



## STAWA DEPTH and BREADTH of CONTENT: Teacher Support Documents

### Senior Secondary Science WACE 2015 – 2016: Human Biology - Unit 1

The STAWA Depth & Breadth of Content documents have been developed through the collaboration of teachers working in Department of Education, Catholic Education and Independent Schools.

#### Purpose

The STAWA Depth & Breadth of Content documents are intended to promote a shared understanding of the course content that improves moderation across schools, regions and systems/sectors.

#### Caution

**The Depth and Breadth points of elaboration are interpretations. The ATAR syllabus content statements are the only parts of these documents that are mandated. Examiners are required to address the mandated statements only.**

*The STAWA Depth & Breadth of Content documents are a great example of teachers helping teachers for the benefit of all students.*

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Leadership in Science Education

# HUMAN BIOLOGY

## ATAR Year 11

### Unit 1 – The functioning human body



#### Unit description

This unit looks at how human structure and function supports cellular metabolism and how lifestyle choices affect body functioning.

Cells are the basic structural and functional unit of the human body. Cells contain structures that carry out a range of functions related to metabolism, including anabolic and catabolic reactions. Materials are exchanged in a variety of ways within and between the internal and external environment to supply inputs and remove outputs of metabolism. Metabolic activity requires the presence of enzymes to meet the needs of cells and the whole body. The respiratory, circulatory, digestive and excretory systems control the exchange and transport of materials in support of metabolism, particularly cellular respiration. The structure and function of the musculo-skeletal system provides for human movement and balance as the result of the co-ordinated interaction of the many components for obtaining the necessary requirements for life.

Students investigate questions about problems associated with factors affecting metabolism. They trial different methods of collecting data, use simple calculations to analyse data and become aware of the implications of bias and experimental error in the interpretation of results. They are encouraged to use ICT to interpret and communicate their findings in a variety of ways.

#### Unit content

This unit includes the knowledge, understandings and skills described below.

#### Science Inquiry Skills

1. identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
2. design investigations, including the procedure(s) to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics, including animal ethics
3. conduct investigations, **including monitoring body functions; use microscopy techniques; and perform real or virtual dissection**, safely, competently and methodically for the collection of valid and reliable data

4. represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error, and uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions
5. interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments
6. select, construct and use appropriate representations, **including labelled diagrams and images of various cells, tissues and organ systems**, to communicate conceptual understanding, solve problems and make predictions
7. communicate to specific audiences, and for specific purposes, using appropriate language, nomenclature, genres and modes, including scientific reports

**Green:** specific content related to Unit 1. The rest of the statements are the same generic ones across the units.

## Unit 1 Summary

### Cells and Tissues

SU 1: hierarchy of organisation  
SU 2: cell structures and functions  
SU 3, 4: cell membrane and movement of materials  
SU 5 tissue types  
SIS 3: microscopy  
SIS 6: use of diagrams and images

### Metabolism

SU 6, 9: enzymes  
SU 7: respiration  
SU 8: types of nutrients

### Respiratory system

SU 10: respiratory system structure and function  
SU 11: gas exchange  
SIS 3: monitoring body functions, dissection  
SHE 2: dysfunctions - diagnosis and treatment  
SHE 4: consequences of lifestyle choices

### Circulatory system

SU 12: circulatory system structure and function  
SU 13: blood - structures and functions  
SU 14: lymphatics - structure and function  
SIS 3: monitoring body functions, dissection  
SHE 2: dysfunctions - diagnosis and treatment  
SHE 4: consequences of lifestyle choices

### Digestive system

SU 15: digestive system structure and function  
SU 16, 17: digestion and enzymes  
SU 18: absorption  
SU 19: elimination  
SIS 3: monitoring body functions, dissection  
SHE 2: dysfunctions - diagnosis and treatment  
SHE 4: consequences of lifestyle choices

### Musculoskeletal system

SU 20: sliding filament theory  
SU 20, 21: posture, movement and paired muscles  
SU 22: structure of bone and cartilage tissue  
SU 23: joints - structure and function  
SIS 3: monitoring body functions, dissection  
SHE 2: dysfunctions - diagnosis and treatment  
SHE 4: consequences of lifestyle choices

### Excretory system

SU 24: excretion and organs involved in excretion  
SU 25: deamination and role of liver  
SU 26: structure and function of the kidney  
SIS 3: monitoring body functions, dissections  
SHE 2: dysfunctions - diagnosis and treatment  
SHE 4: consequences of lifestyle choices

Unit Content	Elaboration	Activities	Assessment opportunities
<b>Cells and tissues</b> STAWA HB Yr 11 ATAR workbook activities - unless otherwise stated			
1. the human body is comprised of cells, tissues and organs within complex systems that work together to maintain life	8. hierarchy of structural organisation within the body (cells, tissues, organs and systems) 9. systems support the functioning of cells 10. cells are the basic structural and functional units; each type having a different structure and function that carry out the life processes (respiration, ingestion, excretion, response, growth, reproduction, movement) 11. tissues are composed of groups of cells of similar structure that perform a particular function within an organ 12. organs are structures of definite form and structure, made up of two or more tissues and have particular functions within a system	Act 1: I'm alive, I think  Act 2: Cells tissues and stem cells- includes microscope work  Act 28: Body imaging and virtual dissection  Structural Organization of Living Things <a href="http://www.lakesc.lake.k12.ca.us/resources/Structural_Organization_of_Living_Things.pdf">http://www.lakesc.lake.k12.ca.us/resources/Structural_Organization_of_Living_Things.pdf</a> Cells and tissues - for slides of different cells and tissue types <a href="http://anatomycorner.com/main/anatomy-topics/cells-and-tissues/">http://anatomycorner.com/main/anatomy-topics/cells-and-tissues/</a> The Virtual Body <a href="http://medtropolis.com/virtual-body/">http://medtropolis.com/virtual-body/</a>	
2. cell organelles maintain life processes and require the input of materials and the removal of wastes to support efficient functioning of the cell	13. cell organelles structure and function: cell membrane, cytoplasm, nucleus, centrioles, endoplasmic reticulum (rough, smooth), ribosomes, mitochondria, golgi body, vesicles, lysosomes  14. microscopy including skills magnification and calculations  15. link functions of cellular structures to life	Cell structure function websites <a href="http://people.eku.edu/ritchisong/301notes1.htm">http://people.eku.edu/ritchisong/301notes1.htm</a> includes video clips <a href="http://www.biologyjunction.com/cell_functions.htm">http://www.biologyjunction.com/cell_functions.htm</a> table of cellular contents <a href="http://biology.unm.edu/ccouncil/Biology_124/Summaries/Cell.html">http://biology.unm.edu/ccouncil/Biology_124/Summaries/Cell.html</a> - contents compared to city components <a href="http://www.biology4kids.com/files/cell_main.html">http://www.biology4kids.com/files/cell_main.html</a> (very simple)	

	<p>processes</p> <p>16. inputs - oxygen, water, nutrients; outputs - carbon dioxide, metabolic wastes, water, heat energy</p> <p>17. cell respiration word equation and chemical equation</p>	Act 2 Cells tissues and stem cells including microscopy	
<p>3. the cell membrane separates the cell from its surroundings with a structure described by the fluid mosaic model which allows for the movement of materials into and out of the cell by diffusion, facilitated diffusion, osmosis, active transport and vesicular transport (endocytosis/exocytosis)</p>	<p>18. structure of the cell membrane (fluid mosaic model): phospholipid bilayer with carrier proteins, protein channels, receptors and identifying chemicals (eg marker proteins)</p> <p>19. methods of transport with or without the use of energy; either through the membrane / protein molecules / via the cell membrane/ vesicular transport</p> <p>20. give examples of materials that move by each method of transport</p>	<p>Act 3: Diffusion: How fast and Which Way.</p> <p>Act 4: EGGsperimenting with Osmosis</p> <p>Act 4: Properties of the Cell Membrane</p> <p>Fluid Mosaic Model of the Cell Membrane  <a href="http://www.youtube.com/watch?v=LKN5sq5dtW4">http://www.youtube.com/watch?v=LKN5sq5dtW4</a>  The fluid mosaic model  <a href="http://alevelnotes.com/The-Fluid-Mosaic-Model/129?tree=">http://alevelnotes.com/The-Fluid-Mosaic-Model/129?tree=</a>  Diffusion and osmosis - with slide show  <a href="http://www.biologycorner.com/bio1/notes_diffusion.html">http://www.biologycorner.com/bio1/notes_diffusion.html</a>  Diffusion, Osmosis and Tonicity  <a href="http://www.youtube.com/watch?v=GwYCr0VubNM">http://www.youtube.com/watch?v=GwYCr0VubNM</a>  Active and passive transport  <a href="http://www.youtube.com/watch?v=kfy92hdaAHQ">http://www.youtube.com/watch?v=kfy92hdaAHQ</a></p>	
<p>4. factors affecting the exchange of materials across the cell membrane include</p>	<p>21. surface area to volume ratio for large and small bodies and for different shapes</p>	Act 15: SA: Vol - Why is it Important?	

<p>surface area to volume ratio, concentration gradients and the physical and chemical nature of the materials being exchanged</p>	<p>22. concentration gradients: molecules disperse from areas of high concentration to low concentration without the use of energy until they are evenly dispersed</p> <p>23. SA:Vol and concentration gradient influence the direction and/or the speed movement of materials across the membrane</p> <p>24. the size and form of the particles (atoms, molecules, ions) and the nature of the materials (organic/inorganic, lipid or water soluble) affects efficiency of movement across the membrane</p>		
<p>5. the various tissues of the human body can be categorised into four basic tissue types; epithelial, connective, muscular and nervous, that perform specific functions</p>	<p>25. epithelial tissue covers and lines external surfaces, internal organs and body cavities</p> <p>26. connective tissue binds and supports the other tissues of the body including adipose, cartilage, bone, tendons/ligaments and blood</p> <p>27. muscular tissue brings about movement (skeletal, cardiac, smooth)</p> <p>28. nervous tissue receives and transmits messages around the body - detailed structure not required as is covered in unit 3</p> <p>29. simple diagrams and images/micrographs can be used to identify tissues</p>	<p>Act 2 Cells tissues and stem cells including microscopy</p> <p>Tissue types - good micrographs  <a href="http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20102/bio%20102%20lectures/Animal%20cells%20and%20tissues/Animal%20Tissues.htm">http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20102/bio%20102%20lectures/Animal%20cells%20and%20tissues/Animal%20Tissues.htm</a></p> <p>Tutorial covering 4 tissue types  <a href="http://www.youtube.com/watch?v=OTzSz17RH-E">http://www.youtube.com/watch?v=OTzSz17RH-E</a></p> <p>Tissue types - animations simple  <a href="http://www.youtube.com/watch?v=tKWTJ3-1E8">http://www.youtube.com/watch?v=tKWTJ3-1E8</a></p>	
<p>SIS 3</p> <ul style="list-style-type: none"> <li>conduct investigations, including use of microscopy techniques, safely, competently and methodically for the collection of valid and reliable data</li> </ul> <p>SIS 6</p> <ul style="list-style-type: none"> <li>select, construct and use appropriate representations, including labelled diagrams and images of various cells and tissues, to communicate conceptual</li> </ul>			

understanding, solve problems and make predictions

## Metabolism

<p>6. biochemical processes including anabolic and catabolic reactions in the cell are controlled in the presence of specific enzymes</p>	<p>30. metabolism is the sum of all reactions in a cell</p> <p>31. anabolic reactions use energy to build smaller substances into larger substances eg protein synthesis</p> <p>32. catabolic reactions release energy by breaking down large molecules into smaller ones eg cell respiration. Provide examples of common catabolic and anabolic reaction.</p>	<p>Act 1: I'm alive: I think</p> <p>Act 5: Respiration - aerobic and anaerobic</p> <p>Act 6: How much oxygen do I use?</p>	
<p>7. cellular respiration occurs in different locations in the cytosol and mitochondria, to catabolise organic compounds, aerobically or anaerobically, to release energy in the form of ATP</p>	<p>33. aerobic respiration requires oxygen for the complete breakdown of glucose to form carbon dioxide, water and energy. Consists of a series of steps (simplified): Glycolysis, Krebs Cycle (basic cycle) so one molecule of glucose produces 38 ATP molecules</p> <p>34. anaerobic respiration consists of Glycolysis only, producing 2 ATP and lactic acid</p> <p>35. conditions under which each type of respiration provides energy differ</p>	<p>Act 5: Respiration - aerobic and anaerobic</p> <p>Act 6: How much oxygen do I use?</p>	
<p>8. for efficient metabolism, cells require oxygen and nutrients, including carbohydrates, proteins, lipids, vitamins and minerals</p>	<p>36. carbohydrates contain C, H, O; main energy source and excess stored as glycogen or converted to lipids. Basic structure of monosaccharides, disaccharides polysaccharides</p> <p>37. proteins contain C, H, O, N and often S, P; functions include catalytic, regulatory,</p>	<p>Act 7: Contents of my food</p> <p>Act 24 Healthy eating and eating disorders</p> <p>Food Pyramids and Plates: What Should You Really Eat?</p> <p><a href="http://www.hsph.harvard.edu/nutritionsource">http://www.hsph.harvard.edu/nutritionsource</a></p>	



	<p>movement, immunological, recognition, structural and transport; amino acids (basic structural unit)</p> <p>38. lipids contain C, H, small amounts of oxygen; lipids are stored as energy reserves and occur as phospholipids, cholesterol and steroid hormones; made up of glycerol and fatty acids; can saturated/unsaturated/trans fats and high and low density lipids</p> <p>39. vitamins are organic substances which have an important role in metabolism such as co-enzymes or co-factors (A, C, D, E, K and B vitamins); lack of particular vitamins produce deficiency diseases (provide example for common current diseases)</p> <p>40. minerals are inorganic substances which have a role in biological processes (use a selection of these to illustrate importance: Ca, Cl, F, Fe, P, K, Na); lack of particular minerals produce deficiency diseases</p>	<p><a href="#">e/pyramid-full-story/</a> Food testing with coloured results <a href="http://jmbe.asm.org/index.php/jmbe/article/view/242/html_103">http://jmbe.asm.org/index.php/jmbe/article/view/242/html_103</a></p> <p>Vitamin chart with link to mineral chart <a href="http://kidshealth.org/teen/misc/vitamin_chart.html">http://kidshealth.org/teen/misc/vitamin_chart.html</a> OR <a href="http://www.kidspot.com.au/files/kidspot-vitamins-and-minerals-chart.pdf">http://www.kidspot.com.au/files/kidspot-vitamins-and-minerals-chart.pdf</a></p> <p>Why is fire important <a href="http://www.nhs.uk/chq/Pages/1141.aspx?CategoryId=51&amp;SubCategoryId=167">http://www.nhs.uk/chq/Pages/1141.aspx?CategoryId=51&amp;SubCategoryId=167</a></p>	
<p>9. enzyme function can be affected by factors including pH, temperature, presence of inhibitors, co-enzymes and co-factors, and the concentration of reactants and products</p>	<p>41. enzymes are organic catalysts that reduce the amount of energy needed to start a chemical reaction</p> <p>42. all steps in metabolic reactions require the presence of an enzyme; each enzyme controls a specific reaction by binding to a specific substrate at the active site (lock and key model)</p> <p>43. enzymes have their own optimum pH,</p>	<p>Act 8: Effective enzymes</p> <p>Enzymes lecture Bozeman Science <a href="https://www.youtube.com/watch?v=ok9esggzN18">https://www.youtube.com/watch?v=ok9esggzN18</a></p> <p>Animated enzyme activity <a href="https://www.youtube.com/watch?v=AKyyvuOmXq0&amp;list=PL04629EEBCE0ED977&amp;index=5">https://www.youtube.com/watch?v=AKyyvuOmXq0&amp;list=PL04629EEBCE0ED977&amp;index=5</a></p> <p>Lock-and-key compared to induced fit models of enzyme function</p>	

	<p>temperature and may require co-factors or co-enzymes and are affected by inhibitors that alter the shape of the active site affecting the rate of reaction</p> <p>44. lock and key model and induced fit models explain how enzymes function</p> <p>45. the concentration of reactants and products of the reaction affect the rate of the reaction</p> <p>46. denaturation of enzymes reduces or stops their function</p>	<p><a href="https://www.youtube.com/watch?v=E-r3omrnw&amp;list=PL04629EEBCE0ED977&amp;index=3">https://www.youtube.com/watch?v=E-r3omrnw&amp;list=PL04629EEBCE0ED977&amp;index=3</a> Animation showing anabolic reaction</p> <p><a href="https://www.youtube.com/watch?v=r1ryDVgx0zw">https://www.youtube.com/watch?v=r1ryDVgx0zw</a> Chemical factors affecting enzymes</p> <p><a href="https://www.youtube.com/watch?v=g9FA0Lho0No">https://www.youtube.com/watch?v=g9FA0Lho0No</a> Enzymes and environment</p> <p><a href="https://www.youtube.com/watch?v=S9Ledk18dY">https://www.youtube.com/watch?v=S9Ledk18dY</a></p>	
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## Respiratory system

<p>10. the exchange of gases between the internal and external environments of the body is facilitated by the structure and function of the respiratory system at the cell, tissue and organ levels</p>	<p>47. the pathway of air into and out the lungs; structure and function of the nose, pharynx, larynx, trachea, bronchi, bronchioles, alveoli, lungs</p> <p>48. link types of cells and tissues found in each part of the pathway of air to the functions carried out eg cartilage in trachea, ciliated epithelium and mucous membranes in upper tract areas</p>	<p>Act 14: Respiratory volumes</p> <p>Act 16: Heart and lung dissection</p>	
<p>11. the efficient exchange of gases in the lungs is maintained by the actions of breathing, blood flow and the structure of the alveoli</p>	<p>49. mechanics of breathing: inspiration and expiration involving the actions of diaphragm and intercostal muscles causing air flow due to pressure differences</p> <p>50. features of the respiratory surfaces: large surface area: volume ratio of alveoli, thin alveoli membranes, moist fluid lining the alveoli, extensive network of capillaries</p>	<p>Act 14: Respiratory Volumes</p> <p>Act 15: SA:Vol why is it important</p> <p>Smoking and respiratory disease <a href="http://ash.org.uk/files/documents/ASH_110.pdf">http://ash.org.uk/files/documents/ASH_110.pdf</a> Health effects of cigarette smoking <a href="http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smokin">http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smokin</a></p>	

	<p>51. gas exchange direction and rate of exchange of oxygen and carbon dioxide is determined by the concentration gradients of each and are independent of each other</p> <p>52. diffusion gradients maintained by continual alveolar ventilation and blood flow</p>	<p><a href="http://www.unc.edu/courses/2004spring/engl/012/070/56593/affects.html">g/ Emphysema and alveoli http://www.unc.edu/courses/2004spring/engl/012/070/56593/affects.html</a></p> <p>Emphysema and chronic bronchitis <a href="http://labspace.open.ac.uk/mod/oucontent/view.php?id=451948&amp;section=1.4.2">http://labspace.open.ac.uk/mod/oucontent/view.php?id=451948&amp;section=1.4.2</a></p>	
<b>Circulatory system</b>			
<p>12. the transport of materials within the internal environment for exchange with cells is facilitated by the structure and function of the circulatory system at the cell, tissue and organ levels</p>	<p>53. heart and blood vessels (arteries, capillaries and veins): structure and function. Major structure of the heart anatomy</p> <p>54. role of the heart in blood pressure (maintaining blood flow), with cardiac cycle (systole, diastole), and cardiac output (heart rate, stroke volume)</p> <p>55. exchange of materials occurs only via the capillaries due to structure of the walls of the blood vessels</p> <p>56. different materials are exchanged at different places within the body and between the internal and external environments - gases, water, nutrients, wastes, excess water and heat (hormones)</p>	<p>Act 16: Heart and lung dissection</p> <p>Act 17: Blood vessels and blood flow</p> <p>Blood pressure <a href="http://www.heartfoundation.org.au/your-heart/cardiovascular-conditions/Pages/blood-pressure.aspx">http://www.heartfoundation.org.au/your-heart/cardiovascular-conditions/Pages/blood-pressure.aspx</a></p>	
<p>13. the components of blood facilitate the transport of different materials around the body (plasma and erythrocytes), play a role in the clotting of blood (platelets) and the protection</p>	<p>57. blood: erythrocytes, leucocytes, platelets, plasma - relate structure/contents to function</p> <p>58. role of blood (transport of gases, nutrients, wastes, hormones/protection against pathogens, toxic substances, blood loss/regulation of water content, pH and body</p>	<p>Act 18: Blood: specialised cells</p> <p>Blood and cells it contains <a href="http://www.ncbi.nlm.nih.gov/books/NBK2263/">http://www.ncbi.nlm.nih.gov/books/NBK2263/</a></p> <p>Inflammatory response</p>	

<p>of the body (leucocytes)</p>	<p>temperature, protection against damage through blood clotting)</p> <p>59. phagocytes and phagocytosis (basic explanation)</p> <p>60. inflammatory response - role of blood flow, changes to capillary permeability and migration of leucocytes</p>	<p><a href="http://www.youtube.com/watch?v=bNN95sA6-8">http://www.youtube.com/watch?v=bNN95sA6-8</a> OR</p> <p><a href="http://www.youtube.com/watch?v=426PDam1ey4">http://www.youtube.com/watch?v=426PDam1ey4</a> OR</p> <p><a href="http://www.youtube.com/watch?v=t8oUIVIAOYo">http://www.youtube.com/watch?v=t8oUIVIAOYo</a></p>	
<p><b>SHE 1: blood transfusions rely on determining blood groups and can be used to treat many different diseases and conditions</b></p> <p>61. blood groups ABO and Rh blood system - blood matching of donor and recipient</p> <p>62. maternal/foetal problem due to Rh+/- incompatibility</p> <p>Act 18: Blood - specialised cells</p> <p>Blood groups and transfusions</p> <p><a href="http://en.wikipedia.org/wiki/Blood_type">http://en.wikipedia.org/wiki/Blood_type</a></p> <p>Blood lab</p> <p><a href="http://jacusers.johnabbott.qc.ca/~paul.anderson/806%20LAB%20ANSWERS/BLOODLAB/bloodlab.htm">http://jacusers.johnabbott.qc.ca/~paul.anderson/806%20LAB%20ANSWERS/BLOODLAB/bloodlab.htm</a></p> <p>Blood bank project</p> <p><a href="http://dp.hightechhigh.org/~jrobin/Projects/Blood_Bank/Blood_Bank.html">http://dp.hightechhigh.org/~jrobin/Projects/Blood_Bank/Blood_Bank.html</a></p>			
<p>14. the lymphatic system functions to return tissue fluid to the circulatory system and to assist in protecting the body from disease</p>	<p>63. exchange of materials between capillaries, tissue fluid and cells</p> <p>64. excess tissue fluid drains into lymph capillaries/vessels and is a one-way system for returning body fluids to the blood</p> <p>65. lymphatic system is part of the Immune system with lymph nodes and organs containing leucocytes/macrophages which play a role in non-specific defence and swelling of damaged tissues</p>	<p>Immune and Lymphatics system</p> <p><a href="http://www.innerbody.com/image/lympov.html">http://www.innerbody.com/image/lympov.html</a></p>	
<p><b>Digestive system</b></p>			

<p>15. the supply of nutrients in a form that can be used in cells is facilitated by the structure and function of the digestive system at the cell, tissue and organ levels</p>	<p>66. structure and function of the digestive system (mouth including salivary glands and teeth), oesophagus, stomach, liver, gall bladder, pancreas, small and large intestine, rectum, pyloric and cardiac sphincters</p> <p>67. the sequence of organs in the digestive system is important in the efficient digestion of food and absorption of nutrients in providing the appropriate conditions and enzymes</p> <p>68. the tissues of the organs of the digestive system have specific features to increase the efficiency of the organ's function eg. lining of the stomach has different cells that produce mucus, enzymes (eg lipases, protease, amylase) and HCl; the structure of the lining of the small intestine - rugae and villi, with the presence of capillaries and lymph vessels</p>	<p>Act 21: Inside the Digestive system</p>	
<p>16. digestion (mechanical and chemical) involves the breakdown of large molecules to smaller ones by enzymes with distinctive operating conditions and functions that are located in different sections of the digestive system</p>	<p>69. mechanical digestion including the role of teeth, peristalsis, bile - types of teeth but not tooth structure</p> <p>70. chemical digestion of carbohydrates to monosaccharides, proteins to amino acids, lipids to glycerol and fatty acids by the enzymes amylase, protease and lipase</p> <p>71. production of enzymes by the various glands for the food type acted on and the products produced in the sequence of digestion and the different locations of the digestive tract</p>	<p>Act 22: Digestion simulation</p> <p>Act 23: Why is my stomach acid?</p>	

	72. the microbial content of the large intestine carry out some digestive activity on otherwise indigestible materials		
17. the salivary glands, pancreas, liver and gall bladder produce or store secretions which aid the processes of digestion	73. enzyme and bile production/storage and location of action related to each	Act 8: Effective enzymes Act 25 Liver - warehouse, processing plant and distribution centre	
18. absorption requires nutrients to be in a form that can cross cell membranes into the blood or lymph and occurs at different locations including the small intestine and large intestine	74. large surface area of the small intestine (length, folding, villi, microvilli) aids in the absorption of monosaccharides, amino acids and fatty acids and glycerol, vitamins, water via the processes of active transport, diffusion, facilitated diffusion and osmosis 75. the structure of the villi in the small intestine facilitates efficient absorption of nutrients 76. absorption of water, some B and K vitamins at the large intestine	Act 21: Inside the Digestive system  Lipid digestion and absorption <a href="http://education-portal.com/academy/lesson/lipids-digestion-and-absorption.html#lesson">http://education-portal.com/academy/lesson/lipids-digestion-and-absorption.html#lesson</a> The lymphatic system <a href="http://www.lymphnotes.com/article.php/id/151/">http://www.lymphnotes.com/article.php/id/151/</a>	
19. elimination removes undigested materials and some metabolic wastes from the body	77. role of large intestine in storage and muscle action 78. diarrhoea and constipation 79. formation of faeces		
<b>Musculoskeletal system</b>			
20. the muscular system is organised to maintain posture and produce	80. macroscopic structure, location, function of skeletal muscle tissue 81. microscopic structure of skeletal muscle (muscle	Act 12 Muscle mapping Act 13: Muscle movement	

<p>movement; muscle fibre contraction can be explained using the sliding filament theory</p>	<p>fibres, myofibrils, myofilaments, actin and myosin, sarcomeres, H Zone, A and I Bands, Z lines)</p> <p>82. sliding filament theory: projections on the myosin form cross bridges with actin to move the Z lines closer together</p> <p>83. sarcomere in relaxed and contracted states and requires calcium ions (mention potassium flooding, troponin and tropomyosin)</p> <p>84. energy requirements -role of ATP in muscle contraction</p>	<p>Sliding filament theory  <a href="http://www.youtube.com/watch?v=EdHzKYDxrKc">http://www.youtube.com/watch?v=EdHzKYDxrKc</a>  or  <a href="http://www.youtube.com/watch?v=BMT4PtXRCVA">http://www.youtube.com/watch?v=BMT4PtXRCVA</a>  then  <a href="http://www.youtube.com/watch?v=Ct8AbZnA8A">http://www.youtube.com/watch?v=Ct8AbZnA8A</a>  or  <a href="http://www.youtube.com/watch?v=H6okUPuyby">http://www.youtube.com/watch?v=H6okUPuyby</a></p>	
<p>21. movement results from the actions of paired muscles with others acting as stabilisers to produce the required movement</p>	<p>85. skeletal muscles and movement, location of major muscles of the body</p> <p>86. origin and insertion of muscles involving tendons</p> <p>87. flexor and extensor muscles, major pairs of antagonistic muscles and their movements - muscles producing movement at the shoulder, elbow, wrist, fingers and muscles used in walking, balance, posture and upright stance</p>	<p>Act 12 Muscle mapping</p> <p>Act 13: Muscle movement</p>	
<p>22. the skeletal framework of the body consist of bone and cartilage which function to provide body support, protection and movement and is facilitated by the structure and function at cell and tissue levels</p>	<p>88. function and location of major bones that make up the axial and appendicular skeleton</p> <p>89. macroscopic (structure of the long bone) and microscopic (compact and cancellous bone - osteocytes and structure of bony matrix) structure of bone</p> <p>90. function and location of cartilage in the skeleton</p> <p>91. macroscopic (hyaline, fibrocartilage and elastic</p>	<p>Act 9: Major bones of the skeleton</p> <p>Act 10: Bones and osteoporosis</p> <p>Synovial joints  <a href="https://www.youtube.com/watch?v=sW3-9zM9ohE">https://www.youtube.com/watch?v=sW3-9zM9ohE</a>  Skeletal joints  <a href="https://www.youtube.com/watch?v=QWRV4WZrzDs">https://www.youtube.com/watch?v=QWRV4WZrzDs</a></p>	

	cartilage) and microscopic (cartilage cells and matrix) structure of cartilage		
23. articulations of joints of the skeleton are classified according to their structure or the range of movements permitted	<p>92. types of joints (immoveable, semi-moveable and freely moveable): structure, function, reasons for particular joints at different locations</p> <p>93. range of movements (flexion, extension, abduction, adduction, rotation, circumduction)</p> <p>94. limitations of movement at joints due to structure and attachments to surrounding muscles</p>	<p>Act 11 Joints and arthritis</p> <p>Contortionist  <a href="https://www.youtube.com/watch?v=Sa7XymeHhkU">https://www.youtube.com/watch?v=Sa7XymeHhkU</a>  <a href="https://www.youtube.com/watch?v=Xh9o95etgYo">https://www.youtube.com/watch?v=Xh9o95etgYo</a></p>	
<p><b>SHE 3: osteoporosis and osteoarthritis are diseases primarily of ageing that cause disability. Increased understanding of the causes of these conditions leads to improved practices for management and prevention</b></p> <p>95. relate these conditions to the skeletal system to explain the symptoms and effects on lifestyle of each</p> <p>96. describe these degenerative diseases including their causes, risk factors, prevention and current medical technologies to treat them</p> <p>Act 10: Structure of bones and osteoporosis  Act 11: Joints arthritis and flexibility  SIS 6</p> <p>97. select, construct and use appropriate representations, including labelled diagrams and images of various cells, tissues and organ systems, to communicate conceptual understanding, solve problems and make predictions</p>			
<b>Excretory system</b>			
24. the excretory system regulates the chemical composition of body fluids by removing metabolic wastes and retaining the proper amounts of water, salts, and	<p>98. the origin and organ of excretion of metabolic waste products including water, bile pigments, urea, ions (salts), hormones, carbon dioxide</p> <p>99. differentiate between excretion and elimination</p> <p>100. macroscopic structure of the kidney and</p>	<p>Act 26: Kidney - organ of excretion</p> <p>Act 27: Urine production</p>	



nutrients; components of this system include the kidneys, liver, lungs, and skin functioning at the organ level	associated blood vessels and connections to the bladder and the external environment 101. introduce the structure of the nephron - in terms of areas for filtration, secretion and absorption only (no hormones)		
25. deamination of amino acids in the liver produces urea, which then is transported to the kidneys for removal	102. role of the liver in process of deamination and urea production 103. toxicity of the waste products - ammonia compared to urea	Act 25: Liver - processing plant and distribution centre	

**SHE 2: treatment of conditions due to system or organ dysfunction has changed through improvements in early diagnosis and appropriate use of drugs, physical therapy, radiation therapy, and removal and/or replacement of affected parts**

104. relate the use of Chemotherapy, Radiation therapy and surgery/transplants/replacements to specific dysfunctions eg cancers, degenerative diseases or sporting injuries

105. limitations of use of different treatments

Act 28: Body imaging and virtual dissection

SIS 3

106. conduct investigations, including monitoring body functions and perform real or virtual dissection, safely, competently and methodically for the collection of valid and reliable data

SIS 6

107. select, construct and use appropriate representations, including labelled diagrams and images of various cells, tissues and organ systems, to communicate conceptual understanding, solve problems and make predictions

**SHE 4: lifestyle choices, including being active or sedentary, the use of drugs and type of diet, can compromise body functioning in the short term and may have long term consequences**

108. cardiovascular diseases and alcohol, smoking and lifestyle choices

109. first aid for emergency responses to heart attack or breathing issues

110. performance enhancing drugs and the developing body

111. diseases/conditions associated with digestive system such as malnutrition, anorexia, obesity

Act 19: Cardiovascular Disease

Act 20: CPR emergency

Act 24: Healthy eating and eating disorders

SIS 3

112. conduct investigations, including monitoring body functions, safely, competently and methodically for the collection of valid and reliable data