CHEMISTRY OF WATER:

- Ratio of 2:1 (H:O)
- Each water molecule is slightly polarized (charged).
    - The oxygen atom is very slightly negative ($\boldsymbol{\delta^-}$)
    - The hydrogen atoms are very slightly positive ($\boldsymbol{\delta^+}$)
    - This difference and unequal distribution of electrical charge makes water a dipolar molecule
    - The negatively charged oxygen atom of one water molecule will attract the positively charged hydrogen atom of another molecule forming a bond called hydrogen bond
        - This bond is rather weak in nature but there are so many of them which makes water molecules stick together more than expected
    - Be careful: Hydrogen bond between adjacent water molecules, covalent bonds within one water molecule
- Is a triangular molecule, not a linear one forming an angle of 104.5° between H's and O's

BE CAREFUL: DO NOT CONFUSE THE TERMS SOLVENT AND SOLUTE

- Solvent is the medium (in biology is always water, in chemistry is usually an organic one such as ethanol) in which various substances- SOLUTES- can be dissolved –found.
- Example: water and sugar. Water is the solvent, sugar is the solute

Type of carbohydrate (how many saccharides?)	Examples	Notes
Monosaccharides (one saccharide)	Glucose	• Main substrate for respiration • Soluble, osmotic effect
	Galactose	• Soluble, osmotic effect
	Fructose	• 'fruit' sugar • Soluble, osmotic effect
Disaccharide (two saccharides)	sucrose	• Glucose + fructose • Main transport sugar in plants • soluble
	lactose	• 'milk' sugar • Glucose + galactose • soluble
	maltose	• glucose + glucose • soluble
Polysaccharides (many saccharides)	amylose	• found in starch – energy storage molecule in plants • α –glucose molecules in tight spirals so compact • insoluble, no osmotic effect
	amylopectin	• found in starch – energy storage molecule in plants • branched chains of α –glucose molecules – lots of terminal ends so digested more rapidly than amylose • insoluble, no osmotic effect
	glycogen	• energy storage molecule in animals, bacteria and fungi • branched chains of glucose molecules • compact, insoluble, no osmotic effect

SECONDARY:

- Is the local folding of the chain leading to the formation of other structures (**α**-helix and **β**-pleated sheet)
- These happen because of the presence of H bonds between carboxyl groups and amino groups that carry small charges

TERTIARY:

- Is further folding that forms a precise three dimensional shape held together by bonds between R side chains, as well as hydrophobic interactions which are
    - Hydrogen bonds
    - Ionic bonds between ionized R groups
    - Covalent bonds – disulfide bridges in cysteine
    - Polar interactions (hydrophilic on outside of protein, hydrophobic on inside)

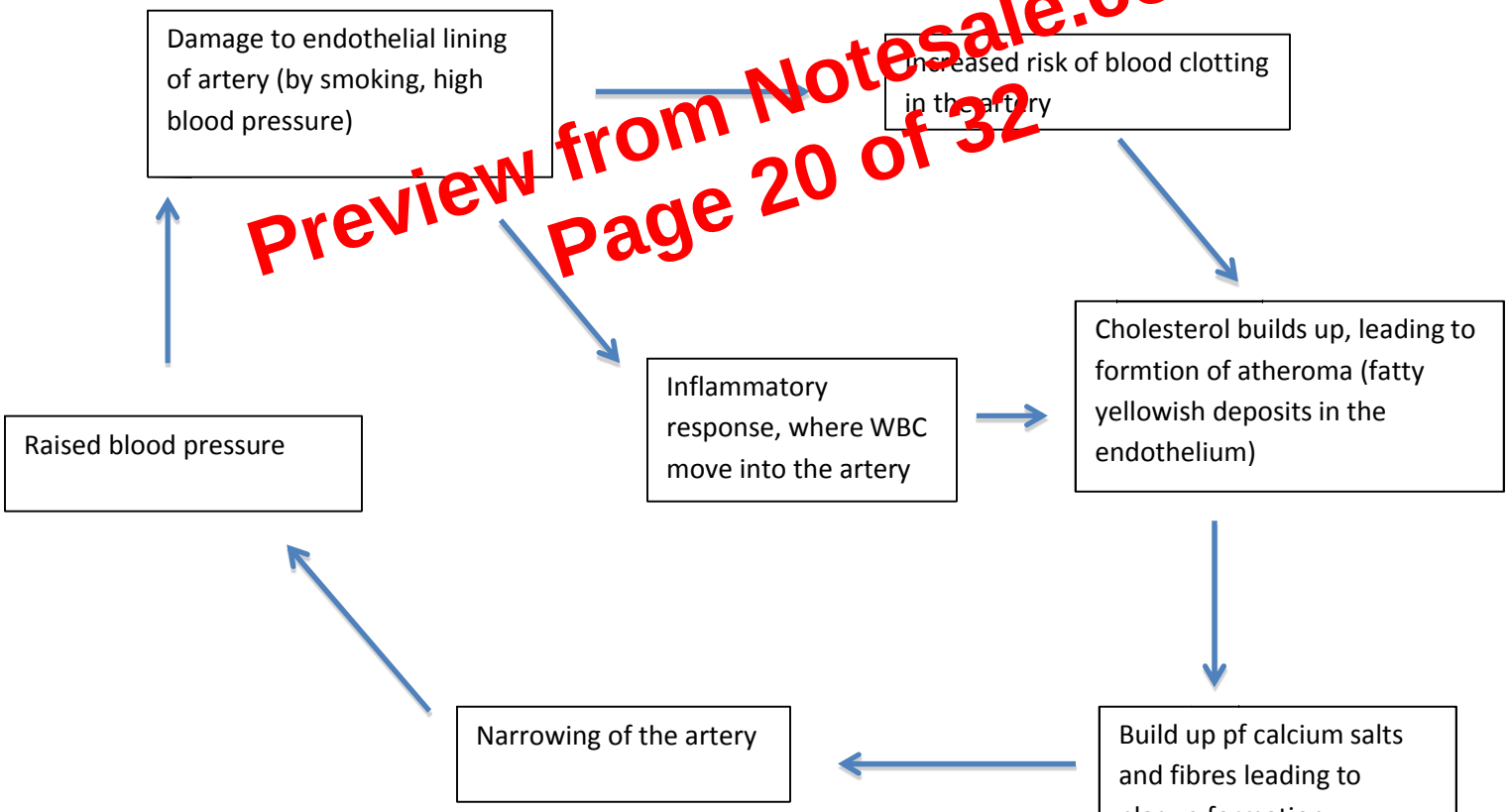
CVD: CardioVascularDiseases: Diseases of heart and associated blood vessels. Most deaths are due to atherosclerosis

ATHEROSCLEROSIS: is the progressive degeneration of the artery walls

- Athero = artery
- Sclerosis = hardening

It usually happens in arteries because blood flows there under high pressure, fast, so there is more strain on the endothelium

<u>STEPS IN ATHEROSCLEROSIS</u>



There are various types of cardiovascular diseases, all caused as a result of atherosclerosis

LAB: *Describe how the effect of caffeine on heart rate in* Daphnia *can be investigated practically and consideration of whether there are ethical issues in the use of invertebrates*.

We can study the functioning of the heart in an organism in which the heart is visible without the need for damaging and invasive procedures, such as the water flea, Daphnia sp. This invertebrate is suitable for this experiment because:

- Is abundant and easily obtained
- Is transparent
- Has a very simple nervous system and will not suffer 'stress' such as a mammal might, which makes it ethically more appropriate

There are two ways to do this experiment:

- Put Daphnia in a caffeine solution and compare heart rates with control Daphnia in plain pond water
- Put Daphnia in a range of different strength caffeine solution

What you should do...	Why should you do this?
Immobilise Daphnia	Use strands of cotton wool in a small dish of the experimental solution
Control other variables such as • water temperature • Daphnia size	• Difficult to maintain a constant temperature but should be monitored with a thermometer in the water • Obtain Daphnia of similar size to be used for all measurements
Accurate measurement of heart rate	A dot is put on a piece of paper (in an S shape to avoid putting one dot on top of the other), or clicking a button on a calculator
Repeatability	Ensure that other variables except for caffeine concentration are controlled