set per pair)

http://www.sharemylesson.com/teaching-resource/Environmental-chemistry-6117133/

KENDRIYA VIDYALAYA SANGATHAN

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