Intermediate 1

Int 1 Chemistry

Section 11

Food & Diet

LO11 Section 11: Learning Outcomes

LO	Lesson	Text Book	Learning Outcome	Int1 Only
1	11.1	p158	A balanced diet provides the body with all the essential elements and compounds.	
2	11.1	p159	**The major constituent elements of the human body are oxygen, carbon, hydrogen and nitrogen.**	
3	11.1	p158	Elements are present in the diet and in the body as chemical compounds and not as the free elements.	
4	11.1	p158	Essential compounds include carbohydrates, fats and proteins.	
5	11.1	p159	More than 60% of body weight is made up of water.	
6	11.2	p159	Minerals supply the body with small quantities of: a) calcium for bones and teeth, b) iron for the blood, as well as c) trace elements.	
7	11.2	p160	Some trace elements if taken in too large quantities are toxic.	
8	11.3	p161	Carbohydrates form an important class of food made by plants.	
9	11.3	p160	Carbohydrates are used by the body to produce energy.	
10	11.3	p160	**Carbohydrates are compounds which contain carbon, hydrogen and oxygen.**	Int1
11	11.3	p160	Carbohydrates can be divided into sugars and starches.	
12	11.5	p160	Examples of sugars include glucose, **fructose**, **maltose** and sucrose (table sugar).	Int1
13	11.5	p165	**Most sugars can be detected by the Benedict's test; sucrose is an exception.**	Int1
14	11.4	p160	**Starch can be distinguished from other carbohydrates by the iodine test.**	Int1
15	11.3	a) p160 b) p161	**a) Starch is not sweet and does not dissolve readily in water b) sugars are sweet and very soluble in water.**	Int1
16	11.3	p161	Sugars are carbohydrates with small molecules.	
17	11.6	p161	Starch is a polymer made of many **glucose**/small molecules linked together.	(Int1)
18	11.6	p161	Plants convert the glucose into starch for storing energy.	
19	11.7	p163	During digestion starch is broken down to glucose which is carried by the blood stream to body cells where respiration occurs.	
20	a) 11.6 b) 11.7	p164	**Starch can be broken down by a) acid and b) enzymes.**	Int1
21	11.7	p164	**Body enzymes function best at body temperature and are destroyed at higher temperatures.**	Int1
22	11.8	p165	Fats and oils form an important class of food obtained from both plants and animals.	
23	11.8	p167	Fats and oils are much more concentrated sources of energy than carbohydrates.	
24	11.8	p168	Fats and oils can be detected by a filter paper test.	
25	11.9	p168	Saturates are believed to increase the cholesterol level in the bloodstream and this in turn may cause heart disease.	
26	11.9	p168	Polyunsaturates are considered to be less potentially harmful to the heart.	
27	11.9	p168	Medical opinion suggests that total fat consumption should be reduced and, where possible, foods with polyunsaturates should be eaten.	
28	11.10	p169	Proteins form an important class of food obtained from both plants and animals.	
29	11.10	p169	Proteins provide material for body growth and repair.	
30	11.11	p171	**Proteins can be detected by heating with soda lime and testing for an alkaline gas.**	Int1
31	11.10	p171	**Proteins are chemical compounds of carbon, hydrogen, oxygen and nitrogen.**	Int1
32	11.12	p171	**Proteins are polymers made up of many amino acid molecules linked together.**	Int1
33	11.12	p170	**In the body, animals make particular proteins for specific purposes.**	Int1
34	11.12	p173	**The amino acids required to make animal proteins are obtained from animal and vegetable foods.**	Int1
35	11.12	p173	**During digestion proteins in foods are broken down to amino acids.**	Int1
36	11.12	p174	**A vegetarian diet must include a wide variety of vegetables to supply all the necessary amino acids.**	Int1
37	11.13	p174	Fibre keeps the gut working well, preventing constipation.	
38	11.13	p174	Fibre absorbs water and swells; this provides bulk for the gut muscles to work on as food is squeezed along.	
39	11.14	p175	Vitamins are complex carbon compounds which are required to keep the body healthy.	
40	11.14	p175	Lack of important vitamins can cause poor health.	
41	11.15	P178/179	Food additives can be used to: a) supply or enhance the nutritional value of food, **eg vitamins and minerals**, b) improve the keeping qualities of food, **eg food preservatives**, c) alter the appearance of food, **eg food colouring**, d) alter the flavour of food, **eg food flavouring**.	(Int1)
42	11.15	p177	Food additives can be used only if they have been tested and approved.	

11.1 Major Elements in The Body

a) **Copy** the following passage into your jotter.

Staying healthy and eating a healthy diet are becoming increasingly important to stay fit and healthy. Let's look at the major elements and compounds we need to achieve a balanced diet.

b) **Copy** and **complete** the following table in your jotter.

- Use p159 of the text book to complete the table (✓ the correct boxes)

Essential Compounds (Type of Food Group)	Elements in Food Group Compound			
	Carbon	Hydrogen	Oxygen	Nitrogen
Carbohydrate				
Fats & Oils				
Protein				

c) **Copy** and **complete** the following passage in your jotter.

The major elements in your body are …… , …… , …… and …… . These elements are joined together as compounds like …… , …… and protein in my body.

Mt body contains more than 60% water.

Water (H_2O) contains the elements …… and …… .

d) **Weigh** yourself on scales in kilograms

- If 60% of your body weight is water, calculate 60% of your body weight and this is equivalent to the weight of water in your body.
- A 2 litre bottle of fizzy drinks weighs approx 2kg. Calculate the approximately number of bottles of juice the water in your body is equivalent to.

11.2 Trace Elements In The Body

a) **Copy** the following passage into your jotter.

The major elements in the body are carbon, hydrogen, oxygen and nitrogen.

The body also requires other trace elements, called minerals, for our body to work properly and stay healthy.

b) **Copy** and **complete** the following table in your jotter.

Trace Element (mineral)	Function In Body
	for healthy teeth and bones
	for healthy red blood cells
+ other trace elements	various functions in the body

c) **Answer** the following question in your jotter.

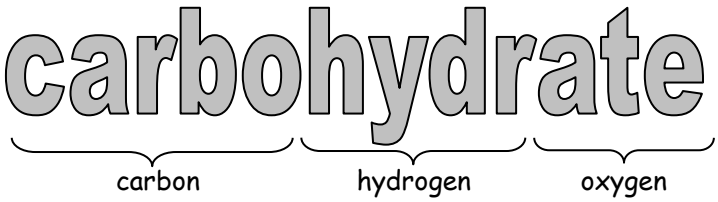
1. Trace elements eaten in small quantities in our diet are good for our health. What would happen if you were to receive a huge dose of a mineral supplement?

11.3 Carbohydrates

a) **Copy** the following passage into your jotter.

Carbohydrates are an important class of foods made by plants. Carbohydrates are broken down in the body and release energy for use by the body.

Carbohydrates contain the elements carbon, hydrogen and oxygen.



There are two main types of carbohydrate.

i. Starch
ii. Sugars

b) **Copy** the following table into your jotter.

Carbohydrate	Solubility	Taste	Size of Molecules
Sugar			
Starch			

c) **Carry out** solubility and taste tests on sugar and starch (potato)

d) **Complete** your table in your jotter.

11.4 Testing for Starch

a) **Copy** the following passage into your jotter.

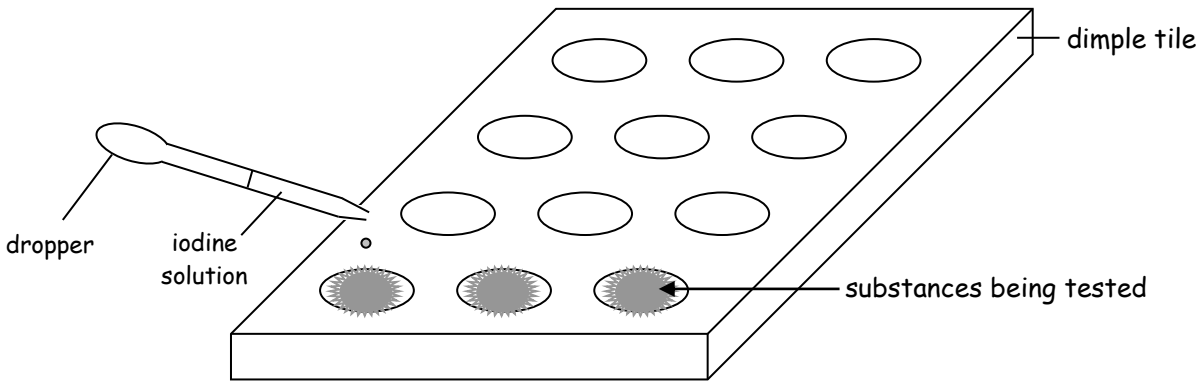
There are two types of carbohydrates – starch and sugars.

Can we tell starch and sugar apart?

b) **Copy** the following table into your jotter.

Substance	Type of Carbohydrate	Colour Change with iodine solution?
Starch	starch	
Glucose	sugar	
Fructose	sugar	
Maltose	sugar	
Sucrose	sugar	

c) **Carry out** the following experiment.



d) **Complete** your table with your results.

- If there is no colour change (i.e. stays yellow) – record as no change.

e) **Copy** and **complete** the following statement in your jotter.

Starch turns …… when iodine solution is added.

11.5 Testing For Sugars

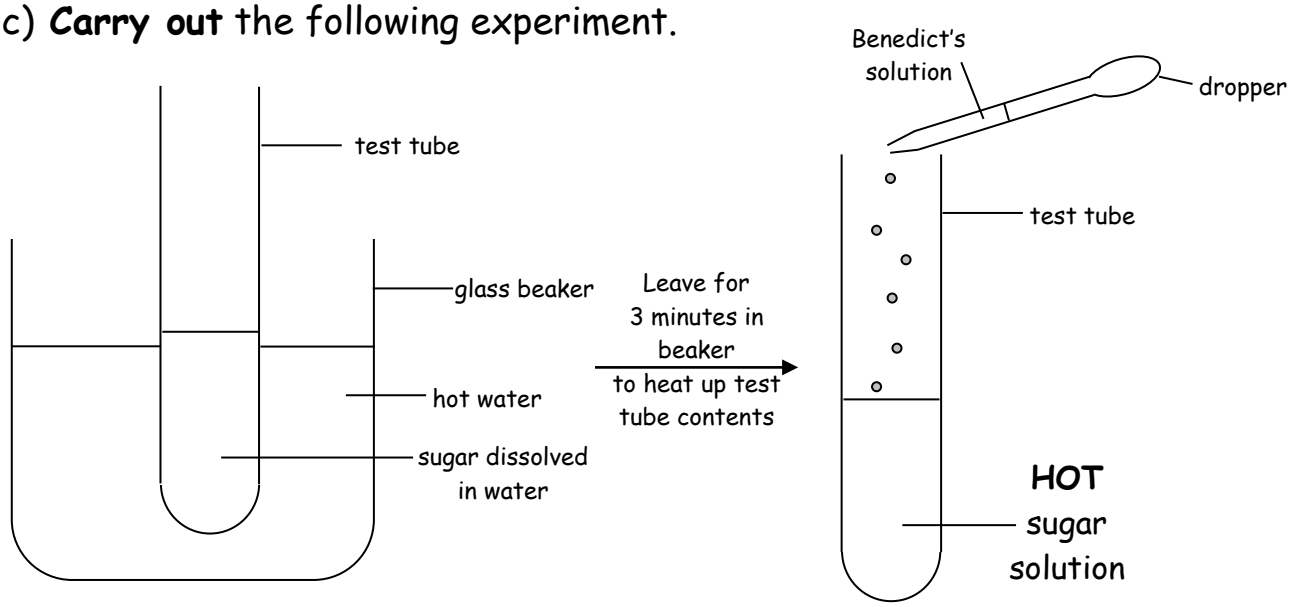
a) **Copy** the following passage into your jotter.

The second type of carbohydrate are called sugars. There are many types of sugars but they all taste sweet. Can we test for sugar?

b) **Copy** the following table into your jotter.

Substance	Type of Carbohydrate	Colour Change with Benedict's solution
Starch		
Glucose		
Fructose		
Maltose		
Sucrose		

c) **Carry out** the following experiment.



d) **Complete** your table with your results.

- If there is no colour change – record 'no change' in your table

e) **Copy** and **complete** the following statement.

……, …… and …… change the colour of Benedict's solution from blue → …… .

…… and …… do not change the colour of Benedict's solution.

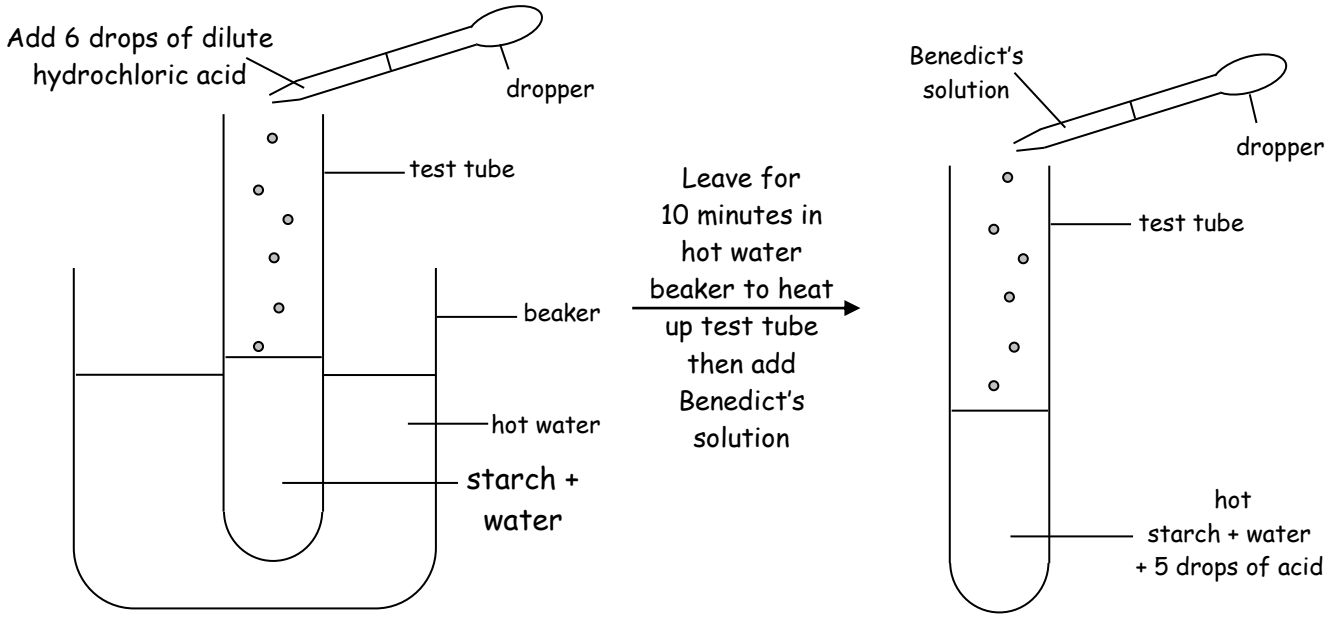
f) If you have time, your teacher may allow you to achieve a colour change with sucrose (table sugar)

11.6 Structure of Starch

a) **Copy** the following passage into your jotter.

Starch is a large, insoluble molecule made by plants for long term storage of energy. Let's look at the structure of starch.

b) **Copy** the following diagram into your jotter.

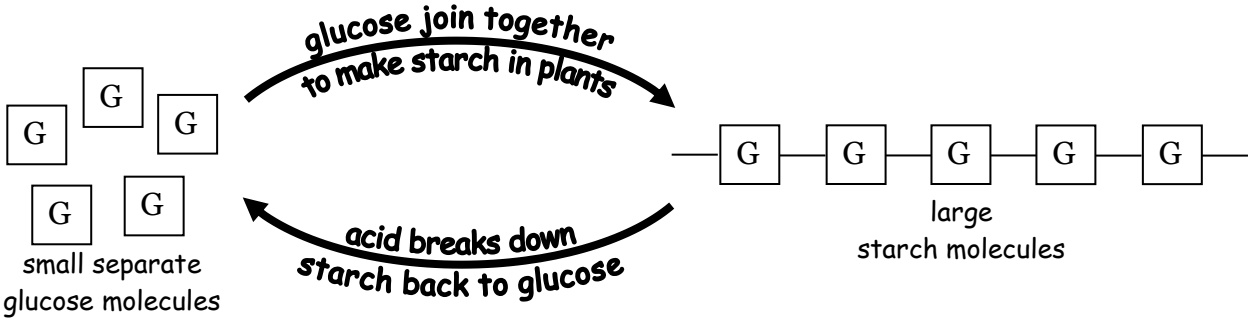


c) **Answer** the following questions in your jotter.

1. Does starch react with Benedict's solution before the addition of acid?
2. Does starch react with Benedict's solution after the addition of acid?
3. Which substance is starch made up of?

d) **Copy** the following passage into your jotter.

Starch is a long chain polymer formed when many glucose molecules join together.



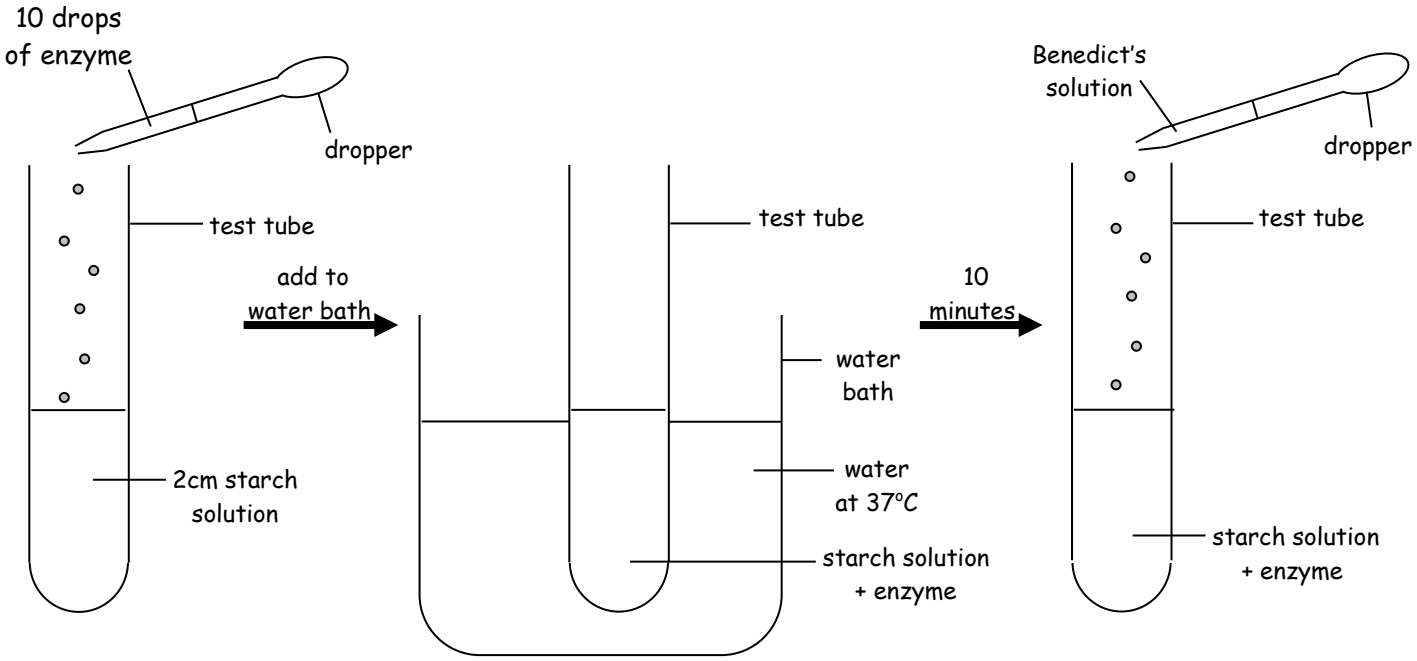
11.7 Digestion of Starch

a) **Copy** the following passage into your jotter.

Starch is a large polymer which can be broken down into small glucose molecules. In the laboratory, hot acid will break down starch.

However, the body's temperature is constant at 37°C and not any hotter. How does starch get broken down at body temperature.

b) **Copy** the following diagram into your jotter.

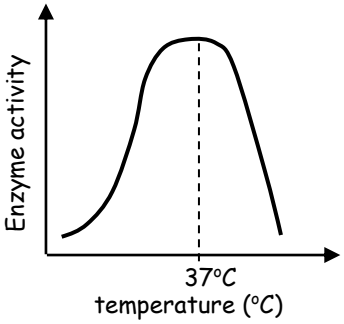


c) **Answer** the following questions in your jotter.

1. When Benedict's solution changes colour, what substance must be present?
2. Which chemical must the enzyme break starch down into at 37°C?
3. Would this reaction work better at a hotter temperature (e.g.80°C)?
4. Where in the body does digestion take place?
5. What happens to the glucose produced by the digestion of starch in the body?

d) **Copy** the following passage and diagram into your jotter.

Enzymes are designed to work best at body temperature (37°C). If the temperature increases well above 37°C, the enzymes are destroyed and no longer work.



11.8 Testing for Fats & Oils

a) **Copy** the following passage into your jotter.

Fats and oils are an important class of foods. They are obtained by eating plants and animals foods.

Fats & Oils provide our body with energy.

- Fats and oils provide more energy than the same weight of carbohydrate.
- Fats and oils are described as a more concentrated energy source than carbohydrates.

b) **Copy** the following table into your jotter.

Food	Oily Mark on Filter Paper	Fat or Oil Present?

c) **Copy** and **complete** the following statement in your jotter.

The test for fat/oil in a food is ……

…… .

11.9 Healthy and Unhealthy Fats & Oils

a) **Copy** the following passage into your jotter.

Fats and oils provide your body with energy but too much fat in your diet is unhealthy for you.

There are generally two types of fats/oil

1. Saturates – usually solid fats
2. Polyunsaturates – usually liquid oils

Saturates increase your *cholesterol* levels in your blood.

- This can lead to your arteries in your heart becoming blocked with fatty deposits.
- This is called *heart disease*.

Polyunsaturated fats & oils are considered to be potentially less harmful to your heart

- Too much polyunsaturated fats & oils are still not good for your health.
- Unsaturated fats & oils e.g. olive oil are less likely to block up your arteries than saturated fats.

11.10 Proteins

a) **Copy** the following passage into your jotter.

Proteins are the 3rd important class of foods in our diet. Proteins can be obtained from both animal and plant sources.

The body needs them for growth and repair to body tissues.

- Animal protein e.g. steak, fish
- Plant protein e.g. vegetables, soya

b) **Copy** the following table into your jotter.

- Use p159 and 170/171 of the text book to **complete** your table

Class of food	Function in Body	Food Group contains the elements			
		carbon	hydrogen	oxygen	nitrogen
Protein					
Fat					
Carbohydrate					

c) **Copy** the following table into your jotter.

- Use page 7 of the date booklet to **complete** your table.

Food	Mass of protein in 100g of food (g)
Fish	
Bread	
Carrot	
Cheese	
Steak	
Orange Juice	

d) **Answer** the following questions in your jotter.

1. What does protein get used for in your body?
2. Which element is found in proteins but not in carbohydrates or fats?

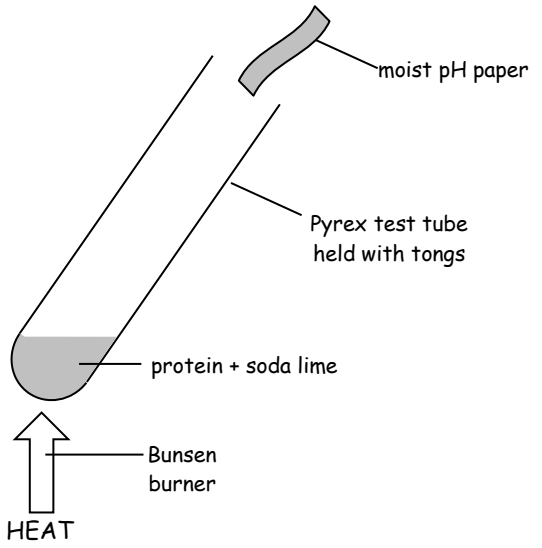
3. Which 3 elements are found in proteins, fats and carbohydrates.

11.11 Testing for Proteins

a) **Copy** the following passage into your jotter.

Starch, sugars and fats have positive tests for their presence in foods. Let's llok at proving the presence of protein in a food.

b) **Copy** the following diagram into your jotter.



He pH paper must be moist with water. There will be no colour change in paper is dry

Safety Tip

SODA LIME is a very caustic substance and must be handled with care. If you spill any, let the teacher know immediately and we will clean it up.

c) **Carry out** the experiment with extreme care.

d) **Answer** the following questions in your jotter.

1. What colour does the moist pH paper turn on heating the mixture.
2. The colour change in the pH paper indicates what about the gas given off.
3. Have you smelt this gas before? If so, can you name the gas?

e) **Copy** and **complete** the following table in your jotter.

Class of Food	Test for Food Group
Carbohydrate (sugar)	
Carbohydrate (starch)	
Fats & Oils	
Protein	

11.12 Digesting & Building Protein

a) **Copy** the following passage into your jotter.

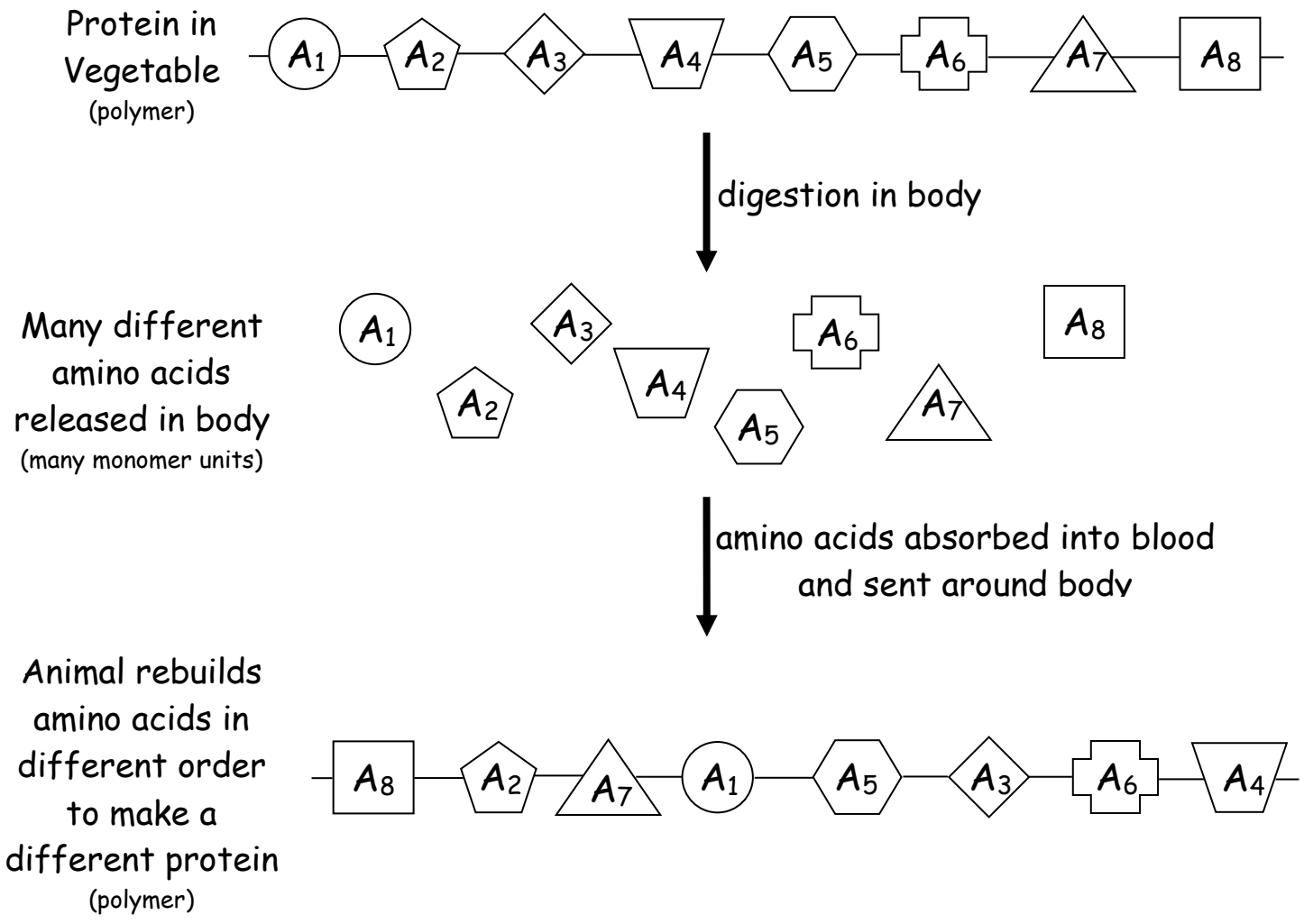
Proteins are made in the body for specific purposes e.g. muscles, hair, etc.

Plants make protein they need for themselves and animals get the protein they need from eating protein in plants and other animals.

Vegetarian and vegan diets must include a wide variety of vegetables to provide all the proteins needed for a healthy diet.

Proteins are *polymers* made of many <u>amino acid</u> *monomer* units joined together in a particular order.

b) **Copy** the following diagram into your jotter.



11.13 Fibre

a) **Copy** the following passage into your jotter.

Your body needs carbohydrates, fats and proteins in the correct quantities to stay healthy. Food contains more than just three food groups though.

Fibre in your diet helps keep the gut working properly.

b) **Answer** the following questions in your jotter.

- Use p174 of the text book to help answer the questions.

1. Name 3 types of food which are rich in fibre.
2. If your body does not break down fibre for absorption into the body, what happens to the fibre in the intestines (gut) instead?
3. Why is it good for fibre to do this in your gut?
4. What medical condition can you get if you do not have enough fibre in your diet?

11.14 Vitamins

a) **Copy** the following passage into your jotter.

Vitamins are found in the food that we eat and are required to keep the body healthy.

- Vitamins are complex carbon-based compounds.
- Lack of vitamins can cause poor health.

b) **Copy** the following table into your jotter.

Vitamin	Lack of vitamin in diet
A	Impaired night vision
B_x	B_6 - depression B_{12} – bone marrow don't produce red blood cells properly
C	scurvy
D	rickets
E	Muscle weakness and impaired balance

11.15 Food Additives

a) **Copy** the following passage into your jotter.

Our food contains many additional chemicals, called food additives, to improve different aspects of the food.

- Some food additives are controversial but hey can only be used if they have been tested and approved by independent scientists.
- Some food additives used years ago are now banned because they may cause harmful effects to our bodies over a period of years.

b) **Copy** the following table into your jotter.

Type of food additive	Reason for Use as a Food Additive
	To supply and enhance the nutritional value of the food
	To improve the keeping qualities of the food so it stays fresh for longer
	To alter the appearance of the food
	To alter the flavour of the food e.g. sweetner

c) Use the word bank to **complete** your table.

wordbank

Food Flavouring	Food Preservatives	Vitamins & minerals	Food Colouring

Revision
11.16

Access 3 Level Revision Questions

1. How much of the body is water?

approx 50% or **approx 60%**

2. The small molecules which join together to make starch are

glucose or **amino acids**

3. Which of the following has been linked to causing heart disease?

polyunsaturates or **saturates**

4. Which of the following is caused by a lack of fibre in your diet?

constipation or **diarrhoea**

5. Which of the following is used by the body for repair of body tissues?

carbohydrates or **proteins**

6. Which sugar is produced by the digestion (break down) of starch?

glucose or **sucrose**

7. When iodine solution is added to starch, the colour changes to

brick red or **blue/black**

8. Which of the following contains the most energy?

carbohydrates or **fat**

9. Which element is **NOT** found in carbohydrates?

nitrogen or **carbon**

10. Calcium is needed in the body for

healthy blood or **healthy bones and teeth**

Revision
11.17

Intermediate 1 Level Revision Questions

1. Which of the following is not a carbohydrate?

A. protein B. glucose C. sucrose D. starch

Answer questions 2-5 using the following possible answers:

A. Heating with soda lime B. Filter Paper Test C. Benedict's solution D. Iodine solution

2. Glucose is tested with
3. Starch is tested with
4. Fats & Oils are tested by
5. Proteins are tested by

Answer questions 6-9 using the following possible answers:

A. brick red B. blue/black C. oily mark D. moist pH paper blue

6. Iodine solution turns
7. Filter paper leaves an
8. Heating with soda lime turns
9. Benedict's solution turns

Answer questions 10-13 using the following possible answers:

A. keeps gut working well B. repair body tissues C. supply body with energy D. supply body with energy

10. Carbohydrates are needed in a healthy diet because they
11. Fibre is needed in a healthy diet because it
12. Protein is needed in a healthy diet because it is needed to
13. Fats & Oils are needed in a healthy diet because they

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14. Proteins are broken down into

A. fibre B. vitamins C. amino acids D. minerals

15. Which element is found in proteins but not carbohydrates or fat?

A. carbon B. hydrogen C. oxygen D. nitrogen