Year 10 Science Triple – Biology

Combined Science

Biology, Chemistry and Physics – Paper 1 – 1 hour 15 minute paper each

Triple Science

Biology, Chemistry and Physics – Paper 1 – 1 hour 45 minute paper each

Topics for both Combined and Triple Science

Biology

- Cell Biology
- Organisation
- Infection and Response
- Bioenergetics

Chemistry

- Atomic Structure & the Periodic Table
- Bonding, Structure & Properties of Matter
- Quantitative Chemistry
- Chemical Changes
- Energy Changes

Physics

- Energy
- Electricity
- Particle Model of Matter
- Atomic Structure

Useful Revision Resources –

- Fact sheets for recall of factual content (behind this summary)
- https://www.aqa.org.uk/subjects/science - Syllabus information & past papers with mark schemes
- https://www.youtube.com/@Freesciencelessons – excellent topic summaries presented as short videos for all Science content.
- https://www.physicsandmathstutor.com/ - revision resources & past paper questions and mark schemes – past paper questions are arranged by topic which is useful for revision. Covers all science content.
- https://www.kerboodle.com/users/login - all students have an individual log in – can view an electronic copy of the textbook and various revision resources.

Biology Fact Sheet – Paper 1 - Triple

Bold – Triple Content

Cell Biology	Cell Structure	1. Eukaryotic cells have a nucleus and include animal and plant cells. 2. Cell membrane controls the movement of substances into and out of a cell. 3. Cytoplasm is a jelly like substance where reactions take place inside a cell. 4. Respiration releases energy and takes place inside mitochondria in cells. 5. Proteins are made inside ribosomes in cells. 6. Cell walls are made of cellulose and give a cell structure. 7. A vacuole stores cell sap and gives a cell structure. 8. Chloroplasts contain chlorophyll used for photosynthesis. 9. Chlorophyll absorbs light for photosynthesis. 10. Genetic material is stored on chromosomes held in the nucleus of a cell. 11. Prokaryotic cells, bacteria cells, have a cell membrane and cytoplasm but no nucleus.
	Specialised	12. As a cell differentiates it develops different sub-cellular structures to enable it to carry out a particular function. It has become a specialised cell. 13. Sperm cells are specialised for energy production with a large number of mitochondria. 14. Mesophyll cells are specialised for photosynthesis with a large number of chloroplasts. 15. Animal cells differentiate at an early stage of life. 16. Plant cells can differentiate throughout their life.
	Microscopy	17. Magnification = image size ÷ actual size 18. µm = Micrometre, nm = nanometre 19. 1mm = 1000 µm 20. Light microscopes were developed first. 21. Electron microscopes give greater magnification and resolution. 22. Electron microscopes can allow people to see more subcellular structures and develop our understanding of them.
	Cell Division	23. Mitosis allows cells to divide for growth, repair and development of an embryo. 24. During the three stage cell cycle a) Stage 1 – DNA is copied & number of subcellular structures, mitochondria & ribosomes are increased b) Stage 2 – chromosomes are pulled to either end of the cell and nucleus divides c) Stage 3 – cytoplasm and cell membranes divide to form 2 genetically identical cells.
	Stem Cells	25. Stem cells are undifferentiated cells found in embryos, adult animals and meristems in plants. 26. Stem cells from human embryos can be cloned and made to differentiate into most different types of human cells. 27. Treatment with stem cells can be used to help diabetes and paralysis. 28. Use of stem cells has risks, such as transfer of viral infection and religious and ethical objections about killing a potential human life. 29. Stem cells in plants can be used to produce clones of plants quickly and economically.

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Organisation	Transport	30. Diffusion is the passive movement of particles from a high concentration to a low concentration. 31. Rate of diffusion can be changed by altering concentration gradient, temperature and surface area. 32. For multicellular organisms, surfaces and organ systems are specialised for exchanging materials. 33. The effectiveness of an exchange surface is increased by – i. Having a large surface area ii. Thin membrane iii. Efficient blood supply (in animals) iv. Being ventilated (in animals for gas exchange) 34. Osmosis is the passive movement of water from an area of higher water concentration to an area of lower water concentration, across a partially permeable membrane. 35. Mass changes are caused by the movement of water across a plant cell membrane. 36. Active transport uses energy from respiration, to transport substances across a membrane from low concentration to high concentration. 37. Active transport is used in root hair cells and the small intestine for the absorption of nutrients.
	Principals	38. Cells are the basic building blocks of all living organisms. 39. A tissue is a group of similar cells working together for a particular function. 40. An organ is a group of different tissues working together for a particular function. 41. An organ system is a group of different organs working together.
	Digestive System	42. The digestive system is an organ system. Several organs work together to digest and absorb nutrients. 43. Enzymes are specialised proteins used in the digestive system. Enzymes are biological catalysts. 44. Enzyme function can be described as the 'lock and key model'. 45. The substrate binds to the active site on the enzymes. 46. An enzyme denatures when the active site changes shape and the substrate can no longer bind to the enzyme. 47. High temperatures and the wrong pH denature enzymes. 48. Carbohydrase enzymes break down carbohydrates into simple sugars. 49. Amylase is a type of carbohydrase which breaks down starch into sugars 50. Lipase enzymes break down fats into fatty acids and glycerol. 51. Protease enzymes break down protein into amino acids. 52. Bile is made in liver and stored in the gall bladder. 53. Bile neutralises the substances from the stomach and helps to emulsify fats. 54. Different chemicals test for different nutrient groups – a) Iodine tests for starch – pale yellow to blue/black b) Benedicts tests for sugar – blue to brick red c) Biuret reagent tests for protein – blue to purple d) Ethanol tests for fats – clear to cloudy

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	Heart & Blood Vessels	55. The circulatory system is made of arteries, veins, capillaries and the heart. 56. Arteries are specialised with thick elastic walls and a small lumen. 57. Capillary walls are only one cell thick, so there is a short distance for diffusion. 58. Veins have valves, thinner and less elastic walls and a larger lumen. 59. The main structure of the heart includes the aorta, vena cava, pulmonary artery, pulmonary vein, valves, atria and ventricles. 60. Heart rate is controlled by a group of cells that act as a pacemaker. 61. The pacemaker cells are located in the right atrium. 62. Blood contains red blood cells, white blood cells, platelets and plasma. i. Red blood cells carry oxygen. ii. White blood cells destroy pathogens. iii. Platelets clot the blood. iv. Plasma is the liquid part of the blood.
	Heart disease	63. In coronary heart disease layers of fatty material build up blocking the coronary arteries, narrowing them. This reduces blood flow, resulting in a lack of oxygen for the heart so less respiration. 64. Stents keep coronary arteries open. 65. Statins reduce blood cholesterol level which slows down the rate of fatty material deposit. 66. Heart valves may become faulty. 67. Faulty heart valves can be replaced using biological or mechanical valves. 68. Heart failure can be treated using artificial hearts or a heart transplant.
	Health Issues	69. Health is the state of physical and mental wellbeing. 70. Communicable and non-communicable diseases are causes of ill health. 71. Diet, stress, life situations can have an effect on both physical and mental health. 72. Non communicable diseases cannot be transmitted and are not caused by pathogens, eg diabetes, heart disease, cancer. 73. Risk factors are linked to an increased chance of getting a disease – a) Obesity as a risk factor for type 2 diabeties b) Effect of smoking on lung disease and lung cancer c) Effects of diet, smoking and exercise on cardiovascular disease d) Carcinogens as risk factors for cancer.
	Cancer	74. Cancer is caused by changes in cells leading to uncontrolled growth and division. 75. Benign tumours are surrounded by a membrane and do not invade other parts of the body. 76. Malignant tumour cells are cancers and can spread to different parts of the body forming secondary tumours.
	Plant tissues & organs	77. Plant tissues in a leaf include: epidermal tissues, palisade mesophyll, spongy mesophyll, xylem and phloem and stomata surrounded by guard cells. 78. Roots are organs adapted (root hair cells to increase surface area) for uptake of water by osmosis and mineral ions by active transport. 79. Stomata and guard cells in the leaf control gas exchange and water loss. 80. Phloem transports dissolved sugars up and down the plant. 81. Movement of food molecules through phloem tissue is called translocation. 82. Xylem transports water and mineral ions from roots to leaves. 83. Transpiration is the loss of water at the leaves by evaporation.

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Infection & Response	Communicable Disease	84. Communicable diseases are spread by pathogens. 85. Pathogens are microorganisms that cause disease. 86. Pathogens may be: bacteria, viruses, fungi or protists. 87. Bacteria reproduce inside the body and produce toxins that make us feel ill. 88. Viruses reproduce inside cells causing damage to the cell and making us feel ill. 89. Viral diseases include measles and HIV in animals and tobacco mosaic virus in plants. 90. Bacterial diseases include salmonella and gonorrhoea. 91. Rose black spot is a fungal disease affecting plants. 92. Malaria is caused by a protist that is spread by mosquitos.
	Human Defence	93. Non-specific defences of the human body include: skin, nose, stomach acid and cilia and mucus. 94. The immune system uses white blood cells to destroy pathogens. 95. White blood cells defend against pathogens by: phagocytosis, antitoxin production and antibody production.
	Prevention & Treatment	96. Vaccines contain dead or weakened pathogens. 97. Vaccination prevents illness by causing a more rapid immune response to pathogens. 98. Transmission of pathogens can be reduced by immunising a large proportion of the population. 99. Painkillers can be used to treat the symptoms of illness but do not kill pathogens. 100. Antibiotics kill bacteria. 101. Antibiotics do not kill viruses as the virus is inside the cell.
	Drugs	102. New drugs have been extracted from plants and microorganisms. 103. The heart drug 'Digitalis' comes from foxgloves. 104. The pain killer 'Aspirin' comes from the willow tree. 105. Penicillin comes from the penicillium mould. 106. New medical drugs have to be tested in trials to check that they are safe, effective and of the correct dosage. 107. Preclinical testing is done in the lab using cells, tissues and animals. 108. Clinical trials are first done on healthy volunteers and then patients. 109. To reduce bias, placebos and double blind trials are used in clinical trials.
	Monoclonal Antibodies	110. **Monoclonal antibodies are produced from a single cell clone.** 111. **Monoclonal antibodies specifically bind onto one shape of antigen, so can target one type of cell or chemical inside the body.** 112. **Monoclonal antibodies are made using mouse lymphocytes and tumour cells to make a hybridoma cells.** 113. **Hybridoma cells are cloned to produce the same antibody that can be collected and purified.** 114. **Monoclonal antibody uses include: pregnancy tests, locating specific cells or tissues and cancer treatments.**

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Bioenergetics	Plant disease	115. **Plant defences include: thick cell walls, waxy cuticle on leaves, antibacterial chemicals, poisons to deter herbivores, leafs which droop, mimicry and thorns and hairs.** 116. **Plant diseases can be detected by: stunted growth, spots or discolouration, decay, growth or malformed stems and the presence of pests.** 117. **A lack of nitrate ions can lead to stunted growth in plants.** 118. **A lack of magnesium ions causes a lack of chlorophyll in plants.** 119. **Physical plant defence responses – cellulose cell walls, tough waxy cuticle, layers of dead cells (bark)** 120. **Chemical plant defence responses – antibacterial chemicals, poisons** 121. **Mechanical adaptations – thorns and hairs, leaves which droop or curl, mimicry**
	Photosynthesis	122. Photosynthesis transfers light energy into chemical energy inside plants. 123. Photosynthesis is an endothermic reaction. 124. The reactants in photosynthesis are carbon dioxide and water. 125. The products of photosynthesis are glucose and oxygen. 126. Substances associated with photosynthesis have the following chemical symbols: i. Carbon dioxide - CO_2 ii. Water - H_2O iii. Oxygen - O_2 iv. Glucose - $C_6H_{12}O_6$. 127. Glucose made in photosynthesis is used for: production of cellulose cell walls, producing amino acids, producing fats and oils and can be stored as insoluble starch. 128. The rate of photosynthesis can be affected by: carbon dioxide concentration, light intensity, temperature and the amount of chlorophyll. 129. **Limiting factors for photosynthesis are important to the economics of growing in greenhouses.** 130. **Limiting factors interact to gain maximum growth rate and profit.**
	Respiration	131. Aerobic respiration is an exothermic reaction which takes place inside mitochondria. 132. The reactants in aerobic respiration are glucose and oxygen. 133. The products of aerobic respiration are carbon dioxide, water and energy. 134. The energy made in aerobic respiration is used for: movement, keeping warm and chemical reactions to build large molecules. 135. During exercise, heart rate, breathing rate and breath volume increases. 136. Anaerobic respiration does not require oxygen. 137. Anaerobic respiration produces less energy. 138. Lactic acid is produced during anaerobic respiration and is toxic to the body. 139. Oxygen debt is the amount of oxygen needed to break down the lactic acid produced in anaerobic respiration. 140. Anaerobic respiration in plant and yeast cells produces carbon dioxide and ethanol. 141. Anaerobic respiration in yeast can be used in the manufacture of bread and alcohol.
	Metabolism	142. Metabolism is the sum of all reactions inside the cells of the body. 143. Metabolism includes: production of lipid molecules, production of amino acids, respiration, breakdown of excess proteins and conversion of glucose to starch and glycogen.