

BA PROVINCIAL FREE BIRD INSTITUTE

ANNUAL EXAMINATION 2020

YEAR 12 BIOLOGY

Time Allowed: 3 hours

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

INSTRUCTIONS

1. Write your **Name** on the front page .
2. Write **all** your answers in the **Answer Booklet** provided.
3. If you use extra sheets of paper, be sure to show clearly the question number(s) being answered and to tie each sheet in your **Answer Booklet** at the appropriate places.
Ensure that your **Name** is written on the extra sheets.
4. Answer **all** the questions with a blue **or** black ballpoint pen or ink pen. Do **not** use red ink. You may use a pencil **only** for drawing.
5. You may use a calculator, provided it is silent, battery-operated and non-programmable.

SUMMARY OF QUESTIONS

STRAND	GUIDELINES	TOTAL MARK	SUGGESTED TIME
1	There are 14 Multiple Choice questions, 18 Short Answer questions; and one essay question. Questions 1-32 are compulsory	64	115 minutes
2	There are 3 Multiple Choice questions, 3 Short Answer questions, and one essay question. Questions 1-6 are compulsory.	14	25 minutes
3	There are 3 Multiple Choice questions, 2 Short Answer questions; and one essay question. Questions 1-5 are compulsory.	12	21 minutes
Essay	There is one essay question under each strand. Answer only one question from any strand of your choice.	10	19 minutes
TOTAL		100	180 minutes

INSTRUCTIONS

Multiple Choice Questions

Circle the letter that represents the best answer in the grid provided in each strand in the **Answer Booklet**. Each question is worth 1 mark.

Short Answer Questions

Write your answers in the spaces provided in the **Answer Booklet**.

Essay Questions

There are three essay questions, one each under the respective strand. Answer only one question.

STRAND 1 : STRUCTURE AND LIFE PROCESSES

[64 marks]

MULTIPLE CHOICE QUESTIONS

[14marks]

1. An alternative form of the gene coding for a particular trait is known as

- A. genotype
- B. genome
- C. allele
- D. gene pool

2. In a **test cross**, the organism to be tested is mated with one that is

- A. heterozygous for the trait
- B. homozygous recessive for the trait
- C. homozygous dominant for the trait
- D. of the same genotype as the organism being tested

3. DNA was extracted from the cells of a rabbit and analysed. The table below shows the percentage abundance of each base in the DNA extract.

Guanine	Adenine	Cytosine	Thymine
30 %	X %	Y %	Z %

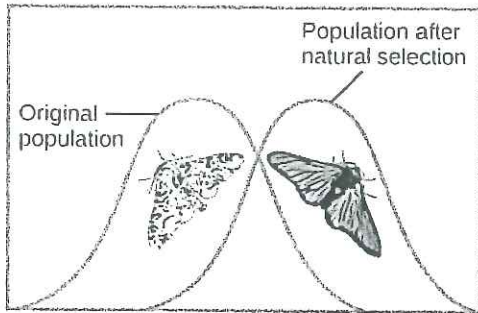
The percentage abundance of **Thymine** base in the DNA extract is

- A. 20 %
- B. 30 %
- C. 40 %
- D. 60 %

STRAND 1 : STRUCTURE AND LIFE PROCESSES (continued)

4. The graph below is of peppered moths. The light-coloured peppered moths are better camouflaged against a pristine environment likewise , dark-colored peppered moths are better camouflaged against a sooty environment.

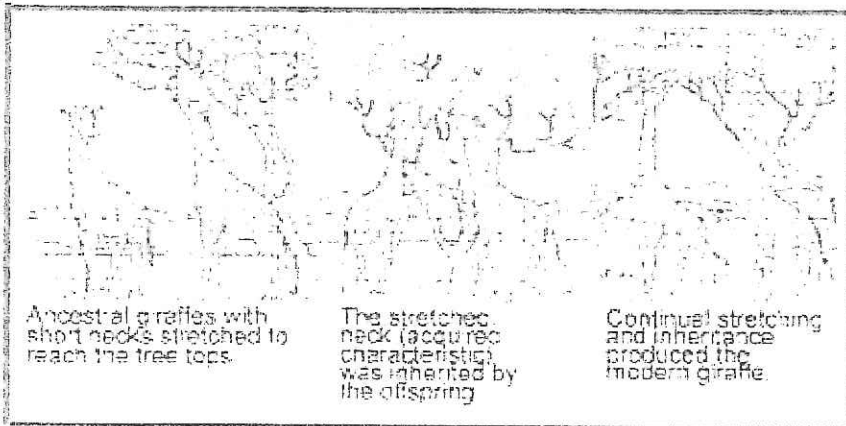
Thus, as the industrial revolution progressed in nineteenth century England, the color of the moth population shifted from light to dark.



Source : <https://biologydictionary.net>

The illustrated in the above example is

- A. Lamarck's Theory
 - B. Adaptive radiation
 - C. Sympatric speciation
 - D. Natural selection
5. The series of diagrams below represents



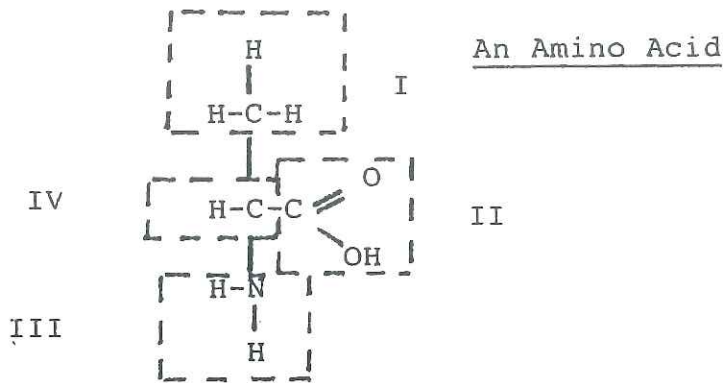
Source : <https://edu.glogster.com>

- A. Darwin's Theory
- B. Lamarck's Theory
- C. Adaptive Radiation
- D. Sympatric speciation

6. The type of skeleton found in **cnidarians** is

- A. endoskeleton
- B. exoskeleton
- C. hydrostatic skeleton
- D. contractile skeleton

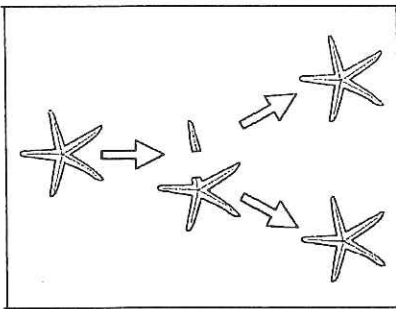
7. Shown below is the structural formula of an amino acid.



The variable group is shown by

- A. I
- B. II
- C. III
- D. IV

8. Which method of asexual reproduction is shown in the diagram of a starfish below ?



Source : <https://socratic.org/questions>

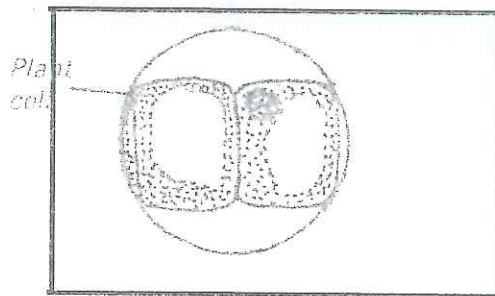
- A. budding
- B. binary fission
- C. fragmentation
- D. hermaphroditism

9. Which of the following is **not** a property of an enzyme ?

- A. enzymes work by lowering a reactions activation energy
- B. enzymes are changed by the reactions they catalyse
- C. enzymes are affected by inhibitors
- D. many enzymes require co-factors to function

10. Using a microscope, a student was able to see the following at a magnification of 400X.



If the magnification is changed to 100x, how many cells would be seen ?




- A. 1 B. 2 C. 4 D. 8

11. The characteristics described below is of a person having syndrome known as

- Mental retardation
- Short stature
- Hypotonia
- Depressed nasal bridge, upslanting palpebral fissures, epicanthal fold (a skin fold of the upper eyelid covering the inner corner of the eye)
- Congenital heart defects (~40% of cases)
- Alzheimer disease by 5th or 6th decade (amyloid precursor protein, APP gene on chromosome 21)
- Reduced fertility



Source : <https://www.memorangapp.com>

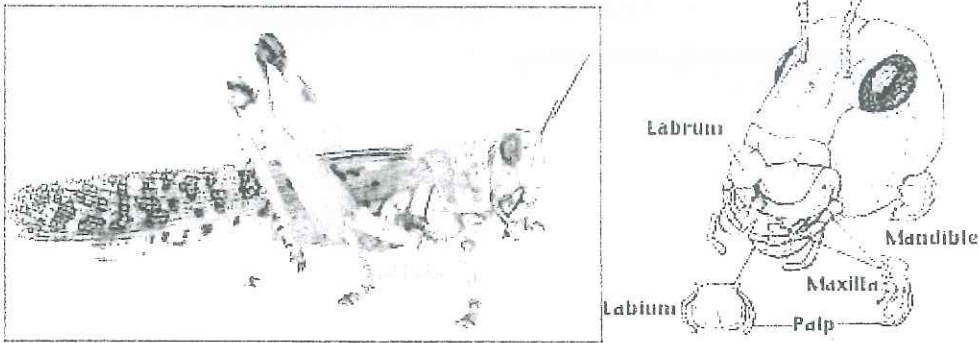
- A. Downs Syndrome
 B. Klinefelter's Syndrome
 C. Turners Syndrome
 D. Patau's Syndrome
12. The gas exchange structure found in mangroves is

- A. sieve plates
 B. stomata
 C. lenticels
 D. pneumatophores

Turn Over

STRAND 1 : STRUCTURE AND LIFE PROCESSES (continued)

13. The mandible in a grasshopper shown in the diagram below is used for



Source : <https://socratic.org/questions>

- A. holding grass
- B. cutting grass
- C. moistening food
- D. passing food into mouth

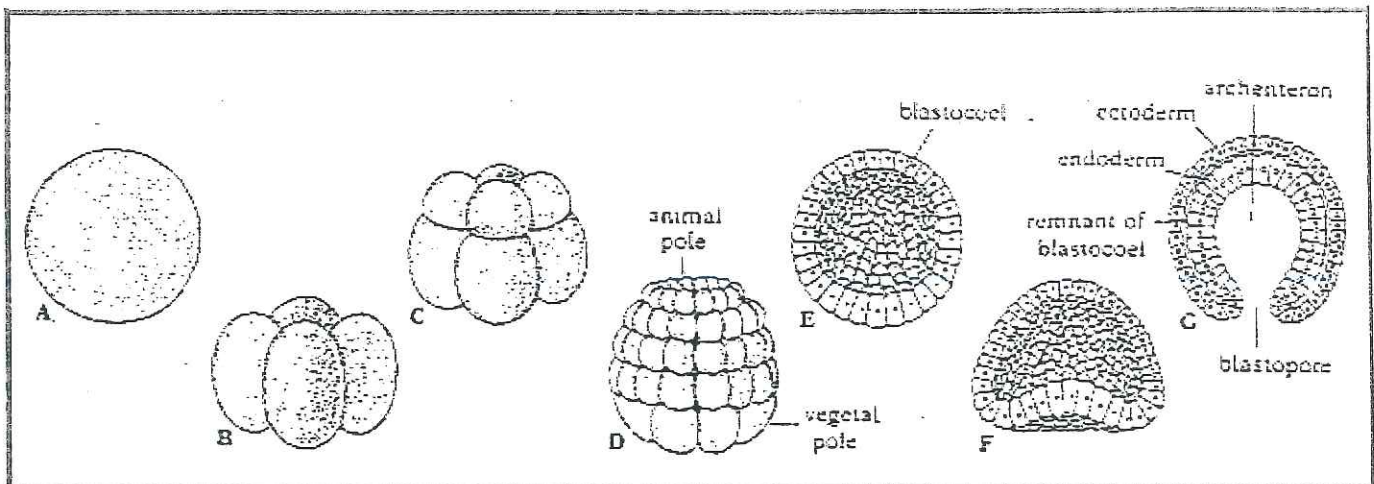
14. Earthworms are said to be **hermaphrodites** which means that an earthworm

- A. has both male and female reproductive organs
- B. can reproduce from an unfertilized egg
- C. can undergo regeneration
- D. can reproduce sexually by self-fertilisation

SHORT ANSWER QUESTIONS

[50 marks]

15. The diagram below shows stages of embryonic development.



Source : <http://www.twow.net/ObjText/OtkCbGeRRS04D.htm>

Identify, name and describe the structures :

(i) A

(ii) C

(iii) E

(3marks)

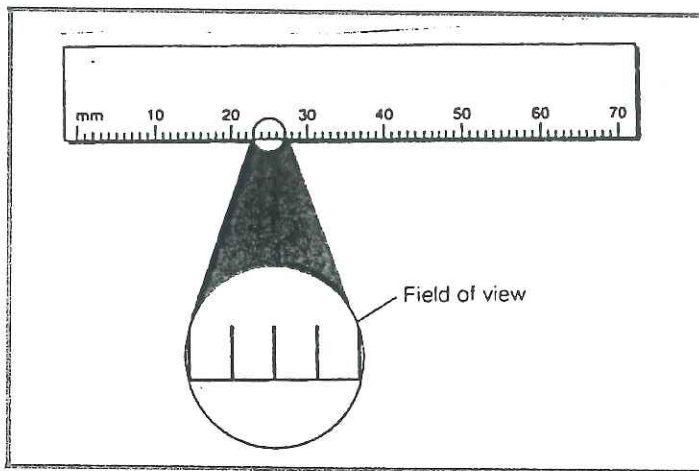
(iv) Name and describe the process which leads to the formation of structure G.

(1mark)

(v) There are three types of changes the cells experience in the process stated in Q(iv) above. Describe any two changes.

(2marks)

16. A millimeter ruler was seen under the microscope at 100x as shown.



Calculate the diameter of the field of view at 400x magnification in micrometers.

(2marks)

17. Prokaryote cells and eukaryote cells differ in a number of ways.

In the table given, place a tick if description is correct where applicable.

Description	Prokaryotes	Eukaryotes
Chromosome is circular		
Transcription & translation occurs sequentially		
Chlorophyll contained in the chromatophores		
Bidirectional DNA replication		

(2marks)

Turn Over

STRAND 1 : STRUCTURE AND LIFE PROCESSES (continued)

18. One part of the DNA molecule has a section with the following sequence:

A - T - G - C - A - T - G - C - T - A - C - T sense strand

(i) Use the table below to determine the sequence of amino acids that is being coded for in this case.

(1 mark)

		SECOND CODON ELEMENT				
FIRST CODON ELEMENT	U	U	C	A	G	THIRD CODON ELEMENT
		PHE PHE LEU LEU	SER SER SER SER	TYR TYR TERMINATE TERMINATE	CYS CYS TERMINATE TRP	
C	LEU LEU LEU LEU	PRO PRO PRO PRO	HIS HIS GLU GLU	ARG ARG ARG ARG	U C A G	
	A	ILE ILE ILE MET	THR THR THR THR	ASPN ASPN LYS LYS	SER SER ARG ARG	U C A G
G		VAL VAL VAL VAL	ALA ALA ALA ALA	ASP ASP GLU GLU	GLY GLY GLY GLY	U C A G

A **mutation** changes the sequence of components to the new one below.

A - T - **C** - C - A - T - G - C - T - A - C - T

↑

(ii) Use the table to describe the effect that this mutation will have on the sequence of amino acids being coded for. (1mark)

(iii) What term is used to describe the type of mutation that has occurred in the original sequence of DNA ? (1mark)

(iv) Effects of mutation can be both harmful as well as beneficial.

State one harmful and one beneficial effect of mutation.

(2marks)

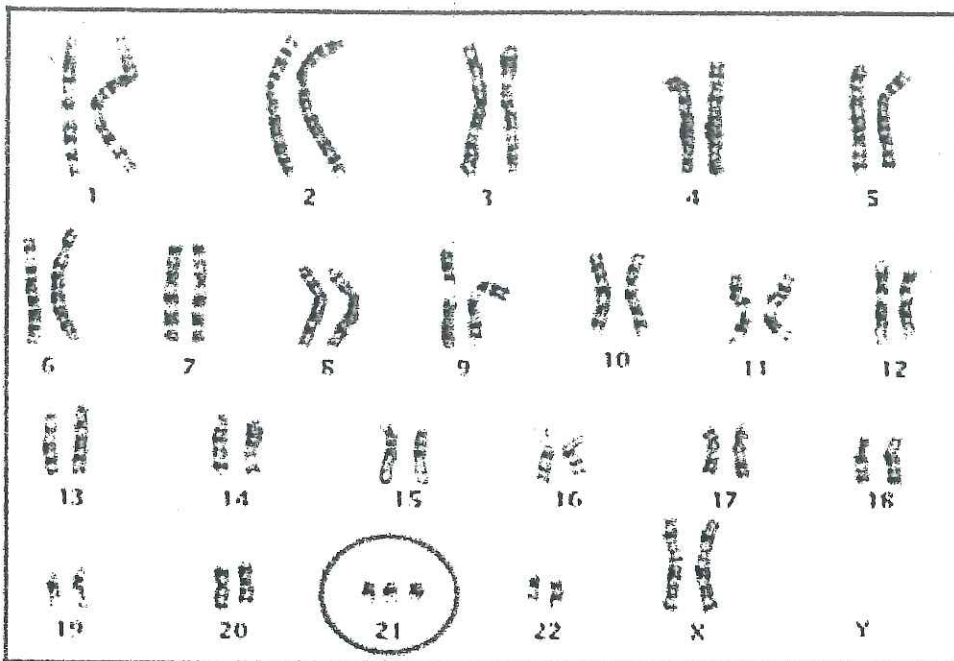
19. Differentiate between the following processes :

(i) **Hydrolysis** reaction and **Condensation** reaction. (2marks)

(ii) **Transcription** and **DNA Replication** . (2marks)

20. Explain why DNA replication is called a **semi-conservative** process. (1mark)

21. Shown below is a **human karyotype**.



Source : <http://www.downsyndromereport.weebly.com>

(i) Does this karyotype belong to a male or female ? Support your answer with a reason.

(2marks)

(ii) The chromosomes have been arranged in categories 1-23.

State **two features** used to classify them into their categories.

(2marks)

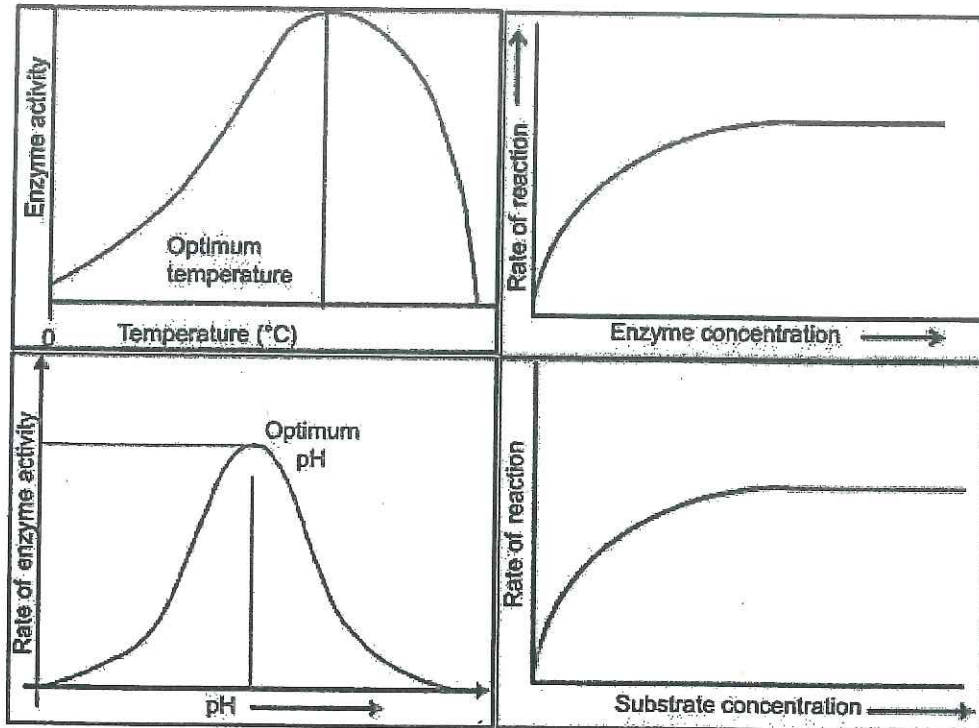
(iii) Identify and name the disorder shown in the karyotype.

(1mark)

Turn Over

22.

The diagram below shows the action of peroxidase and how the surface area of substrate affects enzyme action. Use the diagram and your knowledge to answer the questions that follow.



Source: <https://www.sciencedirect.com/topics/engineering/enzyme-concentration>

- (i) Name the substrate which is broken down by peroxidase. **(1 mark)**
- (ii) Suggest reasons for the difference in the reaction rates observed. **(1 mark)**
- (iii) What effect does heating to boiling have on enzymes? **(1 mark)**
- (iv) Briefly explain the relationship between surface area of substrate and rate of enzyme action. **(1 mark)**