IAT/RAK

Chemistry G10

Questions & Answers

An “After Studying” Self Check

LC1 & LC2

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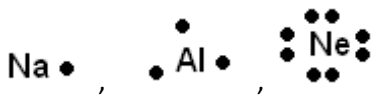
Sec.	Question	Answer
LC1		
Mystery Material	**What is the chemical name of the mystery material?**	Sodium polyacrylate.
	What is it used for? Why?	One of its uses is in diapers (diaper crystals) because it can absorb large amounts of liquid.
	Are absorbing water and dissolving in water the same thing?	No. Dissolving is not the same as absorbing.
	List some of the physical properties of the mystery material.	White, grainy, light, soft, looks like salt…..
	Is the change that happened to the material after the addition of water physical or chemical? Why?	Physical. No new substance produced, water and the material are still the same substances and we can reverse the process.
Mega Mining Mart	**Why were you asked to organize items in the supermarket?**	To understand the challenge Mendeleev faced when he tried to organize the elements.
	Where would you place the following items in your supermarket: a) Chocolate syrup, b) Coffee machine, c) Teen Magazines?	a) Next to ice creams and sweets, b) Near the entrance, c) Next to CDs and gadgets.
	What is the pattern or arrangement in your store's aisles?	Items of the same use or have the same "properties" were put together.
(1-1) The Puzzle of Matter	**What is the difference between a pure substance and a mixture?**	Pure substance has a fixed composition everywhere (oxygen, water…). A mixture doesn't have a fixed composition (tea, sea water, air…) and you can see that by your eyes or a microscope.
	Classify the following into pure substance or mixtures: element, homogeneous, compound, heterogeneous.	Pure substance: element, compound. Mixtures: homogeneous, heterogeneous.
	Compare between elements and compounds.	Both are pure substances, but an element is made up of only one type of atom, ex: oxygen O_2, Gold Au. A compound is made up of two or more types of atoms bonded together, ex: H_2O, NaCl, H_2SO_4.
	Compare between homogeneous mixtures (solutions) and heterogeneous mixtures.	In a **homogeneous** mixture, particles are distributed evenly and are not visible. Colloids and suspensions are two types of **heterogeneous** mixtures. The particles in a suspension will settle eventually. Particles of a colloid will not. Milk is an example of a colloid, while mud is an example of suspension.

	Which type of matter can be represented by: **a) symbol , b) formula**	a) elements b) compounds
	Give examples on each type of matter.	Element: oxygen, gold, iron, …. Compound: salt, baking soda, sugar, water,…. Homogeneous mixture (solution): soda, gasoline, air… Heterogeneous mixture: dirt, blood, milk…
(1-2) Properties and changes of Matter	**What are physical properties? Give examples.**	Physical properties are characteristics of materials that you can observe without changing the identity of the substance such as size, shape, color, surface, density, and mass.
	What are chemical properties? Give examples.	Chemical properties indicate what chemical changes substances can undergo. You can only observe them after changing the identity of the substance. Many medicines are stored in dark bottles because they react with light. Iron rusts. Alcohol is flammable.
	What is the difference between a physical change and a chemical change?	In **physical changes**, the identities of substances remain unchanged. **Examples**: cutting, pumping air, pounding metals, boiling, freezing and all changes of state. In **chemical changes**, the identities of substances change; new substances are formed. Another name for chemical change is chemical reaction. **Examples**: burning, cooking, rusting, decomposing …
	What is the "Law of Conservation of Mass"?	"In a chemical change, matter is neither created nor destroyed"
	Explain the previous law further.	In a chemical change, the total number of atoms entering a chemical reaction is equal to the total number of atoms that are produced from this reaction. Or the total mass in is equal to the total mass out.
	What is an "exothermic" reaction? Give examples.	An exothermic reaction is a reaction that releases (gives off) energy. Examples: burning wood, explosives' reactions…
	What is an "endothermic" reaction? Give examples.	An endothermic reaction is a reaction that absorbs (take in) energy. Examples: decomposition of water, photosynthesis.

(2-1) Atoms and their Structures	**What is the atomic number?**	It is the number of protons in an atom. It is also equal to the number of electrons. This number is unique for every element.
	What is the mass number?	It is the sum of protons and neutrons. Mass number = protons + neutrons
	What is the atomic mass?	It is the mass of an atom in atomic mass units (***u***).
	How many neutrons are there in chlorine-35?	From the periodic table, atomic number = 17 So, number of protons = 17 Neutrons = mass number – number of protons = 35 – 17 = 18
	What information can you get from each block of the periodic table?	Element's name, symbol, atomic number, average atomic mass and state of matter.
	What are isotopes?	Isotopes are atoms of the same element that have the same number of protons but different number of neutrons. (same atomic number but different mass number)
(2-2) Electrons in Atoms	**Describe the electron cloud model of the atom.**	It describes the atom as made up of two regions, the **nucleus** and the **electron cloud**. The nucleus is the heavy part of the atom and is made up of neutrons and positive protons. The electron cloud is the area around the nucleus where electrons may exist. Electrons are negatively charged, and are very small and fast.
	How do electrons move around the nucleus?	Electrons move in energy levels around the nucleus. The lowest in energy is the closest to the nucleus. And electrons fill the lowest energy level first.
	How many electrons can each energy level take?	First energy level can have a maximum of two electrons. Second energy level can have a maximum of 8 electrons. Third energy level can have a maximum of 18 electrons. The fourth energy level can have a maximum of 32 electrons.
	Write the electron configuration of: Na, Ne, Al	**Na** (atomic number =11) **2, 8, 1** **Ne** (atomic number = 10) **2, 8** **Al** (atomic number = 13) **2, 8, 3**
	What are valence electrons?	They are electrons in the outermost (highest) energy level.
	What are Lewis Dot Diagrams?	Show the valence electrons of an atom as dots around its symbol.
	Draw Lewis diagrams for Na, Ne, Al.	

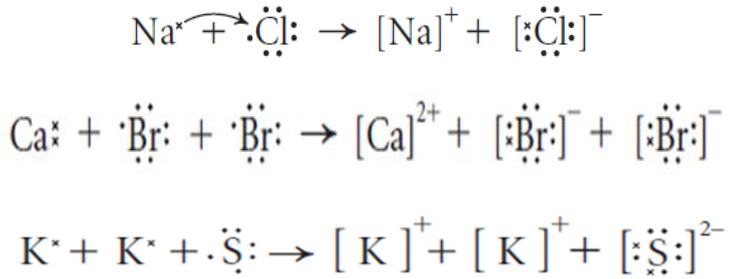
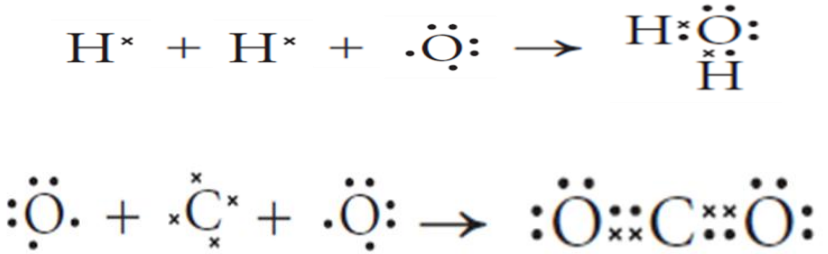
LC2		
(3-1) Development of the periodic table	**What role did Mendeleev play in putting up a periodic tablein1869?**	Mendeleev was the first to notice that the properties of elements repeat when elements are arranged according to their atomic mass.
	What is periodicity?	Is the tendency of properties to repeat at regular intervals.
	What is the periodic law?	The physical and chemical properties of elements repeat in a regular pattern when arranged according to their atomic numbers.
	Why did scientists believe in Mendeleev?	1) He correctly predicted the properties of Gallium (eka-aluminum) and Germanium (eka-silicon). 2) He placed elements in the right order even though they didn't agree with the order of atomic mass.
	What did Dobereiner do?	He placed similar elements in groups of three called Triads.
	Give three examples on triads.	1) Halogen Triad: Chlorine, Bromine, Iodine 2) Coinage Triad: copper, silver, gold 3) Alkali Metals: lithium, sodium, potassium
	How did the physical properties change with increasing the atomic mass?	They increase too.
	What was the last group of elements to be discovered? Why is that?	The Noble gases were the last group of elements to be discovered. Scientists didn't know about them earlier due to their un-reactivity.
(3-2) Using the periodic table	**The Modern Periodic Table is arranged according to……**	Atomic Number
	There are 18 columns (vertical) that are called……	Groups or families.
	There are se7en rows (horizontal) that are called……	Periods
	Some groups in the periodic table have names, give examples.	- Group 1: Alkali metals. - Group 2: Alkaline Earth metals - Groups from 3 to 12: transition metals, with Lanthanides and Actinides as inner transition metals. - Group 17: Halogens. - Group 18: Noble Gases
	What are the main groups?	Groups 1+2 , and Groups: 13, 14, 15, 16, 17, 18.
	What information would you get from a period number?	The number of energy levels in an atom. Example: an element in group 4, has 4 energy levels.
	What information would you get from a group number?	Only in the main groups, the group number helps identifying the number of valence electrons. Example: in group 1, elements have 1 valence electron. In group 15, elements have 5 valence electrons.

	How many elements are there in the liquid state?	Mercury (which is a metal) and Bromine (which is a nonmetal) only.
	How can you tell the state of matter of an element from the periodic table?	In each block of the periodic table, there is a little icon. If it is a balloon, then the element is a gas. If it is a cube, then the element is a solid, and if it is a drop then the element is liquid.
	What is meant by "natural" and "synthetic" terms?	Natural element is found naturally in Earth. Synthetic is man-made. Synthetic elements have a circle icon to indicate this.
	Metals in the periodic table occupy the……	Center and left side (in your book, with blue color)
	Nonmetals in the periodic table occupy the……	Upper right corner (in your book, with yellow color)
	Metalloids in the periodic table lie around the……	Stair-stepped line between metals and nonmetals (in your book with green)

Compare between metals, nonmetals and metalloids:

Metals	Nonmetals	Metalloids
Shiny, Luster	Dull, non-luster	Have some physical and chemical properties of those metals and nonmetals. Some are semiconductors. **Semiconductor:** an element that does not conduct electricity as well as metal, but does conduct better than a nonmetal.
Easily deformed	Brittle. Can be hard or soft.	
Good conductors of heat and electricity.	Poor conductors of heat and electricity.	
Loosely held valence electrons.	Tightly held valence electrons.	
In reactions, usually lose electrons.	In reactions, usually gain or share electrons.	
Have 1, 2, 3 valence electrons. (few have 4)	Have 3, 4, 5, 6, 7, or 8 valence electrons.	

(4-2) How elements form compounds	**What is meant by a stable element?**	An element that does not react with other elements because it has filled outer energy level, usually with 8 electrons. Example: the noble gases. G18
	What is the octet rule?	Atoms can become stable by having eight electrons in their outermost energy level. (except smallest atoms that can only have two)
	How do elements achieve the noble gas configuration and become stable?	By one of two ways: 1) Losing/ Gaining valence electrons → Ionic Bond. 2) Sharing valence electrons → Covalent Bond.
	When a metal reacts with a nonmetal, what is most likely to happen?	The metal will lose its valence electrons, and the nonmetal with gain them. Making a crystal of positive and negative ions attracted by a strong ionic bond.
	When nonmetals react together, what is most likely to happen?	They will share valence electrons forming molecules. Within the molecule, atoms are held with a covalent bond.
	What are interparticle forces?	Forces between particles that make up a substance.

	Ionic Bond	Covalent Bond
Definition:	The strong attraction forces between ions of opposite charge.	The attraction of two atoms for a shared pair of electrons.
Chemical equations:		

	Ionic Compounds	Covalent Compounds
Made up from:	ions: are charged atoms. Ex: Na^+ and Cl^- (positive →lost electrons) , (negative →gained electrons)	Molecules: uncharged group of two or more atoms held together by covalent bond. Ex: H_2O molecule, CO_2 molecule
Interparticle Forces:	Very strong interparticle forces due to the strong attraction between positive and negative ions.	Weak interparticle forces between molecules as they have no charges.
	That is why ionic and covalent compounds have the following properties:	
State of matter	Solids, in crystal form.	Most are liquids and gases. Few are solids.
Melting Points	High melting points. More energy is needed to break the strong interparticle forces between ions.	Low melting points. Little energy is needed to melt the covalent compound as the interparticle forces are weak.
Hardness	Hard and rough, but brittle (easy to break).	Most are soft.
Dissolving in water	Most dissolve in water.	Most don't dissolve in water.
Conducting electricity	Good conductors of electricity when dissolved in water or when molten. (charged ions moving freely) → Electrolytes	Poor conductors of electricity. (No charged particles) → Non-electrolytes