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南洋女子中學校
Nanyang Girls' High School
End-of-Year Examination 2021
Secondary Three

IP BIOLOGY
Paper 1 Multiple Choice

Thursday 7 October 2021

Additional materials: OAS

45 minutes
1130 – 1215

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your name, register number and class at the top of this page and on the OAS in the spaces provided.

There are **thirty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **pencil** on the separate OAS provided.

Read the instructions on the OAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

This document consists of **16** printed pages.

Setter: LZJ, TZZ

NANYANG GIRLS' HIGH SCHOOL

[Turn over

- 1 Which row is correct in matching the tissue to the correct organ found in a living organism?

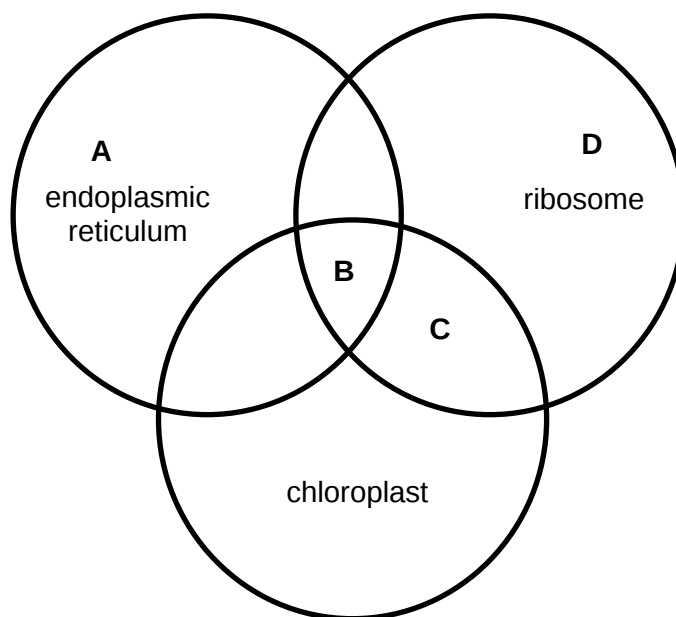
	organ	tissue
A	brain	hepatic cells
B	leaf	mesophyll cells
C	oesophagus	hepatic cells
D	stem	mesophyll cells

- 2 Brefeldin A is a drug that inhibits the formation of vesicles at the rough endoplasmic reticulum.

What are the other cell structures that will be affected by this drug?

- A** lysosomes and centrioles
B lysosomes and cell membrane
C cytoplasm and ribosomes
D nucleus and cell wall
- 3 Cyanobacteria are prokaryotes capable of performing photosynthesis.

Which of these structures are present in the cyanobacteria?



- 4 A gene contains 900 phosphate groups.

How many bases will the gene contain?

- A 450
- B 900
- C 1800
- D 2700

- 5 Some of the processes of protein synthesis are listed.

1. hydrolysis of amino acids
2. positioning of adjacent amino acids
3. formation of polypeptide chains
4. binding of amino acids to mRNA

Which of these processes are correct?

- A 1 and 2
- B 1 and 4
- C 2 and 3
- D 3 and 4

- 6 The order of bases in a short length of one strand of DNA is shown below.

G A A T T A

What is the sequence on the other strand of DNA and its mRNA?

	the sequence on the other DNA strand	the sequence on the mRNA molecule
A	TAATTC	CTTAAT
B	TAATTC	GAATTA
C	CTTAAT	CUUAAU
D	CUUAAU	GAAUUA

7 Which of the following statements are always true of dominant alleles?

1. They cannot undergo mutation.
2. They give a better advantage to the organism than the recessive allele.
3. They give the same phenotype in heterozygotes and homozygotes.
4. They occur more frequently in the population than the recessive alleles.
5. They occupy the same position as the recessive allele on a pair of homologous chromosomes.

- A** 1, 2 only
- B** 3 and 4 only
- C** 3 and 5 only
- D** 3, 4 and 5 only

8 The inheritance of blood type is an example of codominance in humans.

What are the possible blood types of children born to a woman who is heterozygous for her blood type and a man with blood type AB?

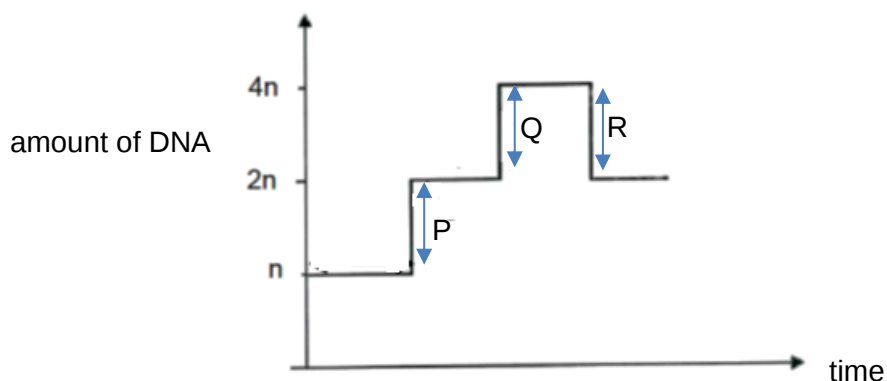
- A** A and AB only
- B** A and B only
- C** A, AB and O only
- D** A, AB and B only

9 Haemophilia is a sex-linked recessive condition. A haemophiliac man has one son who has inherited haemophilia and two more sons who have not.

The man's wife is pregnant again. If this baby is a girl, what is the chance that she will have haemophilia?

- A** 0 %
- B** 25 %
- C** 50 %
- D** 75 %

- 10** The figure below shows the changes in the amount of DNA in a cell over a period of time.



What is represented by P, Q and R?

	P	Q	R
A	cytokinesis	interphase	fertilisation
B	fertilisation	interphase	cytokinesis
C	interphase	fertilisation	anaphase
D	prophase	interphase	anaphase

- 11** Which stages of mitosis ensure that each daughter cell has received a chromatid from each replicated chromosome?

- A** anaphase and metaphase
- B** anaphase and telophase
- C** interphase and prophase
- D** metaphase and prophase

- 12** Which of the statement(s) about cytokinesis is/are true?

- 1. cell structures replicate
- 2. formation of cleavage furrows
- 3. DNA replicates
- 4. nuclear membrane reforms

- A** 2 only
- B** 2 and 4 only
- C** 2 and 3 only
- D** 1, 3 and 4 only

- 13** Which chemical change takes place in green plants but **not** in animals?
- A** glucose → cellulose
B glucose → glycogen
C glycogen → cellulose
D glycogen → glucose
- 14** Lactose is a type of disaccharide. Which of the following shows the correct chemical formula for lactose?
- A** $(C_6H_{10}O_5)_2$
B $(C_6H_{12}O_6)_2$
C $C_{12}H_{22}O_{11}$
D $C_{12}H_{24}O_{12}$
- 15** An investigation was performed where four equal masses of different foods were burned to heat up a fixed volume of distilled water contained in a boiling tube.

The temperature of the water was measured before and after each experiment. The results are recorded in the table below.

food	initial water temperature / °C	final water temperature / °C
1	20	87
2	21	97
3	23	34
4	22	88

Which row shows the most likely order of the food in terms of lipid content?

	food with least lipid content  food with most lipid content			
A	1	2	3	4
B	2	1	4	3
C	3	4	1	2
D	4	3	2	1

16 Which row represents the correct features of a phospholipid molecule?

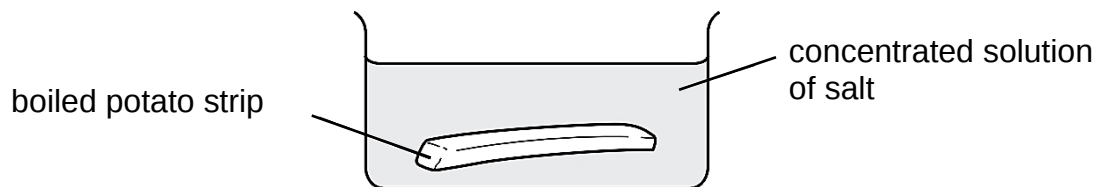
	can be modified into glycolipid	has glycerol moiety in the structure
A	X	X
B	X	√
C	√	X
D	√	√

key

√ = true

X = false

17 A peeled, boiled potato strip is placed in a concentrated solution of salt. Which processes will take place?



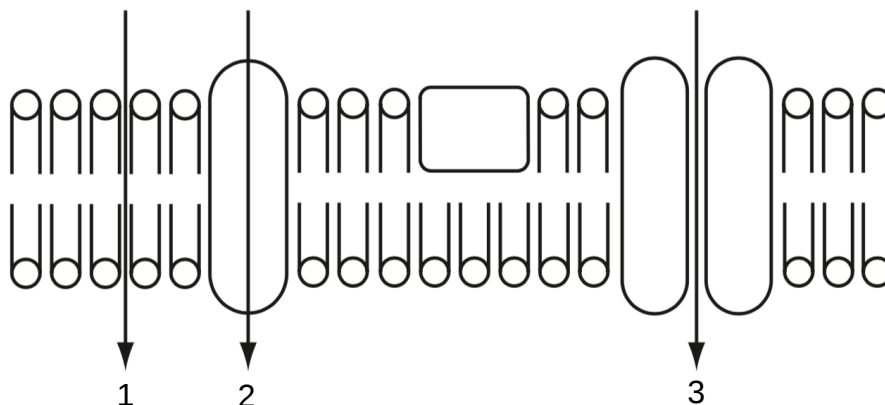
	osmosis	solute diffusion
A	√	√
B	√	X
C	X	√
D	X	X

key

√ = takes place

X = does not take place

- 18** The diagram shows three routes, 1, 2 and 3, through which substances can pass across a cell surface membrane.



Which row correctly shows the routes taken by a water-soluble amino acid and the fat soluble vitamin E?

	amino acid	vitamin E
A	1	2
B	1	3
C	2	1
D	3	1

- 19** According to the 'lock and key' hypothesis, what is the 'lock' and what is the 'key' for the enzyme amylase?

	'lock'	'key'
A	amylase	starch
B	amylase	glucose
C	glucose	amylase
D	starch	amylase

- 20** A student investigated the effect of temperature on an enzyme-catalysed reaction and recorded the results in the table. All other variables were kept constant.

temperature / °C	rate of reaction / arbitrary units
10	3
20	7
30	16
40	33
50	32
60	14

Which statement correctly explains the results?

- A** At 10 °C, the enzyme molecules are partially denatured.
- B** At 30 °C, bonds are formed between enzyme and substrate molecules.
- C** At 40 °C, the kinetic energy of enzyme molecules is the highest.
- D** At 60 °C, enzyme-substrate complexes are formed at the highest rate.
- 21** An enzyme is found to catalyse blood clotting. The activity of the enzyme was investigated by recording the time taken for the enzyme to clot blood in different conditions. The table shows the different conditions used and the results of the investigation.

tube	volume added to 10 cm ³ of blood / cm ³				time to clot blood / s
	3 % enzyme	retinoic acid	water	zinc ions	
1	5	3	0	2	60
2	5	3	2	0	600
3	5	0	3	2	1500
4	0	3	5	2	no clot

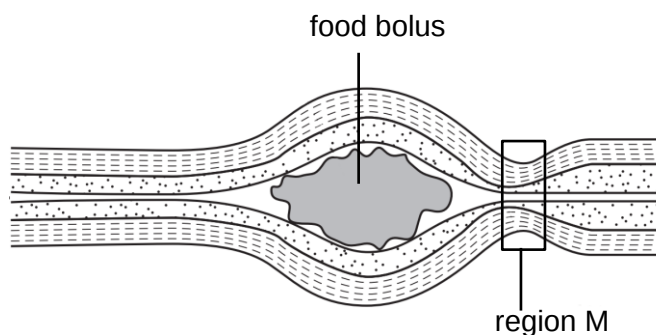
Based on the results, what is an **incorrect** conclusion?

- A** Denaturation of the enzyme occurs due to retinoic acid.
- B** Retinoic acid is essential for the activity of the enzyme.
- C** Water decreases the activity of the enzyme.
- D** Zinc ions increase the activity of the enzyme.

22 Which region in the alimentary canal absorbs the **highest** volume of water?

- A** colon
- B** duodenum
- C** ileum
- D** mouth

23 The diagram shows a food bolus moving along the alimentary canal.



Which row identifies the direction of movement of the food bolus and the muscle type with its actions at region M?

	direction of movement of food bolus	muscle type	muscle action
A	left	circular	relaxing
B	left	longitudinal	relaxing
C	right	circular	contracting
D	right	longitudinal	contracting

24 A student made notes about digestive structures involved in digestion in humans.

organ 1 The hydrolysed products have lesser bonds present.

organ 2 Antagonistic contractions of muscles help to break up food.

organ 3 The rate of starch digestion is increased mechanically.

organ 4 Polypeptides are formed from protein digestion.

Which table identifies the correct organ and the type of digestion involved?

A

	mouth	stomach
chemical digestion	1	4
physical digestion	2	3

B

	mouth	stomach
chemical digestion	3	1
physical digestion	4	2

C

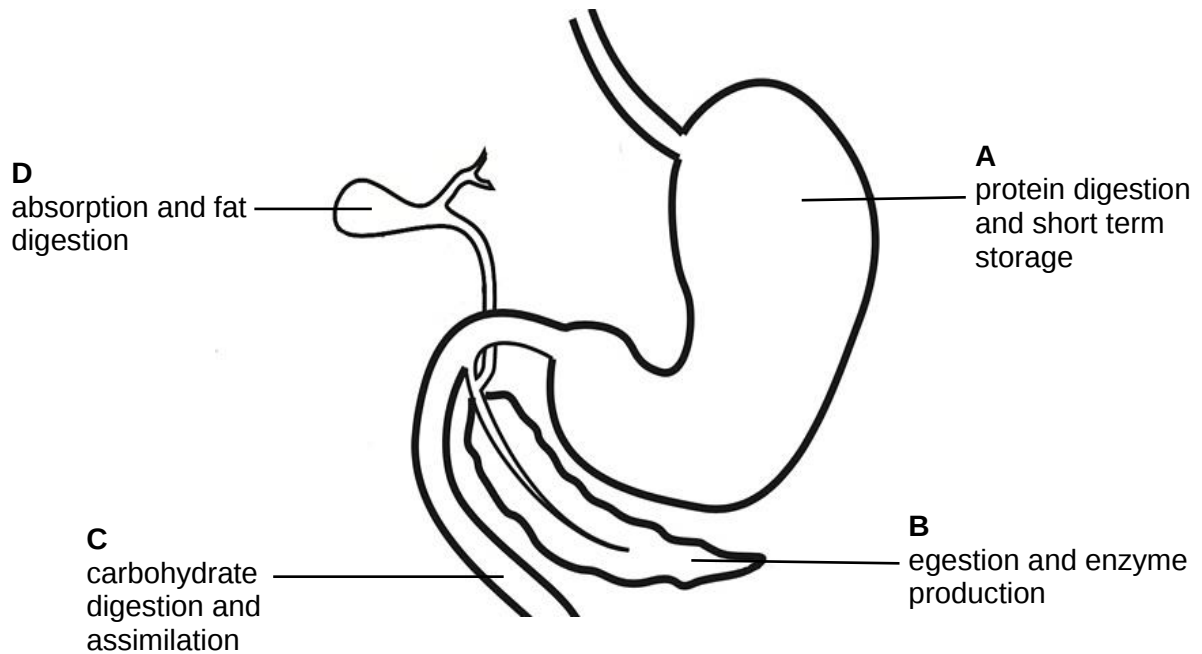
	mouth	stomach
chemical digestion	2	1
physical digestion	3	4

D

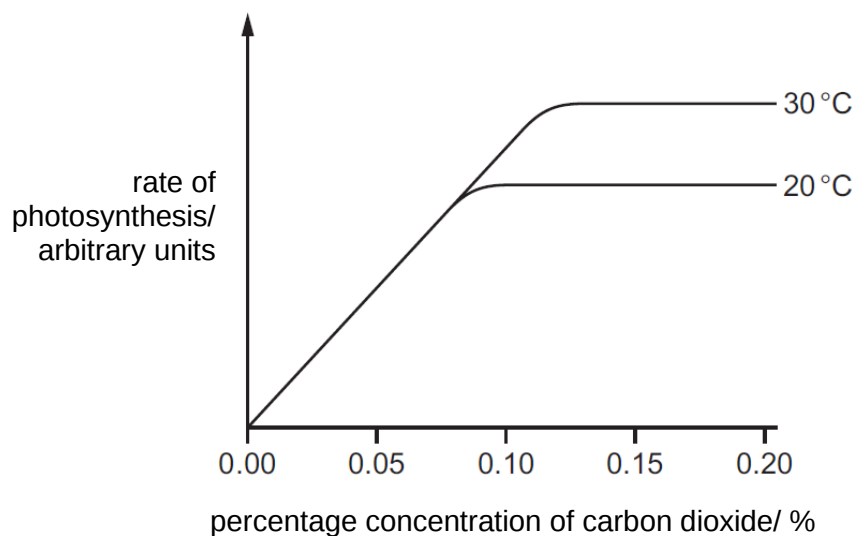
	mouth	stomach
chemical digestion	1	4
physical digestion	3	2

- 25** The diagram shows part of the alimentary canal and its associated organs with labels for their functions.

Which label is correct?



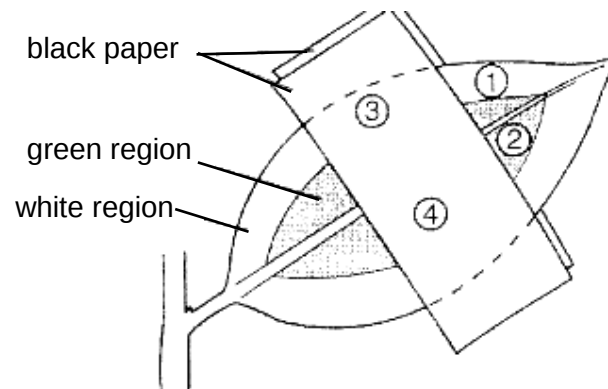
- 26** The graph shows the rate of photosynthesis in a plant in full sunlight at two different temperatures and different concentrations of carbon dioxide.



Which of the following statement(s) about the graphs is/are correct?

1. At normal atmospheric carbon dioxide concentration, carbon dioxide is a limiting factor.
 2. At 0.10% carbon dioxide, temperature is a limiting factor.
 3. At low temperature, the plant is unable to photosynthesise.
 4. Carbon dioxide concentration is always a limiting factor.
- A** 2 only
B 1 and 2 only
C 3 and 4 only
D 1, 3 and 4 only

- 27** The diagram shows a destarched, variegated leaf covered by black paper. The plant is placed in bright light for several hours. Four discs are then cut from the leaf in the positions shown and are tested for starch.

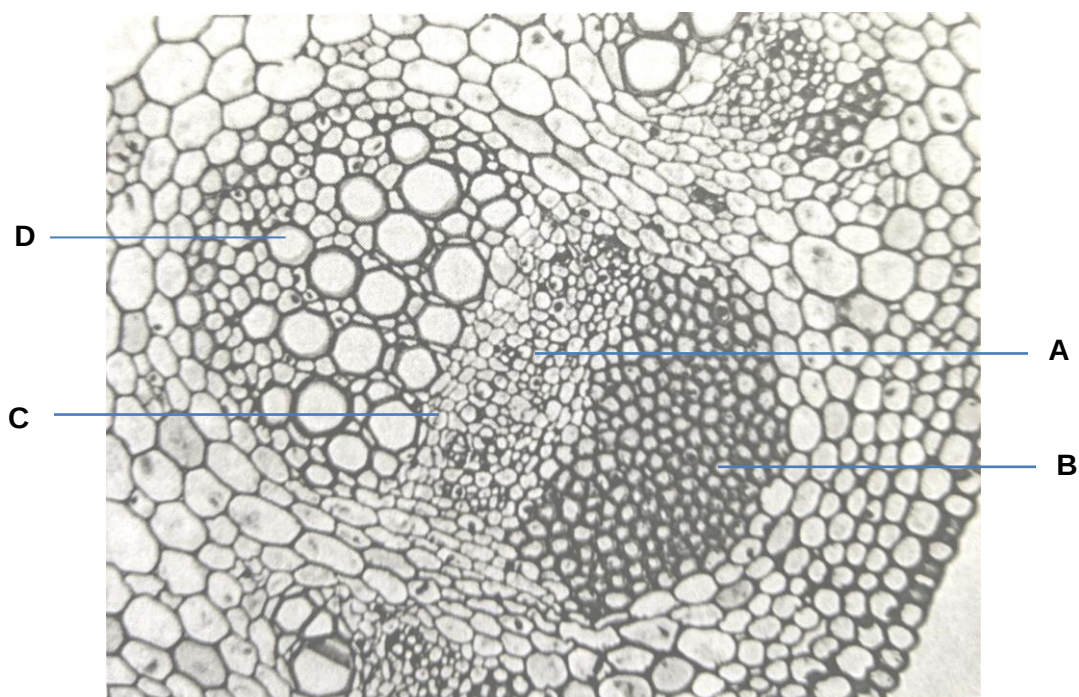


Which discs should be used for comparison to conclude that chlorophyll is required for photosynthesis?

- A** 1 and 2 only
 - B** 1 and 4 only
 - C** 1, 2 and 3 only
 - D** 2, 3 and 4 only
- 28** What is the main function of a companion cell in the phloem tissue?
- A** provides cytoplasmic contact with the sieve tube element for sugar loading
 - B** provides DNA for repair of the phloem
 - C** provides storage for sugars
 - D** provides structural support for the sieve tube element

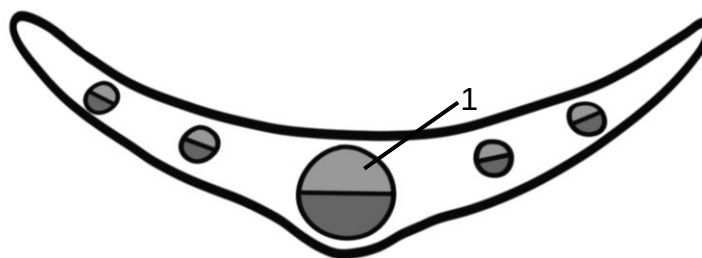
29 The diagram shows a transverse section of the stem of a plant.

In which region does translocation occur?



30 The diagram shows the cross section of a leaf seen under the microscope.

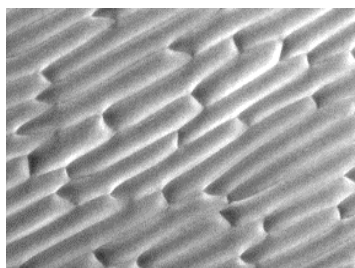
Which tissue is found in the area labelled 1?



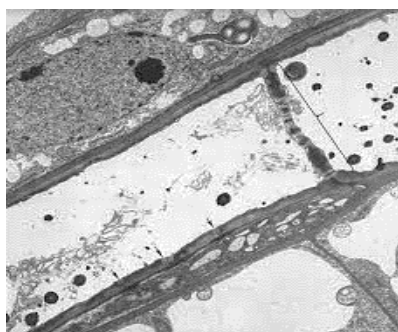
A



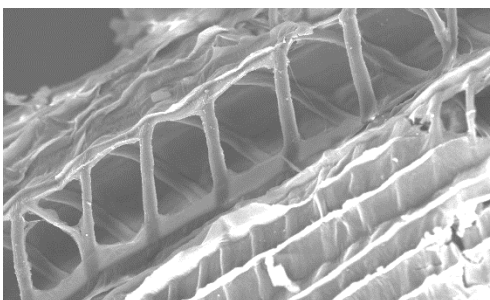
B



C



D



End of Paper 1