



EXAM PAPERS PRACTICE

## Immunity, Infection and Forensics -2

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 -2

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

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## Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation that makes reference to three of the following</p> <ul style="list-style-type: none"><li>• the bacteria are inside {macrophages /phagocytes} (1)</li><li>• this bacterium has a (thick) waxy cell wall (1)</li><li>• lysosomes cannot fuse with phagocytic vacuole / bacteria not destroyed by enzymes (1)</li><li>• bacteria within tubercles (cannot be destroyed) (1)</li></ul>	ALLOW waxy coat	Expert (3)



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Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	<p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"><li>• heat to 90-98°C { to break hydrogen bonds between (DNA) strands / separate the strands of DNA} (1)</li><li>• { joining of primers / annealing } at 50- 75°C (1)</li><li>• { elongating / extension / addition of nucleotides } / DNA polymerase involved in formation of phosphodiester bonds (1)</li><li>• to double the quantity (of the DNA) (1)</li></ul>	<p>ALLOW heating to 90-98°C to break hydrogen bonds or to unzip DNA or to denature the DNA</p> <p>ALLOW 'binding/aligning' for joining</p> <p>ALLOW description of production of complementary strands of DNA ALLOW taq polymerase</p> <p>ALLOW replication for doubling</p>	(3)

Question Number	Answer	Additional Guidance	Mark
(ii)	<ul style="list-style-type: none"><li>• calculation correct</li><li>• correct answer provided (1)</li></ul>	<p><u>Example of calculation</u></p> <p><math>2^{20}</math></p> <p>1 048 576 (&gt; 1 000 000) or <math>1.05 \times 10^6</math></p> <p>Correct answer without working scores full marks</p>	(2)



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Q3.



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## EXAM PAPERS PRACTICE

Question Number	Answer	Additional Guidance	Mark																					
(i)	An answer that makes reference to the following: <ul style="list-style-type: none"><li>• correct ranking for both columns (1)</li><li>• correct difference in rank (1)</li><li>• correct difference squared (1)</li></ul>	<table border="1"><tr><td>E</td><td>48.8</td><td>4</td><td>23.6</td><td>4</td><td>0</td><td>0</td></tr><tr><td>F</td><td>50.1</td><td>7</td><td>24.2</td><td>5</td><td>2</td><td>4</td></tr><tr><td>G</td><td>49.2</td><td>6</td><td>23.1</td><td>2</td><td>4</td><td>16</td></tr></table> <p>-2 and -4 are incorrect differences in rank</p>	E	48.8	4	23.6	4	0	0	F	50.1	7	24.2	5	2	4	G	49.2	6	23.1	2	4	16	(3)
E	48.8	4	23.6	4	0	0																		
F	50.1	7	24.2	5	2	4																		
G	49.2	6	23.1	2	4	16																		

Question Number	Answer	Additional Guidance	Mark
(ii)	<ul style="list-style-type: none"><li>• numerator (top line of formula) correctly calculated (1)</li><li>• denominator (bottom line of formula) correctly calculated (1)</li><li>• correct answer (1)</li></ul>	<p>Example of calculation</p> <p>6 x 34 or 204</p> <p>7 x 48 or 336</p> <p>0.3929 / 0.393 / 0.39 Correct answer with no working scores full marks</p>	(3)



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Question Number	Answer	Additional Guidance	Mark
(iii)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"><li>no (significant) correlation (1)</li><li>as the calculated figure is less than { 0.786 / the critical value for <math>p= 0.05</math> } (1)</li></ul>	<p>ALLOW not statistically significant</p> <p>ECF - ALLOW significant correlation if the value calculated for 3aii is greater than { cv for 0.05 / 0.786 }</p> <p>ALLOW 5% FOR 0.05</p> <p>ECF- ALLOW calculated value is greater than the cv if the value calculated for 3aii is greater than 0.786</p>	(2)

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	<p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"><li>measure temperature from { several readings / random positions } (within the group of larvae) (1)</li><li>description of how mean calculated (1)</li></ul>	<p>ALLOW stated number of measurements</p> <p>e.g. readings summated and answer divided by number of readings taken</p> <p>ALLOW 'average' for mean</p>	(2)



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Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"><li>• increases enzyme activity for ( larvae / species F ) (1)</li><li>• high temperature { kills / denatures enzymes of } other species (1)</li><li>• (high temperature) increases food availability by { reducing competition from other species / increasing rate of decomposition of rhino } (1)</li></ul>	<p>ALLOW description of increase in activity including maximizes rate of growth/digestion, shorter lifecycle IGNORE ref to metabolic activity unqualified</p> <p>ALLOW outcompetes other {species / larvae} for food</p>	(3)

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Q5.



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Question Number	Answer	Additional Guidance	Mark
(i)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"><li>• increasing dose of interferon increases the survival time of the mice</li><li>• because interferon inhibits viral replication (inside cells)</li><li>• the greater the dose of interferon the fewer virus particles {produced / released} (to infect other cells)</li></ul>	<p>ALLOW positive correlation between interferon dose and survival time</p> <p>ALLOW interferon prevents virus infecting other cells</p>	(3)





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Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"><li>• bacteria do not possess {rER / Golgi apparatus}</li><li>• polypeptide chain is not {processed / modified} properly</li><li>• therefore the protein is {incorrectly folded / carbohydrate is not added}</li></ul>	<p>ALLOW converse statements for each marking point</p> <p>ALLOW Golgi body</p> <p>ALLOW protein</p> <p>ALLOW is not glycosylated</p>	(2)

Question Number	Answer	Mark
(iii)	<p><b>B</b> - exocytosis</p> <p><i>The only correct answer is <b>B</b></i></p> <p><i><b>A</b> is not correct because endocytosis is the process used to take particles into cells</i></p> <p><i><b>C</b> is not correct because facilitated diffusion is not used to transport proteins</i></p> <p><i><b>D</b> is not correct because phagocytosis is a process used to engulf large particles such as bacteria</i></p>	(1)



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Q6.



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Question Number	Answer	Additional Guidance	Mark
(i)	<p>Correct answer gains all 3 marks</p> <ol style="list-style-type: none"><li>1. line drawn between 25°C (core) and 15°C (ambient) ;</li><li>2. line drawn from centre of circle through the intersect of line 1 with diagonal ;</li><li>3. time of death = {23 - 24} ;</li></ol>	<p><b>1 ACCEPT</b> within the next scale line</p> <p><b>2 CE</b> applies</p> <p><b>3 CE</b> applies</p>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
* (ii)	<p><b>(QWC – Spelling of technical terms must be correct and the answer must be</b></p>	<p><b>QWC emphasis is clarity of expression</b></p>	



Question Number	Answer	Additional Guidance	Mark
	<p><b>organised in a logical sequence)</b></p> <p><b>Clothing</b></p> <p>1. for the clothed body the {estimate was too short / eq } ;</p> <p>2. because the clothing would {reduce heat loss / body would cool more slowly / temperature would drop slower / eq} ;</p> <p>3. idea that clothing would {insulate / trap the heat / eq} ;</p> <p><b>Position</b></p> <p>4. for the body curled up the {estimate was too short / eq } ;</p> <p>5. because {heat loss is reduced / body would cool more slowly / temperature would drop slower / eq} ;</p> <p>6. as the (exposed) surface area was smaller/ eq ;</p> <p><b>Air movement</b></p> <p>7. for the moving air {the estimate was too long / eq } ;</p> <p>8. as moving air {speeds up heat loss / body would cool faster / temperature would drop faster / eq } ;</p>	<p><b>ACCEPT</b> converse arguments for Mps other than 1, 4 and 7</p> <p><b>1 ACCEPT</b> time of death was earlier / died longer ago</p> <p><b>4 ACCEPT</b> time of death was earlier / died longer ago</p> <p><b>7 ACCEPT</b> time of death was more recent / died later</p> <p><b>IGNORE</b> submersion in water</p>	<p><b>(6)</b></p>

PICE



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Q7.



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Question Number	Answer	Additional Guidance	Mark
(a)(i)	<ol style="list-style-type: none"><li>1. levels of antibody rise sooner after infection / eq ;</li><li>2. levels of antibody rise faster after infection / eq ;</li><li>3. levels of antibody rise higher after infection / eq ;</li><li>4. credit comparative manipulation of data ;</li></ol>	<p><b>do not piece together</b> ACCEPT converse for mps 1, 2 and 3 in context of vaccination</p> <p>4. e.g. increase after infection is {10 (au) more / 1.83 times more} peak after infection is 13 (au) higher rate of increase after infection is 1.27 au day<sup>-1</sup> faster</p>	(2)



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Question Number	Answer	Additional Guidance	Mark
(a)(ii)	<ol style="list-style-type: none"><li>1. secondary (immune) response ;</li><li>2. reference to memory cells ;</li><li>3. idea that (on infection / second exposure) memory cells are {activated / cloned / stimulated / eq};</li><li>4. idea that (in secondary response) antibodies are released from plasma cells ;</li></ol>	<ol style="list-style-type: none"><li>1. ACCEPT secondary immunity</li><li>3. ACCEPT B memory cells differentiate into plasma cells</li></ol>	(3)

Question Number	Answer	Additional Guidance	Mark
(b)(i)	<ol style="list-style-type: none"><li>1. idea that antibodies will only be present if antigen present ;</li><li>2. idea that antigen B is not present in vaccine ;</li><li>3. vaccination failed to stimulate immune response / eq ;</li></ol>		(2)

Question Number	Answer	Mark
(b)(ii)	C natural active	(1)





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Question Number	Answer	Additional Guidance	Mark
(c)	<ol style="list-style-type: none"><li>idea that {a comment cannot be made / caution in interpreting results should be taken / eq} ;</li><li>no indication of number of rats used / eq ;</li><li>no data points / eq ;</li><li>no error bars (on graph) / no indication of variability / eq ;</li><li>no statistical evidence / eq ;</li><li>idea that no indication of {experimental details / control variables / control group / eq} ;</li><li>idea that mean has been used therefore there must have been some repeats / eq ;</li></ol>	<ol style="list-style-type: none"><li>IGNORE not reliable or is reliable</li><li>IGNORE no repeats / sample was small ACCEPT number of repeats not known / sample size not known</li></ol>	(3)

Q8.

Question Number	Answer	Mark
(i)	<p>The only correct answer is A artificial active immunity</p> <p><i>B is incorrect because the immunity is not passive</i></p> <p><i>C is incorrect because the immunity is not natural</i></p> <p><i>D is incorrect because the immunity is not natural or passive</i></p>	(1)



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Question Number	Answer	Additional guidance	Mark
(ii)	<p>An explanation that makes reference to three of the following</p> <ul style="list-style-type: none"> <li>• T helper cells bind to { protein / antigen } the APC (1)</li> <li>• (therefore) leading to the production of {active T helper cells / T memory cells} (1)</li> <li>• the T helper cells activate the B cells to { divide / become } cells capable of producing antibodies (1)</li> <li>• The memory cells remain in the body so antibodies can be produced quickly (on re-infection)(1)</li> </ul>	<p>ALLOW B cells develop into B effector cells or plasma cells</p>	(3)

Q9.

Question Number	Answer	Additional Guidance	Mark
(a)(i)	<ol style="list-style-type: none"> <li>1. {skin / epidermis} is a barrier / eq ;</li> <li>2. reference to keratin ;</li> <li>3. reference to lack of receptors (for the virus) ;</li> </ol>	<p><b>Accept</b> prevents entry but <b>not</b> prevents infection  <b>NB</b> keratin in skin forms a barrier = 2 marks  <b>Accept</b> skin has different receptors</p>	(2)

Question Number	Answer	Additional Guidance	Mark
(a)(ii)	<ol style="list-style-type: none"> <li>1. idea that viruses only {infect / attach to / eq} {specific receptors / specific cells / host cells} ;</li> <li>2. idea that receptors not present on {blood cells / endothelial cells / eq} ;</li> <li>3. reference to {destruction / eq} of viruses by phagocytes ;</li> </ol>	<p><b>Accept</b> white blood cells. neutrophils; PMN  <b>Ignore</b> macrophages  <b>Not</b> lymphocytes, T cells, plasma cells</p>	(2)



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Question Number	Answer	Additional Guidance	Mark
(b)	<ol style="list-style-type: none"><li>reverse transcriptase (required) in HIV, no reverse transcriptase in cold virus ;</li><li>DNA formed (using RNA) in HIV, {no DNA formed / RNA used to make protein / translation} in cold virus ;</li><li>reference to {provirus / latency / delay in virus formation / eq} in HIV infection, {no provirus / lytic cycle / (immediate) formation of virus particles / eq} in cold virus ;</li></ol>	<b>NB</b> answers can be pieced together but candidates still have to state both parts of mark point	(2)

Question Number	Answer	Additional Guidance	Mark
(c)(i)	<ol style="list-style-type: none"><li>to synthesise (common cold) RNA / eq ;</li><li>for amino acids to bind to tRNA / eq ;</li><li>to synthesise (common cold) protein (capsid) / eq ;</li></ol>	<b>Accept</b> translation	(2)

Question Number	Answer	Additional Guidance	Mark
(c)(ii)	<ol style="list-style-type: none"><li>idea of enzyme affecting {molecules in membrane / proteins / (phospho)lipids / cholesterol} ;</li><li>enzyme breaks {bonds / named bonds / eq} ;</li><li>reference to {(by) hydrolysis / hydrolytic enzymes} ;</li><li>credit detail of enzyme action ;</li><li>reference to enzyme U as {protease / lipase / cholesterase} ;</li></ol>	eg lowers activation energy, binding of active site to substrate (cannot credit reference to catalyst, as in stem of question) <b>Ignore</b> lysosyme	(3)



## EXAM PAPERS PRACTICE

Q10.

Question Number	Answer	Additional Guidance	Mark
(a)	<ol style="list-style-type: none"><li>reference to enzymes {killing / destroying / eq} (microorganisms) ;</li><li>reference to {stomach acid / hydrochloric acid / HCl} {killing / destroying / eq} (microorganisms) ;</li><li>reference to lack of oxygen affecting (microorganisms) ;</li><li>idea of competition by gut flora with (microorganisms) ;</li><li>idea that insufficient numbers of (microorganisms) (to cause food poisoning) ;</li><li>idea that the (microorganisms) may not be {pathogenic/ harmful / cause food poisoning} ;</li><li>reference to (immediate) vomiting to remove (microorganisms) ;</li></ol>	<ol style="list-style-type: none"><li><b>1. Accept</b> lysozymes / enzymes in saliva <b>Accept</b> enzymes destroying viruses</li><li><b>2. Accept</b> acid destroying viruses</li><li><b>3. Not</b> viruses</li><li><b>4. Not</b> viruses</li><li><b>6. Not</b> pathogens</li></ol>	(3)

Question Number	Answer	Additional Guidance	Mark
(b)(i)	<ol style="list-style-type: none"><li>reference to synthesis of RNA ;</li><li>using host cell {enzymes / named enzyme / (RNA) nucleotides} ;</li><li>reference to synthesis of (viral) proteins ;</li><li>using host cell {enzymes / named enzyme / amino acids / ribosomes / tRNA / ATP} ;</li><li>reference to assembly of {viruses / particles} (inside cells) ;</li></ol>	<ol style="list-style-type: none"><li><b>1. Accept</b> mRNA</li><li><b>2. Not</b> reverse transcriptase</li><li><b>5. Accept</b> protein and RNA {form / make / eq} {viruses / particles}</li></ol>	(4)



## EXAM PAPERS PRACTICE

Question Number	Answer	Additional Guidance	Mark
(b)(ii)	<ol style="list-style-type: none"><li>idea of a delay (up to 24 hours) whilst viral particles are replicating / eq ;</li><li>idea that a virus can {result in many particles being formed / replicate very fast} ;</li><li>idea that more host cells infected ;</li></ol>	<b>2. Accept</b> reference to lytic cycle	(2)
Question Number	Answer	Additional Guidance	Mark
(b)(iii)	<ol style="list-style-type: none"><li>reference to the {hand wash / alcohol} not affecting the virus ;</li><li>reference to (noro) virus {not having an envelope / surrounded by protein / eq} ;</li><li>alcohol does not {damage protein coat / penetrate} virus / eq ;</li><li>protein is hydrophilic / alcohol is an organic solvent / eq ;</li></ol>	<b>1. Not</b> does not kill virus <b>2. Accept</b> surrounded by a capsid	(2)

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