chemistry 2nd Kanti study sheet for the test on the 6/21/2011

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TEST 6/21/11

TABLE OF CONTENTS

You can describe in details how NaCl is formed in a reaction of sodium (Na) and chlorine (Cl) 3

You can explain why melted salt can conduct electric current. 3

You can predict the charge of any ions within a salt. 3

You know how to explain the force between the ions in a salt crystal. 3

You can describe the process of the solubilisation of a salt in water. 3

You can explain why all salt compounds are badly soluble in petrol. 3

You know the inFLence of the size and the charge of ions on the forces in salt crystals. 3

You know the rule of eight (noble gas) and you can explain why some atoms form molecules to fuFIl the rule of eight (noble gas). 3

You are able to draw the Lewis formula for any simple molecule. You can distinguish between a bonding pair of electrons and a lone pair of electrons. 3

You can show what a dative bond is and are therefore able to draw more complex molecules. 4

You are able to describe the three dimensional shape of any molecule. 4

You understand the deINition of the electro-negativity 4

You can distinguish between a strong polar bond, a polar bond and a non-polar bond. 4

You can explain the term intermolecular forces and knew the difference from the term chemical bond at any time. 4

You can explain what effects intermolecular forces have on the boiling point of a substance. 4

You can explain how the van der Waals force forms between two molecules. 5

You know the rules of the inFLence on the strength of the van der Waals force. 5

You can estimate the boiling point of easy examples of boiling points of substances by comparison. 5

You can explain what a dipole molecule is! 5

You know the difference between the terms polar bond and dipole molecule! 5

You can explain the term hydrogen bonds. 6

You can explain the abnormality of water as a result of hydrogen bonds. 6

Find out if the molecules of substances form hydrogen bonds between each other 6

You can explain with help of the model of water how a salt can dissolve in water! 6

The students can predict the miscibility of substances in water based on the formula 6

Different forces in order 6

INFO

This is a study sheet by Linus Metzler about Test 6/21/11, which was mentioned in the 2nd Kanti at Mr. Uetz. There is no claim for completeness. All warranties are disclaimed.

STUDY PART

SOME LEARNING AIMS ARE MERGED WITH OTHERS OR EVEN MERGED WITH A COMMON TITLE!

YOU CAN DESCRIBE IN DETAILS HOW NACL IS FORMED IN A REACTION OF SODIUM (NA) AND CHLORINE (CL)

An electron from the sodium atom goes to the chlorine atom.

YOU CAN EXPLAIN WHY MELTED SALT CAN CONDUCT ELECTRIC CURRENT.

A salt is stable crystal compound whereas when melted the ions can move and hereby conduct electricity.

YOU CAN PREDICT THE CHARGE OF ANY IONS WITHIN A SALT.

RULE: METALS (WHEN AS ION) ARE POSITIVE, NON-METALS (WHEN AS ION) ARE NEGATIVE

YOU KNOW HOW TO EXPLAIN THE FORCE BETWEEN THE IONS IN A SALT CRYSTAL.

The different charged ions attract each other.

YOU CAN DESCRIBE THE PROCESS OF THE SOLUBILISATION OF A SALT IN WATER.

H_2O is a dipole molecule. So the water molecules have poles which are attracted by the ions of the salt. The H_2O pulls the ions from the salt structure and the compound dissolves. The by water molecules surrounded ions are called hydrated ions.

YOU CAN EXPLAIN WHY ALL SALT COMPOUNDS ARE BADLY SOLUBLE IN PETROL.

Petrol isn't a dipole and therefore not able to dissolve salt.

YOU KNOW THE INFLENCE OF THE SIZE AND THE CHARGE OF IONS ON THE FORCES IN SALT CRYSTALS.

The bigger / more charge, the stronger the forces are.

YOU KNOW THE RULE OF EIGHT (NOBLE GAS) AND YOU CAN EXPLAIN WHY SOME ATOMS FORM MOLECULES TO FUFIL THE RULE OF EIGHT (NOBLE GAS).

The RULE OF EIGHT states, every atom wants to have its outer shell filled completely – which is in most cases eight electrons.

YOU ARE ABLE TO DRAW THE LEWIS FORMULA FOR ANY SIMPLE MOLECULE. YOU CAN DISTINGUISH BETWEEN A BONDING PAIR OF ELECTRONS AND A LONE PAIR OF ELECTRONS.

DEFINITION: LEWIS STRUCTURES ARE DIAGRAMS THAT SHOW THE BONDING BETWEEN ATOMS OF A MOLECULE AND THE LONE PAIRS OF ELECTRONS THAT MAY EXIST IN THE MOLECULE.

1. Calculate maximum amount of electron pairs
2. Place atoms with little electro-negativity in the middle, arrange symmetrically
3. Fulfill the rule of eight, otherwise make double bonds resp. dative bonds

YOU CAN SHOW WHAT A DATIVE BOND IS AND ARE THEREFORE ABLE TO DRAW MORE COMPLEX MOLECULES.

One partner gives to electrons and the other one none.

YOU ARE ABLE TO DESCRIBE THE THREE DIMENSIONAL SHAPE OF ANY MOLECULE.

- Linear
- Planar-trigonal
- Tetraedrisch
- Trigonal-bipyramidal
- Oktaedrisch

YOU UNDERSTAND THE DEINITION OF THE ELECTRO-NEGATIVITY.

Definition: The ability of an atom to attract the binding electrons within a compound oft two elements. → "Elektronenhunger".

Within a period: The more protons an atom has, the stronger the nucleus attracts the electrons.

Electro-negativity increase from left to the right

The size within a period: The bigger the electro-negativity, the smaller the atom because the same amount of shells is more attracted

YOU CAN DISTINGUISH BETWEEN A STRONG POLAR BOND, A POLAR BOND AND A NON-POLAR BOND.

Polar bond: if two connected atoms in a ***molecule*** have significantly different values electro-negativity (more than 0.1) the bond between the two atoms is called a polar bond. That means the electron of the weaker molecule is slightly more attracted by the other atom.
(In a salt the weaker atom loses the electron really and there is no bond, in a polar bond it's just attracted)

Non polar bond: The difference between to electro-negativity is 0.1 or less.
Strong polar bond: The difference is 0.5 and more

YOU CAN EXPLAIN THE TERM INTERMOLECULAR FORCES AND KNEW THE DIFFERENCE FROM THE TERM CHEMICAL BOND AT ANY TIME.

Forces between molecules. The stronger the intermolecular forces, the higher the boiling temperature. A chemical bond is a bond between atoms in the same molecule.

Fact that show, that there is a big distance between molecules in gases:

- We can press them together & other molecules can move through > there must be space in between!

YOU CAN EXPLAIN WHAT EFFECTS INTERMOLECULAR FORCES HAVE ON THE BOILING POINT OF A SUBSTANCE.

1. van der Waals —>10°C rise between for an electron pair at an atom of the first and second period, 20°C in third period and 30°C in fourth period
2. dipole-dipole —>30°C-80°C
3. each hydrogen bond —>100°C

The stronger the intermolecular force, the higher the boiling temperature

You need more energy to separate the molecules, because if they become gaseous the molecules can freely move -> the intermolecular force, which holds them together, must be overcome.

If you boil or melt a compound the bonds never break, only the intermolecular forces are destroyed so the molecules can move. If there are just bonds in a compound it's very stable. E.g. a diamond can't really be boiled or melted.

YOU CAN EXPLAIN HOW THE VAN DER WAALS FORCE FORMS BETWEEN TWO MOLECULES.

The bigger the distance between neighboring molecules, the weaker the forces. The more electron clouds on the surface of a molecule and the bigger the electron cloud, the stronger the forces.

YOU KNOW THE RULES OF THE INFLENCE ON THE STRENGTH OF THE VAN DER WAALS FORCE.

Rule 1: The more electron clouds are on the surface of a molecule, the stronger the forces become between the molecules. That means the boiling temperature rises.

Rule 2: If the electron clouds belong to a bigger atom, the forces get stronger. That means the boiling temperature rises.

YOU CAN ESTIMATE THE BOILING POINT OF EASY EXAMPLES OF BOILING POINTS OF SUBSTANCES BY COMPARISON.

1. Always weak van der Waals forces: Boiling temperature rises per electron pair at an atom of the
   1. /2. Period: + 10°C
   3. Period: +20°C
   4. period : +30°C
2. Dipole-dipole forces. The stronger the dipole, the bigger the force: + 30° - 80°C
3. Hydrogen bonds. Each such bond rises the temperature by 100°C.

YOU CAN EXPLAIN WHAT A DIPOLE MOLECULE IS!

No point symmetry

Polar bonds > the molecule has to have a positive and a negative end! (Big difference in electronegativity); marked with small Greek delta and a plus or a minus → $\delta^+ \; resp. \; \delta^-$

There is a bigger attraction between the molecules because of the poles > dipole-dipole forces, boiling temperature rises 30° - 80°C.

It's a dipole molecule if the center of all negative poles of a polar bond and the center of all positive poles of a polar bond don't coincide. The molecule has a positive and a negative end.

YOU KNOW THE DIFFERENCE BETWEEN THE TERMS POLAR BOND AND DIPOLE MOLECULE!

Polar bond: if one electron is a little bit more at one atom than by the other->there is a slight charge within the molecule

Dipole molecule: existence of polar bonds, the poles of the bonds mustn't to coincide

A dipole molecule has always polar bonds, but a molecule with polar bonds is not necessarily a dipole molecule

YOU CAN EXPLAIN THE TERM HYDROGEN BONDS.

A hydrogen bond is an intermolecular force between hydrogen and a nitrogen, oxygen or fluorine.

- Between molecules (don't have to be of the same kind)
- In one molecule: H (positive) bound to a negative O, N, F (other polar bonds would be to weak)
- In the other molecule: O, N or F, where the H can make a "bond"

The force is very strong > boiling temperature rises per hydrogen bond about 100 °C.

YOU CAN EXPLAIN THE ABNORMALITY OF WATER AS A RESULT OF HYDROGEN BONDS.

- highest density not 0°C instead at +4°C
- two forms of frozen water
- extreme high boiling temperature

FIND OUT IF THE MOLECULES OF SUBSTANCES FORM HYDROGEN BONDS BETWEEN EACH OTHER

Look if there is a hydrogen in the molecule, draw the Lewis formula, look if there are polar bonds which polarize the hydrogen atom positively, then look how many negatively polarized F,O,N atoms are in the molecule and how many H, you can only make as many hydrogen bonds with a molecule as it has H and "Andockstellen".

YOU CAN EXPLAIN WITH HELP OF THE MODEL OF WATER HOW A SALT CAN DISSOLVE IN WATER!

In the salt Na^+Cl^- the sodium-atom is taken out/attracted by the negatively polarized oxygen atom from the water and the Chlorine atom is taken/attracted by the positively polarized hydrogen and forms a hydrogen bond.

THE STUDENTS CAN PREDICT THE MISCIBILITY OF SUBSTANCES IN WATER BASED ON THE FORMULA

Oil solubilizes much better in petrol than in water because petrol is like oil only held together by van der Waals forces. Molecules with dipole-dipole forces solubilize in other dipole molecules.

A water strider doesn't sink into the water because the surface of his legs contains just molecules, which are held together by van der Waals forces. These are weaker than the hydrogen bonds of the water.

DIFFERENT FORCES IN ORDER

1. covalent bond
2. ionic bond
3. hydrogen bond
4. dipole-dipole
5. van der Waals