Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE ASSESSMENT TASKS

HUMAN BIOLOGY

ATAR YEAR 12

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Disclaimer

Any resources such as texts, websites and so on that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandatory or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any they may wish to use.

Sample assessment task

Human Biology – ATAR Year 12

Task 2 – Unit 3

Assessment type Science Inquiry – Investigation

Conditions Time allowed for completion of the task:

- investigation planning – one class period
- conduction of investigation – up to three class periods
- completion of the introduction, materials and method sections of the scientific report – at home
- completion of the results, analysis and evaluation of data sections of the scientific report – one period under invigilated conditions.

Task weighting 5% of the school mark for this pair of units

Temperature regulation mechanisms of the human body **(45 marks)**

You will plan, conduct and evaluate an investigation based on the temperature regulation mechanisms of the human body. You will write up your investigation as a scientific report.

Plan the investigation

Things to consider when planning your investigation:

- Research and provide background information on temperature regulation mechanisms.
- Devise a hypothesis and choose dependent and independent variables for your investigation.
- Identify variables to control.
- Decide upon the appropriate sample size, trials and data collection methods.
- Describe, in detail, the methodology you will use during your investigation.
- Decide upon the data recording method.

Conduct the investigation

- Set up times and places for the measurements to be taken.
- Carry out data collection from test subjects.

Commence writing the scientific report (10 marks)

- Include an introduction to the investigation.
- Include the background research on temperature regulation mechanisms.
- Write the hypothesis for the investigation.
- Identify the dependent and independent variables.

Materials and method (6 marks)

- Include a list of materials used in the investigation.
- Include details on the method used to collect the data.
- Include design features of the investigation that ensured reliability and validity.

Complete the remainder of the scientific report under invigilated conditions.

Results (11 marks)

- Show processing of raw data by identifying any outliers and working out averages.
- Plot appropriate graphs by hand to show results.

Analysis and evaluation (14 marks)

- Describe the trends and/or patterns in your data.
- State how your data relates to your hypothesis.
- Use your knowledge and understanding to explain the trend and/or pattern of your results.
- Comment on the reliability and validity of the data collected.
- List two limitations in the data collection strategy that may have affected the reliability of your data and comment on how they would have affected it.
- List two improvements you could make to the data collection strategy to improve your investigation.

Conclusion (4 marks)

- Summarise your findings and comment on the reliability and validity of the outcome of the investigation.

Marking key for sample assessment task 2 — Unit 3

Commence writing the scientific report

- Include an introduction to the investigation.
- Include the background research on temperature regulation mechanisms.
- Write the hypothesis for the investigation.
- Identify the dependent and independent variables.

Description	Mark
Succinctly writes a general introduction that summarises the aim of the investigation	1
Provides background information on temperature control mechanisms and the function of the following in maintaining constant body temperature: • Vasoconstriction/vasodilation • Shivering • Piloerection • Sweating • Importance of maintaining constant body temperature, optimal for reactions	 1 1 1 1 1
Writes a hypothesis relating dependent and independent variables and stating direction of effect OR Writes a simple hypothesis relating dependent and independent variables without stating direction of effect	2 1
Correctly identifies the dependent and independent variables	1–2
Total	**/10**

Materials and method

- Include a list of materials used in the investigation.
- Include details on the method used to collect the data.
- Include design features of the investigation that ensured reliability and validity.

Description	Mark
Clearly lists materials with quantities OR Briefly lists materials	2 1
Explains the method in detail, including how the sampling and data collection will be determined OR Briefly describes the method	2 1
Uses an appropriate sample size and number of trials to increase reliability	1
States how the effects of uncontrolled variables and other factors were minimised during data collection in order to increase validity	1
Total	**/6**

Results

- Show processing of raw data by identifying any outliers and working out averages.
- Plot appropriate graphs by hand to show results.

Description	Mark
Records raw data in an appropriate format • Uses headings • Groups relevant data • Records repeat trials	 1 1 1
Carries out simple processing of raw data • Calculates mean values • Uses appropriate format for recording data	 1 1
Identifies outliers in the raw data	1
Plots appropriate graph/s of the processed data using correct conventions • Uses appropriate title, stating independent and dependent variables • Correctly labels axes with names • Labels axes with units • Uses correct type of graph • Plots graph correctly	 1 1 1 1 1
Total	**/11**

Analysis and evaluation

- Describe the trends and/or patterns in your data.
- State how your data relates to your hypothesis.
- Use your knowledge and understanding to explain the trend and/or pattern of your results.
- Comment on the reliability and validity of the data collected.
- List **two** limitations in the data collection strategy that may have affected the reliability of your data and comment on how they would have affected it.
- List **two** improvements you could make to the data collection strategy to improve your investigation.

Description	Mark
Describes the trends and patterns in the processed data	1
Makes a valid statement about the trends and patterns using data collected OR Describes the trends but no data included	2 1
Makes a valid statement about the trends and relates it to hypothesis	1
Explains data using scientific knowledge and understanding and provides detail on the changes to the body during exercise for temperature control, including breathing rate, circulation and sweating OR Explains data using scientific knowledge and understanding and provides generalised changes to body during exercise without using correct or appropriate terminology	2 1

Description	Mark
Comments on the reliability of the raw data collected, using correct terminology, such as repeat trials or greater number of test subjects OR Makes comments on the reliability of the raw data collected that are generalised and not related to repeat trials or more test subjects	2 1
Comments on the validity of the raw data collected, using correct terminology, such as variables being controlled to eliminate sources of error OR Makes comments on the validity of the raw data collected that are generalised and not related to control of variables	2 1
Lists **two** limitations in the data collection strategy that may have affected the accuracy or precision of the raw data collected – one mark for each limitation	1–2
Suggests at least **two** improvements to the data collection strategy – one mark for each improvement	1–2
Total	**/14**

Conclusion

- Summarise your findings and comment on the reliability and validity of the outcome of the investigation.

Description	Mark
Summarises the results of the investigation with the use of data OR Summarises the results with generalised comments	2 1
Comments on the validity of the outcome of the investigation by relating it back to the hypothesis OR Comments on the validity of the outcomes of the investigation	2 1
Total	**/4**

Sample assessment task

Human Biology – ATAR Year 12

Task 3 – Unit 3

Assessment type	Test
Conditions	Time for the task: 60 minutes
Task weighting	10% of the school mark for this pair of units

Response to infection

Part A: Multiple-choice **(10 marks)**

This section has **10** questions. Answer all questions on the multiple-choice answer sheet provided.

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1. Antibiotics are often ineffective against viruses because viruses

   (a) keep changing their external protein coat.
   (b) are able to disguise themselves in the host cell membrane.
   (c) are not true living cells, so their metabolism is not affected by antibiotics.
   (d) can destroy or inhibit the actions of antibiotics in living cells.

2. Macrophages are large white blood cells that

   (a) divide to produce B lymphocytes.
   (b) engulf bacteria and destroy them.
   (c) produce antibodies against specific antigens.
   (d) secrete bacteria-destroying enzymes into the blood.

3. Which of the following is an example of passive natural immunity?

   (a) The body manufactures antibodies in response to an invading pathogen.
   (b) Antibodies enter the bloodstream via an injection of antitoxin.
   (c) The body manufactures antibodies after an injection of toxoids.
   (d) Antibodies enter the bloodstream from mother to foetus across the placenta.

4. Which of the following differentiates correctly between antibiotics and vaccines?

   (a) Antibiotics treat an invading bacterium, while many vaccines involve the introduction of an inactivated pathogen into the bloodstream.
   (b) Antibiotics provide long-lasting immunity due to the production of memory cells, while vaccines only provide short-term immunity.
   (c) Antibiotics provide artificial, active immunity, while vaccines provide artificial, passive immunity.
   (d) Antibiotics are often injected into the bloodstream, while vaccines are normally ingested in pill form.

5. Which of the following statements best describes what is most likely to happen when an individual receives a vaccination containing a weakened pathogen?

   The ability to

   (a) fight the disease caused by the pathogen will increase due to antibody production.
   (b) fight the disease will increase due to antibodies received from the pathogen.
   (c) produce antibodies will decrease after vaccination.
   (d) resist most types of diseases will increase.

6. Microorganisms that cause disease in other living organisms are known as

   (a) decomposers.
   (b) antigens.
   (c) antibiotics.
   (d) pathogens.

7. One important response to an infection is the antigen–antibody reaction. Which of the following is **NOT** a feature of such a reaction?

   (a) The antibody is specific for a particular antigen.
   (b) Antibodies are found in blood plasma and are all proteins.
   (c) The range of antibodies possessed by an individual is inherited and has been present since birth.
   (d) Antibodies are associated with phagocytes in protecting the body.

8. A typical characteristic of a virus is that it

   (a) is destroyed by antibiotics.
   (b) releases toxins into the body of the host.
   (c) evades detection by the host's immune system.
   (d) manipulates the host cell's DNA to produce copies of itself.

9. After contact with the polio virus, a child developed polio and recovered. Twelve months later, the child came in contact with the polio virus again but did not show any symptoms of the disease. This happened because, shortly after the first infection, the child

   (a) had an injection of polio antibodies.
   (b) grew memory B cells specific to polio.
   (c) grew memory B cells that could respond to any virus.
   (d) developed T cells that consumed the new polio virus particles.

10. The following diagrams show the antigens on the surface of different bacteria isolated from an open wound.

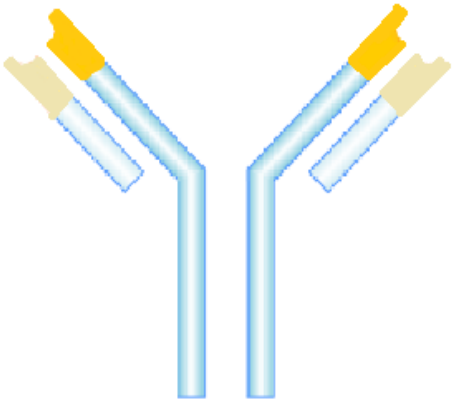
Antigen 1

Antigen 2

Antigen 3

Antigen 4

An antibody was also detected. It is shown below.



This antibody is most likely to react to antigen

   (a) 1.
   (b) 2.
   (c) 3.
   (d) 4.

End of Part A

Part B: Short answer (31 marks)

This section has **three** questions. Answer all questions in the spaces provided.

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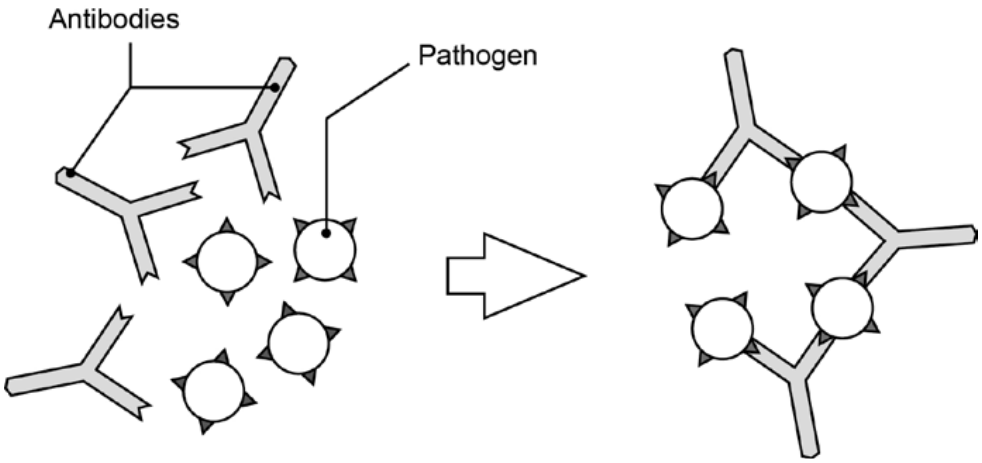
11. Immunity can be classed as passive or active and natural or artificial. Complete the table below, describing the different types of immunity. (4 marks)

	Passive	Active
Natural		
Artificial		

12. The diagram below shows one of the actions of antibodies on pathogens. (5 marks)



(a) What action of antibodies does the diagram represent? (1 mark)

_____

(b) Describe three other ways in which antibodies can act on pathogens to help fight infection. (3 marks)

1: _____

_____

_____

2: _____

_____

_____

3: _____

_____

_____

(c) Name the type of lymphocyte responsible for the production of antibodies. (1 mark)

_____

13. (a) The effects of many diseases have been minimised in many countries due to the introduction of live attenuated vaccines. A live attenuated vaccine uses a weakened version of the disease-causing pathogen to stimulate an immune response in the vaccinated person. The MMR (measles, mumps and rubella) vaccination program attracts a lot of media attention, which highlights some of the risks and ethical considerations associated with the use of vaccines.

Discuss **two** benefits and **two** risks for the use of vaccines. (4 marks)

Benefits: _____

_____

_____

Risks:_____

_____

_____

(b) Vaccines are designed to work against specific microbes and can be produced in a number of ways.

Complete the following table on the different types of vaccines. (12 marks)

Vaccine type	**Description**	**Advantage**	**Disadvantage**
Live attenuated			
Inactivated/ dead microbe			
Toxoid			
Polysaccharide conjugate			

(c) Outline the action of B-lymphocytes in antibody-mediated immunity. (6 marks)

Part C: Extended answer **(20 marks)**

This section has one question. Answer all three parts to the question in the space provided. Make sure you identify each part clearly.

14. A man arrived home feeling unwell. His partner took him to the doctor when he started suffering a fever, sweats and chills. The patient was given an antibiotic to take every day for the following 10 days. The doctor stressed the importance of completing the course of antibiotics even when he started to feel better.

    (a) Describe the physiological mechanisms that cause fever. (8 marks)

    (b) Explain how different antibiotics can be used to treat infections. (8 marks)

    (c) Explain why the doctor stressed that the full course of antibiotics needed to be taken. ___ (4 marks)

End of test

Marking key for sample assessment task 3 — Unit 3

Test: Response to infection

Part A: Multiple-choice **(10 marks)**

Answer		Marks
1.	B	1
2.	B	1
3.	D	1
4.	A	1
5.	A	1
6.	D	1
7.	C	1
8.	D	1
9.	B	1
10.	C	1
	Total	**10**

Part B: Short answer **(31 marks)**

11. Immunity can be classed as passive or active and natural or artificial. Complete the table below, describing the different types of immunity.

Description			Mark
	Passive	Active	1–4
Natural	Antibodies enter bloodstream by transfer across the placenta or through breast milk	Antibodies are produced by body as a result of infection by a pathogen	
Artificial	Antibodies are introduced into bloodstream	Antibodies are produced by the body as a result of an antigen being introduced by vaccination	
		Total	**/4**

12. The diagram below shows one of the actions of antibodies on pathogens.

    (a) What action of antibodies does the diagram represent?

Description	Mark
Agglutination/clumping together of pathogens	1
Total	**/1**

(b) Describe **three** other ways in which antibodies can act on pathogens to help fight infection.

Description	Mark
• Neutralise them/inactivate them/produce toxins • Bind to surfaces of viruses • Prevent the viruses decoating/prevent them from entering the cell/coat bacteria • Enhance phagocytosis/make them more easily consumed • Phagocytes/macrophages/opson/opsonisation combine with foreign bacterial toxins • Dissolve organisms/membrane • Make soluble substances insoluble/form a precipitate • Make bacteria/foreign cell membranes permeable/lysins/lysination	1–3
Total	**/3**

(c) Name the type of lymphocyte responsible for the production of antibodies.

Description	Mark
B/B cells/plasma cells	1
Total	**/1**

13. The effects of many diseases have been minimised in many countries due to the introduction of live attenuated vaccines. A live attenuated vaccine uses a weakened version of the disease-causing pathogen to stimulate an immune response in the vaccinated person. The MMR (measles, mumps and rubella) vaccination program attracts a lot of media attention, which highlights some of the risks and ethical considerations associated with the use of vaccines.

(a) Discuss **two** benefits and **two** risks for the use of vaccines.

Description	Mark
Benefits: • causes an immune response to develop long-term immunity • stops an individual from contracting a disease • herd immunity/if enough people are vaccinated, it could stop pathogens infecting whole populations • generally only requires a single dose for immunity to develop • fewer side effects.	1–2
Risks: • mild allergic reactions to vaccine • reversion of pathogen to a more virulent form • can't be given to immunocompromised patients.	1–2
Total	**/4**

(b) Vaccines are designed to work against specific microbes and can be produced in a number of ways.

Complete the following table on the different types of vaccines.

Description				Mark
Vaccine type	**Description**	**Advantage**	**Disadvantage**	
	1 mark for one point in each category/heading			
Live attenuated	• consists of weakened virus or bacteria • doesn't cause disease • stimulates an immune response	• closest to developing natural immunity • long-term immunity	• needs to be refrigerated • can revert to virulent form	1–3
Inactivated/dead microbe	• contains either whole or parts of killed virus or bacteria	• stable and safe • easily stored and transported	• stimulates a weaker immune response • requires several doses or 'booster'	1–3
Toxoid	• contains toxins produced by bacteria that have been inactivated	• safer	• weaker immune response developed • requires booster	1–3
Polysaccharide conjugate	• contains polysaccharides joined to immune-stimulating molecules (protein)	• long-lasting immunity • protection for babies and toddlers	• expensive and complex to produce	1–3
			Total	**/12**

(c) Outline the action of B-lymphocytes in antibody-mediated immunity.

Description	Mark
Antigen reaches lymphoid tissue	1
B lymphocytes stimulated and undergo division	1
New B cells develop into plasma cells	1
Plasma cells produce antibodies and release into blood and lymph	1
Antibodies combine with antigen and inactivate or destroy it	1
Some of the B cells form memory cells	1
Total	**/6**

Part C: Extended answer **(20 marks)**

14.

(a) Describe the physiological mechanisms that cause fever. (8 marks)

Description	Mark
Hypothalamus increases thermostat setting of body (person feels cold)	1
Pyrogens released	1
Muscles begin to shiver	1
Blood vessels constrict	1
Both processes help to drive up body temperature	1
Macrophage engulfs pathogen	1
Macrophage stimulated to release interleukins/cytokines	1
Interleukins/cytokines enhance the pyrogens	1
Total	**/8**

(b) Explain how different antibiotics can be used to treat infections. (8 marks)

Description	Mark
Antibiotics target disease-causing bacteria	1
Can be broad spectrum/affect a wide range of bacteria	1
Or can be narrow spectrum/effective only against specific types of bacteria	1
(Bacteriostatic) antibiotics inhibit growth of bacteria	1
By interfering with protein synthesis	1
(Bactericidal) antibiotics destroy bacterial pathogens	1
By targeting cell walls, cell membranes or enzymes	1
Metabolic pathways/action of enzymes found inside bacteria	1
Total	**/8**

(c) Explain why the doctor stressed that the full course of antibiotics needed to be taken. ___ (4 marks)

Description	Mark
Antibiotics gradually reduce the number of bacteria	1
There will still be a small population of bacteria that remain	1
If antibiotics are stopped, the bacteria that persist will increase in number/surviving bacteria will reproduce	1
Reinfection occurs/patient becomes sick again	1
Total	**/4**

Sample assessment task

Human Biology – ATAR Year 12

Task 6 – Unit 4

Assessment type	Extended response
Conditions	Time for the task: Part A: two lessons to research topic and complete notes. Part B: one lesson in class to respond to questions in class under invigilated conditions.
Task weighting	8% of the school mark for this pair of units

Further evidence for evolution

Part A: Research notes **(5 marks)**

On November 24, 1859, *On the Origin of Species* was published. In this book, Charles Darwin introduced the Theory of Evolution. Darwin's work illustrated that populations evolve over time through a process of natural selection. Darwin based his theory on the evidence available to him at the time – personal observations from his travels on the *HMS Beagle* and fossil evidence. He also used the writings of Sir Charles Lyell and Thomas Malthus to support his views.

Further evidence to support this theory comes from the relatively new fields of comparative biochemistry and bioinformatics.

1. Research the following:

   - the Human Genome Project
   - comparative biochemistry and bioinformatics
   - processes involved in comparative biochemistry
   - the use of comparative biochemistry and bioinformatics as evidence for the Theory of Evolution
   - the benefits of using comparative biochemistry and bioinformatics
   - applications that exist for the use of comparative biochemistry.

   You will need to use your research notes to prepare a single-sided A4 page of notes to be used when completing Part 2. (3 marks)

2. You must include your references in a standard referencing format of your choice; for example, APA, MLA, Harvard or Chicago. Hand this in as a separate sheet attached to your note-taking sheet. (2 marks)

Part B: In-class assessment **(20 marks)**

You will have the whole lesson to answer the questions below. You can use your single page of notes.

Responses could include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; clearly labelled tables and graphs; and annotated flow diagrams with introductory notes.

Note: the single page of notes needs to be your own work. Your teacher will initial the notes at the commencement of the task. Any notes that are deemed identical will be collected and those students will be required to complete the task without them.

1. A source of evidence for evolution is the examination of fossils and their surroundings. Different comparative studies may also be used to support the Theory of Evolution. Two of these involve studies in biochemistry; namely, protein sequences and DNA.

   Describe the two comparative studies, protein sequences and DNA, and explain how they show evidence for evolution. (10 marks)

2. The Human Genome Project has provided more supporting evidence for the Theory of Evolution by providing a better comparison between the DNA of modern humans and hominids and extinct humans and hominid species. Explain how the project could also help to treat genetically inherited diseases. (3 marks)

3. Discuss how comparative biochemistry works with bioinformatics to determine evolutionary relationships. (7 marks)

Marking key for sample assessment task 6 — Unit 4

Further evidence for evolution: comparative biochemistry, comparative genomics and bioinformatics.

Part A: Research notes **(5 marks)**

1. Research the following:
   - the Human Genome Project
   - comparative biochemistry and bioinformatics
   - processes involved in comparative biochemistry
   - the use of comparative biochemistry and bioinformatics as support for the Theory of Evolution
   - the benefits of using comparative biochemistry and bioinformatics
   - applications that exist for the use of comparative biochemistry.

Description	Marks
Presents research in a note-taking format	1
Provides concise notes and does not include irrelevant information	1
Provides notes which cover all recommended research areas	1
Total	**/3**

2. You must include your references in a standard referencing format of your choice; for example, APA, MLA, Harvard or Chicago. Hand this in as a separate sheet attached to your note-taking sheet.

Description	Marks
Provides a minimum of four references	1
Uses the correct format for the selected referencing type	1
Total	**/2**

Part B: In-class assessment **(20 marks)**

1. A source of evidence for evolution is the examination of fossils and their surroundings. Different comparative studies may also be used to support the Theory of Evolution. Two of these involve studies in biochemistry; namely, protein sequences and DNA.

   Describe the two comparative studies, protein sequences and DNA, and explain how they show evidence for evolution.

Description	Marks
Protein sequences • Proteins made of long chains of amino acids • Determines the type and sequence of amino acids/describes a method of sequencing • Western blotting to detect specific proteins in a sample • Using similar/ubiquitous proteins (e.g. cytochrome c) in different species • Compares the sequence in different species	1–4
Species that are distantly related have more differences in their amino acid sequence/closely related, more similarities/more time has passed since common ancestry	1
DNA • Code/sequence in DNA is different for different species • Determines the sequence • Hybridisation/forming hybrid DNA from different species/more heat required to separate strands that have been fused from two species, more similar DNA/electrophoresis/other new methods of sequencing use of ERVs/virus inserting into a gamete DNA to compare non-functional DNA • Compares the sequence in different species	1–4
Species that are distantly related have more differences in their DNA/closely related, more similarities/more time has passed since common ancestry	1
OR	
Mitochondrial DNA • Code/sequence in DNA is different for different species • Determine sequence • Hybridisation/forming hybrid DNA from different species/more heat required to separate strands that have been fused from two species, more similar DNA/electrophoresis/other new methods of sequencing • Inherited only from the mother • Higher rate of mutation than nuclear DNA • Amount of mutation corresponds to amount of time passed	1–4
Estimate closeness of relationship through maternal ancestry/useful for same species or closely related species/more time has passed since common ancestry	1
Total	**/10**

2. The Human Genome Project has provided more supporting evidence for the Theory of Evolution by providing a better comparison between the DNA of modern humans and hominids and extinct humans and hominid species. Explain how the project could also help to treat genetically inherited diseases.

Description	Marks
Discusses **three** points on how the project could help to treat genetically inherited diseases	
Answer could include, but is not limited to:	
• Allows faulty/mutated genes to be identified • Once identified, the reason for the dysfunction/abnormal protein can potentially be identified • Potentially, then, genes can be replaced/switched off/bypassed/gene therapy • Treated with correct protein to cure the disease/genetic engineering • Genetic counselling • Develop individual-specific treatments	1–3
Total	**/3**

3. Discuss how comparative biochemistry works with bioinformatics to determine evolutionary relationships.

Description	Marks
• Comparative biochemistry is the comparison of DNA and proteins between different species	1
• The base sequences in DNA/amino acid sequences in proteins can be expressed as data that is easily read by computer software	1
• Bioinformatics provides the (IT) platform for the (biochemical) data provided	1
• This platform can store and manage the large amount of information provided by genomic studies	1
• Bioinformatics allows for the analysis and comparison of DNA/protein sequences	1
• By analysing the similarities and differences between the sequences, it is possible to determine the evolutionary closeness of the organisms	1
• The more DNA/amino acids/proteins two organisms have in common, the closer the evolutionary relationship	1
Total	**/7**

Acknowledgements

Question 10 Adapted from: Fvasconcellos. (2007). *Antigens* [Image] (public domain). Retrieved March 27, 2015, from http://commons.wikimedia.org/wiki/File:Antibody.svg

Question 12 Adapted from: *The actions of antibodies on pathogens* [Diagram]. Retrieved January, 2012, from http://leavingbio.net/The%20Human%20Defence%20System-web-2.htm.