

Sample Paper Biology

Mark Scheme

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Biology Paper 1 Solutions		
1(a)	<p>The diagram shows a prokaryotic cell with a capsule on the outside, followed by a cell wall and a cell membrane. Inside, there is a large, circular, blue chromosome (nucleoid), two smaller orange circular plasmids, and several flagella extending from one end. The cytoplasm is the internal fluid.</p>	[3] -1 mark per mistake
1(b)	Prokaryotic	[1]
1(c)	Pathogens	[1]
1(d)	Viruses are much larger than bacteria.	[1]
2(a)	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$	[2] -1 mark per mistake
2(b)	Chlorophyll	[1]
2(c)	Temperature	[1]
	Carbon dioxide concentration	[1] accept CO ₂ levels
	Light intensity	[1]
3	<p>Relevant points for sexual reproduction:</p> <ul style="list-style-type: none"> sexual reproduction involves specialised sex cells called gametes which are produced in flowers there are male and female gametes female gamete is an egg cell contained within an ovule male gamete is contained within a pollen grain sexual reproduction involves mixing of genes from two 'parents' during fertilisation fertilisation produces a zygote which develops into an embryo plant within a seed offspring produced from sexual reproduction will be genetically different from parents <p>Relevant points for asexual reproduction:</p> <ul style="list-style-type: none"> no specialised gametes are produced and no fertilisation cells from one part of the plant divide to form a structure which breaks away from the parent plant to form a new organism offspring produced from asexual reproduction are genetically identical to the parent organism 	<p>[6] 5-6 marks: discussion of at least 3 relevant points for sexual reproduction with direct comparison to asexual reproduction. Correct identification of cause of genetic variation in sexual reproduction. Answers must include key terms 'fertilisation', 'gametes' and 'zygote' for 6 marks.</p> <p>3-4 marks: discussion of at least 2 relevant points for sexual reproduction with direct comparison to asexual reproduction. Correct identification of cause of genetic variation in sexual reproduction for 4 marks</p> <p>1-2 marks: discussion of at least 1 relevant point for sexual reproduction with direct comparison to asexual reproduction.</p> <p>0 marks: no relevant points discussed.</p>

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4(a)(i)	biotic	[1]
(ii)	abiotic	[1]
(iii)	abiotic	[1]
4(b)(i)	Producer	[1]
(ii)	Bacteria and / or fungi	[1] <i>accept microorganisms</i>
	Recycle nutrients and minerals	[1] <i>accept named examples</i>
5(a)	Any two from: <ul style="list-style-type: none"> • use a larger quadrat • place more quadrats • randomly place the quadrats in the field 	[2] <i>accept sensible alternate answers</i>
5(b)(i)	$120 \times 40 \times 4$	[1]
	$= 19\,200$	[1] <i>accept 20,000 (2 s.f.)</i>
5(b)(ii)	Overestimate	[1]
	(There are likely to be) less clovers in the areas that have been churned up	[1] <i>accept alternate wording</i>
6(a)	Any three from: <ul style="list-style-type: none"> • heat resistance • larger volume of food • higher salt resistance • better balance of nutrients • longer shelf life • higher resistance to herbicides / weed killers • greater disease resistance • faster rate of growth 	[3] <i>ignore 'better taste'</i> <i>ignore 'cheaper / less expensive'</i>
6(b)	Desired gene is taken (from DNA of another species) and cut using a restriction enzyme	[1] <i>must specify restriction enzyme for mark</i>
	Plasmid taken from <i>Agrobacterium</i> is cut with the same restriction enzyme	[1] <i>must specify restriction enzyme for mark</i>
	Gene is joined to cut plasmid using ligase enzyme	[1] <i>must specify ligase enzyme for mark</i>
	Leaf discs (from plant to be modified) are floated on a solution containing the modified plasmids to allow uptake	[1] <i>allow equivalent explanation</i>
	Leaf discs cultivated into plantlets via micropropagation	[1] <i>allow correct description of micropropagation</i>

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7(a)	Any one from: <ul style="list-style-type: none"> • bone marrow • skin • lining of intestine 	[1]
7(b)	any one from: <ul style="list-style-type: none"> • (embryonic stem cells have) greater ability to differentiate / specialise • easy to mass produce 	[1]
	ethical / moral concerns over the use of embryos	[1] <i>ignore ideas of unproven or expensive</i>
8(a)	Limewater goes cloudy	[1] <i>accept milky for cloudy</i>
	Goes cloudy faster in exhaled air	[1] <i>accept alternate wording</i>
	Higher carbon dioxide concentration in exhaled air	[1] <i>accept converse argument</i>
8(b)	Both go cloudy faster	[1] <i>ignore other answers</i>
	Due to increased rate of respiration	[1]
9(a)	Cilia destroyed by chemicals in the cigarette smoke	[1]
	Mucus is not swept away / cleared from air passages	[1]
	Smoke irritates lining of airways to produce more mucus	[1]
	Irritation and build up of bacteria in mucus can lead to lung diseases / bronchitis	[1]
9(b)	any four from: <ul style="list-style-type: none"> • Smoke damages the walls of the alveoli • Alveoli are fused together • Surface area of alveoli is greatly reduced • Gas exchange is less efficient • Blood carries less oxygen • Sufferer may have difficulty exercising • Sufferer may require supplemental oxygen • Sufferer may eventually die from the illness 	[4]
10(a)(i)	Growth responses to the direction of gravity	[1]
10(a)(ii)	Roots	[1]
10(a)(iii)	Shoots	[1]

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10(b)	Auxin diffuses <u>away</u> from source of light	[1] <i>accept alternate wording</i>
	Higher concentration of auxin on one side of shoot stimulates cells to grow	[1]
	Growth on side of shoot <u>away</u> from light causes shoot to bend towards light	[1]
11(a)	Arterioles dilate	[1] <i>allow 'blood vessels' for 'arterioles'</i>
	Blood flow to capillary loops is increased	[1]
	More heat is radiated through the skin	[1] <i>idea of blood vessels moving closer to skin scores max 1 mark</i>
11(b)	Evaporation (of sweat) requires energy	[1]
	Sweat absorbs body heat to supply energy (latent heat of vaporisation)	[1]
	Sweat does not evaporate in humid conditions (so does not cool the body down)	[1] <i>accept argument of concentration of water vapour in air</i>
12(a)(i)	Volcanic eruptions	[1] <i>accept volcanoes</i>
(ii)	Lightning	[1]
12(b)	Gases dissolve in rainwater / clouds	[1]
	Forming sulfuric / nitric acids	[1] <i>accept pH is lowered</i> <i>accept 'sulphuric' for sulfuric</i>
12(c)	Any two from: <ul style="list-style-type: none"> • acidification of lakes • death of aquatic life • changes in ecosystem • acidification of soil • slower growth of plants • death of trees 	[2] <i>accept named examples</i> <i>'harmful to wildlife' is insufficient</i>
12(d)	Indicator species	[1]

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<p>12(e)(i)</p>	<p>Relevant points include:</p> <ul style="list-style-type: none"> • short-wave infrared (IR) radiation from the sun passes through Earth's atmosphere • short-wave IR is absorbed at Earth's surface • re-radiation of IR produces long-wave IR • long wave IR is absorbed by greenhouse gases and re-radiated back to the Earth's surface • 'layer' of greenhouse gases traps heat energy from the sun inside the Earth's atmosphere • trapped heat energy causes an increase in the surface temperature on Earth • increased levels of / extra carbon dioxide due to human activity / burning of fossil fuels enhances the greenhouse effect • accelerated heating of Earth's surface due to enhanced greenhouse effect is known as global warming 	<p>[6] 5-6 marks: <i>clear description of the causal mechanism of greenhouse effect in terms of absorption and re-emission of IR radiation. Clear distinction between natural greenhouse effect and additional impact of human activity including definition / explanation of global warming</i> <i>accept 'heat energy' oe for IR radiation for max 5 marks</i></p> <p>3-4 marks: <i>brief overview of the greenhouse effect in terms of IR radiation. Clear illustration of idea of trapped heat energy (IR radiation) is required. Link to human activity in terms of increased carbon dioxide levels and global warming</i></p> <p>1-2 marks: <i>brief summary of either the greenhouse effect or human activity contributing to increased levels of carbon dioxide with link to global warming.</i></p> <p>0 marks: <i>no relevant points discussed.</i></p>
<p>(ii)</p>	<p>any two from:</p> <ul style="list-style-type: none"> • rising sea levels • disruption to migratory patterns of animals • change in weather patterns (e.g. changes in rainfall) • destruction of habitats • extinction of species • greater abundance of pests 	<p>[2] <i>accept any two sensible answers if justified</i></p>

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<p>13(a)(i)</p>	<p>The diagram illustrates the nitrogen cycle. At the top, a box labeled 'Nitrates (NO₃⁻)' is connected to 'Lightning' (indicated by a downward arrow) and 'Denitrifying Bacteria' (indicated by an upward arrow). From the 'Nitrates' box, an arrow labeled 'Assimilation' points to a plant icon. Below the 'Nitrates' box is a box labeled 'Nitrites (NO₂⁻)', with an upward arrow labeled 'Nitrifying Bacteria' between them. Below the 'Nitrites' box is another 'Nitrifying Bacteria' icon with an upward arrow pointing to the 'Nitrites' box. A feedback loop at the bottom shows an arrow from the 'Nitrates' box going down and then right to the 'Nitrifying Bacteria' icon.</p>	<p>[2] -1 mark per mistake</p>
<p>(ii)</p>	<p>Decomposers</p>	<p>[1]</p>
<p>13(b)</p>	<p>Ammonia made by the bacteria is passed to the plant</p>	<p>[1] <i>accept the plant uses ammonia to make proteins or equivalent explanation</i></p>
	<p>The plant passes (organic) nutrients to the bacteria</p>	<p>[1]</p>
<p>13(c)</p>	<p>Any two from:</p> <ul style="list-style-type: none"> • DNA • Vitamins • ATP • Amino acids 	<p>[2]</p>
<p>13(d)(i)</p>	<p>Crops consume / assimilate nitrogen in the soil (to make proteins)</p>	<p>[1]</p>
	<p>Nitrogen is removed / taken away from the soil when crops are sold</p>	<p>[1]</p>
	<p>Nitrogen must be artificially replaced by fertilisers</p>	<p>[1] <i>accept alternate wording for all three points</i></p>
<p>(ii)</p>	<p>Any one advantage from:</p> <ul style="list-style-type: none"> • more specific balance of ions / minerals • can replace <u>all</u> of the lost ions / minerals 	<p>[1] <i>allow other <u>correct</u> points if justified</i></p>
	<p>Any one disadvantage from:</p> <ul style="list-style-type: none"> • does not improve soil structure • can lead to pollution problems 	<p>[1] <i>allow other <u>correct</u> points if justified</i></p>

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