Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

Homeostasis and Response	Homeostasis	1. Homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions. 2. Homeostasis maintains optimal conditions for enzymes. 3. Control systems may involve nervous or chemical responses. 4. All control systems include – • cells called receptors which detect stimuli • coordination centres eg brain, spinal cord and pancreas that receive and process information from receptors. • Effectors eg muscles or glands, which bring about responses which restore optimum levels.
	Human Nervous System	5. The nervous system enables humans to react to their surroundings and to coordinate their behaviour. 6. Information is passes as an electrical impulse along cells called neurones. 7. The central nervous system is the brain and spinal cord. 8. Stimulus → receptor → coordinator → effector → response 9. Reflexes are rapid and automatic. 10. Reflexes do not use the brain, the impulse travels across the relay neurone in the spinal cord. 11. Synapse is a gap between two neurones. 12. Chemicals diffuse across the synapse to start a new chemical message in the next neurone.
	Brain	13. **The brain controls complex behaviour.** 14. **The brain is made of billions of interconnected neurons.** 15. **Different regions of the brain carry out different functions, as follows.** • **Cerebral cortex – consciousness, intelligence, memory & language** • **Cerebellum – coordinating muscle behaviour** • **Medulla – unconscious activities – heartbeat, movement of the gut, breathing etc** *16.* ***Investigating brain function and disease is difficult due to the complexity and delicacy of the brain.*** 17. ***MRI scanners can be used to study regions of the brain by studying patients with brain damage and electrically stimulating the different parts.***

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	The Eye	18. **The eye is a sense organ containing receptors sensitive to light intensity and colour.** 19. **Accommodation is the process of changing the shape of the lens to focus on near or distant objects.** 20. **To focus on a near object –** • **The ciliary muscles contract** • **The suspensory ligaments loosen** • **The lens is then thicker and refracts light rays strongly** 21. **To focus on a distant object –** • **The ciliary muscles relax** • **The suspensory ligaments are pulled tight** • **The lens is then pulled thin and only slightly refracts light rays** 22. **Two common defects of the eye are myopia (short sightedness) and hyperopia (long sightedness) in which rays of light do not focus on the retina.** 23. **Glasses refract the light rays so they do focus on the retina.** 24. **Hard and soft contact lenses can also be used.** 25. **Laser eye surgery changes the shape of the lens and replacement lenses can be placed in the eye.**
	Control body temperature	26. **Body temperature is monitored and controlled by the thermoregulatory centre (hypothalamus) in the brain.** 27. **The thermoregulatory centre contains receptors sensitive to the temperature of the blood.** 28. **The skin contains temperature receptors and sends nervous impulses to the thermoregulatory centre.** 29. **If body temperature is too high, blood vessels dilate (vasodilation) and sweat is produced. Both these cause a transfer of energy from the skin to the environment.** 30. **If body temperature is too low, blood vessels constrict (vasoconstriction), sweating stops and skeletal muscles contract (shiver).**
	Endocrine System	31. The endocrine system is made up of glands which secrete chemicals called hormones directly into the blood stream. 32. Hormones are chemical messengers. 33. The blood carries the hormone to a target organ where it produces an effect. 34. Compared to the nervous system the effects of hormones are slower but act or longer. 35. The pituitary gland is a “master gland” which secretes several hormones into the blood. These hormones in turn act on other glands to stimulate other hormones to be released to bring about effects.
	Blood Glucose Regulation	36. Blood glucose in monitored and controlled by the pancreas. 37. If blood glucose is too high, the pancreas produces insulin. 38. Insulin causes glucose to move from the blood into the cells. In liver and muscle cells excess glucose is converted to glycogen for storage. 39. *If blood glucose is too low, the pancreas produces glucagon.* 40. *Glucagon causes glycogen to be converted to glucose.* 41. Type 1 diabetes is where the pancreas fails to produce enough insulin. Sufferers have uncontrolled high blood glucose levels and is normally treated with insulin injections. 42. In Type 2 diabetes body cells no longer respond to insulin. A carbohydrate controlled diet and exercise are common treatments. Obesity is a risk factor for type 2 diabetes.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Maintaining water & nitrogen balance	43. **Water leaves the body via the lungs during exhalation.** 44. **Water, ions and urea are lost from the skin in sweat.** 45. **There is no control over water, ions or urea loss by the lungs or skin.** 46. **Excess water, ions and urea are removed via the kidneys in urine.** 47. **If body cells gain or lose water by osmosis they do not function properly.** 48. ***The digestion of proteins from the diet results in excess amino acids which need to be removed from the body safely.*** 49. ***In the liver amino acids are deaminated to form ammonia.*** 50. ***Ammonia is toxic and so it is immediately converted to urea so it can be safely excreted.*** 51. **The kidneys produce urine by filtering the blood and selectively reabsorbing useful substances.** 52. **Glucose is completely reabsorbed by the kidney tubule.** 53. **Water and ions are selectively reabsorbed depending on the body needs.** 54. **Urea, excess water and ions are not reabsorbed and leave the body as urine.** 55. **Urine is produced from urea, excess water and ions.** 56. ***Water levels in the body are controlled by the hormone ADH.*** 57. ***ADH is released by the pituitary gland.*** 58. ***ADH is released when blood is too concentrated and it causes more water to be reabsorbed back into the blood from the kidney tubules.*** 59. ***This is controlled by negative feedback.*** 60. **People who suffer from kidney failure may be treated by organ transplant or by kidney dialysis.**
	Hormones in human reproduction	61. During puberty reproductive hormones cause secondary sex characteristics to develop, for example, breast development in females and voice deepening in males. 62. Oestrogen in the main female sex hormone, produced in the ovary. 63. Testosterone is the main male sex hormone, produced by the testes, testosterone stimulates sperm production. 64. The menstrual cycle releases an egg and prepares a woman's body for pregnancy. 65. The menstrual cycle is, on average, 28 days long. 66. Ovulation is the release of a mature egg from the ovary. 67. Menstruation, a period, lasts on average, 5 days. 68. Several hormones control the menstrual cycle – • Follicle stimulating hormone (FSH) causes eggs to mature an egg in the ovary and stimulates the production of oestrogen. • Oestrogen inhibits (stops) the production of FSH, stimulates the lining of the uterus and stimulates the production of oestrogen. • Luteinising hormone (LH) stimulates ovulation (release of a mature egg from the ovary). • Progesterone maintains the lining of the uterus.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Contraception	69. Fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception. These include – • Oral contraceptives contain hormones (oestrogen & progesterone) to inhibit FSH production so no eggs mature to be fertilised. • Injection, implant or skin patch of slow release progesterone to stop the maturing and release of eggs for a number of months or years. • Barrier methods of contraception, eg. Condoms and diaphragm which prevent sperm reaching an egg. • Intrauterine devices prevent the implantation of an embryo (IUD) or release a hormone (IUS). • Spermicidal agents which kill or disable sperm • Abstaining from intercourse when an egg may be in the oviduct • Surgical methods of male and female sterilisation.
	Hormones to treat infertility	*70. Infertility (where a couple are unable to get pregnant) can be helped by giving a "fertility drug". This drug includes the hormones FSH and LH, she may then become pregnant in the normal way.* *71. In Vitro Fertilisation (IVF) treatment involves –* • *Giving the mother FSH & LH to stimulate the maturing of several eggs.* • *The eggs are collected from the mother and fertilised by sperm from the father in the lab.* • *The fertilised eggs develop into embryos.* • *At the stage when the embryo's are tiny balls of cells, one or two embryo's are inserted into the mother's uterus.* *72. Fertility treatment gives a woman the chance to have a baby of her own, but it can be –* • *Very emotionally and physically stressful* • *The success rates are low* • *Can lead to multiple births which increase the risks to both mothers and babies.*
	Negative Feedback	*73. Adrenaline is produced by the adrenal glands in times of fear or stress. It increases the heart rate and the amount of oxygen and glucose to the brain and muscles, preparing the body for 'flight or fight'.* *74. Thyroxine from the thyroid gland stimulates the basal metabolic rate. It plays an important role in growth and development.* *75. Thyroxine levels are controlled by negative feedback.*
	Plant Hormones	76. **Plants produce hormones to coordinate and control growth and responses to light (phototropism) and gravity (gravitropism or geotropism).** 77. **Auxin is a plant growth hormone.** 78. **Unequal distributions of auxin cause unequal growth rates in plant roots and shoots.** 79. **In agriculture and horticulture –** • **Auxins are used as weedkillers, rooting powders and for promoting growth in tissue culture.** • **Ethene is used in the food industry to control ripening of fruit during storage and transport.** • **Gibberellins can be used to end seed dormancy, promote flowering and increase fruit size.**

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

<table>
<tr>
<td rowspan="2">Inheritance</td>
<td>Reproduction</td>
<td>
80. Sexual reproduction involves the joining (fusion) of male and female gametes:

Sperm & egg cells in animals
Pollen & egg cells in flowering plants

81. In sexual reproduction there is a mixing of genetic information, this leads to variety in the offspring.
82. Gametes are produced by meiosis.
83. Asexual reproduction involves one parent.
84. There is no joining of gametes so there is no mixing of genetic information.
85. Asexual reproduction leads to genetically identical offspring – clones.
86. Asexual reproduction uses mitosis.
87. Cells in ovarys and testes divide by meiosis to form gametes.
88. When a cell divides to form gametes:

Copies of genetic information are made
The cell divides twice to form four gametes, each with a single set of chromosomes
All gametes are genetically different from each other

89. Gametes join at fertilisation to restore the normal number of chromosomes.
90. The new cell divides by mitosis to form an embryo. As the embryo develops the cells differentiate.
91. Advantages of sexual reproduction –

Produces variation in the offspring
If the environment changes variation gives the organism an advantage by natural selection

92. Advantages of asexual reproduction

Only one parent needed
More time and energy efficient as do not need to find a mate
Faster than sexual reproduction
Many identical offspring can be produced when conditions are favourable

93. Some organisms reproduce by both methods –

Malarial parasites reproduce asexually in the human host, but sexually in the mosquito
Many fungi reproduce asexually by spores but also reproduce sexually to give variation.
Many plants produce seeds sexually, but also reproduce asexually eg strawberry plants by runners or bulb division such as daffodils.

</td>
</tr>
<tr>
<td>DNA & the genome</td>
<td>
94. The genetic material in the nucleus of a cell is composed of a chemical called DNA.
95. DNA is a polymer and has two strands forming a double helix.
96. DNA is contained in structures called chromosomes.
97. A gene is a small section of DNA on a chromosome.
98. Each gene contains the instructions for a sequence of amino acids, to make a specific protein.
99. The genome of an organism is the entire genetic material of that organism.
100. The whole human genome has been studied. This is important –

For medicine in the future
To search for genes linked to different types of disease
Understanding and treatment of inherited diseases.
For tracing human migration patterns from the past.

</td>
</tr>
</table>

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	DNA Structure	101. **DNA is a polymer made from four different nucleotides.** 102. **Each nucleotide consists of a common sugar and phosphate group, with one of four different bases attached to the sugar.** 103. **The four bases are A, C, G and T.** 104. **A sequence of three bases is the code for a particular amino acid.** 105. **The order of bases gives the instructions for a sequence of amino acids which are assembled to produce a particular protein.** 106. ***Base C always pairs with G and A always pairs with T.*** 107. ***A change in the order of bases may results in a change in the protein made by the gene (a mutation)*** 108. ***Proteins are made on ribosomes.*** 109. ***Carrier molecules bring specific amino acids to add to the protein chain, in the correct order.*** 110. ***When a protein chain is complete it folds up to form a unique shape.*** 111. ***This unique shape enables the proteins to do their job as enzymes, hormones or structures in the body such as collagen.*** 112. ***Mutations occur continuously, most do not alter the protein, or alter it slightly so that its appearance or function is not changed.*** 113. ***A few mutations code for an altered protein with a different shape. An enzyme may no longer fit the substrate binding site or a structural protein may lose its strength.*** 114. ***Not all parts of DNA code for proteins. Non-coding parts of DNA can switch genes on and off. So changes in these areas of DNA may affect how genes are expressed.***
	Genetic Inheritance	115. Some characteristics are controlled by a single gene eg fur colour in mice and red green colour blindness in humans. 116. Each gene may have different forms called alleles. 117. The combination of alleles present is the organisms genotype. 118. The characteristics that are expressed is the organism's phenotype. 119. A dominant allele is always expressed, even if only one copy is present. 120. A recessive allele is only expressed if two copies are present (no dominant allele present) 121. If two of the same alleles are present, the organisms are homozygous for that characteristic. 122. If two different alleles are present the organism is heterozygous for that characteristic.
	Inherited disorders	123. Some disorders are caused by the inheritance of certain alleles. 124. Polydactyly – having extra fingers or toes – is caused by a dominant allele. 125. Cystic fibrosis – a disorder of the cell membranes – is caused by a recessive allele. 126. Embryo's can be screened (have their genetic information checked) to see if they have any alleles for a genetic disorder.
	Sex determination	127. Human body cells contain 23 chromosomes. One pair of chromosomes determines sex. 128. Females have sex chromosomes XX 129. Males have sex chromosomes XY.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

Variation & Evolution	Variation	130. Differences in the characteristics of individuals in a population is called variation. 131. Variation is due to – • Genes that are inherited (genetic causes) • The conditions the organism has developed in (environmental causes) • Combination of genes and the environment. 132. Mutations occur continuously. 133. Very rarely a mutation will lead to a new phenotype (characteristic).
	Evolution	134. The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago. 135. **Charles Darwin proposed the theory of natural selection by evolution.** • **Individual organisms within a particular species show a wide range of variation for a characteristic.** • **Individuals with characteristics most suited to the environment are more likely to survive to breed successfully.** • **The genes for the characteristics that have enabled these individuals to survive are then passed on to the next generation.** 136. **Darwin published his ideas in *On the Origin of Species (1859).*** 137. **Darwin's theory of evolution by natural selection was only gradually accepted because -** • **The theory challenged the idea that God made all organisms.** • **Insufficient evidence at the time** • **Mechanism of inheritance & variation was not known.** 138. **Jean-Baptiste Lamarck proposed a theory of evolution – changes during an organisms life time can be inherited.**
	Speciation	139. **Alfred Russel Wallace independently proposed the theory of natural selection.** 140. **Wallace published joint writings with Darwin in 1858, which prompted Darwin to publish *On the Origin of Species* (1859).** 141. **Wallace collected evidence for evolutionary theory from around the world.** 142. **Wallace worked on warning colouration.** 143. **Wallace completed early work on speciation.** 144. **Organisms of the same species are able to produce fertile offspring.** 145. **Speciation – two populations become isolated – natural selection occurs on each population until the two populations become so genetically different that interbreeding is no longer possible.**
	Fossils	146. Fossils are the remains of organisms from millions of years ago, which are found in rocks. 147. Fossils may be formed – • From parts of organisms that have not decayed • Parts of the organism are replaced by minerals • Preserved traces of organisms eg footprints, burrows & rootlet traces 148. Many early forms of life were soft bodied so left few traces behind. Any traces that have been left behind have mainly been destroyed by geological activity. 149. Few fossils mean scientists cannot be certain how life began on Earth. 150. Fossils can tell us how much or how little different organisms have changed as life developed on Earth.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Extinction	151. Extinctions occur when there are no remaining individuals of a species still alive. 152. Extinction can occur for many reasons including, new predators, new disease, new more successful competitors, catastrophic events & changes to the environment over geological time.
	Classification	153. Carl Linnaeus classified living organisms depending on their structure and characteristics. 154. Linnaeus classified living things into kingdom, phylum, class, order, family, genus, species. 155. Organisms are named by the binomial system of genus and species. 156. As evidence and knowledge of internal structures became more developed due to improvements in microscopes and the understanding of biochemical processes, new models of classification were proposed. 157. Carl Woese developed a three domain system, which sits above Linnaeus' system above. 158. The three domains are – • Archaea – primitive bacteria living in extreme environments (extremophiles) • Bacteria – true bacteria • Eukaryota – protists, fungi, plants and animals. 159. Evolutionary trees are used to show how organisms are related. They use current classification data for living organisms and fossil data for extinct organisms.
	Selective Breeding	160. Selective breeding is the process by which humans breed plants and animals for particular genetic characteristics. 161. Humans have been doing this for thousands of years since they first bred food crops from wild plants and domesticated animals. 162. Characteristics for selective breeding can be chosen for usefulness or appearance – • Disease resistance in food crops • Animals which produce more meta or milk • Domestic dogs with a gentle nature • Large or unusual flowers. 163. Selective breeding can lead to "inbreeding" where some breeds are prone to disease or inherited defects.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Genetic Engineering	164. Genetic engineering is when the genome from one organism is changed by inserting a gene from another organism to give a desired characteristic. 165. Genes are "cut out" from one organisms using enzymes. 166. Plant crops have been genetically engineered to be resistant to disease, produce bigger better fruits, are resistant to insect attack or herbicides. 167. Genetically engineered (or modified) crops generally show increased yield. 168. Bacterial cells have been genetically engineered to produce useful substances such as human insulin to treat diabetes. 169. Concerns about genetically modified crops include the effect on populations of wild flowers and insects and the effect of eating GM crops on human health. 170. *In genetic engineering –* • *Enzymes are used to isolate the required gene, this gene is inserted into a vector* • *The vector is used to insert the gene into the required cells* • *Genes are transferred to the cells of animals, plants or microorganisms at an early stage in their development so that they develop with the desired characteristics.*
	Cloning	171. **Tissue culture – small groups of cells are used to grow genetically identical new plants. This is important for preserving rare plant species or commercially in nurseries.** 172. **Cuttings - older but simple method used by gardeners to produce many identical new plants from a parent plant.** 173. **Embryo transplants – splitting apart cells from a developing animal embryo before they become specialised, then transplanting the identical embryos into host (surrogate) mothers.** 174. **Adult Cell cloning –** • **The nucleus is removed from an unfertilised egg cell.** • **The nucleus from an adult body cell is inserted into the empty egg cell.** • **An electric shock stimulates the egg cell to divide to form an embryo.** • **When the embryo has developed into a ball of cells it is inserted in to the uterus of an adult female to develop.** • **Offspring produced are genetically identical to the nucleus donated from the adult body cell.**

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

Ecology	Adaptations, interdependence & competition	175. An ecosystem is the interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment. 176. Plants in a community often compete with each other for light, space, water and mineral ions from the soil. 177. Animals often compete with each other for food, mates and territory. 178. Within a community each species depends on other species for food, shelter, pollination, seed dispersal etc. If one species is removed if can affect the whole community – this is interdependence. 179. A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant. 180. Abiotic (non living) factors which affect a community are – • Light intensity • Temperature • Moisture levels • Soil pH and mineral content • Wind intensity and direction • Carbon dioxide levels for plants • Oxygen levels for aquatic plants. 181. Biotic (living) factors which affect a community are – • Availability of food • New predators arriving • New pathogens • One species outcompeting another so the numbers are no longer sufficient to breed. 182. Organisms have features (adaptations) that enable them to survive in the conditions in which they normally live. These adaptations may be structural (camouflage), behavioural (basking in the sun) or functional (controlling the amount of urine produced to conserve water). 183. Some organisms live in environments that are very extreme, for example, high pressure, high temperature or high salt concentration. 184. These organisms are called extremophiles. 185. Bacteria living in deep sea vents are called extremophiles.
	Organisation of an ecosystem	186. Producers are organisms that carry out photosynthesis. Producers always start a food chain. 187. Producers are eaten by primary consumers, which are eaten by secondary consumers and then tertiary consumers. 188. Consumers that kill and eat other animals are predators and those eaten are prey. 189. In a stable community the numbers of predators and prey rise and fall in cycles. 190. Quadrats are used to measure the population of organisms in a habitat. 191. Transects are used to measure the distribution of organisms in a habitat.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	How materials are cycled	192. All materials in the living world are recycled to provide the building blocks for future organisms. 193. The carbon cycle returns carbon from organisms to the atmosphere as carbon dioxide to be used by plants in photosynthesis. 194. The main processes in the carbon cycle are photosynthesis, respiration, combustion and decay. 195. Proteins, fats and carbohydrates all contain carbon atoms. 196. Microorganisms return carbon to the atmosphere as carbon dioxide in respiration and return mineral ions to the soil. 197. All energy absorbed by producers from the sun is eventually transferred to the environment. 198. The water cycle provides fresh water for plants and animals on land before draining into the seas. 199. Water is continually evaporated and precipitated.
	Decomposition	200. **Microorganisms cause decay.** 201. **Warm temperatures, the presence of water and lots of oxygen increase the rate of decay.** 202. **Gardeners and farmers try to provide optimum (the best) conditions for decay of waste biological material.** 203. **The compost produced is used as a fertiliser for growing garden plants or crops as is is very rich in nutrients.** 204. **Anaerobic decay produces methane gas. Biogas generators can be used to produce methane gas as a fuel.**
	Impact of Env. change	*205.* ***Environmental changes affect the distribution of species in an ecosystem. These changes include –*** • ***Temperature*** • ***Availability of water*** • ***Composition of atmospheric gases*** ***These changes may be seasonal, geographic or caused by human interaction.***
	Biodiversity	206. Biodiversity is the variety of all the different species of organism on earth, or within an ecosystem. 207. A large biodiversity ensures the stability of ecosystems by reducing the dependence of one species on another for food, shelter and the maintenance of the environment. 208. The future of the human species on Earth relies on us maintaining a good level of biodiversity. 209. Many human activities are reducing biodiversity and only recently have measures been put in place to try to stop this reduction.
	Waste Management	210. Rapid growth in the human population and an increase in the standard of living mean that more resources are used and more waste is produced. 211. Unless waste and chemical materials are properly handled, more pollution will be caused. 212. Pollution can occur: • In water, from sewage, fertiliser or toxic chemicals • In air, from smoke and acidic gases • On land, from landfill and from toxic chemicals 213. Pollution kills plants and animals which can reduce biodiversity.

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Land Use	214. Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste. 215. The destruction of peat bogs and other areas of peat to produce garden compost, reduces the area of this habitat and thus the variety of different plant, animal and microorganism species that live there (biodiversity). 216. The decay or burning of the peat releases carbon dioxide into the atmosphere.
	Deforestation	217. Large scale deforestation in tropical areas has occurred to : • Provide land for cattle and rice fields • Grow crops for biofuels
	Global Warming	218. Levels of carbon dioxide and methane in the atmosphere are increasing and contribute to global warming. 219. Biological consequences of global warming (be able to describe how these may happen with examples) – • Loss of habitat • Changes in distribution of organisms • Changes in migration patterns • Reduced biodiversity
	Maintaining Biodiversity	220. Scientists and concerned citizens have put in place programmes to reduce the negative effects of humans on ecosystems and biodiversity. 221. These include – • Breeding programmes for endangered species • Protection and regeneration of rare habitats • Reintroduction of field margins and hedgerows in agricultural areas where farmers grow only on type of crop. • Reduction of deforestation and carbon dioxide emissions by some governments • Recycling resources rather than dumping waste in landfill.
	Trophic levels & Pyramids of Biomass	222. **Trophic levels can be represented by numbers, starting at level 1 with plants and algae. Trophic levels are numbered according to how far the organism is along the food chain.** • **Level 1 – plants and algae – make their own food via photosynthesis & are called producers** • **Level 2 – Herbivores eat plants/algae and are called primary consumers.** • **Level 3 – Carnivores that eat herbivores are called secondary consumers** • **Level 4 – Carnivores that eat other carnivores are called tertiary consumers. Apex predators are carnivores with no predators.** 223. **Decomposers break down dead plant and animal matter by secreting enzymes into the environment. Small soluble food molecules then diffuse into the microorganism.** 224. **Pyramids of biomass show the relative amounts of biomass in each level of a food chain. Trophic level 1 is at the bottom of the pyramid.**

Biology Fact Sheet – Paper 2 - Triple

Bold – Triple Content *Higher tier in Italics*

	Transfer of Biomass	225. **Producers are mostly plants and algae which transfer about 1% of the energy from light for photosynthesis.** 226. **10% of the biomass from each trophic level is transferred to the level above it.** 227. **Losses of biomass are due to:** • **Not all the eaten material is absorbed, some is egested as faeces** • **Some absorbed material is lost as waste, such as carbon dioxide and water in respiration and water and urea in urine.** 228. **Large amounts of glucose are used in respiration.**
	Factors affecting food security	229. **Food security is having enough food to feed a population.** 230. **Biological factors which are threatening food security include:** • **The increasing birth rate has threatened food security in some countries.** • **Changing diets in developed countries means scarce food resources are transported around the world.** • **New pests and pathogens that affect farming** • **Environmental changes that affect food production, such as widespread famine occurring in some countries if rains fail** • **The cost of agricultural inputs** • **Conflicts that have arisen in some parts of the world which affect the availability of water or food.** 231. **Sustainable methods must be found to feed all people on Earth.**
	Farming Techniques	232. **The efficiency of food production can be improved by restricting energy transfer from food animals to the environment.** 233. **This can be done by limiting their movement and controlling the temperature of their surroundings.** 234. **Some animals are fed high protein foods to increase growth.**
	Sustainable Fisheries	235. **Fish stocks in the oceans are declining.** 236. **It is important to maintain fish stocks at a level where breeding continues or certain species may disappear altogether in some areas.** 237. **Control of net size (holes to allow immature individuals to escape) and fishing quotas play important roles in conservation of fish stocks at a sustainable level.**
	Role of biotechnology	238. **Modern biotechnology techniques enable large quantities of microorganisms to be cultured for food.** 239. **The fungus *Fusarium* is useful for producing mycoprotein, a protein rich food substitute for vegetarians.** 240. **The fungus is grown on glucose syrup, in aerobic conditions, the biomass is harvested and purified.** 241. **A genetically modified bacterium produces human insulin, used to treat people with diabetes.** 242. **GM crops could provide more food or food with an improved nutritional value such as golden rice.**