



EXAM PAPERS PRACTICE

Immunity, Infection and Forensics -5

Name: _____

Class: _____

Date: _____

Time:

Total Marks Available:

Total Marks Archived:

Level: Edexcel A level Biology

Subject: Biology

Exam Board: Pearson Edexcel Level 3 GCE AS and A level Biology A (Salters-Nuffield) and also Pearsons Edexcel AS and A Level Biology B (9BI0) - Is however suitable for use by AS and A level Biology Students of other Boards

Topic: Immunity, Infection and Forensics -5

Type: Mark Scheme

To be used by all students preparing for Edexcel AS and A level Biology A and Biology B - Students of other Boards may also find this useful



Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none">• (large) circular DNA (1)• DNA not associated with histone proteins (1)• (small / several) plasmids (1)• located in the cytoplasm / not inside a nucleus (1)	<p>ALLOW nucleoid NOT two marks for plasmids are circular DNA</p>	<p>3</p>



Q2.

Question Number	Answer	Additional guidance	Mark
	<p>A description that makes reference to four of the following:</p> <ul style="list-style-type: none">• DNA obtained from the two types of grass snake (1)• { PCR / restriction enzymes } used to produce fragments of DNA (1)• gel electrophoresis used to analyse the DNA samples (1)• (gel electrophoresis) used to separate the fragments of DNA (1)• more differences in the pattern of bands produced would indicate that the snakes are different species (1)	<p>ALLOW produce different length sections of DNA or target regions of DNA</p> <p>ALLOW description of gel electrophoresis e.g. use of agarose gel and electric current</p> <p>ALLOW similar patterns in the bands would indicate they are the same species</p>	<p>(4)</p>



Q3.

Question Number	Acceptable Answer	Additional Guidance	Mark
	<p>A description that makes reference to the following:</p> <ul style="list-style-type: none">• response that is effective against (wide) range of infectious agents (1)• does not involve recognition of infectious agent (1)• does not react to specific antigens (1)		(3)



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Q4.

Question Number	Answer	Additional guidance	Mark
	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none">• (body) temperature falls (1)• rigor mortis / stiffening of the muscles (1)• autolysis / break down of cells by enzymes in the body (1)• putrefaction / discolouration / bloating (1)	<p>ALLOW algor mortis</p> <p>ALLOW breakdown of tissues by enzymes</p> <p>ALLOW accumulation of gases</p>	(3)

Q5.



Question Number	Answer	Additional guidance	Mark
	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none">• hand wash (stations) (1)• (doctors / nurses) not to wear { ties / watches / long sleeves } (1)• testing patients for the presence of antibiotic resistant bacteria before admission / {isolation / quarantine} of infected patients (1)• increased washing of bedding / disinfection of { beds / surfaces } (1)	<p>ALLOW antibacterial / antiseptic / alcohol gel / hand sanitisers</p> <p>ALLOW use of disposable bedding</p>	(3)



Q6.

Question Number	Answer	Additional Guidance	Mark
	<ol style="list-style-type: none">1. decomposition / idea of breakdown of {organic matter / plant material / biomass / eq} ;2. idea of (bacteria) producing {enzymes (for digestion) / correctly named hydrolytic enzyme} ;3. respiration {produces / eq} {carbon dioxide / eq} ;	<p>1 ACCEPT animal material</p> <p>decay / rot</p>	(3)

Q7.

Question Number	Answer	Additional Guidance	Mark
	<p>A description that makes reference to two of the following:</p> <ul style="list-style-type: none">• decomposers break down organic material (from the dead body)• (decomposers) respire• releasing carbon dioxide (into the atmosphere)	<p>ALLOW organic molecules / named organic molecule / organic compounds</p> <p>ALLOW respiration takes place</p> <p>ALLOW methane in context of anaerobic respiration</p>	(2)



Q8.

Question Number	Answer	Additional Guidance	Mark
	<p>A description that makes reference to two of the following:</p> <ul style="list-style-type: none">• (skin flora) {prevents /reduces } colonisation by other microbes (1)• make environment hostile for other microbes (1)• outcompetes other microbes (1)	<p>ALLOW {bacteria / pathogenic bacteria / pathogens} for other microbes</p> <p>e.g. produce { lactic acid / lactate }</p>	<p>(2)</p>



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Q9.

Question Number	Answer	Additional Guidance	Mark
(i)	C keratin		(1)

Question Number	Answer	Additional Guidance	Mark
(ii)	<ol style="list-style-type: none">1. idea of little {tertiary / quaternary } structure / eq OR mainly secondary structure ;2. made up of {long / linear / straight / eq} {molecules / (poly)peptides / polymers };3. idea of cross-linking (between one polypeptide chain and another) ;4. idea of repeating amino acid sequences / eq ;5. insoluble / eq ;6. tough / strong / eq ;	<p>3 NOT peptide bonds</p> <p>5 IGNORE hydrophobic on outside</p>	(4)



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Q10.



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Question Number	Answer	Additional Guidance	Mark
(i)	<ul style="list-style-type: none">• 66	ALLOW 67	(1)

Question Number	Answer	Additional Guidance	Mark
(ii)	<ul style="list-style-type: none">• correct values taken from the graph• correct rate calculated from figures used from graph	<p><u>Example of calculation</u></p> <p>$(12 - 6.8) \div (90 - 60) =$ or $5.2 \div 30 =$</p> <p>ALLOW 5.0, 5.1 or 5.2</p> <p>0.17 (mm hour⁻¹)</p> <p>(0.1667 or 0.167 – one mark only)</p> <p>Correct answer without working gains full marks</p>	(2)



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Question Number	Answer	Additional Guidance	Mark
(iii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none">• temperature affects {enzymes / metabolism / reactions}• an increase in temperature increases kinetic energy• producing more (frequent) collisions between enzyme and substrate (molecules) <p>(1)</p>	<p>ALLOW protein synthesis / cell division</p> <p>ALLOW converse statement for temperature decrease</p> <p>ALLOW more (frequent) formation enzyme-substrate complexes</p>	(3)

Q11.



Question Number	Answer	Mark
	<p>The only correct answer is B polymerase chain reaction</p> <p><i>A is not correct because it is not profiling</i></p> <p><i>C is not correct because it is not RNA</i></p> <p><i>D is not correct because it is not translation</i></p>	(1)



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Q12.

Question Number	Answer	Additional Guidance	Mark
* (a)(i)	<p>(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none">multiple copies of DNA made / eq ;using {PCR / <i>polymerase chain reaction</i>} ;credit any correct detail of PCR ;reference to <i>restriction {enzymes / endonucleases}</i> to produce DNA {<i>fragments / eq</i>} ;reference to (<i>gel electrophoresis</i>) ;idea of {loading / eq} the DNA onto the {<i>gel / named gel</i>} ;idea that an {<i>electric current / charge</i>} is applied ;reference to use of {<i>dye / fluorescent tag / UV light / Southern blotting / gene probes / radioactive labelling / eq</i>};	<p>QWC emphasis on spelling</p> <ol style="list-style-type: none">IGNORE refs to amplification, large amountse.g. step 1: 90 to 95 °C, step 2: 50 to 65 °C, step 3: 70 to 80 °C, use of {<i>primers / DNA polymerase / nucleotides</i>}, many repetitionse.g. <i>agarose, agar</i>ACCEPT apply <i>potential difference</i>	<p>(6)</p>



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Question Number	Answer	Additional Guidance	Mark
(a)(ii)	<ol style="list-style-type: none">1. idea of comparing total number of {bands / eq} ;2. idea of comparing position of {bands / eq} ;3. idea of comparing {size / width} of {bands / eq} ;	ACCEPT idea of comparing bands for 1 mark if mps 1, 2 or 3 cannot be awarded ACCEPT bars / blocks	(3)

Question Number	Answer	Additional Guidance	Mark
(b)	<ol style="list-style-type: none">1. {scientific / peer reviewed} {papers / journals / magazines / article} ;2. (scientific) {conferences / lecture / forums} ;3. media reports ;	3. e.g. TV, radio, newspaper, internet	(2)



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Q13.



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Question Number	Answer		Mark
(a)	<ol style="list-style-type: none">1. {scientific / peer reviewed} {papers / journals / magazines / article} ;2. (scientific) {conferences / lecture / forums} ;3. media reports ;	3. e.g. TV, radio. newspaper ' internet	(2)



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Question Number	Answer	Additional Guidance	Mark
* (b)(i)	(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence)	QWC focussing on spelling	
	<ol style="list-style-type: none">1. idea of using <i>proteomics</i> (to study protein); <p>Any 5 from :</p> <ol style="list-style-type: none">2. idea of using DNA {<i>profiling / fingerprinting</i>} (to study DNA) ;3. idea of obtaining {<i>tissue / cell</i>} sample from tomcod ;4. multiple copies of DNA made / eq ;5. using {PCR / <i>polymerase chain reaction</i>} ;6. ref to <i>restriction {enzymes / endonucleases}</i> to produce DNA {<i>fragments / eq</i>} ;7. reference to (<i>gel</i>) <i>electrophoresis</i> ;8. idea of {loading / eq} the DNA onto the {<i>gel / named gel</i>} ;9. idea that an {<i>electric current / charge</i>} is applied ;10. reference to use of {<i>dye / fluorescent staining / UV light / Southern blotting / gene probes / radioactive labelling / eq</i>} ;	<p>4. IGNORE refs to amplification, large amounts</p> <p>8. e.g. <i>agarose, agar</i></p> <p>9. ACCEPT apply <i>potential difference</i></p>	(6)



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Question Number	Answer	Additional Guidance	Mark
(b)(ii)	<ol style="list-style-type: none">1. same number of chromosomes ;2. idea that the mutation affected the sequence of DNA ; <p>OR</p> <ol style="list-style-type: none">3. idea that (all / most of) the {bands / eq} are the same (size / position / width) ;4. idea that only {a small region of DNA / the AHR2 gene} is affected ;	<ol style="list-style-type: none">1. ACCEPT both contain AHR2 gene	(2)

Question Number	Answer	Additional Guidance	Mark
(b)(iii)	<ol style="list-style-type: none">1. a protein with a different {structure / amino acids / function} / eq ;2. idea that the mutation will affect the DNA ;	<ol style="list-style-type: none">1. ACCEPT two AAs missing2. e.g. two codons missing	(2)

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Q14.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to the following</p> <ul style="list-style-type: none">• by comparing the {location / number of} bands produced by the two types of DNA (1)• similarities would indicate interbreeding (in the past) (1)	ALLOW a description eg looking whether the bands are next to each other	(2)



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Q15.



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Question Number	Acceptable Answer	Additional Guidance	Mark
(a)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none">antibiotics target { organelles / structures / processes } found in bacteria (1)viruses therefore unaffected by antibiotics (1)		(2)

Question Number	Acceptable Answer	Additional Guidance	Mark
(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none">survivors will have antibodies specific to the virus in their plasma (1)antibodies given to individuals infected with Ebola will provide passive immunity (1)the antibodies provided will		(3)



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Question Number	Acceptable Answer	Additional Guidance	Mark
	therefore (1) { agglutinate / opsonise } the virus particles		

Question Number	Acceptable Answer	Additional Guidance	Mark
(c)	An explanation that makes reference to the following: <ul style="list-style-type: none">• vaccine stimulates immune response to make antibodies specific to viral proteins (1)• mutations in the virus nucleic acid (1)• results in a change in the shape of the viral proteins (1)• therefore antibodies can no longer bind to the virus (1)	Accept reference to antigens Ebola is an RNA virus but allow reference to mutations in DNA	(4)



Q16.

Question Number	Answer	Additional Guidance	Mark
	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none">tetracycline { is bacteriostatic / stops bacteria dividing } (because the number of bacteria stays the same) (1)penicillin {is bactericidal / kills bacteria } (because the number of bacteria decreases) (1)		2

Q17.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to four of the following</p> <ul style="list-style-type: none">restriction { enzymes / endonucleases } used to cut DNA (from modern humans and Neanderthals) into fragments (1)DNA samples are loaded onto (agarose) gel (1){electric current is passed through / potential difference is applied across} the gel (1)markers are added to visualise the bands (1)the position of the bands produced can be compared (1)	ALLOW use of fluorescent dyes	(4)



Q18.

Question number	Answer	Additional guidance	Mark
	<p>A description that makes reference to two of the following:</p> <ul style="list-style-type: none">• (accumulation of) mutations resulting in change in target recognised by host (1)• transfer of genetic material coding for resistance genes (1)• example of a resistance mechanism (1)	<p>ALLOW mutations result in change in shape of antigens</p> <p>ALLOW transfer of plasmids between bacteria</p> <p>e.g. enzyme / change in shape of receptor binding protein / TB mechanisms, waxy coat / virus using host cell membrane</p>	<p>Expert</p> <p>(2)</p>

Q19.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none">• histamine is released• (histamine) causes {arterioles to dilate/ vasodilation}• which increases the blood flow (to the site causing redness)• (histamine) also causes the permeability of capillaries to increase• allowing blood plasma to {leave the capillary / enter the tissues} (causing oedema / swelling)	<p>ALLOW reference to 'leaky' capillaries</p>	<p>(4)</p>



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Q20.

Question Number	Answer	Additional Guidance	Mark
	<p>An explanation that makes reference to five of the following:</p> <ul style="list-style-type: none">• detail of loading of electrophoresis tank (1)• { current / potential difference } applied across the gel (1)• use { gene probe / DNA stain } (1)• use of { STRs / DNA } of black panther (1)• compare { bands / DNA profiles } (1)• a match would indicate that (DNA from) a black panther was present (1)	<p>e.g. use of agarose gel, use of a buffer, sample placed in wells</p> <p>ALLOW voltage</p> <p>e.g. fluorescent dye, methylene blue, iodine or ethidium bromide ALLOW reference to Southern blot technique</p> <p>ALLOW compare lines</p>	(5)



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Q21.

Question Number	Answer	Additional Guidance	Mark
	<p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none">• bacterial molecules are engulfed by { macrophages / phagocytes / B cell } (1)• antigen presented on the surface of cell / antigen presenting cell produced (1)• T (helper) cells with complementary { CD4 / receptor } bind to APCs (1)• cytokine released causes { cloning of B cells / formation of B effector cells } (1)• plasma cells { produce / release } antibodies (1)	<p>ALLOW reference to antigens on MHCs ALLOW APC</p>	<p>(4)</p>



Q22.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none">• (donated) { proteins / cells / tissues / organs} act as antigens (1)• (which are) presented by {macrophages / phagocytic cells / antigen presenting cells} (1)• (leading to) activation of T helper cells (1)• (leading to) activation of {T killer cells / cytotoxic T cells / B cells / plasma cells to produce antibodies} (1)• (resulting in) destruction of the transplanted tissue (1)	<p>ALLOW { proteins / cells / tissues / organs} are recognised as being foreign</p> <p>ALLOW cells { destroyed / marked for destruction }</p>	<p>(4)</p>



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Q23.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none">• virus binds to receptors on (neural) cells (1)• { virus / genetic material } is taken into the cell (1)• virus replicates (1)• causing (neural) cells to {die / burst} / inhibiting replication of (neural) cells / spreads to other (neural) cells (1)	<p>(It must be clear that the answer refers to either neural cells or brain cells to gain the first or last marking point)</p> <p>IGNORE viral DNA / RNA replicated IGNORE virus reproduces</p>	<p>(3)</p>

Q24.

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Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to the following</p> <ul style="list-style-type: none">• an increase in temperature will increase the rate of { decomposition / decay } (1)• (an increase in temperature) increases enzyme activity (1)• an increase in temperature increases growth rate of {bacteria / fungi / decomposers} (1)	<p>ALLOW converse for all points for the effects of a decrease in temperature</p> <p>ALLOW high temperatures may denature enzymes and decrease rate of decomposition</p> <p>ALLOW increases rate of multiplication</p>	<p>(3)</p>



Q25.

Question Number	Answer	Additional Guidance	Mark
(i)	<ol style="list-style-type: none">idea of binding of {bacteria / virus / pathogen / microorganism / antigen / non-self / foreign matter / eq} to (phagocytic) cell ;idea that {bacteria / virus / pathogen / microorganism / antigen / eq} is {engulfed by / taken into / endocytosis into } (phagocytic) cell ;idea of bacteria being inside a {vacuole / phagosome / eq} ;	<p>1 ACCEPT phagocyte</p> <p>2 ACCEPT phagocyte</p> <p>3 ACCEPT vesicle</p>	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	<ol style="list-style-type: none">idea that the body {reacts / defends itself / responds / eq } to a {bacteria / virus / pathogen / microorganism / antigen / non-self /	<p>1 NOT reference to immune response</p> <p>2 ACCEPT</p>	(2)



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Question Number	Answer	Additional Guidance	Mark
	foreign matter / eq} ; 2. idea that the response is not dependent on the specific {bacteria / virus / pathogen / microorganism / antigen / eq} ; 3. credit named reaction e.g. lysozymes , inflammation, phagocytosis, interferon production ;	idea of no previous infection / responds to any pathogen 3 IGNORE egs of barriers	

Question Number	Answer	Additional Guidance	Mark
(iii)	1. reference to {bacteria / virus / pathogen / microorganism / eq} ; 2. being inside {tissues / cells } / eq ;	1 IGNORE disease / infection / foreign matter / antigen 2 IGNORE body ACCEPT idea that has evaded barriers, named cell or tissue IGNORE {infects / attaches / harms / attacks} cells	(2)