**Learning outcomes**

**You should be able to ….**

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Explain in simple terms why food is required by all living organisms

**Know 2 types of Energy Transfer Reactions:** Anabolic reactions **and** Catabolic reactions

State the common elements present in food

**Biomolecular Structures**

Explain that these elements combine (join or bond) together in different ratios

to form simple biomolecular units e.g. carbohydrates Cx(H2O)y e.g. glucose when x= y = 6.

**Carbohydrates:** You should know …

- Elements present

- The smallest unit of a carbohydrate

- What is formed when monosaccharides join together

- What is formed when many saccharides join together

- Test for carbohydrates

- Sources of carbohydrates.

- Structural role

- Metabolic role

**Fats and oils (lipids)** You should know …

Elements present and Different ratio to carbohydrates.

Fats are solid at room temperature.

The basic unit of a fat

Know what a **triglyceride** is made of

Know difference between oils and fats

Know what is meant by a **Phospholipids**

Test for lipids

Sources of lipids

- Structural role

- Metabolic role

**Proteins** You should know …

Elements present

The smallest part of a protein

There are 20 common and several rare amino acids found in proteins.

Test for proteins

Sources of proteins.

- Structural role

- Metabolic role

**Vitamins**  You should know …

Know 1 example of water soluble and fat soluble vitamins

Function of each

Disorders associated with the deficiency of a water-soluble and a fat-soluble vitamin

**Hormones** You should know …

as regulators of metabolic activity.

**Minerals** You should know …

Name any 2 minerals required by (a) plants and (b) animals

One function of each

**Water**

Know the Importance of water

**Key words**

**Metabolism, Anabolism, Catabolism, Monosaccharide, Disaccharide, Polysaccharide, Amino acid, Triglyceride, Phospholipid, Benedicts, Biuret, Vitamin, Hormone**

**Nutrition (Summary)**

**Functions of food**:

1. To provide organisms with energy, and

2. To provide the materials for growth and repair of cells and tissues.

**Energy Transfer reactions** : All chemical reactions that take place in the body are known as **metabolism.** They are catalysed by enzymes and involve the release or intake of energy.

**Anabolic reactions:** Large molecules built from small ones. Energy required. **Example**: Photosynthesis

**Catabolic reactions:** Large molecules broken down into small ones. Energy released. **Example**: Respiration. Catalysed by enzymes

Remember: **CRAP**

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| **CHEMICAL ELEMENTS IN FOOD** | | | | | | |
| **Common elements** | Carbon  C | Hydrogen  H | Nitrogen  N | Oxygen  O | Phosphorous  P | Sulphur  S |
| **Elements in dissolved salts** | Sodium  Na | Magnesium  Mg | Chlorine  Cl | Potassium  K | Calcium  Ca |  |
| **Trace elements** | Iron  Fe | Copper  Cu | Zinc  Zn |  |  |  |

* **Biomolecules**:

Carbohydrates, Lipids (fats,) Proteins, Vitamins, Minerals, Water

**Carbohydrates**

Composed of elements **carbon, hydrogen and oxygen.**

**General formula of carbohydrate**: **Cx(H2O)y**

**Three Types of Carbohydrates**

* **Monosaccharides**: single sugar units, e.g. **glucose** – C6H12O6
* **Disaccharides**: two sugar units, e.g. **Sucrose**, **maltose** – C12H22O11
* **Polysaccharides:** many sugar units. Examples: **starch** : plant storage polysaccharide, **cellulose** : plant structural carbohydrate, **glycogen**: animal storage carbohydrate, **chitin:** animal structural carbohydrate

**Food tests:**

* Starch – **iodine** – blue black
* Glucose: **Benedicts** – heat – brick red

**Sources in diet:** bread, rice, pasta.

**Structural Role** : cellulose (plant cell walls), chitin (fungi cell walls).

**Metabolic Role :**  primary sources of energy (glucose)**Lipids (Fats & Oils)**

* Composed of the elements carbon, hydrogen and oxygen, but in **different ratios to** carbohydrates.
* Fats are solids at room temperature and lipids are liquids.
* **Triglyceride:** basic unit of a fat –made up of three fatty acid and one glycerol molecule.
* **Phospholipid**: a lipid with one of its fatty acids replaced with a phosphate group.
* **Sources in diet**: Fat, butter, red meat, oil.

**Food test:** Brown paper – translucent spot

**Structural role:** – phospholipids found in the cell membrane

**Metabolic role:** – release of energy & long term energy storage

**Proteins**

Composed of the elements: **C,H,O,N, and sometimes S.**

**Basic unit is the amino acid.** There are 20 common and several rare amino acids found in proteins.

**Sources in diet**: lean meat, fish, eggs

**Food test:** – **Biuret** - lilac

**Structural role:**  myosin in muscle, collagen in hair

**Metabolic role:**– enzymes control chemical reactions in cells

* **Role of Hormones and Vitamins**

**Hormones:** Regulate metabolic activity

**Vitamins:** Required in small amounts , essential organic catalysts of metabolism,

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| --- | --- | --- | --- | --- | --- |
| **Vitamin** | **Water soluble** | **Fat soluble** | **Sources** | **Function** | **Deficiency** |
| **C**  (Ascorbic acid) | Yes | No | Vegetables, Citrus fruits | * Growth of connective tissue * Cell production, * Health maintenance | Scurvy |
| **D**  (Calciforal) | No | Yes | Liver, Milk  Egg yolk, Sunlight | * Absorption of calcium * Healthy teeth and bones | Rickets (children)  Osteomalacia (adults) |

**Minerals needed by Plants**

|  |  |  |
| --- | --- | --- |
| **Mineral** | **Source** | **Use** |
| Calcium  (Ca) | Salts absorbed from soil | Helps form calcium pectate in cell walls |
| Magnesium  (Mg) | Salts absorbed from soil | Part of the structure of chlorophyll |

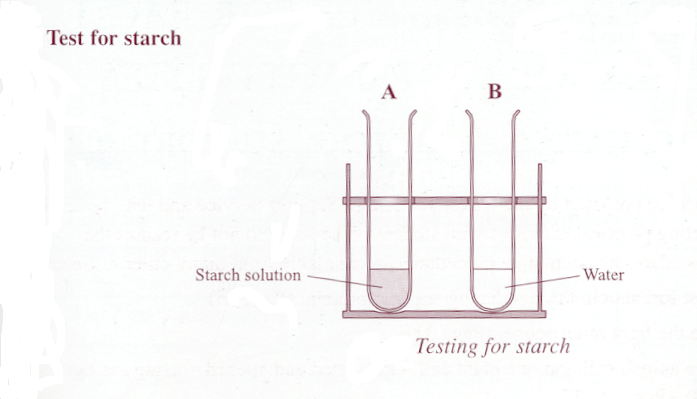
**Minerals needed by Animals**

|  |  |  |
| --- | --- | --- |
| **Mineral** | **Source** | **Use** |
| Calcium  (Ca) | Milk, Cheese, Hard drinking water | Forms bone and teeth |
| Iron  (Fe) | Liver, Meat, Green vegetables | Part of the structure of haemoglobin |

**Water**

* A major component of cells and body fluids
* A good solvent and medium in which chemical reactions take place
* A participant in chemical reactions e.g. photosynthesis and respiration
* Helps move materials in and out of cell e.g. osmosis
* Controls cell shape

FOOD TESTS



**1. Test for Starch:**

**starch + Iodine = Blue black**

**PROCEDURE**

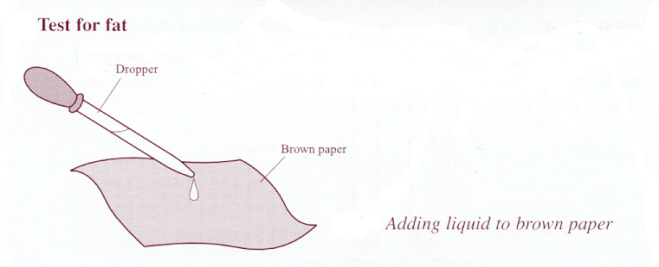
1. I added **starch solution** into tube A.
2. I added water into tube B. This acted as a control.
3. I added 2-3 drops of **iodine solution** to each tube.
4. I recorded my result.

**RESULT**

**Conclusion**

Tube A contains starch. The solution turned from yellow/ brown to blue black in the presence of iodine. There was no starch present in Tube B. It did not turn blue black when tested with iodine.

|  |  |  |
| --- | --- | --- |
| **Boiling Tube** | **Initial colour** | **Final colour** |
| **A – Starch solution** | **Yellow/Brown** | **Blue black** |
| **B – Water** | **Yellow/Brown** | **Yellow/Brown** |

**2. Test for Fat**

**Fat + Brown paper = Translucent spot**

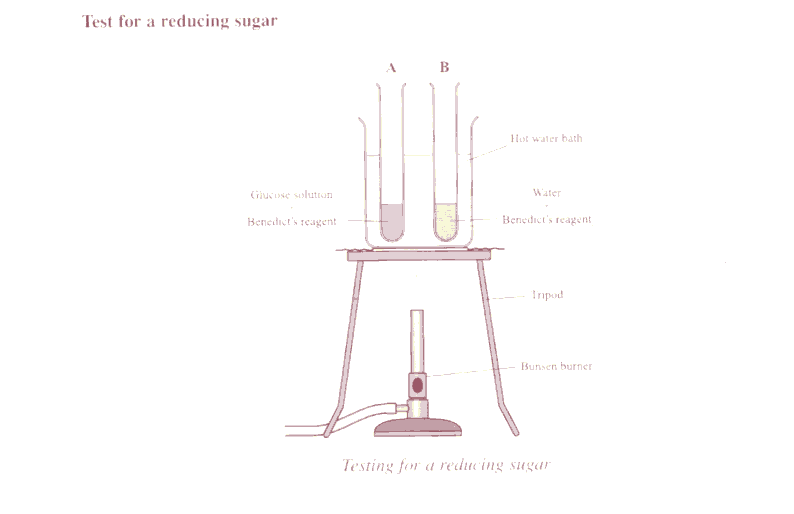
**PROCEDURE**

1. I placed a drop of **oil** on one piece of **brown paper**
2. I placed a drop of water on the other piece of paper. This acted as a **control.**
3. Ileft both aside to dry.
4. I held both pieces up to the light.
5. I recorded my result.

**RESULT**

|  |  |  |
| --- | --- | --- |
| Sample | Presence of Translucent spot | |
| **Before drying** | **After drying** |
| **Oil** | **No** | **Yes** |
| **Water** | **No** | **No** |

**CONCLUSION**

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**3. Test for reducing sugar**

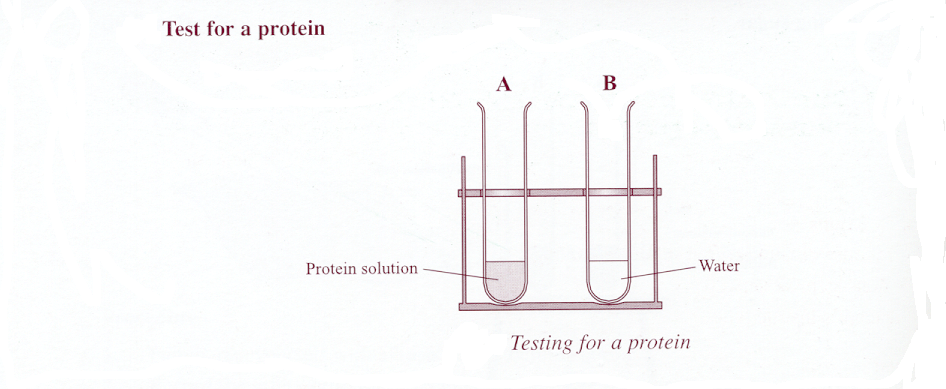
**Glucose + Benedicts = Brick red**

**PROCEDURE**

1. I placed **glucose** solution into tube A.
2. I placed water into tube B. This acted as a control.
3. I added **Benedict’s reagent** to each tube.
4. I placed both tubes in the hot water bath and heated for 5 minutes.
5. I recorded my result.

**RESULT**

|  |  |  |
| --- | --- | --- |
| Sample | Initial colour | Final colour |
| A – Glucose solution | Blue | Brick red |
| B - Water | Blue | Blue |

**4. Test for Protein**

**Protein + Biuret = Lilac**

**PROCEDURE**

1. I placed the **milk** into tube A.
2. I placed water into tube B. This acted as a control.
3. I added **Biuret reagent** to each tube
4. I recorded my results.

**RESULT**

|  |  |  |
| --- | --- | --- |
| **Sample** | **Initial colour** | **Final colour** |
| **A – Protein solution** | **Blue** | **Lilac** |
| **B - Water** | **Blue** | **Blue** |

CONCLUSION