PICTON HIGH SCHOOL

Creating Opportunities Achieving Success

YEAR 12 Biology - Research Task

Due Date: Friday 13th March 2020	**Assessment Name: Yr 12 Biology Research Task**
Mark: /60	**Weighting: 25%**

SYLLABUS OUTCOMES TO BE ASSESSED:

Bio 12-3: conducts investigations to collect valid and reliable primary and secondary data and information
Bio 12-5: analyses and evaluates primary and secondary data and information
Bio 12.6: Solves scientific problems using primary and secondary data, critical thinking skills and scientific processes
Bio 12-7: communicates scientific understanding using suitable language and terminology for a specific audience or purpose
Bio 12-12: explains the structures of DNA and analyses the mechanisms of inheritance and how processes of reproduction ensure continuity of species

DIRECTIVES TO BE ASSESSED:

Identify: Recognise and name
Explain: Relate cause and effect; make the relationships between things evident; provide why and/or how.
Justify: Support an argument or conclusion
Evaluate: Make a judgement based on criteria; determine the value of
Describe: Provide characteristics and features
Assess: make a judgement of value, quality, outcomes, results or size
Analyse: Identify components and the relationship between them; draw out and relate implications.

TASK DESCRIPTION:

1. Compare and contrast germline and somatic mutations.
2. Choose a genetic disorder that is caused by mutation in a gene (either a recent mutation, or a mutation that can be traced to an historical event in the past).
3. Give details of the cause of the mutation (whether the mutagen is chemical, electromagnetic radiation or naturally occurring) and outline the phenotypic effect in the human body.
4. Detail how the specific gene has changed by including information about the type of mutation (Point Mutation {Nonsense, Missense, Silent, Neutral}, Frameshift Mutation {Insertion, Deletion}, Chromosomal- {Deletion, Duplication, Inversion, Translocation}, Aneuploidy).

ASSESSMENT CRITERIA – STUDENT CHECKLIST:

- Compare and contrast the type of mutation (give similarities and differences)
- Describe the mutagen and how it operates to change the sequence

- Identify the disorder caused by a mutation
- Discuss the effect of the mutation on the individual, including phenotypic changes

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In your research assignment, you will find out more about mutations in a secondary-sources investigation, aimed at discovering the source of genetic disorders, and the specific type of mutations caused, detailing how the gene has been changed. You will compare and contrast both germline and somatic mutations, providing detailed research into how both occurs. You will also include the different causes of mutations; chemical, electromagnetic radiation or naturally occurring, and include how the mutation manifests. At the conclusion of your research, you will create an A1 poster, communicating your findings and ideas about the particular disease researched, including graphics (no more than 30% of the poster space), all labelled and referenced correctly.

BACKGROUND

A mutagen is an agent of substance that can bring about a permanent alteration to the physical composition of a DNA gene such that the genetic message is changed.

Mutation is a change in DNA, the hereditary material of life. An organism's DNA affects how it looks, how it behaves, and its physiology. So a change in an organism's DNA can cause changes in all aspects of its life.

Why are Mutations essential to evolution?
Why are they classified as the raw material of genetic variation?
How are diseases related to genetic mutations, and are these diseases only non infectious?

Task Requirements:

1. Compare and contrast germline and somatic mutations
    a. Draw a table with each of ‘Compare’ & ‘Contrast’ headings
    b. Describe the similarities between germline and somatic mutations
    c. Describe the differences between germline and somatic mutations
2. Choose a genetic disorder
    a. Name the disorder and determine if it is recent or historical (give examples)
    b. Detail the disorder and how it manifests (what are the signs and symptoms)
3. What is the mutagen and detail its origin?
    a. Use your research to create a table or flowchart to represent the type of mutagen
    b. Detail the effect of the mutagen on the structure of the DNA
    c. Describe the resulting phenotypic changes in the human body.

4. Describe the specific genetic modification within the DNA.
    a. Identify the parts of the DNA that are modified for the mutation
    b. Outline the role of each part with the DNA which results in the mutation
    c. Define any new terms, include diagrams, and Reference all sources

Bio 12 Research Assignment Marking Guidelines

Conducting investigations

Bio 12-3: conducts investigations to collect valid and reliable primary and **secondary** data and **information**

Valid	**Conducts investigations to collect valid primary and secondary data and information.**
A (9-10)	Investigation poster shows that the student has a clear understanding of how to collect valid data and information (information that can be used appropriately to answer the questions).
B (7-8)	Investigation poster shows that the student has an understanding of how to collect valid data and information (information that can be used appropriately to answer the questions).
C (5-6)	Investigation poster shows that the student has collected information but gives little indication as to how they ensured the data was valid (information that can be used appropriately to answer the questions).
D(3-4)	Investigation poster shows that the student has collected information but gives no indication as to how they ensured the data was valid (data that can be used appropriately to answer the questions).
E (0-2)	Information is collected but there is no explicit basis for gauging how valid it is (whether it can be used appropriately to answer the questions).

Analysing data and information

12-5: analyses and evaluates primary and secondary data and information

Analyses	**Analyses primary and secondary information.**
A (9-10)	Poster displays clear evidence that the student has gathered information from a wide range of sources and has worked on it to understand it and has put it into their own words. There is a named Mutation/Disorder with a comprehensive and detailed description of symptoms and historical connections.
B (7-8)	Poster provides evidence that the student has gathered information from a range of sources and has worked on it to understand it and has put it into their own words. Named Mutation/Disorder with symptoms and history recorded.
C (5-6)	Some evidence that the student has gathered information from a range of sources and has changed some of the words or sentence structure to reflect their understanding of it. Named Mutation/Disorder with some symptoms/history.
D(3-4)	Information has been mostly copied from sources without proper acknowledgement. May not be relevant to the question. Named Mutation/Disorder.
E (0-2)	Information gathered is of low quality and general in nature, rather than being specifically linked to the question being asked. No information on Mutation/Disorder.

Evaluates	**Evaluates primary and secondary data and information.**
A (9-10)	Poster shows clear evidence that the student has gathered information from a wide range of sources and has made informed decisions about which information is most accurate, valid and reliable.
B (7-8)	Poster shows evidence that the student has gathered information from a range of sources and has made some decisions about which information is most accurate, valid and reliable.
C (5-6)	Poster shows some evidence that the student has gathered information from a range of sources but has not acknowledged sources. Student has made some attempt to choose information that is accurate, valid and reliable.
D(3-4)	Information gathered is not totally related to the question being investigated. It is of low quality and there has been little effort to use only the most relevant information.
E (0-2)	Large amounts of the information gathered is unrelated to the question being investigated. It is of low quality and there has been no effort to use only the most relevant information.

Bio 12-6: solves scientific problems using primary and secondary data, critical thinking skills and scientific processes

Evaluates	**solves scientific problems using primary and secondary data, critical thinking skills and scientific processes**
A (9-10)	Clearly defines the primary and/or secondary sources being used to solve a given problem/question. Demonstrates the thought process(es) or train of thought followed to use the data meaningfully and shows how information taken from the data sources has been considered and applied using a high level of critical thinking skills to solving the problem/answering the question. It is clear that the data has been judged objectively, similarities grouped and patterns described.
B (7-8)	Defines the primary and/or secondary sources being used to solve a given problem/question. Demonstrates some of the thought process(es) or trains of thought followed to use the data meaningfully and shows how information taken from the data sources has been considered and applied using critical thinking skills to solving the problem/answering the question. It can be seen that the data has been judged objectively, similarities grouped and patterns described.
C (5-6)	Has data available in the report and uses some or all of it but it is not clear which data is being used or how the data is being applied to the problem/question. Provides some insight into how information taken from the data sources was used to help solve the problem/answer the question but there is not a high level of critical thinking displayed. The data is manipulated but little effort is shown to objectively judge, group similarities or look for patterns in the data.
D(3-4)	Includes data in the report but there is only vague application of the data to solving the problem/answering the question. It is not clear how the data was used to provide information for solving the problem/answering the question. There is no clear thought process described or obvious in the way information was taken from the data and used to solve the problem/answer the question. There is basic manipulation of the data in an effort to objectively judge it, group similarities and describe patterns in the data.
E (0-2)	There may be no data present or it is very difficult to clearly understand the data that is provided. The data may not be directly used or it is very difficult to interpret the processes or thought patterns used to extract information from the data and used to solve the problem/answer the question. The problem/question is not answered to a satisfactory standard. There is limited

	manipulation of the data in an effort to objectively judge it, group similarities and describe patterns in the data.

Communicating

11/12-7: communicates scientific understanding using suitable language and terminology for a specific audience or purpose

	Communicates scientific understanding using suitable language and terminology for a specific audience or purpose.
A (9-10)	Presents a logical, well-organised poster and uses effective forms of digital, visual and written forms of communication. Uses scientific language to communicate comprehensive knowledge and supports conclusions/ideas with evidence. Poster contains 2 x accurately constructed and informative tables/flowcharts comparing and contrasting mutations and describing the mutation/mutagen that effectively communicate the information required.
B (7-8)	Presents a well-organised report and selects and uses suitable forms of digital, visual written and/or oral forms of communication. Selects and applies appropriate nomenclature and scientific language, and demonstrates sound knowledge by explaining biological concepts. Poster contains 2 x tables/flowcharts comparing and contrasting mutations and describing the mutation/mutagen that effectively communicate the information required.
C (5-6)	Information is communicated using suitable language (including little use of scientific terminology) with appropriate explanations where needed, depending on the intended audience. Poster contains 2 x tables/flowcharts comparing and contrasting mutations and describing the mutation/mutagen that communicate the information required.
D(3-4)	Information is communicated but uses language that is too complex or too simple for the intended audience. There is some use of scientific terminology but without appropriate explanations and the presentation does not allow for a particular audience. Poster contains only one of the tables or flowcharts required or they are partially completed.
E (0-2)	Information is communicated poorly, with little regard for the audience.The scientific terminology (if used) is beyond the understanding of the presenter and is not explained. Tables and flowcharts are missing or largely incomplete.

Bio 12-12: explains the structures of DNA and analyses the mechanisms of inheritance and how processes of reproduction ensure continuity of species.

	Explains the structures of DNA and analyses the mechanisms of inheritance and how processes of reproduction ensure continuity of species.
A (9-10)	Gives an extensive explanation of the structure of DNA including pictures/diagrams. Names the mutation correctly. Relates the structure of DNA to the way in which a mutation forms using well captioned diagrams and prose to clearly describe how the mutation occurs. Clearly shows the mechanism that allows the mutation to be passed on. Clearly describes the effect on phenotype.
B (7-8)	Gives a thorough explanation of the structure of DNA including pictures or diagrams. Names the mutation correctly. Relates the structure of DNA to the way in which a mutation forms using diagrams and prose to describe how the mutation occurs. Shows the mechanism that allows the mutation to be passed on. Describes the effect on phenotype.
C (5-6)	Gives a sound explanation of the structure of DNA which might include a picture or diagram. Shows the structure of DNA and gives some indication of the changes that can occur in the

	DNA that lead to mutations. Gives an indication that mutations are passed on through a mechanism. Mention phenotype, but no changes
D(3-4)	Gives a basic explanation of the structure of DNA. Has a picture/diagram that shows either the structure of DNA or the change that occurs in the code when a mutation occurs. Shows the mechanism that allows the mutation to be passed on. Mention changes, but not phenotype.
E (0-2)	Gives a limited explanation of the structure of DNA. Has a picture/diagram that shows either the structure of DNA or the change that occurs in the code when a mutation occurs.Indicates that the mutation can be passed on. Does not mention the effect on phenotype.

				To what extent is the impact effective?
			What is the impact? How does this relate to the set criteria/main idea?	What is the impact? How does this relate to the set criteria/main idea?
		What is the function or purpose? What is the effect of component? 'Why' may need to be addressed	What is the function or purpose? What is the effect of component? Give evidence. 'Why' may need to be addressed	What is the function or purpose? What is the effect of component? 'Why' may need to be addressed
	What are the features and characteristics?	What are the features and characteristics?	What are the features and characteristics?	What are the features and characteristics?
What is the main component?	What is the main component?	What is the main component?	What is the main component?	What is the main component?
IDENTIFY (Main Concept)	**DESCRIBE**	**EXPLAIN/ANALYSE**	**CRITICALLY ANALYSE**	**EVALUATE**

Senior ALARM steps 10-12
Which verb is used in the question?
Follow the steps in the column that corresponds to that verb.