



## Year 9 Biology

### Introduction

These lessons are intended to work as a series of units following the general themes set out below which lead towards approximate coverage of the Programme of Study to KS3 in Sc2. Their planning is based on the Truth to Teach, Way to Work, Learning for Life model, opportunity being woven into the lessons to consider the application of the topic to Society, any relevant issues of citizenship, and how the Christian worldview affects the topic under consideration. Considering the Christian worldview requires the handling of scripture in such a way as to derive principles within the scientific context, and the handling of Science in making moral decisions.

### Aims

- To cover KS3 Curriculum as outlined by the National Curriculum
- To consider the applications and implications of the curricular content
- To place this in a Christian context as constructed from Scriptural truth
- To inform worshipful and responsible life choices

### Outline

Year 9		
Timing	Biological Curriculum	Wider Issues
Sept - Oct	Nutrition	Stewardship, Diet and Body Image
Oct-Nov	Circulation	Activity & Variation in God's Environment
Nov-Dec	Breathing	Health, Habits and Peer Choices
Jan	Respiration	Animal Experimentation
Jan-Feb	Moving	Sport, Performance and Status
Feb-Mar	Health and Disease	Compassion in a Suffering World
April	SATs preparation	
May	SATs	
June-July	Man and the Environment	Stewardship, Government and Purpose

### Bibliography

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## Websites

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www.thebls.org.uk/tandt.htm

www.schoolscience.co.uk/content/4/biology/abpi/diseases/index.html

www.yptenc.org.uk/docs/factsheets/env\_facts/river\_pollution.html

www.nhm.ac.uk/botany/lichen/twig/interpret.html

www.wwtlearn.org.uk/worksheets/worksheet-pond\_safari.pdf

http://216.31.193.171/asp/1\_introduction.asp

([http://www.environment-agency.gov.uk/science/monitoring/1843531/?version=1&lang=\\_e](http://www.environment-agency.gov.uk/science/monitoring/1843531/?version=1&lang=_e))

www.who.int/docstore/water\_sanitation\_health/wg\_monitor/ch13.htm

## Detail

Lesson	Date (approx)	Lesson Content — TI pp. 8 to 34	Homework	Text & Worksheet refs
<p><b>Nutrition</b></p> <p><i>Truth:</i> God has given us bodies to steward, and cares for us enough to provide for our needs. The 'body beautiful' as represented by the media is not God's purpose for our lives.</p>				
<p><b>KS3 National Curriculum - Nutrition</b></p> <p>a. About the need for a balanced diet containing carbohydrates, proteins, fats, minerals, vitamins, fibre and water, and about foods that are sources of these.</p> <p>b. The principles of digestion, including the role of enzymes in breaking down large molecules into smaller ones.</p> <p>c. That the products of digestion are absorbed into the bloodstream and transported throughout the body and that waste material is egested.</p> <p>d. That food is used as a fuel during respiration to maintain the body's activity and as a raw material for growth and repair.</p>				
1	10/9/03	<p>Use a title in their notes, e.g. 'Nutrition', a) Meals. Pupils list what they have eaten at which points during the day.</p> <p>Ask for any information they have about food types. Also, which need to be eaten in moderation. Use a colour code to shade in foods listed by types. If possible use words such as 'fat', 'protein', 'carbohydrate'.</p> <p><b>Investigation 1</b> – weigh themselves, and then divide this mass by the relevant percentages.</p> <p>Given a value, show how to convert a cost per mass of food into the value of that component of a body.</p>	Find cost per mass for protein-rich, fat-rich, and carbohydrate-rich foods. Calculate worth of the body.	Roberts pp.146-147
2	17/9/03	<p>Discuss 'value' as indicated by Investigation. The particular scripture to be considered at some point is Matthew 6:25-34.</p> <p>Carry out food tests either as a demo, or in groups. Record results for flour, sugar and protein – include solubility &amp; responses to each test (Investigation 1 from p.156). These to be neatly presented.</p>	Neat presentation of results from class notes.	Roberts p.156
3	24/9/03	<p>Hand out 'Choosing What to Eat' sheets. Complete Food Test summary blanks.</p> <p>Allocate food types from the initial lists for groups to research. The info should be fed back to the whole class, notes then being taken by all.</p> <p>Hand out coloured paper and envelopes of some sort for the 'Big and Small Molecules' section. Homework to cut out the necessary numbers for the next lesson.</p>	Cut out and store paper shapes for the next lesson.	Roberts pp.150-155 'Choosing What to Eat'

Lesson	Date (approx)	Lesson Content — TI pp. 8 to 34	Homework	Text & Wsht ref.s
4	1/10/03	Use cartoon pig diagram to identify in- di- and egestion, absorption and use (assimilation). Title 'Digestion' A4, top third separated from the bottom $\frac{2}{3}$ by a dotted line labelled semi-permeable membranes. Top third labelled 'blood stream', bottom $\frac{2}{3}$ labelled contents of the intestine. Protein shapes in chains, pairs and singly below the line, singly above the line; fat shapes, glycerol and 3 fatty acids below, separated above; and, carbohydrate shapes in long chains, pairs and singles below, but only singles above the line. Label arrow across the line as 'absorption', and an arrow between macromolecules to monomers, etc as 'digestion'. Draw and label a sequence of diagrams leading to a villus used for absorption. Scale and location should be included.	Attempt the 'Guts' tasks.	
5	8/10/03	Complete villus diagram. If necessary, hand out 'Guts' sheets. Complete the flap task 'From Here to There'. Emphasize again the idea of insoluble - egestion, and soluble - absorbed. Complete a quiz, word search of structures & processes — words (peristalsis) in the grid, definitions as clues. Read extracts from 'Wasted Childhood' Telegraph Magazine, Oct 03.	Complete the 'Are you what you eat?' Sheet. Revise for a test.	'Wasted Childhood' 'Guts'
6	15/10/03	Consider some of the answers from homework to stimulate discussion, e.g. read one or two of the letters anonymously, and reprise the scriptures quoted with reasons. Set homework by reviewing work covered. Introduce next lesson's work by counting resting pulse rate and recording it on the board.	Revise for a test.	
<p><b>Circulation</b></p> <p><b>Truth:</b> God created variation amongst us and created our bodies to be able to change in response to a changing environment. Somewhere in these lessons take time to list what varies and why, and then consider whether the Bible has anything to say about variation, perhaps in the context of racial differences.</p>				
7	22/10/03	<b>Complete the test.</b> <b>Recount resting rate — perhaps calculate average from this and last week's lessons.</b> <b>Record in a frequency chart and draw a graph to represent these results.</b>	Complete the graph of the data.	

Lesson	Date (approx)	Lesson Content — TI pp. 8 to 34	Homework	Text & Wsht ref.s
8	5/11/03	Use the 'Pulse and Exercise' worksheet. Complete the following sequence: measure resting pulse; carry out two minutes of exercise; measure the pulse rate every minute for five consecutive minutes. Begin to consider the reason blood moves around the body: food from the gut, gases from the lungs, muscle involvement. Extra Task: calculate beats per lifetime, and volume pumped per lifetime.	Complete the graph for homework.	'Pulse and Exercise'
9	12/11/03	If necessary, complete the last section from the worksheet. Hand out 'The Heart Beat' sheet. Complete the labelling, and shade areas red or blue according to oxygenation. Shade cardiac muscles first. Draw a diagram of the circulation including heart, muscles, intestine and brain. Use the folder nets from the sheet as name boxes for the diagram. Cut out max 20 pieces of paper/card to fit in these folders. Label some 'oxygen', some 'carbon dioxide', etc; include sugar, hormones, amino acids, vitamins, water, etc. Discuss the kinds of chemical that should be included, and where they come from. Design a revision game using the folders, cards and circulation diagram.	Complete a list of rules for the Circulation Game.	'The Heart Beat' adapted (4 boxes and lists of chemicals.
10	19/11/03	Use groups to gather information about components of the blood. Prime them by giving a list of words to research, e.g. haemoglobin, red blood cell, plasma, white blood cell, antibodies, phagocytosis, ... Complete a data sheet: numbers of cells, etc. Extra Task: calculate number of each type of cell per person. Issue and explain 'Functions of the Blood' sheet for homework.	Complete sheet for homework.	Roberts pp.204-211 'Functions of the Blood'
11	26/11/03	Complete notes from the board on blood vessels. Designed as a mind map + diagrams. Complete this on A3 using a heart artery → capillary vein heart cycle at the centre. Relate this to the pulse work and review all the information.	Revise for a test.	
12		Complete Test. Include a question for discussion, e.g. Sport are unfair because people vary. Consider why variation is a good thing. Consider how this might be communicated, e.g. poster, pamphlet, etc	Creative worship poster, etc	

### Breathing

**Truth:** God's good creation in a fallen world can go wrong. He has given us ways to correct these effects and can help us respond with compassion. (The Creation-Fall-Redemption model may also be applied here.)

Lesson	Date (approx)	Lesson Content — TI pp. 8 to 34	Homework	Text & Wsht ref.s
<b>KS3 National Curriculum - Breathing</b>				
i) The role of lung structure in gas exchange, including the effect of smoking.				
13	12/12/03	Return the test and discuss some of the answers to the discussion questions. Measure breathing rate and collect the data on the board. Ask the question "How do we breathe?" and point out the movement of the rib cage, linking the appropriate movement to the inhalation and exhalation. Hand out 'Breathing' worksheet and label the parts.	Complete the 'Keeping Lungs Healthy' table.	'Breathing'
14	14/1/04	Make a rib cage model with split pins and card. Colouring and labelling, and the attachment of rubber bands should be careful. Relate the finished product to the diagram on page 2 of 'Breathing'. Consider how the muscles might cause breathing to happen. Assemble the alveoli diagrams into a booklet and label the top diagram with parts. Name the processes involved with a sequence: oxygen in the air oxygen in the bronchi oxygen in the alveoli oxygen in the blood. Complete the 'Gas Exchange' sheet.	Complete the sheet for homework.	'Gas Exchange'
15	2 1/1/04	Dissect pluck to show the various systems and the nature of some of the tissue involved, e.g. buoyancy of lung tissue, inflatable lungs, and tubes of different kinds. When finished summarise arguments by discussion for and against animal experiments. Include relevant scriptures.	Present both sides of the argument appropriately.	
<b>Respiration</b>				
<i>Truth:</i> God has created us to be able to appreciate what science discovers, to use it wisely, and to respond appropriately to Him as a result.				
<b>KS3 National Curriculum – Respiration</b>				
<p>a. That aerobic respiration involves a reaction in cells between oxygen and food, in which glucose is broken down into carbon dioxide and water.</p> <p>b. To summarise aerobic respiration in a word equation.</p> <p>c. That the reactants and products of respiration are transported throughout the body in the bloodstream.</p>				
16	28/1/04	Read out some of the answers anonymously if necessary. Discuss any new issues. Recall what is needed to allow muscles to move. Link this to the process of respiration, and then the difficulty of using animal tissue. Carry out an investigation into how yeast causes dough to rise. Use the 'Respiration' sheet, completing any notes, etc.		Williams pp.65-78; 83-84 'Respiration'

Lesson	Date (approx)	Lesson Content — TI pp. 8 to 34	Homework	Text & Wsht ref.s
<b>Movement</b> <i>Truth:</i> The body is created to act in a coordinated and effective way in the environment. Sport requires this effectiveness. What is the basis for the status that comes from Sport?				
<b>KS3 National Curriculum - Movement</b> The role of the skeleton and joints and the principle of antagonistic muscle pairs [for example, biceps and triceps] in movement.				
17	4/2/04	Look at a skeleton. Label the 'Skeleton' diagram appropriately. Group the class to allow each to complete the table of definitions on the sheet, sharing answers after 15 minutes. Look at a pig's trotter. Investigation 1 p.309 to illustrate answers from the previous task. Make a model of the forearm from a sheet of instructions	Complete the skeleton diagram or definitions.	Roberts pp.302-309 'Skeleton'
18	11/2/04	Lift an object using a bent arm; push an object away using a bent arm. Identify where the muscles are active. Discuss words to use to describe what's happening. Develop a chain of events, e.g. eyes see-brain-*nerves-*)muscles movement. Use p.307, Fig 4; p.308, Fig 6 and p.309 Qs 3 to 5 to describe the function. Include all the words in bold type referring back to last week's lesson.	Devise a test paper for the work so far. Q, A and marks.	
19	25/2/04	Group the class to find out what they can about breaks, healing bones, slipped disks, joints, arthritis, and muscle troubles. Feedback these answers to the whole class. Illustrate these with, e.g. x rays, or personal stories. <b>Consider:</b> (i) Why do these things happen? (ii) How does God help deal with them? (iii) How might we deal with them?	Revise.	Roberts pp.310-313
<b>Health &amp; Disease</b> <i>Truth:</i> Living in the world is risky, but God is directly involved, understands suffering, and has enabled the body to live safely.				
<b>KS3 National Curriculum - Health</b> a. That the abuse of alcohol, solvents, and other drugs affects health. b. How the growth and reproduction of bacteria and the replication of viruses can affect health, and how the body's natural defences may be enhanced by immunisation and medicines.				

Lesson	Date (approx)	Lesson Content – TI pp. 8 to 34	Homework	Text & Wsht ref.s
20	3/3/04	Test on work so far – use SATs questions. Describe an accident. What does the body do to counteract this damage? Wbc, blood clotting, hormones, healing. Describe the course of an illness. Video. Create a flow chart to include these events in an appropriate way. Diagrams to add to this sequence. Hand out [TPG Year 9 immunity.doc] for homework task.	Complete the story of immunity using a given script but freedom to draw, write, cartoon, etc.	
21	10/3/04	Response of the body to infection. Case history to illustrate: infection, incubation, symptoms. Devise a resistance game. Include phagocytosis, antigens, antibodies and their function. Use: <a href="http://www.schoolscience.co.uk/content/biologi/abpi/diseases/index.html">www.schoolscience.co.uk/content/biologi/abpi/diseases/index.html</a> for homework. Use the worksheet on disease, transmission and defence to test understanding of these terms.	Find out about a bacterial, viral and another parasitic disease.	
22	17/3/04	Cancer – give a case history, perhaps using 'C' by John Diamond. Outline what happens to the cells and use a domino puzzle to match treatments with what they do. Per group produce a letter to someone with cancer. Use scripture, compassion and a knowledge of what cancer is. When written read out in class. Let discussion touch on suffering, euthanasia, hospice care, etc. Introduce the mind map: coloured branches choosing a title, areas to learn about. Produce one for fighting infection.	Organize the information from the two weeks into a mind map using colours.	
23	24/3/04	Mind map 'Drugs'. Develop branches towards useful, abuse, types of drugs in each area, reasons for using drugs. Demonstrate products from cigarette smoke. Show tar (revise alveoli/cotton wool), pH. Hand out summary sheet from revision guide.		
24	31/3/04	In support groups devise dominos, word cards, mind maps, etc. to others to revise. Make a pack. Give out areas from the NC to each group. of cards with Submit ideas to other groups, listening to instructions as to how to use them.	Make a pack of cards with words from Years 7 to 9	
26	28/4/04	Revision Lesson: Use the packs of words: (i) Deal five – then describe a biological link between them; (ii) Deal and ask for a definition, perhaps collecting points (possibly Smarties) – pupils judge the answers. (iii) Pelmitism – memory – turn up pairs that are related. Explain the link. Look at past papers as Support groups – devise answers. Compare between groups	Revision	
27	5/5/04	SATs		

Lesson	Date (approx)	Lesson Content – TI pp. 8 to 34	Homework	Text & Wsht ref.s
<p><b>Stewardship and the Environment</b></p> <p><i>Truth:</i> We live in an environment that is designed to function interdependently, and in which the Bible indicates we should be stewards. This entails active understanding of how we should care, e.g. through conservation, not polluting, and ensuring the damage we cause is reparable through natural means.</p>				
28	12/5/04	Go through the answers from the paper. Use a video of a habitat. 'The Blue Planet'. Collect through observations: adaptations for survival, examples of food webs, environmental factors.	1 "Why should a species or a habitat be conserved?"	
29	19/5/04	<p>Devise a quiz on ecology from KS3 work. Either for points, or, assessing environmental consciousness (each question has three answers, 1 = least, 3 = most concerned: the total matching descriptors on the answer sheet.</p> <p><b>Adaptation and competition</b></p> <p>a) About ways in which living things and the environment can be protected, and the importance of sustainable development.</p> <p>b) That habitats support a diversity of plants and animals that are interdependent.</p> <p>c) How some organisms are adapted to survive daily and seasonal changes in their habitats.</p> <p>d) How predation and competition for resources affect the size of populations [for example, bacteria, growth of vegetation.</p> <p><b>Feeding relationships</b></p> <p>e) About food webs composed of several food chains, and how food chains can be quantified using pyramids of numbers.</p> <p>f) How toxic materials can accumulate in food chains.</p> <p>By July, a booklet per pupil. Last week's homework is the first entry.</p> <p>Explain plan for the rest of term, and thus the Contents of this project:</p> <ol style="list-style-type: none"> <li>1. Factors affecting growth — growth on tree bark.</li> <li>2. Sampling in a habitat to detect damage.</li> <li>3. A bigger picture.</li> <li>4. Caring for the environment.</li> <li>5. In Conclusion.</li> </ol> <p>Read through the lichen worksheets and read through them ready for next week.</p>	Designing the title page. Perhaps typing last weeks hwk.	
30	26/5/04	1) Investigating growth on tree bark. Remind pupils of the worksheet handed out last week. Carry out the task following worksheet.	Complete data handling & conclusion.	TPG Year 9 lichen.doc
31	9/6/04	Review what the data shows about growth on tree bark. Complete a data question on air pollution? Read through water pollution worksheets for next week.		

<b>Lesson</b>	<b>Date (approx)</b>	<b>Lesson Content – TI pp. 8 to 34</b>	<b>Homework</b>	<b>Text &amp; Wsht ref.s</b>
32	16/6/04	2) Sample for water creatures with a view to assessing purity of the stream, and the idea of indicator species. Record creatures as collected. Discuss where pitfall traps should be set.	Complete data handling & conclusion.	TPG Year 9 pollution.doc
33	23/6/04	3) Identify pitfall contents (traps set up Tuesday after school.) Devise a key to identify invertebrates trapped. Devise a possible food web from organisms collected. Answer questions on a food web.	Research a habitat to arrive at a description.	
34	30/6/04	4) Work singly, then in pairs, then in groups. Value of the habitat investigated? Pressures on it. How to manage the habitat. Scriptural principles	Research and write environmental Debate.	
35	7/7/04	Ask pupils to read out their cases for and/or against the motion. Open the floor to question each other. Concluding vote. Write a summary report of the debate.	Finish report. Assemble the booklet.	.
36	14/7/04	Hand in the booklet.		

# Biology Year 9 - Breathing

## Context

Timing	Biological Curriculum	Wider Issues
Sept-Oct	Nutrition	Stewardship, Diet and Body Image
Oct-Nov	Circulation	Activity & Variation in God's Environment
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Jan	Respiration	Animal Experimentation
Jan-Feb	Moving	Sport, Performance and Status
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## Truth to Teach

1. God's good creation in a fallen world can go wrong.
2. He has given us ways to correct these effects, and can help us respond with compassion.  
(The Creation-Fall-Redemption model may also be applied here.)
3. The structure and role of lung structure in gas exchange, including the effect of smoking.

## Way to Work

This covers three lessons. The content, in summary, is:

- a. Measure breathing rate, and collect the data on the board. Ask the question "How do we breathe?" and point out the movement of the rib cage, linking the appropriate movement to the inhalation and exhalation.
- b. Hand out 'Breathing' worksheet and label the parts.
- c. Complete the 'Keeping Lungs Healthy' table for homework.
- d. Make a rib cage model with split pins and card. Colouring and labelling, and the attachment of rubber bands should be careful. Relate the finished product to the diagram on page 2 of 'Breathing'. Consider how the muscles might cause breathing to happen.
- e. Assemble the alveoli diagrams into a booklet and label the top diagram with parts. Name the processes involved with a sequence: oxygen in the air-oxygen in the bronchi-oxygen in the alveoli-oxygen in the blood.
- f. Complete the 'Gas Exchange' sheet for homework.
- g. Dissect pluck (trachea, lungs, heart and some blood vessels) to show the various systems and the nature of some of the tissue involved, e.g. buoyancy of lung tissue, inflatable lungs and tubes of different kinds. Those

waiting to see can construct arguments for and against vivisection, dissection.

- h. While considering the pluck discussion can include how artificial respiration can help people stay alive. This draws on prior work.
- i. When finished summarise arguments by discussion for and against animal experiments. Include relevant scriptures.
- j. Present both sides of the argument appropriately (written, pictorial, poster, etc) for homework.

### **Learning for Life**

Pupils should be able to:

- Describe and name lung structures.
- Explain how gases are exchanged.
- Explain why gases need to be exchanged.
- Identify the detail of God's creation, and that understanding this can help us help others when things go wrong.
- Use the information gained in later discussions concerning health.