Name:…… **Class:……**

Section A

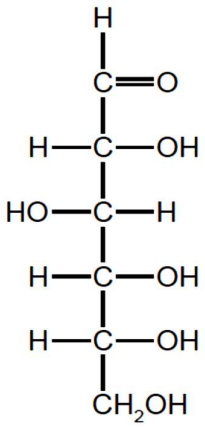
[15 *marks*]

Answer **all** *questions in this section*.

1 Why may fish living in ponds survive temperatures below 0 °C in winter?

A Fish body tissues produce an enzyme which prevents blood from freezing.
B The plants in the pond help to keep the water temperature above 0 °C.
C The rocks in the pond warm up during the day and heat the water.
D The ice on the pond surface insulates the water in the pond.

2 The structural formula of a carbohydrate molecule can be shown as:



Which of the molecules could be represented by this formula?

1 α glucose
2 deoxyribose
3 ribose

A 1 only
B 2 only
C 2 and 3 only
D 1, 2 and 3

3 Features of four proteins, W, X, Y and Z, are described below.

W consists of two polypeptides held together by disulfide bonds
X consists of three polypeptides tightly coiled together
Y consists of four polypeptides each with a prosthetic group
Z consists of four polypeptides held together by disulfide bonds

Which row correctly identifies the named proteins?

	Antibody	Collagen	Haemoglobin
A	W	X	Y
B	W	Y	X
C	Z	X	Y
D	Z	Y	X

4 Which statement is **not** correct in its description of a light microscope or an electron microscope?

A A light microscope has a maximum resolution of 0.2 μm.
B An electron microscope has a maximum resolution of 0.05 nm.
C A light microscope can resolve specimens as small as 200 nm in diameter.
D An electron microscope can resolve specimens as small as 0.5 nm in diameter.

5 Which statements about a typical eukaryotic cell are correct?

1 It is smaller than 2 μm.
2 It has a nucleolus.
3 It has linear DNA.
4 It only has small (70S) ribosomes.

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

6 Which of the following can increase the fluidity of the cell surface membrane at low temperatures?

1 cholesterol
2 fatty acids having shorter chains
3 double bonds between carbon atoms in the fatty acid chains

A 1, 2 and 3
B 1 and 3 only
C 2 and 3 only
D 1 only

7 Which process allows the movement of molecules that are too large to enter through a cell surface membrane?

A active transport
B endocytosis
C exocytosis
D facilitated diffusion

8 Which statements about competitive inhibitors of enzyme action are correct?

1 Increasing the concentration of the enzyme's substrate will reduce their effect.
2 They bind to an enzyme at its active site.
3 They reduce the activation energy required for a reaction to take place.
4 They reduce the maximum rate of reaction.

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

9 The citric acid cycle is the final pathway for the oxidation of

I glycogen
II vitamins
III amino acids
IV glycerol

A I, II and III
B I, II and IV
C I, III and IV
D II, III and IV

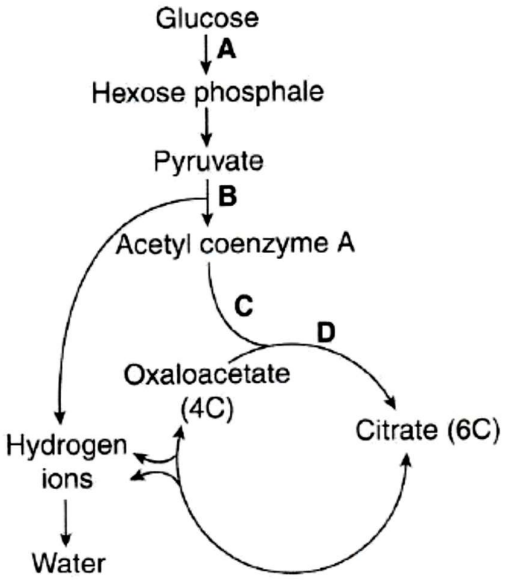
10 The molecule formed in metabolic pathways by the equal splitting of a phosphorylated hexose into two halves is

A acetyl coenzyme A
B fructose 1,6-biphosphate
C ribulose bisphosphate (RuBP)
D triose phosphate

11 The function of molecular oxygen in cellular respiration is

A to cause the breakdown of citric acid
B to combine with hydrogen to produce water
C to combine with carbon to produce carbon dioxide
D to combine with glucose to produce carbon dioxide

12 The diagram shows the stages of aerobic respiration. During which of the following labelled stages does oxidation occur?



13 Which of the following is the sequence by which carbon dioxide may be incorporated into glucose by photosynthesis?

A GP (PGA) + CO_2 → RuBP → triose phosphate → hexose Phosphate → glucose
B GP (PGA) + CO_2 → RuBP → hexose phosphate → triose Phosphate → glucose
C RuBP + CO_2 → GP (PGA) → hexose phosphate → triose Phosphate → glucose
D RuBP + CO_2 → GP (PGA) → triose phosphate → hexose phosphate → glucose

14 Which of the following pathways correctly shows the flow of electrons in photosynthesis?

A H_2O → NADPH → Calvin cycle
B NADPH → chlorophyll → Calvin cycle
C H_2O → photosystem I → photosystem II
D NADPH → electron transport chain → O_2

15 In what aspect are the photosynthetic adaptation of C_4 and CAM plants similar?

A In both cases, the stomata normally close during the day.
B Both types of plants make their sugar without the Calvin cycle.
C Neither C_4 plants nor CAM plants have grana in their chlorophyll.
D In both cases, an enzyme other than RuBisCO carries out the first step in carbon fixation.

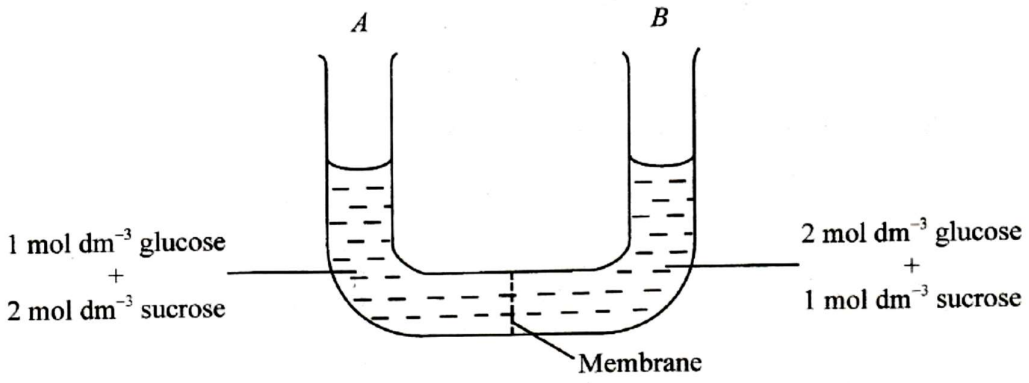
OBJECTIVE ANSWER

1		6		11	
2		7		12	
3		8		13	
4		9		14	
5		10		15	

Section B
[*15 marks*]

*Answer **all** questions in this section.*

16 The diagram below shows a U-tube containing two mixtures of glucose and sucrose solutions separated by a membrane that is permeable to water and glucose but not to sucrose.



Arm A is half-filled with a mixture of 1 mol dm^{-3} glucose and 2 mol dm^{-3} sucrose. Arm B is half-filled with a mixture of 2 mol dm^{-3} glucose and 1 mol dm^{-3} sucrose. The levels of the mixtures in both arms are initially the same.

(a) Explain what is meant by *diffusion*. [2 marks]

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(b) State the initial state, in terms of tonicity, of the mixture in arm A with respect to that in arm B. [1 mark]

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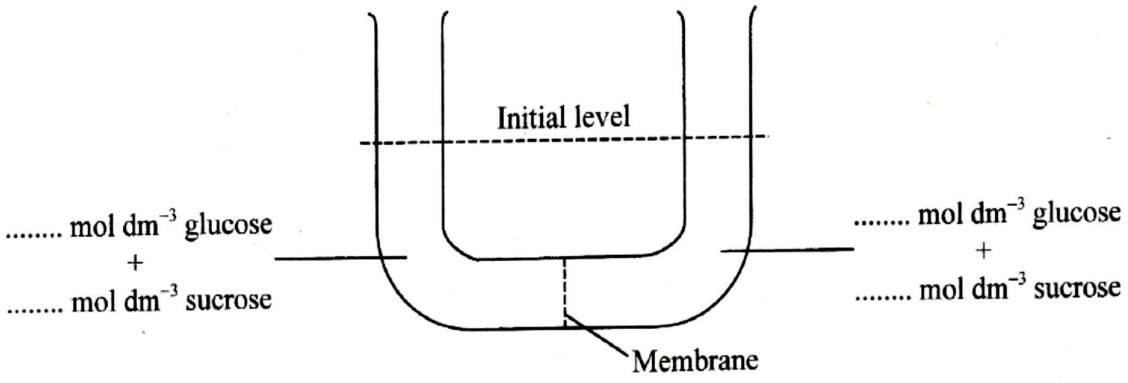
(c) Explain how the system achieves equilibrium. [2 marks]

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(d) Complete the following diagram and labels for the system when the equilibrium is achieved. [2 marks]



17 The unicellular fungus *Kluyveromyces lactis* is found in dairy products. It is a safe microorganism to culture for the extraction of the enzyme lactase. Lactase catalyses the breakdown of lactose, a sugar found in milk.
The reaction catalysed by lactase is summarised in Fig. 16.1.

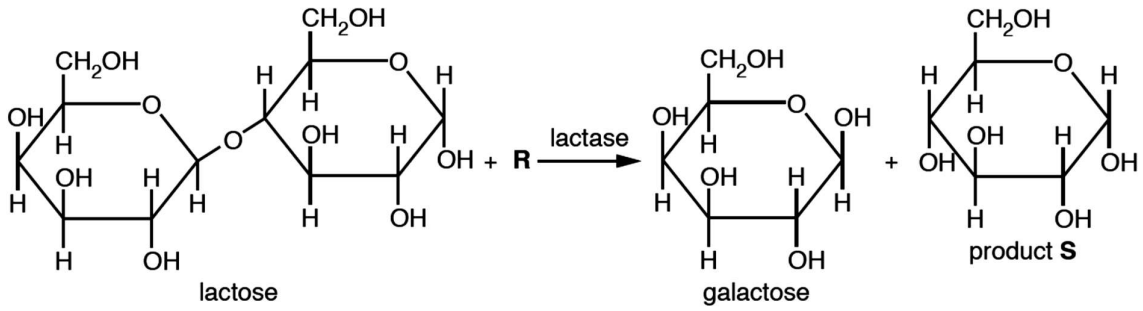


Fig. 16.1

Describe the reaction that is catalysed by lactase. Use Fig. 16.1 to help you.
In your answer, identify **R** and product **S**. [2 marks]

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(b) On a commercial scale, immobilised lactase can be used to produce lactose-free milk. One of the products of the reaction shown in Fig. 16.1 acts as an inhibitor of lactase. This is an example of product inhibition.

(i) Suggest why product inhibition is useful in *K. lactis* when lactase is acting as an intracellular enzyme, but can be a disadvantage when extracted lactase is used free in solution for the production of lactose-free milk. [2 marks]

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(ii) Suggest how using immobilised lactase in a commercial application helps to reduce the problem of product inhibition. [1 marks]

.....

.....

(iii) The first large-scale production of lactose-free milk with an immobilised enzyme used lactase trapped in cellulose triacetate fibres.
Suggest **one** feature of cellulose triacetate that makes it useful as an immobilising material. [1 marks]

.....

(c) For a commercial application using an enzyme, the progress of the enzyme-catalysed reaction needs to be studied.
Outline how the progress of an enzyme-catalysed reaction can be investigated experimentally. [2 marks]

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Section C

[30 marks]

Answer any **two** *questions in this section*.

18(a) Describe four properties which render water to be an important medium for life. [8 marks]

(b) With the aid of a labelled diagram, describe the structure and functions of the Golgi apparatus. [7 marks]

MARKING SCHEME (STPM PENGGL 1 2020)

SECTION A (Objectives)

1	D	9	C
2	A	10	D
3	C	11	B
4	B	12	B
5	C	13	D
6	A	14	A
7	B	15	D
8	A		

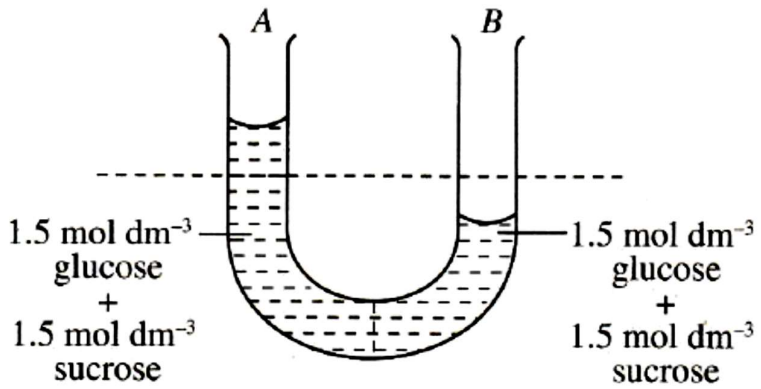
SECTION B (STRUCTURE QUESTIONS)

16(a) Diffusion is the net movement of ions or molecules from a region where they are at higher concentration to a region of lower concentration, that is, to move down a concentration gradient until an equilibrium is reached.

(b) The mixture in arm A has more nonpenetrating solutes than the mixture in arm B. hence water will tend to leave arm B and move into arm A.

(c) Water diffuses across the membrane from arm B to arm A until the concentration of the sucrose solutions on both sides of the membrane are equal.

(d)



17(a) *any **two** from:*

1 disaccharide to monosaccharides **;**
2 **R** is water / water required **;**
3 hydrolysis reaction **;**
4 glycosidic bond broken **;**
5 **S** is α-glucose **;**
6 detail of enzyme action **;** e.g. induced fit or lock and key hypothesis described
7 AVP **;** e.g. (β-)1,4(-glycosidic) bond broken [Any 2]

(b)(i) *intracellular advantage:*

idea of control / maintaining balance / efficient metabolism **;**
e.g. if, (enough) glucose / galactose / monosaccharides, present then no need for uptake / breakdown, of lactose
- avoids osmotic problems as no build-up of monosaccharides
- high quantities of product means no requirement for use in respiration by cell [1]

Suka sampel ini?

Kertas Percubaan STPM

Sem 1 · Biologi

- Semester 1: kertas percubaan (trial) negeri, subjek yang dipilih + skema
- Blueprint 30 hari Semester 1 (setiap subjek)
- Semester 3: percubaan 2024, 10 subjek, banyak negeri, soalan + skema dalam satu fail

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