102/1

MARKER CODE

Student Personal Identification Number

South Pacific Form Seven Certificate

BIOLOGY

2021

QUESTION and ANSWER BOOKLET

Time allowed: Three hours

(An extra 10 minutes is allowed for reading this paper.)

INSTRUCTIONS

Write your **Student Personal Identification Number (SPIN)** in the space provided on the top right-hand corner of this page.

Answer **ALL QUESTIONS**. Write your answers in the spaces provided in this booklet.

If you need more space for answers, ask the Supervisor for extra paper. Write your SPIN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

Major Learning Outcomes (Achievement Standards)	Skill Level & Number of Questions				Weight/ Time
	Level 1 *Uni-structural*	Level 2 *Multi-structural*	Level 3 *Relational*	Level 4 *Extended Abstract*	
Strand 1: Animal Behaviour Demonstrate an understanding of **biological concepts and processes** relating animal behaviour to biotic and abiotic environmental factors and how the behaviour **contributes to the organism's survival**.	4	1	0	1	10% 30min
Strand 2: Gene Expression Describe, explain and discuss **biological concepts and processes** relating to gene expression.	6	4	2	0	20% 60 min
Strand 3: Biotechnology Applications Describe, explain and discuss **biotechnology applications** and the **human needs and demands** for the applications.	2	0	1	0	5% 15 min
Strand 4: Processes and Patterns of Evolution Describe, explain and discuss **processes and patterns** of evolution.	6	2	2	1	20% 60 min
Strand 5: Environmental Issues Demonstrate an understanding of **biological concepts and processes** relating to contemporary environmental issues.	1	2	0	0	5% 15 min
TOTAL	**19**	**9**	**5**	**2**	**60% 180 min**

Check that this booklet contains pages 2–18 in the correct order and that none of these pages are blank.

HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

STRAND 1: ANIMAL BEHAVIOUR

Assessor's use only

1.1

"Salmon come back to the stream where they were 'born' because they 'know' it is a good place to spawn. Scientists believe that salmon navigate by using the earth's magnetic field like a compass. When they find the river they came from, they start using smell to find their way back to the stream of their birth."

Source: https://www.usgs.gov/faqs

Identify **one** feature of homing that is given in the example above.

_____

_____

Unistructural	
1	
0	
NR	

1.2

All organisms have a natural timing device that regulates the cycle of **circadian rhythms**.

Define the term **circadian rhythm**.

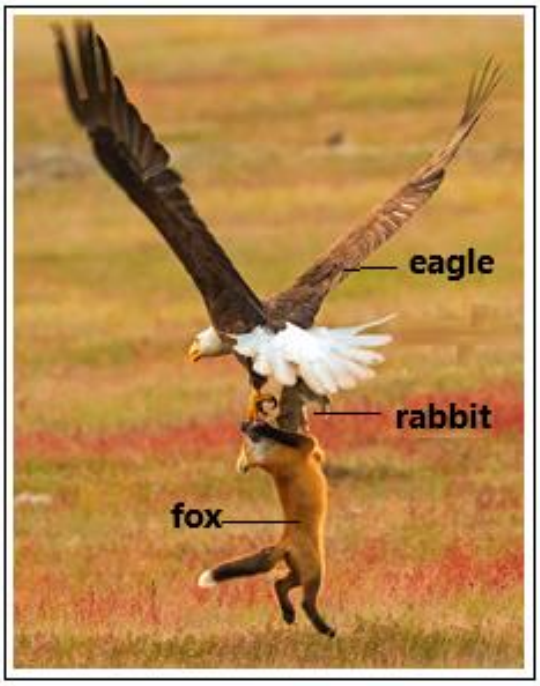
_____

_____

Unistructural	
1	
0	
NR	

1.3a

The photograph below shows an example of **interspecific competition** – an eagle and a fox competing for a rabbit.



Source : https://mymodernmet.com/kevin-ebi-wildlife-photography/

Define the term **interspecific competition.**

_____

_____

_____

Unistructural	
1	
0	
NR	

Assessor's use only

1.3b Discuss, using examples, how interspecific competition contributes to species redistribution.

Extended Abstract	
4	
3	
2	
1	
0	
NR	

Assessor's use only

Use the information given below to answer questions 1.4a and 1.4b.

"The social organization of groups of pigs is known to include the establishment of various friendly relationships and a social hierarchy. For the hierarchy to function properly the size of the group and the space allocated to it are important. Pigs established in a group are quickly able to recognize an alien in the group. Visual and olfactory cues seem to be the main differentiating features of pigs for each other.''

Source: Author: Syed Khawar Abbas Asad https://www.slideshare.net/

1.4a State **one** feature of social organisation in the given example.

_____

_____

_____

_____

Unistructural	
1	
0	
NR	

1.4b List **one advantage** and **one disadvantage** of group living.

_____

_____

_____

_____

_____

_____

_____

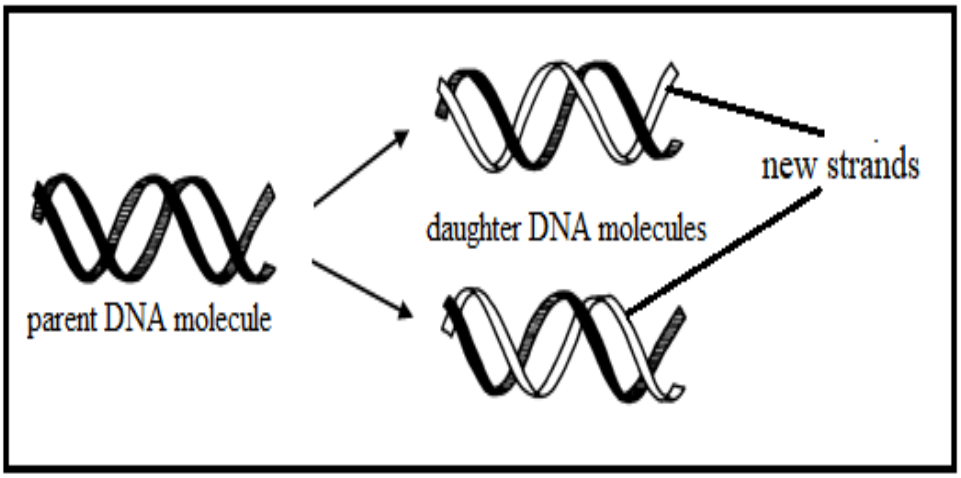
_____

Multistructural	
2	
1	
0	
NR	

STRAND 2: GENE EXPRESSION

Assessor's use only

2.1 Study the diagram of the DNA replication process given below.



Source: *https://www.pnas.org/content/44/7/671*

Identify **one** important characteristic of replication that is represented in the diagram.

_____

_____

_____

_____

Unistructural	
1	
0	
NR	

2.2 DNA replication is a highly accurate process, but mistakes can occasionally occur.

Describe how DNA replication problems may arise.

_____

_____

_____

_____

_____

_____

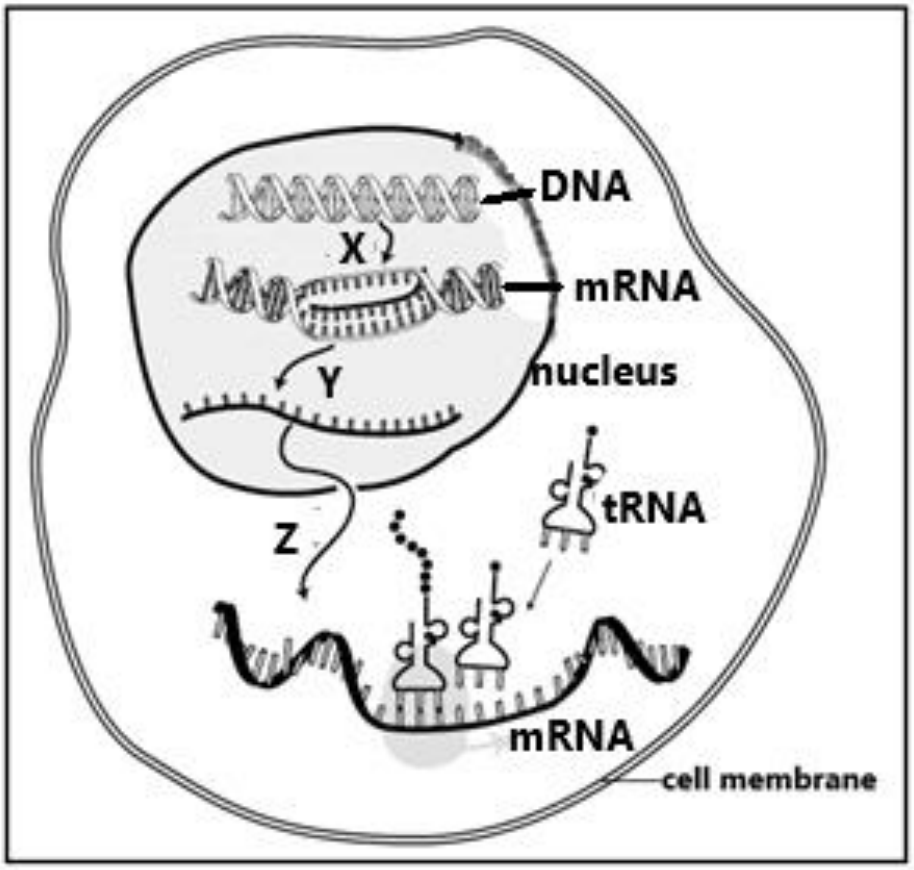
_____

_____

Multistructural	
2	
1	
0	
NR	

Assessor's use only

The diagram below shows a stage of Protein Synthesis. Use the diagram to answer questions 2.3a–2.3c.



Source : https://sites.google.com/site/proteinsynthesis/

2.3a Define **Protein Synthesis**.

_____

_____

_____

_____

Unistructural	
1	
0	
NR	

2.3b Which of the following letters in the diagram represents the process of transcription?

A. X
B. Y
C. Z

_____

Unistructural	
1	
0	
NR	

Assessor's use only

2.3c	Using the diagram above on Protein Synthesis as a guide, explain the relationship between transcription and translation. Your answer may include the roles of DNA, RNA, ribosomes, the use of the genetic code and its redundancy.	**Relational** 3 2 1 0 NR
2.4	Mutations are changes that occur in DNA sequences. Describe **one** feature of mutation using an example.	**Multistructural** 2 1 0 NR

Assessor's use only

2.5a	Many studies suggest that the occurrence of human aneuploidy is at least 5%. Define the term **aneuploidy.**	**Unistructural** 1 0 NR
2.5b	Explain the effects of aneuploidy on the genome using examples.	**Relational** 3 2 1 0 NR

Assessor's use only

2.6a

Use the information below to answer questions 2.6a and 2.6b.

The **metabolic pathway** in phenylketonuria or PKU is the conversion of phenylalanine into another amino acid, tyrosine.

Define **metabolic pathway**.

_____

_____

_____

Unistructural	
1	
0	
NR	

2.6b

Describe **one** characteristic of PKU.

_____

_____

_____

_____

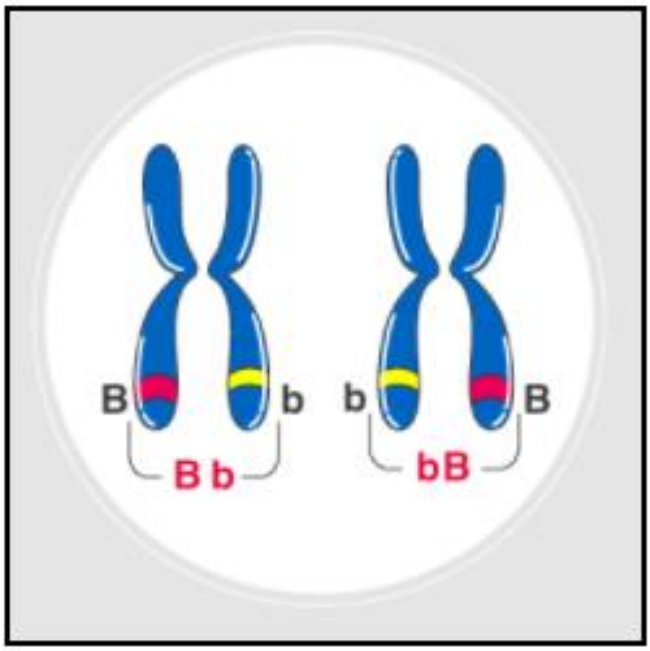
_____

_____

Multistructural	
2	
1	
0	
NR	

2.7

The diagram below shows chromosomes with heterozygous gene pairs.



Source: *https://byjus.com/biology/*

State **one** feature of a heterozygous gene pair.

_____

_____

_____

Unistructural	
1	
0	
NR	

Assessor's use only

2.8	A monohybrid test cross is carried out to determine the genotype of an organism showing a dominant phenotype. Describe the genotypes of the parents in a monohybrid test cross. _____ _____ _____ _____ _____ _____	**Multistructural** 2 1 0 NR

STRAND 3: BIOTECHNOLOGY APPLICATIONS

Assessor's use only

3.1

'**Short tandem repeat** (STR) typing methods are widely used today for human identity testing applications including forensic DNA analysis.'
Source: *https://www.future-science.com/*

Define **short tandem repeat**.

Unistructural	
1	
0	
NR	

3.2a

'After the 2004 Boxing Day tsunami, scientists travelled to Thailand to identify victims. In order to achieve this, specific DNA patterns were obtained from each person or body tissue sample.'
Source: *https://www.sciencelearn.org.nz/resources*

Identify the process used above to identify the victims of the tsunami.

Unistructural	
1	
0	
NR	

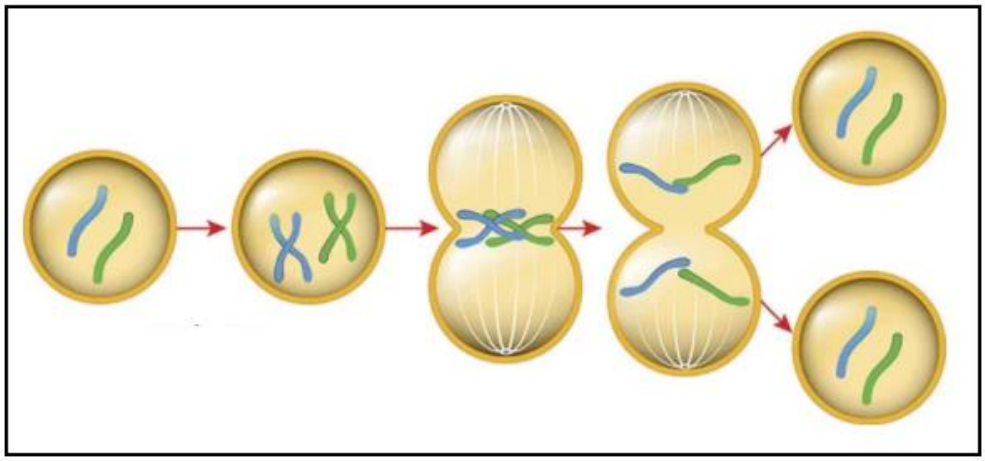
3.2b

Explain the positive impacts of DNA profiling on medical and health services.

Relational	
3	
2	
1	
0	
NR	

STRAND 4: PROCESSES AND PATTERNS OF EVOLUTION

Assessor's use only

4.1	Study the diagram given below of a cell division process.  *Source*: *https://microbenotes.com/* Identify the type of cell division process shown in the diagram above. _____ _____ _____	**Unistructural** 1 0 NR
4.2a	Charles Darwin was a British naturalist who proposed the theory of biological **evolution** by natural selection. Define **evolution.** _____ _____ _____	**Unistructural** 1 0 NR

Assessor's use only

4.2b

Discuss the impact of evolution on the survival of the species and the important role of variation in facilitating the evolution process.

In your answer, you may describe and/or explain the following:

- the link between evolution and survival of the species; and
- importance of variation in a population and its effect in promoting evolution.

Extended Abstract	
4	
3	
2	
1	
0	
NR	

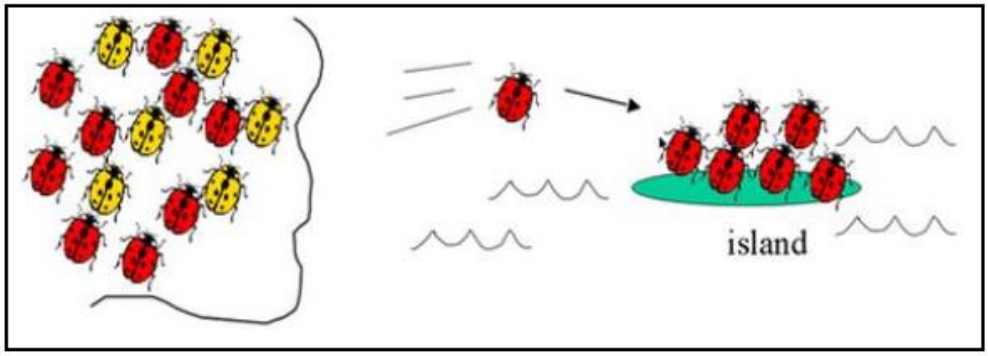
Assessor's use only

4.3	Explain the impact of selective breeding on the genetic diversity of a population.	

Relational	
3	
2	
1	
0	
NR	

Assessor's use only

Study the diagram below showing the process of the founder effect to answer questions 4.4a and 4.4b.



Source: *https://socratic.org/questions/*

4.4a Define the **founder effect**.

_____

_____

_____

Unistructural	
1	
0	
NR	

4.4b Describe **one** feature of the founder effect as a special case of genetic drift.

_____

_____

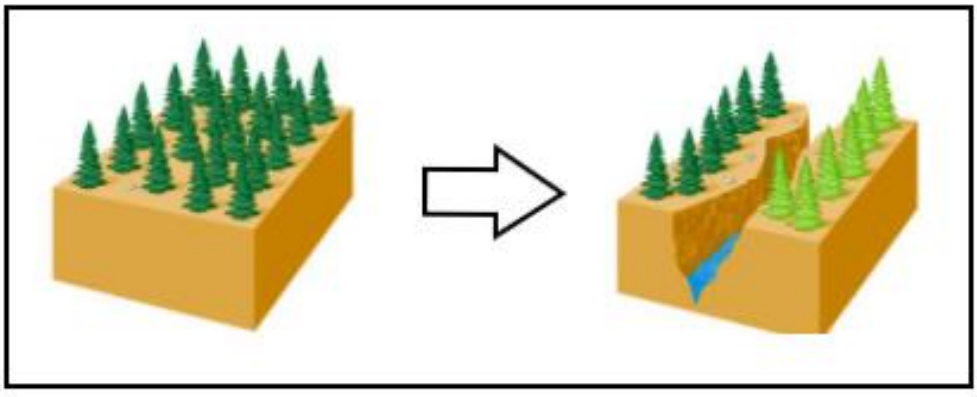
_____

_____

_____

Multistructural	
2	
1	
0	
NR	

4.5 Study the diagram given below.



Source: *https://www.slideserve.com/*

Identify the type of speciation shown in the diagram above.

_____

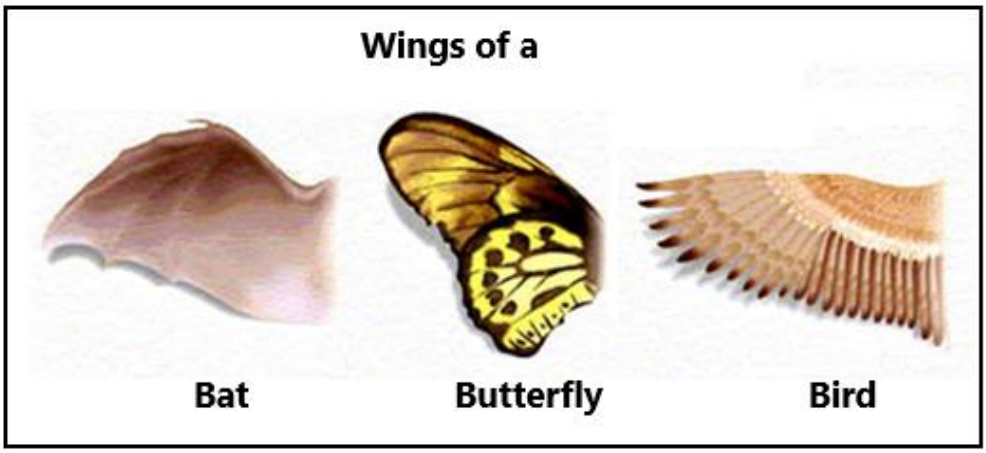
Unistructural	
1	
0	
NR	

Assessor's use only

4.6	Explain why behavioural isolation leads to reproductive isolation.	**Relational** 3 2 1 0 NR
4.7	State a feature of **hybrid sterility**.	**Unistructural** 1 0 NR

Assessor's use only

Refer to the diagram given below on analogous structures to answer questions 4.8a and 4.8b.



Source: *https://quizlet.com/*

4.8a Define the term **analogous structures**.

Unistructural	
1	
0	
NR	

4.8b Analogous structures are believed to arise through **convergent evolution.**

Describe **one** feature of convergent evolution.

Multistructural	
2	
1	
0	
NR	

STRAND 5: ENVIRONMENTAL ISSUES

Assessor's use only

5.1	'Coral reefs sustain the lives of many Pacific Islanders. More than 80% of Pacific Islanders live in or near coastal areas and draw from coral reefs for their livelihoods.' *Source: https://www.sprep.org/climate_change* List **two** effects of climate change on coral reefs. _____ _____ _____ _____ _____ _____	**Multistructural** 2 1 0 NR
5.2a	Sustainability and conservation are words usually heard in discussions on the environment – both concepts emphasise caring and advocating for the planet, and protecting its natural resources and ecosystems. Name **one** conservation practice. _____ _____	**Unistructural** 1 0 NR
5.2b	Using an example, describe **one** renewable source of energy. _____ _____ _____ _____ _____ _____	**Multistructural** 2 1 0 NR

THE END