**Biology: 3. Food**

***Please remember to photocopy 4 pages onto one sheet by going A3→A4 and using back to back on the photocopier***

**Syllabus**

**OB1** Recall that a balanced diet has six constituents: carbohydrates (including fibre), fats, proteins, vitamins, minerals and water, each with different functions

**OB2** Describe a food pyramid and give examples of types of food recommended in a balanced diet.

**OB3** Carry out qualitative food tests for starch, reducing sugar, protein and fat

**OB4** Read and interpret the energy values indicated on food labels and compare the energy content per 100 g of a number of foods, and identify the food types on the label that form part of a balanced diet.

**OB5** Investigate the conversion of chemical energy in food to heat energy

**Student Notes**

Why do humans need food?

**We need food for energy to help us grow and to repair worn down or damaged parts of our bodies.**

**Balanced Diet**

Food is composed of six basic categories, called food types:

**A balanced diet contains the right amount of each of the different types of food**

**1. Carbohydrates 2. Fats 3. Proteins 4. Vitamins 5. Minerals 6. Water**

|  |  |  |
| --- | --- | --- |
| **Food Type** | **Functions** | **Common Sources** |
| **Carbohydrates**  e.g. Sugars, starch and fibre | 1. Sugar supplies energy 2. Starch supplies energy 3. Fibre prevents constipation | 1. Sugar: Fruits, Honey 2. Starch: Bread, Potatoes, Rice, 3. Fibre: Green vegetables |
| **Fats** | Provides energy and insulation | Dairy products |
| **Proteins** | Growth and repair of cells | Meat, Fish, Eggs, Milk, Cheese |
| **Vitamins**  e.g. Vitamin C, Vitamin D | Vitamin C is for healthy gums  Vitamin D is for healthy teeth | Vitamin C: Fruit, Green Vegetables  Vitamin D: Potatoes, Beans, Milk |
| **Minerals**  Calcium, Iron | Calcium - strong bones  Iron – makes red blood cells | Calcium: Dairy products  Iron: Red Meat, Green Vegetables |
| **Water** | Allows cells to function by dissolving and transporting substances | Can be obtained from special bottles in a shop ☺ |

**A food pyramid helps us to determine the correct amount of each food type to maintain in a balanced diet.**

**Foods in a food pyramid are classified into five main groups (see diagram)**



The bottom foods should be eaten often while those at the top should be eaten sparingly.

Failure to eat a balanced diet may cause a person to become overweight, tired, and slow and due to a lack of iron they may result in having a condition called anaemia.

**Energy Values**

|  |  |
| --- | --- |
| Nutritional Information per 100 g | |
| Energy | 872 kJ / 206 kcal |
| Protein | 15 g |
| Carbohydrate | 26.8 g |
| (of which sugars) | 3.8 g |
| Fat | 2.5 g |
| (of which saturates) | 0.5 g |
| Fibre | 36.5 g |
| Sodium | 0.028 g |

Different foods contain different amounts of energy.

These amounts are known as Energy Values.

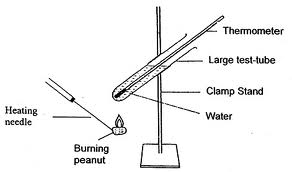
Energy is measured in Joules (J).

However energy values of a food can be measured in Kilojoules per 100 gram.

All foods are supposed to display nutritional information on their packets; the table of information on the right was given on a packet of wheat bran.

**Food Tests**

|  |  |  |
| --- | --- | --- |
| **Food Tested** | **Chemicals Used** | **Positive Result** |
| Starch | Add iodine | Turns blue-black |
| Reducing sugar  e.g. glucose | Add Benedict’s solution and heat | Turns brick-red |
| Fat | Rub food on brown paper | Translucent Stain |
| Protein | Add sodium hydroxide and then copper sulfate | Turns purple |



**To investigate the conversion of chemical energy in food to heat energy**

1. Place a burning cream-cracker or peanut under a test-tube containing water.
2. Note the temperature of the water before and after.
3. The temperature of the water rises.

**Did you know?**

Eggs are not a dairy food – can you say why?

If you eat a piece of iron is it good for you?

Are you an animal lover?

What do you know about the condition in which animals are kept prior to you eating them?

Close to one billion people go to bed every night without enough to eat.

One child dies from malnutrition every six seconds.

We throw out between one third and one quarter of all the food we purchase.

Ireland has the second highest rate of obesity in the EU (second only to England).

**Did you know that you can eat the sun?**

**Where did all the elements come from?**

First off, almost all the matter around us (and from which we are made) was originally produced in one or more exploding stars; you are, quite literally, star stuff.

Now within our sun millions of tonnes of matter are disappearing every second. This produces energy which we call radiation (or just ‘sunlight’) and it is this energy which is used to grow food.

So it is entirely correct to assert that, when next you are eating an apple, you are, quite literally, eating part of the sun!

**Activity**

* Use a food test to make your initials appear on a slice of white bread
* Use a strong magnet to take out the iron in cornflakes.

**Exam Questions**

**Food Types and their functions**

1. [2008]

Give one function for vitamins in our bodies.

1. [2008]

Give one function for minerals in our bodies.

1. [2006 OL]

Name the mineral needed for healthy growth of teeth.

1. [2007 OL][2009 OL]

Fibre is a carbohydrate and it is an important part of a balanced diet.

What is the function of fibre as part of a balanced diet?

1. [2009 OL] [2007 OL]

|  |
| --- |
| Bread |
| Carrots |
| Cheese |
| Burger |
| Potato |
| Fish |
| Chicken |

Proteins, fats and carbohydrates form part of a balanced diet.

Answer the following questions about food types.

1. Pick a good source of fat from the list on the right.
2. Pick a good source of carbohydrate from the list on the right.
3. Pick a good source of protein from the list on the right.
4. Pick a good source of starch from the list on the right.



1. [2007]

Name the principal food type (nutrient), which is present in all of the foods shown.

1. [2012]

Eggs can form part of a balanced diet and provide a good source of some food types.

Name two of these food types.



1. [2011][2006 OL] [2006]

The diagram shows a food pyramid.

* 1. Name one item of food that could be found at X in the pyramid.
  2. Name one other food from level B
  3. Why should only a small amount of the foods at the top of the pyramid be eaten?
  4. Explain how to use a food pyramid to plan a healthy diet.

**Food Tests**

1. ****[2010 OL]

Some Fehling’s (or Benedict’s) solution was added to a food sample.

The mixture was blue at the start.

When the mixture was heated a brick-red colour appeared.

1. For which food type is this a positive test?
2. What is the function of this food type in the body?
3. [2007][2010]

Describe how to test a food for the presence of fat.

1. [2011 OL]

What chemical is used to test for starch?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Food Tested | Food Tests | | | |
| Starch | Reducing sugar | Protein | Fat |
| Food A | + | – | – | + |
| Food B | – | – | + | + |
| Food C | + | – | + | + |

1. [2006]

Tests were carried out on three foods by a pupil in a school laboratory.

The results of these tests are given in the table.

A plus (+) sign means a positive result to a test.

A minus (–) sign means a negative result to a test.

1. Which one of the foods, A, B or C would most likely be cheese, meat, or fish?
2. Which one of the foods, A, B or C would most likely be crisps, or chips?

**Food labelling**

1. [2008 OL]

|  |  |  |
| --- | --- | --- |
| **Nutritional Information** | **Food A per 100 g** | **Food B per 100 g** |
| Energy | 1629 kJ | 394 kJ |
| Protein | 26 g | 5.6 g |
| Carbohydrate | Trace | 20.3 g |
| Fat | 19.5 g | 0.6 g |

The table shows the nutritional information given on the labels on two foods A and B.

1. Which food, A or B, provides the most energy per 100 g?
2. Which food, A or B, is more likely to be cheese?

Give a reason for your answer.

|  |  |
| --- | --- |
| Nutritional Information per 100 g | |
| Energy | 872 kJ / 206 kcal |
| Protein | 15 g |
| Carbohydrate | 26.8 g |
| (of which sugars) | 3.8 g |
| Fat | 2.5 g |
| (of which saturates) | 0.5 g |
| Fibre | 36.5 g |
| Sodium | 0.028 g |

1. [2006]

This nutritional information was given on a packet of wheat bran.

Wheat bran is used with breakfast cereals and is added to brown bread.

Select any two nutrients from the list given and say what role each one has in maintaining health.

1. [2010]

Protein, carbohydrate and fat can all be used to provide energy in our bodies.

The table gives the amount of these food constituents, in grams per 100 grams for five common foods. The energy content per 100 g of each food has also been given.

The energy values have been rounded off to the nearest 100 kJ.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Food Constituent | Protein | Carbohydrate | Fat | Energy kJ/100 g |
| Food 1 – Baked beans | 4.0 | 17.5 | 0.4 | 400 |
| Food 2 – Cooked chicken | 26.2 | nil | 1.6 | 500 |
| Food 3 - Eggs | 12.5 | nil | 11.2 | 600 |
| Food 4 – Bread (wholemeal) | 9.0 | 45.0 | 2.2 | 1000 |
| Food 5 – Cheddar cheese | 25.4 | 0.1 | 34.9 | 1700 |

1. Draw a bar chart, in the grid below, to compare the energy content of 100 g of foods 1-5 given in the table above.
2. Which food constituent is primarily responsible for the high energy content of cheese?
3. What evidence does the table provide to support your answer?



**Food as energy**

1. [2006 OL] [2011 OL]

Describe an experiment you could carry out to show the conversion of chemical energy to heat energy.

Draw a labelled diagram of any equipment used.

1. [2007]

Describe, with the aid of a labelled diagram, a simple laboratory experiment to show the release of chemical energy from food as heat.

**Exam Solutions**

1. Good skin/ night vision/ prevents scurvy (keeps gums healthy)/ prevents rickets/strong bones/ helps blood clotting/ prevents colds/ used in life processes/ prevents anaemia/ good hair/ gives energy/ lack of a vitamin can cause disease.
2. Strong bones (teeth)/ growth/ healthy nerves / used in life processes/lack of a mineral can cause disease/ red blood cells (can prevent anaemia) . . .
3. Calcium
4. Prevents constipation / aids peristalsis / moves food along gut / prevents cancer / provides bulk / absorbs water.
5. Fat: Cheese / burger
6. Carbohydrate: Bread / carrots / burger
7. Protein: Cheese / fish
8. Fat
9. Protein (amino acids)/ fat/ carbohydrate (sugar)/ minerals/vitamins…do *not* accept: starch
   1. Bread / cereal / pasta / rice / potatoes
   2. Beans, peas, lentils, nuts …
   3. Not good for health / contains too much sugar (fat)
   4. Eat some from each layer but eat more from the bottom and less from the top
10. Reducing sugars
11. To provide energy to the body
12. Rub food onto paper. It produces a translucent (greasy) spot.
13. Iodine solution
14. B
15. A
17. A
18. A (More fat / more protein / less carbohydrate / more energy)
19. Protein: growth/ repair

Carbohydrate: energy

Fat: energy/ insulation/protection

Fibre: helps prevent constipation

Sodium: water balance…

1. See graph
2. Fat
3. Cheese has most fat/ more fat than other foods
4. Nut (some combustible material) ignited / lighting Bunsen burner

Heating something (e.g. beaker of water)

Method of detecting (proving that it is) heating e.g. thermometer

OR

Circuit containing battery and heating coil (bulb)

Heating something e.g. container of water

Method of detecting (proving that it is) heating e.g. thermometer (bulb feels hot)

1. Burn a peanut (crisp) (cracker) under a container of water.

Use a thermometer to note that the temperature of water rises.

**Other Test Questions**

1. Food Types: Copy the table and fill in the blanks:

|  |  |  |
| --- | --- | --- |
| Nutrient | Functions | Common Sources |
| Carbohydrates |  |  |
| Fats |  |  |
| Proteins |  |  |
| Vitamins |  |  |
| Minerals |  |  |
| Water |  |  |

1. Food Tests: Copy the table and fill in the blanks:

|  |  |  |  |
| --- | --- | --- | --- |
| Food tested | Chemical(s) used | Positive results | Food source that gives a positive result |
| Protein |  |  |  |
| Reducing sugar |  |  |  |
| Starch |  |  |  |
| Fat |  |  |  |

1. Describe an experiment to compare the amount of energy in different food samples. Include a labelled diagram.
2. What units is energy in food measured in?