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C1

Cambridge Unit Planner Sample

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Summary

Human nutrition Current



Subject	Year	Start date	Duration
Biology	CAIE IGCSE Year 10	Week 1, September	5 weeks 15 hours

Description

This unit of study explores the digestive system as a group of organs working together to convert food into the nutrients needed for growth, repair and energy production. As students tour the digestive system, they will identify and explain how the structure of each major organ relates to its function. Human nutritional requirements will be discussed in the context of human health, as well as the societal and cultural factors which impact diet. Links will be made to topics 2.2 (levels of organisation), 3 (movement in and out of cells), 4 (biological molecules) and 5 (enzymes).

Inquiry

Essential understandings

The conceptual lens through which this topic will be explored is the use of models to support the understanding of real world systems. As students navigate through the digestive system, they will evaluate and create models for describing and explaining the digestive process.

Guiding questions

Type	Inquiry Questions
Conceptual	In what ways can models be useful for advancing public understanding of scientific ideas?
Debatable	Is the use of visking tubing the most effective way of modelling the absorption of digested food in the intestine?
Factual	What are the major organs of the digestive system and how do their structures relate to their functions?

Curriculum

Aims

Provide an enjoyable and worthwhile educational experience for all learners, whether or not they go on to study science beyond this level

Develop skills that:

- are useful in everyday life

Develop attitudes relevant to biology such as:

objectivity

Enable learners to appreciate that:

science is subject to social, economic, technological, ethical and cultural influences and limitations

the applications of science may be both beneficial and detrimental to the individual, the community and the environment

Objectives

AO1 Knowledge with understanding

Demonstrate knowledge and understanding of scientific vocabulary, terminology and conventions (including symbols, quantities and units)

AO2 Handling information and problem solving

Locate, select, organise and present information from a variety of sources

AO3 Experimental skills and investigations

Interpret and evaluate experimental observations and data

Evaluate methods and suggest possible improvements

Syllabus

Enzymes

Core

Define the term catalyst as a substance that increases the rate of a chemical reaction and is not changed by the reaction

Define enzymes as proteins that function as biological catalysts

Describe why enzymes are important in all living organisms in terms of reaction speed necessary to sustain life

Describe enzyme action with reference to the complementary shape of an enzyme and its substrate and the formation of a product (knowledge of the term active site is not required)

Investigate and describe the effect of changes in temperature and pH on enzyme activity

Supplement

Explain enzyme action with reference to the active site, enzyme-substrate complex, substrate and product

Explain the specificity of enzymes in terms of the complementary shape and fit of the active site with the substrate

Explain the effect of changes in temperature on enzyme activity in terms of kinetic energy, shape and fit, frequency of effective collisions and denaturation

Explain the effect of changes in pH on enzyme activity in terms of shape and fit and denaturation

Human nutrition

Diet

Core

State what is meant by the term balanced diet for humans

Explain how age, gender and activity affect the dietary needs of humans including during pregnancy and whilst breast-feeding

Describe the effects of malnutrition in relation to starvation, constipation, coronary heart disease, obesity and scurvy

List the principal sources of, and describe the dietary importance of:

carbohydrates

fats

proteins

vitamins, limited to C and D

mineral salts, limited to calcium and iron

fibre (roughage)

water

Supplement

Explain the causes and effects of vitamin D and iron deficiencies

Explain the causes and effects of protein-energy malnutrition, e.g. kwashiorkor and marasmus

Alimentary canal

Core

Define ingestion as the taking of substances, e.g. food and drink, into the body through the mouth

Define mechanical digestion as the breakdown of food into smaller pieces without chemical change to the food molecules

Define chemical digestion as the breakdown of large, insoluble molecules into small, soluble molecules

Define absorption as the movement of small food molecules and ions through the wall of the intestine into the blood

Define assimilation as the movement of digested food molecules into the cells of the body where they are used, becoming part of the cells

Define egestion as the passing out of food that has not been digested or absorbed, as faeces, through the anus

Describe diarrhoea as the loss of watery faeces

Outline the treatment of diarrhoea using oral rehydration therapy

Describe cholera as a disease caused by a bacterium

Identify the main regions of the alimentary canal and associated organs, limited to mouth, salivary glands, oesophagus, stomach, small intestine (duodenum and ileum), pancreas, liver, gall bladder and large intestine (colon, rectum, anus)

Describe the functions of the regions of the alimentary canal listed above, in relation to ingestion, digestion, absorption, assimilation and egestion of food

Supplement

Explain that the cholera bacterium produces a toxin that causes secretion of chloride ions into the small intestine, causing osmotic movement of water into the gut, causing diarrhoea, dehydration and loss of salts from blood

Mechanical digestion

Core

Identify the types of human teeth (incisors, canines, premolars and molars)

Describe the structure of human teeth, limited to enamel, dentine, pulp, nerves and cement, as well as the gums

Describe the functions of the types of human teeth in mechanical digestion of food

State the causes of dental decay in terms of a coating of bacteria and food on teeth, the bacteria respiring sugars in the food, producing acid which dissolves the enamel and dentine

Describe the proper care of teeth in terms of diet and regular brushing

Chemical digestion

Core

State the significance of chemical digestion in the alimentary canal in producing small, soluble molecules that can be absorbed

State the functions of enzymes as follows:

amylase breaks down starch to simpler sugars

protease breaks down protein to amino acids

lipase breaks down fats to fatty acids and glycerol

State where, in the alimentary canal, amylase, protease and lipase are secreted

State the functions of the hydrochloric acid in gastric juice, limited to killing bacteria in food and giving an acid pH for enzymes

Supplement

Describe the digestion of starch in the alimentary canal:

amylase is secreted into the alimentary canal and breaks down starch to maltose

maltose is broken down by maltase to glucose on the membranes of the epithelium lining the small intestine

Describe pepsin and trypsin as two protease enzymes that function in different parts of the alimentary canal:

pepsin in the stomach

trypsin in the small intestine

Explain the functions of the hydrochloric acid in gastric juice, limited to the low pH:

denaturing enzymes in harmful microorganisms in food

giving the optimum pH for pepsin activity

Outline the role of bile in neutralising the acidic mixture of food and gastric juices entering the duodenum from the

stomach, to provide a suitable pH for enzyme action

Outline the role of bile in emulsifying fats to increase the surface area for the chemical digestion of fat to fatty acids and glycerol by lipase

Absorption

Core

Identify the small intestine as the region for the absorption of digested food

State that water is absorbed in both the small intestine and the colon, but that most absorption of water happens in the small intestine

Supplement

Explain the significance of villi and microvilli in increasing the internal surface area of the small intestine

Describe the structure of a villus

Describe the roles of capillaries and lacteals in villi

Content

Students need to learn the definitions listed in the syllabus. These will appear in the exam as "state" questions. The syllabus also outlines the parts of the digestive system that students need to be able to identify. Extended students also need to be able to make links between structures and their functions, as well as the significance of these. Students will also explore the links between diet and health, and extended students will learn about the impact of cholera bacteria on the function of the gut.

Skills

Students need to be able to identify the major parts of the digestive system, and one skill which supports this is learning drawing and labelling the digestive system. The following rules will support students in the development of scientific drawing skills **https://tinyurl.com/y7yb59o**

Connections

Transdisciplinary skills



Academically Prepared: Be a lifelong learner and a problem solver

The focus on models in this unit will facilitate the development of thinking skills. Students will be required to determine the relative importance and relevance of the different approaches to modelling concepts in this unit, and they will be challenged to find errors and limitations in their models. The more complex models will require synthesis of ideas, and the identification of links between different topic areas within the unit, and with other parts of the syllabus.

Dispositions



Relationship Skills

Responsible Decision-Making

Self Reflector

Description

Students will develop their ability to reflect during this unit, through their self and peer assessment tasks, and through the evaluation of the different models used to demonstrate the digestive process. They will also need to show creativity and collaborative skills as they adapt and improve upon the standard models.

International Mindedness

During the study of the human diet, students will consider the impact that culture, environment and poverty can have on health. In particular, extended students will look at the impact of cholera on the social and economic structure of a country, as well as the biological effects of the bacterium, e.g. www.who.int/topics/cholera/impact/en/

Academic honesty

Students are required to follow the school policy for academic honesty in all work submitted for grading.

Information communication technology

This unit requires research by students, and they will need to evaluate the authenticity, scientific accuracy and objectivity of websites they consult.

Language and literacy development

Students will regularly engage in group discussions to evaluate the models. This will require them to incorporate new terminology into their vocabulary. EAL students will be supported through the provision of a glossary and a focus on definitions in the first few weeks of the topic. Writing frames will be provided for the initial evaluation of models to show students how to structure their thoughts.

Cross-curricular links

In geography, students study the impact of infectious disease on the economic and social structure of developing countries. This unit serves to connect the geographic perspective with the biological explanation of how the cholera bacterium is spread and the impact it has on the digestive system. In physical education, students learn about diet through the lens of sports science. This unit addresses diet from a broader perspective. It also ties in with general health and wellbeing advice that students receive during personal and social education.

Co-curricular links

This topic may be of particular interest to students who are considering a medical or health-related degree at university, and participate in the health science club.

Assessment

Formative assessment

Formative assessment will be used during this unit to inform adjustments to teaching and learning. Checks for understanding will take place at the end of each significant task and lesson. These will include exit slips, think-pair-share, whiteboards, and

individual discussions with the teacher. On-going feedback will serve to help students identify their own strengths and areas for improvement, and understand how to improve.

Summative assessment

Summative assessments will be used during this unit to evaluate student learning against specific outcomes. There will be a variety of types of summative assessment, including an end-of-topic test and a lab report. Data from these assessments will also be used formatively to inform teaching and learning in future units.

DEC 13 — End of year Assignment
Extended | Core | Summative | Assignment — Thursday at 1:05 PM

SEP 24 — What are the benefits of a healthy, balanced diet?
Extended | Core | Summative | Homework — Monday at 3:10 PM

In a summary, try to think about what you've learned in the unit so far and explain the benefits of a healthy and balanced diet.

Peer and self assessment

Both formative and summative assessment tasks will include either peer or self assessment during the process of completing the activity. Students will be asked to evaluate their own work against the assessment rubric and identify areas for improvement. They will also be asked to give feedback to one another by looking for positives and areas for improvement in the work. The purpose is to give students a greater sense of ownership of their learning and to become more self-directed learners, as they develop a deeper understanding of the assessment criteria.

Standardisation and moderation

There are 3 IGCSE Biology classes running concurrently. Summative assessments are consistent across classes and these will be marked by the class teacher. Subsequently, teachers will share examples of student work during a moderation meeting. Copies of exemplar work will be kept for future reference to support marking alignment.

Learning Experiences

Prior learning experiences

In Year 7, students cover much of the core syllabus as part of the Nutrition and Digestion topic. This is revisited before the end-of-year exams of Year 9. The supplement aspects of the syllabus will be new to most students.

Student expectations

Summative assessment tasks have an accompanying rubric, which is used to guide students about expectations, and to assess their work. Rubrics are made available and explained to students when the task is introduced. Where available, exemplar materials from previous years are used to demonstrate the success criteria for summative assessments.

Pedagogical approaches

Lecture
Small group/pair work
PowerPoint lecture/notes

Student lecture/leading

Teaching strategies

The focus of this unit is learning through the use of scientific models. Where relevant, models will be used to demonstrate concepts. Students will be given the opportunity to evaluate, and then improve or extend the models.

Feedback

During this unit, students will receive formal written feedback on their summative assessments, and verbal feedback on formative assessments. A feedback loop model will be used to ensure that teaching is responsive throughout the unit, in order to support the learning needs of individual students, and that specific and individualised verbal feedback is received by students at the most appropriate time for them to improve their work.

Differentiation

Many students will have a solid grounding in the core aspects of the syllabus due to their participation in the Year 7 Nutrition and Digestion topic. There are, however, several students who joined the school after Year 7 and may have a knowledge gap. This will need to be taken into account during planning to ensure that these students are supported. It will also be important to provide a glossary to EAL students as there are many key terms and definitions which may be new to them. Buddying EAL and new students with students who performed highly in the Year 7 test is one strategy that will be used to support learners. High ability students will be encouraged to focus on the supplement aspect of the syllabus and beyond.

Stream & Resources

Lesson 1

1

Sharon Arese
Posted **online lesson** on Sep 19, 2018 at 12:34 AM

SEP 19 — Human Nutrition Lesson
Other online lesson tools — 01:00 Hours - 1:00 PM - 2:00 PM

2

Sharon Arese
Posted **task** on Sep 19, 2017 at 10:05 AM

SEP 1 — Modelling tooth decay
Extended | Core | Summative | Lab Report — Friday at 2:00 PM

Your group will be given the following equipment and it is your task to design and carry out an experiment into tooth decay. You can ask for additional equipment. Equipment: - 6 white hard boiled eggs - Distilled water - Coke - Tea - Vinegar - Orange juice - Milk - 6 large beakers Upload a labelled photograph of your experiment. Work alone to write a conclusion and evaluation of your group results. Your conclusion and evaluation will be graded 9-1 using the lab report rubric.

3

Video posted on Sep 23, 2017 at 8:15 PM

https://www.youtube.com/watch?time_continue=6&v=cj8dDTHGJBY

4

Sharon Arese
Posted **task** on Sep 19, 2017 at 10:07 AM

SEP 18

Evaluating the visking tubing model for absorption of food from the small intestine

Extended Core Summative Lab Monday at 11:00 AM

The visking tubing model is a visual way of demonstrating diffusion through a partially permeable membrane. After carrying out the experiment, work in small groups to evaluate the effectiveness of the visking tubing model as a representation of the small intestine, and then develop an alternative model. 1. In what ways does the visking tubing model effectively represent diffusion in the small intestine? 2. Which features of the small intestine are absent from the visking tubing model? 3. Use the rubric below to evaluate the visking tubing model. 4. Suggest how the visking tubing model could be improved for use in future Year 10 biology classes. 5. Use the resources available in the classroom to develop your own model of diffusion in the small intestine. The rubric attached will be used to assess your model.

5

Sharon Arese
Posted **website** on Sep 19, 2018 at 12:24 AM

Food Science

https://www.sciencedirect.com/topics/food-science/human-nutrition

6

Sharon Arese
Posted **task** on Sep 19, 2017 at 10:08 AM

OCT 20

Topic Review

Extended Core Formative Revision Friday at 10:05 AM

Use the following attached simulations and quizzes to review the digestion topic. In preparation for your test, choose one area of the syllabus you feel less confident in and make a set of 5 flash cards to support your revision. You should include syllabus references on your flash cards and at least one model we have used during this topic. The flashcards can be online or paper. If you choose to work online, you could use PowerPoint or an online tool such as https://quizlet.com/ Remember, you must reference all your sources of information and images. You can make an additional flash card for references, or include references on individual cards.

7

Sharon Arese
Posted **video** on Sep 19, 2018 at 12:29 AM

What causes cavities?

https://youtu.be/zGoBFU1q4g0

8

1 File posted on Sep 20, 2017 at 5:37 AM

4.45_Biological_Molecules_Paper.pdf
200 KB PDF Document

9

Bruce Griffin
Posted **task** on Sep 19, 2018 at 12:16 AM

SEP 24

What are the benefits of a healthy, balanced diet?

Extended Core Summative Homework Monday at 3:10 PM

In a summary, try to think about what you've learned in the unit so far and explain the benefits of a healthy and balanced diet.

Lesson 5

1

Sharon Arese
Posted **task** on Sep 28, 2018 at 1:08 PM

DEC 13 End of year Assignment
Extended Core Summative Assignment Thursday at 1:05 PM

Resources

Sharon Arese
Posted **video** on Sep 19, 2018 at 12:29 AM

What causes cavities?

https://youtu.be/zGoBFU1q4g0

Sharon Arese
Posted **website** on Sep 19, 2018 at 12:24 AM

Food Science

https://www.sciencedirect.com/topics/food-science/human-nutrition

Video posted on Sep 23, 2017 at 8:15 PM

https://www.youtube.com/watch?time_continue=6&v=cj8dDTHGJBY

1 File posted on Sep 20, 2017 at 5:37 AM

4.45_Biological_Molecules_Paper.pdf
200 KB PDF Document