



HSC Trial Examination 2020

Biology

Solutions and marking guidelines

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Section I

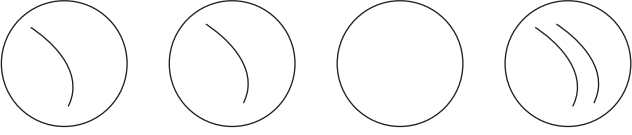
Answer and explanation	Syllabus content, outcomes and targeted performance bands
<p>Question 1 A</p> <p>One advantage of bacterial cells is that they are produced every twenty minutes in ideal conditions. One disadvantage is that the daughter cells produced are genetically identical, resulting in less genetic diversity. This makes bacteria less able to survive environmental change, so A is correct. While less energy is required in binary fission, meiosis is not part of the process; B is incorrect. Binary fission occurs in prokaryotic cells, not eukaryotic cells, and although some bacteria are resistant to antibiotics, this is not related to binary fission. C is incorrect. The cells produced are genetically identical, but binary fission is asexual, requiring only one cell. D is incorrect.</p>	<p>Mod 5 Reproduction BIO12–12</p> <p style="text-align: right;">Band 3</p>
<p>Question 2 C</p> <p>Progesterone prepares the uterus for implantation of the embryo; C is correct. Oxytocin is associated with birth; A is incorrect. Oestrogen is responsible for the menstrual cycle and female features; B is incorrect. Luteinising hormone triggers ovulation and promotes the secretion of progesterone; D is incorrect.</p>	<p>Mod 5 Reproduction BIO12–12</p> <p style="text-align: right;">Band 2</p>
<p>Question 3 A</p> <p>The nucleotide chain is formed by alternating sugar and phosphate molecules; bases do not make up part of the chain. C and D are incorrect. In a nucleotide, the base must attach to the sugar; A is correct and B is incorrect.</p>	<p>Mod 5 Cell Replication BIO12–6, 12–12</p> <p style="text-align: right;">Band 2</p>
<p>Question 4 D</p> <p>A mutation at the point where DNA breaks may cause mutation, but this is not likely to benefit the offspring. D is the correct response. The chromosomes in crossing over are homologous. The point at which the DNA strand breaks may result in a mutation that damages the cell or causes cell death. Crossing over provides gametes with different genetic combinations.</p>	<p>Mod 5 Genetic Variation BIO12–13</p> <p style="text-align: right;">Band 4</p>
<p>Question 5 B</p> <p>The mother of the male in the third generation must be homozygous recessive. This means that the male must get one of these recessive alleles from his mother and the dominant allele, which is expressed, from his father. B is correct. While in this pedigree only males show the dominant allele in their phenotype, there is nothing to indicate the trait is sex-linked. A is incorrect. There is no evidence of a third phenotype produced by the heterozygous form in the pedigree. C is incorrect. The male in the first generation could be homozygous for the dominant allele or heterozygous; D is incorrect.</p>	<p>Mod 5 Genetic Variation BIO12–6, BIO12–12</p> <p style="text-align: right;">Band 5</p>
<p>Question 6 D</p> <p>A mutagen can be anything that causes a mutation – for example, a chemical or a form of energy. D is correct. The mutagen results in a strand of DNA with a mutation, so A is incorrect. An amino acid sequence is a consequence of a mutation, so B is incorrect. tRNA is a molecule that ‘reads’ the mRNA; C is incorrect.</p>	<p>Mod 6 Mutation BIO12–13</p> <p style="text-align: right;">Band 2</p>

Answer and explanation	Syllabus content, outcomes and targeted performance bands
<p>Question 7 D</p> <p>The semen from one bull can be used to inseminate a large number of cows located in different areas. D is correct. The calves produced are not genetically modified, so they are safe for human consumption. A is incorrect. Artificial insemination is not cloning, so B is incorrect. The net effect of artificial insemination is a reduction in genetic diversity across the entire population, even if it is introducing new genes into a specific population. C is incorrect.</p>	<p>Mod 6 Genetic Technologies BIO12–12 Band 3</p>
<p>Question 8 B</p> <p>The process of taking multiple cuttings from one plant and growing them into another plant is whole organism cloning. B is correct. The plant is cloned, so A is incorrect. The plant is not genetically modified, it is just a copy, so C is incorrect. This process doesn't occur naturally in agriculture. D is incorrect.</p>	<p>Mod 6 Genetic Technologies BIO12–12 Band 3</p>
<p>Question 9 C</p> <p>Each sperm has a different genetic combination, increasing the variation in offspring produced. C is correct. Increased rates of migration and mutagens producing beneficial alleles do not relate to fertilisation, so A and B are incorrect. Only one sperm entering an ova does not relate to genetic variation. D is incorrect.</p>	<p>Mod 5 Genetic Variation BIO12–13 Bands 3–4</p>
<p>Question 10 B</p> <p>B is correct; a transgenic species has DNA from two different species. Transgenic relates to genes, not sex; A is incorrect. Transgenic species are produced in laboratories, so C is incorrect. Transgenic species do not produce unsafe products; a lot of medicine is produced through transgenic species. D is incorrect.</p>	<p>Mod 6 Genetic Technologies BIO12–13 Band 3</p>
<p>Question 11 B</p> <p>'A chemical produced by an organ in the body that is transported to another part of the body where it causes a change in other cells, tissues or organs' is the correct definition of a hormone.</p>	<p>Mod 8 Homeostasis BIO12–15 Band 2</p>
<p>Question 12 D</p> <p>Epidemiology is the study of why and how often diseases occur in different groups of people.</p>	<p>Mod 8 Epidemiology BIO12–15 Band 2</p>
<p>Question 13 B</p> <p>The virus that causes dengue fever is endemic in many tropical and sub-tropical regions outside of Australia. B is correct; cases of dengue fever in Australia can arise from people travelling to Australia from regions affected by the disease. The disease is then transmitted by mosquitoes. The disease is caused by a virus, not a bacterium, and is not caused by indirect contact; A and C are incorrect.</p>	<p>Mod 7 Prevention, Treatment and Control BIO12–14 Band 3</p>
<p>Question 14 A</p> <p>The fly (not shown in the diagram) is the least likely to transmit the flu from one person to another.</p>	<p>Mod 7 Causes of Infectious Disease BIO12–6, 12–14 Band 3</p>
<p>Question 15 C</p> <p>Viruses and prions are classed as non-cellular pathogens (B and D are incorrect) and are not living (C is correct and A is incorrect). This is because they cannot replicate outside of a host cell. Viruses can infect all types of organisms, from prokaryotic bacteria to eukaryotic human cells.</p>	<p>Mod 7 Causes of Infectious Disease BIO12–14 Band 4</p>

Section II

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide									
Question 21										
<p>Terrestrial animals reproduce by internal fertilisation; the female reproductive system provides the fluid through which sperm can swim to the ova.</p> <p>One advantage is that the internal environment protects the zygote (and developing embryo) from predators.</p>	<p>Mod 5 Reproduction BIO12–12 Band 4</p> <ul style="list-style-type: none"> • Explains the use of internal fertilisation. <p>AND</p> <ul style="list-style-type: none"> • Explains that a liquid environment is essential to internal fertilisation. <p>AND</p> <ul style="list-style-type: none"> • Describes ONE advantage of internal fertilisation 3 <hr/> <ul style="list-style-type: none"> • Explains the use of internal fertilisation. <p>AND</p> <ul style="list-style-type: none"> • Explains that a liquid environment is essential to internal fertilisation. 2 <hr/> <ul style="list-style-type: none"> • States that terrestrial animals use internal fertilisation. 1 									
Question 22										
(a) The pattern of inheritance is sex-linkage.	<p>Mod 5 Genetic Variation BIO12–12, 12–5, 12–6 Band 4</p> <ul style="list-style-type: none"> • Identifies the pattern as sex-linked 1 									
<p>(b)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td></td> <td style="text-align: center;">X^D</td> <td style="text-align: center;">Y</td> </tr> <tr> <td style="text-align: center;">X^D</td> <td style="text-align: center;">$X^D X^D$</td> <td style="text-align: center;">$X^D Y$</td> </tr> <tr> <td style="text-align: center;">X^d</td> <td style="text-align: center;">$X^D X^d$</td> <td style="text-align: center;">$X^d Y$</td> </tr> </tbody> </table>		X^D	Y	X^D	$X^D X^D$	$X^D Y$	X^d	$X^D X^d$	$X^d Y$	<p>Mod 5 Heredity BIO12–12, 12–5, 12–6 Bands 3–4</p> <ul style="list-style-type: none"> • Constructs an appropriate model. <p>AND</p> <ul style="list-style-type: none"> • Demonstrates likelihood of producing a male with dominant trait is 50% <p>AND</p> <ul style="list-style-type: none"> • Demonstrates likelihood of producing a female with dominant trait is 100%. 3 <hr/> <ul style="list-style-type: none"> • Constructs an appropriate model. <p>AND</p> <ul style="list-style-type: none"> • Demonstrates likelihood of producing a male with dominant trait to is 50% <p>OR</p> <ul style="list-style-type: none"> • Demonstrates likelihood of producing a female with dominant trait is 100%. 2 <hr/> <ul style="list-style-type: none"> • Constructs an appropriate model. 1
	X^D	Y								
X^D	$X^D X^D$	$X^D Y$								
X^d	$X^D X^d$	$X^d Y$								

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 23	
(a) 0.15	Mod 5 Genetic Variation BIO12–12 Band 3 • States the correct frequency 1
(b) The statement is invalid because the frequency of alleles in a population cannot be used to determine the likelihood of offspring with those alleles in individual crosses where the genotypes are known. The frequency data is applied at the population level. Information about the pattern of inheritance is not provided in the question. For example, it is not known if the gene is sex-linked or if the alleles are co-dominant.	Mod 5 Genetic Variation BIO12–12 Band 4 • Assesses the validity of the statement. AND • Demonstrates that population data is NOT linked to individual crosses. AND • Demonstrates the absence of information about the pattern of inheritance 3
	• Assesses the validity of the statement. AND • Demonstrates the absence of information about the pattern of inheritance 2
	• Assesses the validity of the statement . . . 1
Question 24	
(a) gel electrophoresis	Mod 6 Mutation BIO12–12 Band 2 • Identifies ONE relevant technology 1
(b) Gel electrophoresis is used to measure lengths of DNA. It has been used for profiling individuals and can also be used for sequencing DNA. A terminating nucleotide can be added to the DNA strand. This means as the DNA polymerase builds a new strand, it stops every time it comes to a terminating base, providing strands of different lengths. These pieces of DNA are passed through a gel electrophoresis, with smaller strands travelling further than longer strands. The lengths of the strands are analysed to determine where the base is in the original DNA. The process is repeated for all types of bases. A computer processes the data from the gel electrophoresis to determine the position of each base. As the scientists know the code of the allele, analysis of the DNA fragments would determine if that fragment is present in any of the samples taken.	Mod 5 Inheritance Patterns in a Population BIO12–12 Bands 4–5 • Describes the technology, providing TWO points. AND • Describes how the technology confirms presence or absence of the gene 3
	• Describes the technology, providing TWO points 2
	• Describes the technology, providing ONE point 1
(c) Scientists cannot conclude that the recessive gene is no longer present in the population, as it may be present in members of the population from whom tissue was not collected.	Mod 6 Mutation BIO 12–13 Bands 4–5 • States whether it can be concluded that the gene is absent. AND • Demonstrates position with ONE use of evidence 2 • Demonstrates position with ONE use of evidence 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
<p>Question 25</p> <p>(a)</p> 	<p>Mod 6 Mutation BIO12–13 Bands 2–4</p> <ul style="list-style-type: none"> Constructs a diagram with FOUR gametes, showing a gamete with ONE missing chromosome AND a gamete with ONE extra chromosome 2 Constructs a diagram with FOUR gametes, showing a gamete with ONE missing chromosome OR a gamete with ONE extra chromosome 1

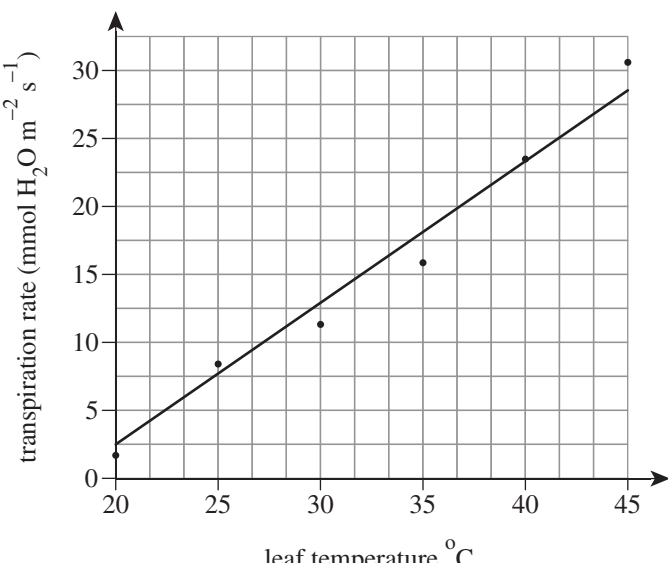
Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
<p>(b) During meiosis, homologous chromosomes come together. When the cell divides, the homologous chromosomes separate. If a chromosome pair does not separate, an irregular number of chromosomes are produced. Then, when the second cell division occurs, two gametes receive one copy of the chromosome, one gamete receives two copies and one gamete does not receive a copy.</p>	<p>Mod 6 Mutation BIO12–13 Bands 3–5</p> <ul style="list-style-type: none"> • Identifies meiosis as the process of gamete formation. <p>AND</p> <ul style="list-style-type: none"> • Describes all THREE of: <ul style="list-style-type: none"> • irregular chromosome number in gametes due to the failure of homologous chromosomes separating. • an extra chromosome being left in ONE gamete. • a chromosome missing from ONE gamete 3 <hr/> <ul style="list-style-type: none"> • Identifies meiosis as the process of gamete formation. <p>AND</p> <ul style="list-style-type: none"> • Describes any TWO of: <ul style="list-style-type: none"> • irregular chromosome number in gametes due to the failure of homologous chromosomes separating. • an extra chromosome being left in ONE gamete. • a chromosome missing from ONE gamete 2 <hr/> <ul style="list-style-type: none"> • Identifies meiosis as the process of gamete formation. <p>AND</p> <ul style="list-style-type: none"> • Describes how the irregular chromosome number in gametes is due to the failure of homologous chromosomes separating. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 26	
(a) Mutation I is a point mutation where guanine is substituted with adenine. Mutation II is a frameshift mutation that shifts the reading frame of the triplet codes.	Mod 5 Cell Replication BIO12–12 Band 3–5 <ul style="list-style-type: none"> • Identifies that mutation I is a point mutation and mutation II is a frameshift mutation. 2 AND <ul style="list-style-type: none"> • Differentiates between point mutation and frameshift mutation 2 <hr/> <ul style="list-style-type: none"> • Identifies that mutation I is a point mutation and mutation II is a frameshift mutation 1
(b) Mutation II is most likely to have the greater effect. Mutation II has a base inserted, resulting in a frameshift mutation that will shift the reading frame for the rest of the DNA sequence, changing the amino acids that are brought to the ribosome during protein synthesis. This may result in the polypeptide chain not forming. Mutation I is a substitution and may affect only one amino acid.	Mod 5 Cell Replication BIO12–12 Bands 3–4 <ul style="list-style-type: none"> • Correctly identifies mutation II. 3 AND <ul style="list-style-type: none"> • Describes the effect of BOTH mutations on the amino acid sequence. 3 <hr/> <ul style="list-style-type: none"> • Correctly identifies mutation II. 2 AND <ul style="list-style-type: none"> • Describes the effect of ONE of the mutations on the amino acid sequence. 2 <hr/> <ul style="list-style-type: none"> • Correctly identifies mutation II 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 27	
<p>Since the beginning of agriculture the genetic make-up of populations has been changing. When farmers started gathering animals – for example, cows and goats – close to where they lived rather than hunting and gathering their food, they started to limit opportunities for these animal populations to reproduce. This meant that the gene pool available was reduced. The variation in the genes reduced even further when farmers started to select individuals within a population to breed based on their desired traits. This means biodiversity was reduced to artificial selection rather than natural selection. Over centuries farming intensified, causing habitat destruction. This resulted in less biodiversity in agricultural populations and a reduction in wild populations of organisms that evolved through natural selection.</p> <p>More recently, genetic engineering has further reduced biodiversity. Organisms are engineered to have genes that produce desired characteristics. Once the desired product is designed, the organisms are cloned. This practice is used more often in plants than animals and produces crops where every plant is genetically identical. This is a dramatic reduction in biodiversity.</p> <p>Emission of green-house gases increases the concentration of carbon dioxide in the atmosphere and contributes to global warming. Current research is investigating possible ways for crops to have higher yields in this environment. For example, crops could be genetically engineered to withstand higher temperatures. While scientists may be able to engineer these crops, the biotechnology would still reduce the genetic variation in a species, because the crops would be genetically engineered with highly specific traits (such as tolerance to higher temperatures).</p>	<p>Mod 6 Biotechnology BIO12–13 Bands 3–6</p> <ul style="list-style-type: none"> • Describes an example of biotechnology from the past. <p>AND</p> <ul style="list-style-type: none"> • Describes an example of biotechnology from the present. <p>AND</p> <ul style="list-style-type: none"> • Describes a possible example of biotechnology for the future. <p>AND</p> <ul style="list-style-type: none"> • Describes the effect of the biotechnology from the past on biodiversity. <p>AND</p> <ul style="list-style-type: none"> • Describes the effect of the biotechnology from the present on biodiversity. <p>AND</p> <ul style="list-style-type: none"> • Describes the possible effect of the biotechnology for the future on biodiversity. <p>AND</p> <ul style="list-style-type: none"> • Evaluates the effect of the biotechnology from the past on biodiversity. <p>AND</p> <ul style="list-style-type: none"> • Evaluates the effect of the biotechnology from the present on biodiversity. <p>AND</p> <ul style="list-style-type: none"> • Evaluates the possible effect of the biotechnology on biodiversity now and in the future. 9 <hr/> <ul style="list-style-type: none"> • Any EIGHT of the above points 8 <hr/> <ul style="list-style-type: none"> • Any SEVEN of the above points 7 <hr/> <ul style="list-style-type: none"> • Any SIX of the above points 6 <hr/> <ul style="list-style-type: none"> • Any FIVE of the above points 5 <hr/> <ul style="list-style-type: none"> • Any FOUR of the above points 4 <hr/> <ul style="list-style-type: none"> • Any THREE of the above points 3 <hr/> <ul style="list-style-type: none"> • Any TWO of the above points 2 <hr/> <ul style="list-style-type: none"> • Any ONE of the above points. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 28	
Recombinant DNA is used to produce large volumes of insulin for diabetes patients.	Mod 6 Genetic Change BIO12–13 Bands 4–5
The human insulin-producing gene is inserted into plasmids of bacterial cells by cutting the plasmid with the same restriction enzymes used to cut the gene. This produces ‘sticky ends’ with complementary base pairs so the plasmid can bind with the gene.	<ul style="list-style-type: none"> • Identifies ONE technique. 1 AND <ul style="list-style-type: none"> • Describes the technique. 1 AND <ul style="list-style-type: none"> • Provides details of how the technique is applied 4
Bacterial cells then take up the plasmids. Those cells with the recombinant DNA plasmids are selected and placed in conditions for optimal reproduction. The large numbers of recombined bacterial cells are then able to produce high yields of insulin for human use.	<ul style="list-style-type: none"> • Identifies ONE technique. 1 AND <ul style="list-style-type: none"> • Provides details of how the technique is applied 3
	<ul style="list-style-type: none"> • Identifies ONE technique. 1 AND <ul style="list-style-type: none"> • Provides ONE detail of how the technique is applied 2
	<ul style="list-style-type: none"> • Identifies ONE technique. 1
Question 29	
(a) The number of cases gradually decreases. This may be the result of, for example, fewer infections due to immunisation.	Mod 7 Prevention, Treatment and Control BIO12–6, 12–15 Bands 2–3
	<ul style="list-style-type: none"> • Gives an appropriate description. 1 AND <ul style="list-style-type: none"> • Gives ONE likely cause. 1
(b) <i>Any one of:</i> <ul style="list-style-type: none"> • a smaller percentage of the population being immunised • greater reporting of cases of the disease • more efficient diagnosis of the disease 	Mod 7 Prevention, Treatment and Control BIO12–6, 12–14 Band 3 <ul style="list-style-type: none"> • Gives ONE likely cause. 1
(c) (i) The mortality rate for a disease is calculated by dividing the number of deaths from a specific disease over a defined period of time by the number of individuals diagnosed with the disease during that time. The resulting ratio is then multiplied by 100 to give a percentage value.	Mod 8 Causes and Effects BIO12–15 Bands 3–4 <ul style="list-style-type: none"> • Gives a detailed explanation, including calculations involved 2 • Gives an explanation 1
(ii) The likelihood of a patient dying of a disease such as measles will depend upon their level of health at the time of infection and the quality of healthcare available to them. These will vary considerably in different countries. The better the health of a country’s population and its available healthcare, the lower the mortality rate will be.	Mod 7 Prevention, Treatment and Control BIO12–6, 12–14 Band 4 <ul style="list-style-type: none"> • Gives at least TWO likely reasons. 2 • Gives ONE likely reason 1
(d) Measles is not caused by a bacterium.	Mod 7 Causes of Infectious Disease BIO12–6 Band 3 <ul style="list-style-type: none"> • Gives the correct response 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
<p>(e) Both posters are trying to raise awareness of measles and how infectious the disease is. It is implied that people should be immunised (vaccinated). Both posters use graphics and a short piece of text to get their message across. The graphics in poster 2 (the pictogram) are probably more easily interpreted than the graphics in poster 1 (the pie chart).</p> <p>The posters are unlikely to be effective by themselves, but would be used in conjunction with print, radio, TV and social media advertising.</p>	<p>Mod 7 Prevention, Treatment and Control BIO 12–5, 12 –7, 12–15 Band 6</p> <ul style="list-style-type: none"> • Gives a detailed discussion, including at least FOUR relevant points. <p>AND</p> <ul style="list-style-type: none"> • Gives an assessment. 4 <hr/> <ul style="list-style-type: none"> • Gives a detailed discussion, including at least THREE relevant points. <p>AND</p> <ul style="list-style-type: none"> • Gives an assessment. 3 <hr/> <ul style="list-style-type: none"> • Gives a discussion, including at least TWO relevant points. <p>AND</p> <ul style="list-style-type: none"> • Gives an assessment 2 <hr/> <ul style="list-style-type: none"> • Gives some relevant points. 1
<p>Question 30</p>	
<p>The innate immune response is the body’s first line of defence against pathogens and is non-specific. It acts quickly to stop pathogens from entering and spreading through the body. It is made up of physical, chemical and cellular defences. Physical defences include skin, nasal hairs, mucus membranes, and coughing. Chemical defences include lysozymes in tears and saliva, acid in the stomach, and the alkaline pH of the lower intestines. Cellular defences include leukocytes such as neutrophils, monocytes, macrophages, eosinophils, mast cells and dendritic cells.</p> <p>The acquired immune response or adaptive immunity is the second line of defence against pathogens. This is a specific response that depends on the type of pathogen. The antigen on a pathogen causes T and B lymphocytes to increase from a few cells to millions of cells to fight that pathogen. The acquired response ‘remembers’ the pathogen (using memory T cells) and gives rise to long-lasting, high immunity to that pathogen.</p>	<p>Mod 7 Immunity BIO12–7, 12–14 Band 6</p> <ul style="list-style-type: none"> • Gives a detailed explanation. <p>AND</p> <ul style="list-style-type: none"> • Refers to innate immunity. <p>AND</p> <ul style="list-style-type: none"> • Refers to acquired immunity 5–6 <hr/> <ul style="list-style-type: none"> • Gives an explanation. <p>AND</p> <ul style="list-style-type: none"> • Refers to innate immunity. <p>AND</p> <ul style="list-style-type: none"> • Refers to acquired immunity 4 <hr/> <ul style="list-style-type: none"> • Gives an explanation. <p>AND</p> <ul style="list-style-type: none"> • Refers to innate immunity. <p>OR</p> <ul style="list-style-type: none"> • Refers to acquired immunity 3 <hr/> <ul style="list-style-type: none"> • Gives a limited explanation 2 <hr/> <ul style="list-style-type: none"> • Gives some relevant details 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
<p>Question 31</p> <p>Bush medicine is traditional Aboriginal Australian medicine, typically prepared from herbs and other plants. Because bush medicine such as Gumbi Gumbi has been discovered and developed by Aboriginal Australians, it is part of their heritage and belongs to them. If it is used by non-Indigenous Australians, then the source of this medicine and knowledge should be acknowledged.</p>	<p>Mod 7 Prevention, Treatment and Control BIO12–14 Band 4</p> <ul style="list-style-type: none"> • Gives an outline. <p>AND</p> <ul style="list-style-type: none"> • Explains the importance. 3 <hr/> <ul style="list-style-type: none"> • Gives an outline. <p>OR</p> <ul style="list-style-type: none"> • Explains the importance. 2 <hr/> <ul style="list-style-type: none"> • Gives some relevant information. 1
<p>Question 32</p> <p>(a)</p> 	<p>Mod 8 Homeostasis BIO12–4 Band 4</p> <ul style="list-style-type: none"> • Uses an appropriate scale. <p>AND</p> <ul style="list-style-type: none"> • Plots points correctly. <p>AND</p> <ul style="list-style-type: none"> • Draws a line of best fit graph. <p>AND</p> <ul style="list-style-type: none"> • Labels axes correctly 3 <hr/> <ul style="list-style-type: none"> • Any THREE of the above points. 2 <hr/> <ul style="list-style-type: none"> • Any TWO of the above points. 1
<p>(b) The greater the temperature of the leaf, the greater the rate of transpiration.</p>	<p>Mod 8 Homeostasis BIO12–4 Band 3</p> <ul style="list-style-type: none"> • Gives a reasonable conclusion. 1
<p>(c) Plants lose most of their water through stomates (openings in their leaves) via transpiration (evaporation). Some water is also lost through the waxy cuticle. To replace this water, plants take in water through their roots. The water travels via the xylem to leaves, where the whole process is repeated. Transpiration is thus responsible for a ‘current’ of water flowing through a plant. To change the water balance, plants have mechanisms to change the rate of transpiration.</p>	<p>Mod 8 Homeostasis BIO12–4 Band 3</p> <ul style="list-style-type: none"> • Gives an outline covering major points 2 <hr/> <ul style="list-style-type: none"> • Gives an outline. 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide
Question 33	
<p>(a) The process is renal dialysis (haemodialysis).</p> <p>This process carries out some of the functions of the human kidney. Blood from the patient is passed through the dialysis machine, which helps to maintain the relative concentrations of minerals, salts and water in the blood. It also removes toxins.</p> <p>Dialysis uses the diffusion of solutes and ultra-filtration of fluid across a semipermeable membrane. Blood flows by one side of this semipermeable membrane, and a special dialysis fluid (dialysate) flows on the other side in the opposite direction. The dialysis fluid contains essential substances, such as glucose and sodium, that are present in the same concentrations as normal blood. Smaller particles pass through the membrane but larger substances, such as red blood cells and large proteins, do not.</p>	<p>Mod 8 Technologies and Disorders BIO12–15 Band 4</p> <ul style="list-style-type: none"> • Identifies the process. <p>AND</p> <ul style="list-style-type: none"> • Describes the process in detail 4 <hr/> <ul style="list-style-type: none"> • Identifies the process. <p>AND</p> <ul style="list-style-type: none"> • Describes the process 3 <hr/> <ul style="list-style-type: none"> • Gives at least TWO relevant details of the process. 2 <hr/> <ul style="list-style-type: none"> • Gives some relevant information 1
<p>(b) The technology enables people to live until a kidney becomes available for transplant. It filters blood and regulates electrolytes but doesn't replace the hormones produced by a working kidney. Additional medication and a special diet are required.</p> <p>The treatment is usually carried out in a dialysis centre where a patient will attend three or four days a week, each session lasting up to four hours, thus limiting the patients' movements.</p>	<p>Mod 8 Technologies and Disorders BIO12–14 Bands 4–5</p> <ul style="list-style-type: none"> • Gives at least THREE relevant examples of the benefits and limitations of the technology 3 <hr/> <ul style="list-style-type: none"> • Gives at least TWO relevant examples of the benefits and limitations of the technology 2 <hr/> <ul style="list-style-type: none"> • Gives at least ONE relevant example of the technology 1
Question 34	
<p>(a) (i) $29\,280 \div 6\,100\,000 = 0.48\%$ or 4.8 cases per 100 people</p> <p><i>Incidence rates are calculated as the sum of all new cases of illness of a certain disease in a specific time period (such as a calendar year), divided by the size of the population. It may be expressed as a percentage or rate (such as per 1000 people).</i></p>	<p>Mod 8 Epidemiology BIO12–15 Bands 3–4</p> <ul style="list-style-type: none"> • Calculates the incidence of the disease 1
<p>(ii) $192\,760 \div 6\,100\,000 = 3.16\%$ or 31.6 cases per 100 people</p> <p><i>Prevalence is the proportion of all the cases in the population at a given time. It may be expressed as a percentage or rate (such as per 1000 people).</i></p>	<p>Mod 8 Epidemiology BIO12–4 Bands 3–4</p> <ul style="list-style-type: none"> • Calculates the prevalence of the disease 1

Sample answer	Syllabus content, outcomes, targeted performance bands and marking guide										
<p>(b) <i>For example:</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;"><i>Disease caused by environmental exposure: asbestosis</i></td> </tr> <tr> <td style="text-align: center;"><i>Cause</i></td> <td>exposure to fibrous material, mineral silicates (asbestos)</td> </tr> <tr> <td style="text-align: center;"><i>Effect(s)</i></td> <td>shortness of breath, appetite loss, decreased ability to exercise and premature death</td> </tr> <tr> <td style="text-align: center;"><i>Treatment/management</i></td> <td>reduced use of asbestos, reduced exposure to asbestos</td> </tr> <tr> <td style="text-align: center;"><i>Means of prevention</i></td> <td>taking oxygen and other measures to ease breathing</td> </tr> </table> <p><i>Note: Students can also use rickets, scurvy, skin cancer, ‘black lung’, heavy metal poisoning or passive smoking.</i></p>	<i>Disease caused by environmental exposure: asbestosis</i>		<i>Cause</i>	exposure to fibrous material, mineral silicates (asbestos)	<i>Effect(s)</i>	shortness of breath, appetite loss, decreased ability to exercise and premature death	<i>Treatment/management</i>	reduced use of asbestos, reduced exposure to asbestos	<i>Means of prevention</i>	taking oxygen and other measures to ease breathing	<ul style="list-style-type: none"> • Mod 8 Causes and Effects • Mod 8 Epidemiology • Mod 8 Prevention <p>BIO12–3, 12–15 Bands 4–5</p> <ul style="list-style-type: none"> • Identifies an appropriate disease. <p>AND</p> <ul style="list-style-type: none"> • Presents answer in a table. <p>AND</p> <ul style="list-style-type: none"> • Describes features of all FOUR of: <ul style="list-style-type: none"> • cause • effect(s) • treatment/management • means of prevention 5 <hr/> <ul style="list-style-type: none"> • Identifies an appropriate disease. <p>AND</p> <ul style="list-style-type: none"> • Presents answer in a table. <p>AND</p> <ul style="list-style-type: none"> • Describes features of any THREE of: <ul style="list-style-type: none"> • cause • effect(s) • treatment/management • means of prevention 4 <hr/> <ul style="list-style-type: none"> • Identifies an appropriate disease. <p>AND</p> <ul style="list-style-type: none"> • Presents answer in a table. <p>AND</p> <ul style="list-style-type: none"> • Describes features of any TWO of: <ul style="list-style-type: none"> • cause • effect(s) • treatment/management • means of prevention 3 <hr/> <ul style="list-style-type: none"> • Identifies an appropriate disease. <p>AND</p> <ul style="list-style-type: none"> • Presents answer in a table 2 <hr/> <ul style="list-style-type: none"> • Gives some appropriate information 1
<i>Disease caused by environmental exposure: asbestosis</i>											
<i>Cause</i>	exposure to fibrous material, mineral silicates (asbestos)										
<i>Effect(s)</i>	shortness of breath, appetite loss, decreased ability to exercise and premature death										
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