# First Semester

# Biology

# (الأحياء)

# (Questions)



سلطنة عمان
وزارة التربية والتعليم



مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٦/١٤٤٥ هـ - ٢٠٢٣ / ٢٠٢٤ م

## الدور الأول - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في ( ١٨ ) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

○ القاهرة ○ الدوحة
● مسقط ○ أبوظبي

**ملاحظة:** يتم تظليل الشكل (●) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ● **غير صحيح** ⊖ ◉ ◒ ⊗ ☑

# مُسَوَّدَة، لا يتم تصحيحها

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## Question 1: Multiple Choice Items (14 marks)

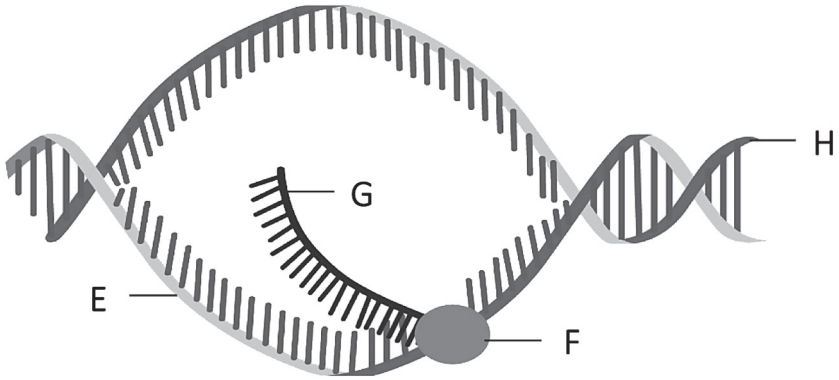
There are 14 multiple-choice items worth one mark each.
Shade in the bubble (⬭) next to the **correct** answer for each of the following items.

**1)** The process that involves the removal of introns and the joining of exons is:

⬭ DNA replication ⬭ DNA transcription

⬭ RNA translation ⬭ RNA modification

**2)** The diagram below represents the transcription of DNA.

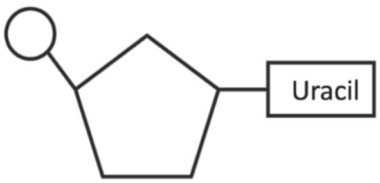



The row that represents the correct labelling of the parts is:

| | E | G | F | H |
|---|---|---|---|---|
| ⬭ | RNA strand | transcribed DNA | DNA polymerase | 3′ |
| ⬭ | transcribed DNA | RNA strand | DNA polymerase | 5′ |
| ⬭ | transcribed DNA | RNA strand | RNA polymerase | 3′ |
| ⬭ | RNA strand | transcribed DNA | RNA polymerase | 5′ |

**3)** The diagram below represents a nucleotide of a nucleic acid.

Which of the following statements about this nucleotide are **correct**?




1. Uracil is a purine.
2. The carbohydrate is pentose.
3. Base pairing occurs with three hydrogen bonds.
4. Can be found on both codons and anticodons.

⬭ 1 and 2 ⬭ 3 and 4

⬭ 1 and 3 ⬭ 2 and 4

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## Question 1 continued

**4)** Two students (student 1 and student 2) were revising the process of DNA replication. The table below summarises the statements provided by student 1 and student 2. Student 1 always gives correct facts and student 2 provided further information that was correct just one time only.

The row that represents the two correct statements from both students is:

| | Student 1 | Student 2 |
|---|---|---|
| ☐ | DNA replication starts by unwinding/ unzipping the double helix. | This unwinding is achieved by the action of DNA polymerase. |
| ☐ | DNA polymerase adds one nucleotide each time. | These nucleotides are held to the template strand by phosphodiester bonds. |
| ☐ | Both the leading and lagging strands are copied at the same time. | DNA polymerase molecules move in both the 5′ to 3′ direction and the 3′ to 5′ direction. |
| ☐ | The leading strand is synthesized in the same direction as the DNA unwinding. | In the lagging strand the newer Okazaki fragments are added closer to the position of the DNA unwinding. |

**5)** The position of a gene on a chromosome is called:

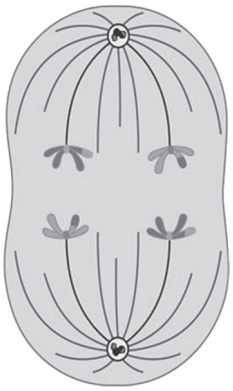
☐ locus ☐ allele

☐ chiasmata ☐ centromere

**6)** The diagram opposite shows one stage of meiosis.

What is the **next stage** and its chromosome set?

| | Next stage | Chromosome set |
|---|---|---|
| ☐ | Telophase I | Haploid |
| ☐ | Telophase II | Diploid |
| ☐ | Telophase I | Diploid |
| ☐ | Telophase II | Haploid |



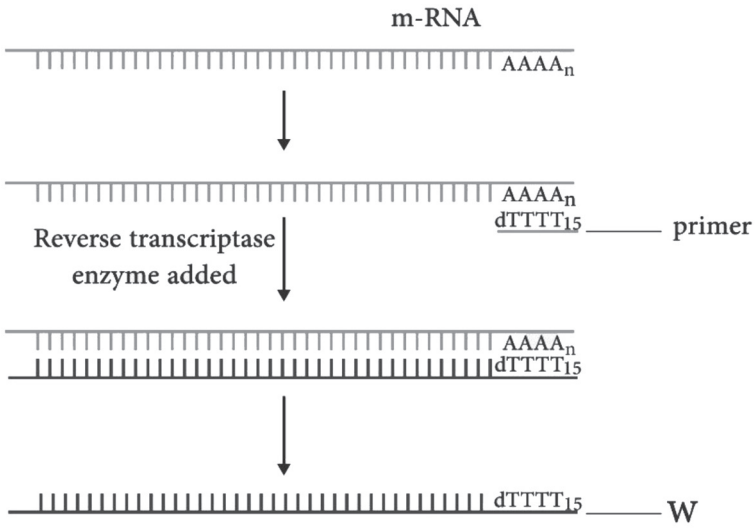
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## Question 1 continued

**7)** The diagram below shows reverse transcription.

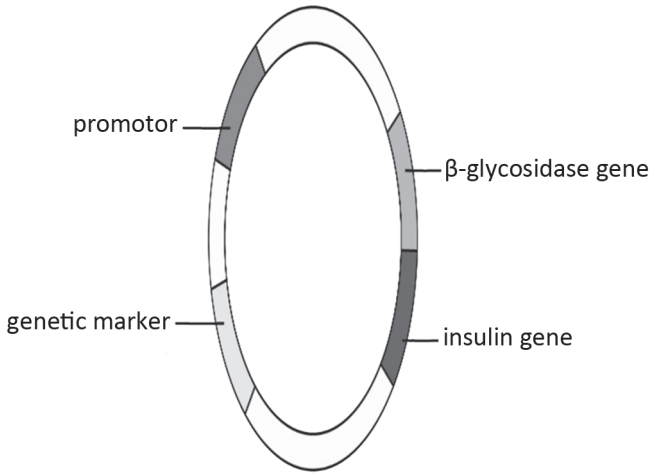



The strand labelled (**W**) refers to:

- ☐ DNA
- ☐ cDNA
- ☐ RNA
- ☐ mRNA

**8)** The diagram below shows the promotor and its role in the expression of a gene.

Predict what will happen if the promotor is inhibited, despite the presence of lactose in the surrounding medium:




- ☐ Only insulin will be produced.
- ☐ Only β-glucosidase will be produced.
- ☐ Both insulin and β-glucosidase will be produced.
- ☐ Both insulin and β-glucosidase will not be produced.

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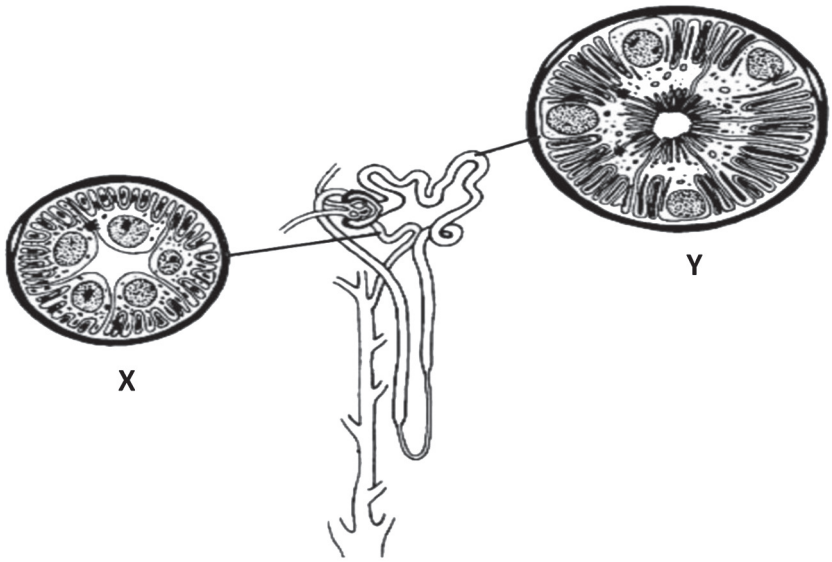
## Question 1 continued

**9)** During the ultrafiltration stage in the nephron, the direction movement of molecules is from:

- ☐ blood to filtrate
- ☐ blood to urine
- ☐ urine to blood
- ☐ filtrate to blood

**10)** The diagram below show two parts in a nephron.

The parts labelled (X) and (Y) are related to:




| | X | Y |
|---|---|---|
| ☐ | collecting duct | glomerulus |
| ☐ | distal convoluted tubule | proximal convoluted tubule |
| ☐ | loop of Henle | glomerulus |
| ☐ | proximal convoluted tubule | distal convoluted tubule |

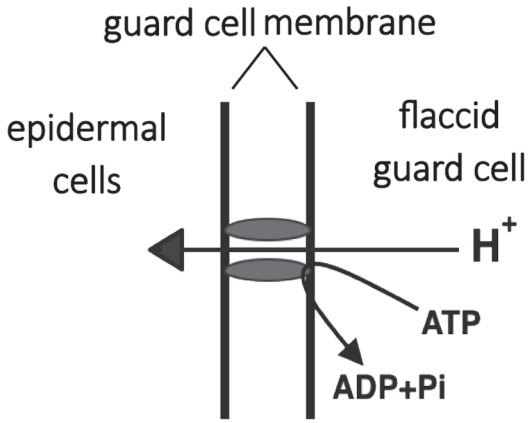
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## Question 1 continued

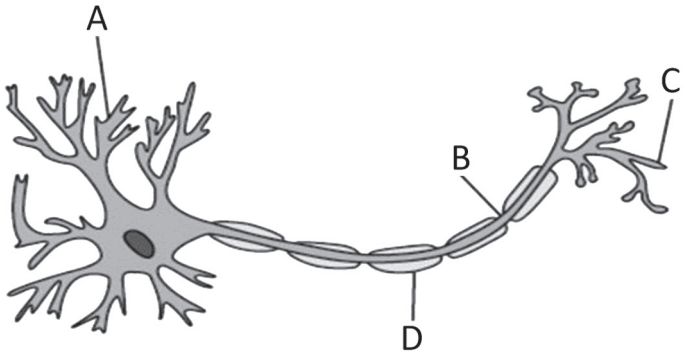
**11)** The diagram below shows the direction of hydrogen ions ($H^+$) movement in a stomata cell.




What is the **next step** with regard to the direction movement of the stomatal aperture and potassium ions ($K^+$).

| | Stomatal aperture | Potassium ion ($K^+$) direction movement |
|---|---|---|
| ☐ | closes | from guard cell to epidermal cell |
| ☐ | closes | from epidermal cell to guard cell |
| ☐ | opens | from epidermal cell to guard cell |
| ☐ | opens | from guard cell to epidermal cell |

**12)** The diagram below shows the structure of a neurone cell.




Which part represents the dendrites?

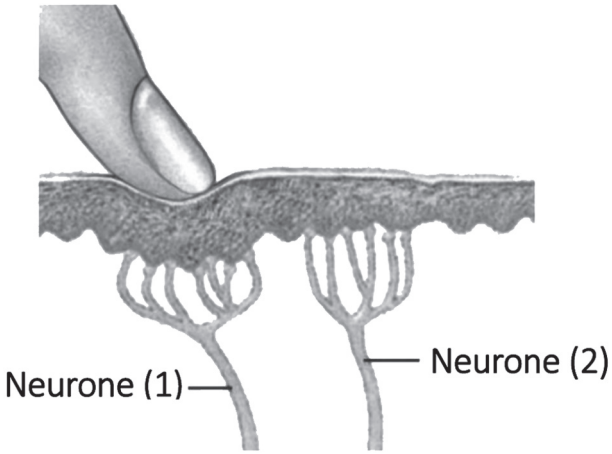
☐ A ☐ B

☐ C ☐ D

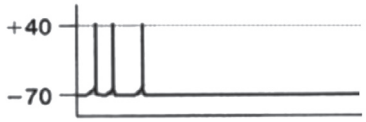
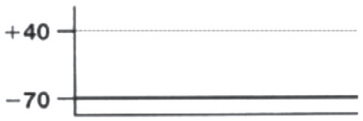
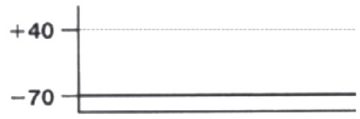
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## Question 1 continued

**13)** The diagram below illustrates the response to a stimulus on a skin cell.




Which row represents a transmission of an impulse in response to a stimulus in the neurones (**1**) and (**2**)?

| | Neurone (1) | Neurone (2) |
|---|---|---|
| ○ |  |  |
| ○ |  |  |
| ○ |  |  |
| ○ |  |  |



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## Question 1 continued

**14)** The table below shows the speed of impulse in two different neurones (**X**) and (**Y**).

| | |
|---|---|
| Speed in neurone (**X**) (m/s) | 3.9 |
| Speed in neurone (**Y**) (m/s) | 12 |

Which row in the following represents the correct description of (**X**) and (**Y**)?

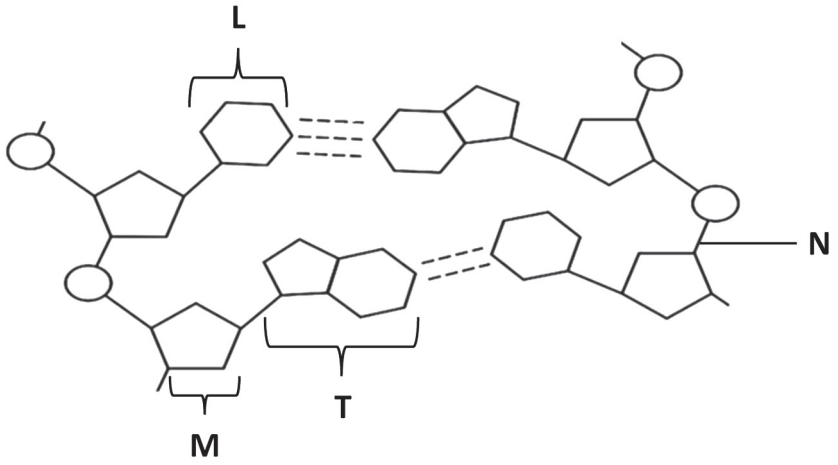
| | X | Y |
|---|---|---|
| ○ | Myelinated | Myelinated |
| ○ | Myelinated | Non-Myelinated |
| ○ | Non-Myelinated | Myelinated |
| ○ | Non-Myelinated | Non-Myelinated |

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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15) a.** The diagram below shows a section of DNA.




**(i)** Name the part (**M**): _____ [1]

**(ii)** Describe how bond (**N**) is formed, and its importance in the DNA strand.

_____

_____ [2]

**(iii)** Identify the type of the nitrogenous bases (**L**) and (**T**):

(**L**): _____ [1]

(**T**): _____ [1]

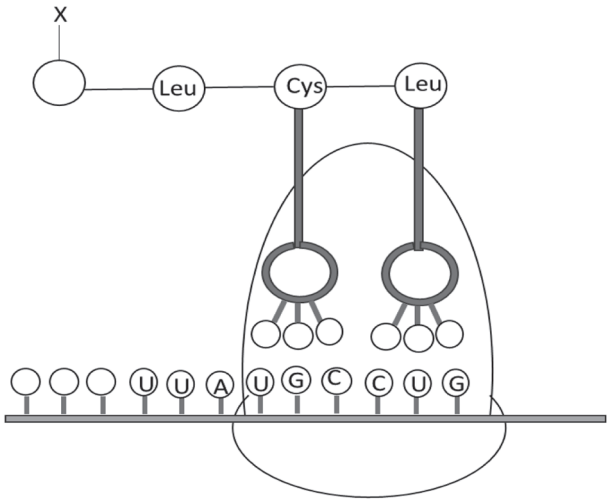
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## Question 2 continued

**b.** The diagram below represents a stage in protein synthesis.




**(i)** State the name of this stage.

_____ [1]

**(ii)** Explain:

The amino acid labelled (**X**) is always the first amino acid in the resultant polypeptide chain.

_____ [1]

**(iii)** The diagram reveals one of the features of the genetic code.

- Describe the represented feature

_____ [1]

- Suggest an advantage for this feature with regard to substitution mutations.

_____ [1]

**c.** In an eukaryotic cell a newly transcribed mRNA strand is composed of **3000 base pairs**. At the end of the translation process a functional polypeptide chain of **300 amino acids** only was produced. Explain why not all the base pairs have been translated to amino acids.

_____

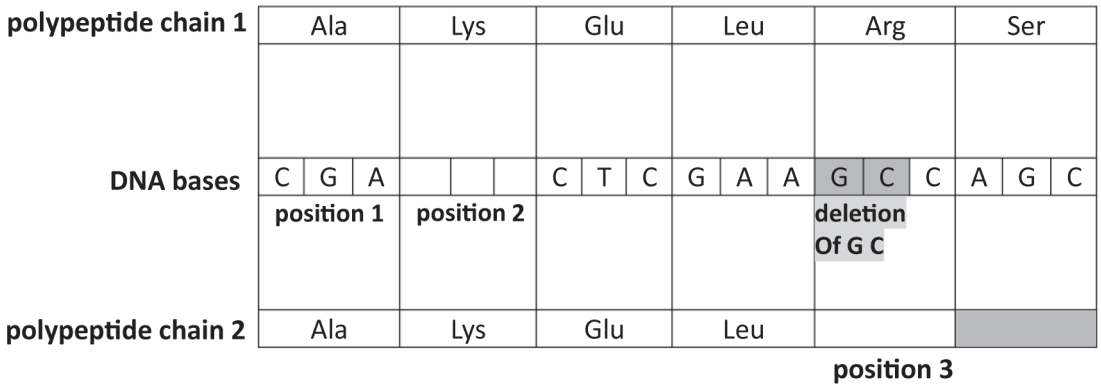
_____

_____ [2]

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## Question 2 continued

**16)** The diagram below represents the effect of mutation on the sequence of amino acids in a polypeptide.




**a.** State the term used to describe the effect of the mutation represented above on the sequence of amino acids in a polypeptide.

_____ [1]

**b.** Write the corresponding codon on the mRNA strand for **position 1**.

_____ [1]

**c.** Use the DNA triplet codes provided in the table below:

**(i)** Provide the missing triplet code at **position 2**: _____ [1]

**(ii)** What is the resulting amino acid at **position 3**? _____ [1]

| **Triplet code on DNA** | TCG | TTC | GTC | GCC | CGG | CAG | AGC |
|---|---|---|---|---|---|---|---|
| **Amino acid** | Ser | Lys | Gln | Arg | Ala | Val | Ser |

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## Question 2 continued

**17)** The maize protein (aleurone) gives maize its colour. The phenotype (red colour) is produced by the dominant allele (R), and its recessive allele (r) produces a contrasting phenotype (white colour). The presence of allele (I) inhibits the expression of the dominant allele.

**a.** Predict the inheritance type of the maize colour.

_____ [1]

**b.** What are the genotype and the phenotype of the first generation, that result in a cross between maize with genotype (RRII) and another with genotype (rrii)?

- The genotype:

_____ [1]

- The phenotype:

_____ [1]

**c.** What are the gametes of the first generation?

_____ [1]

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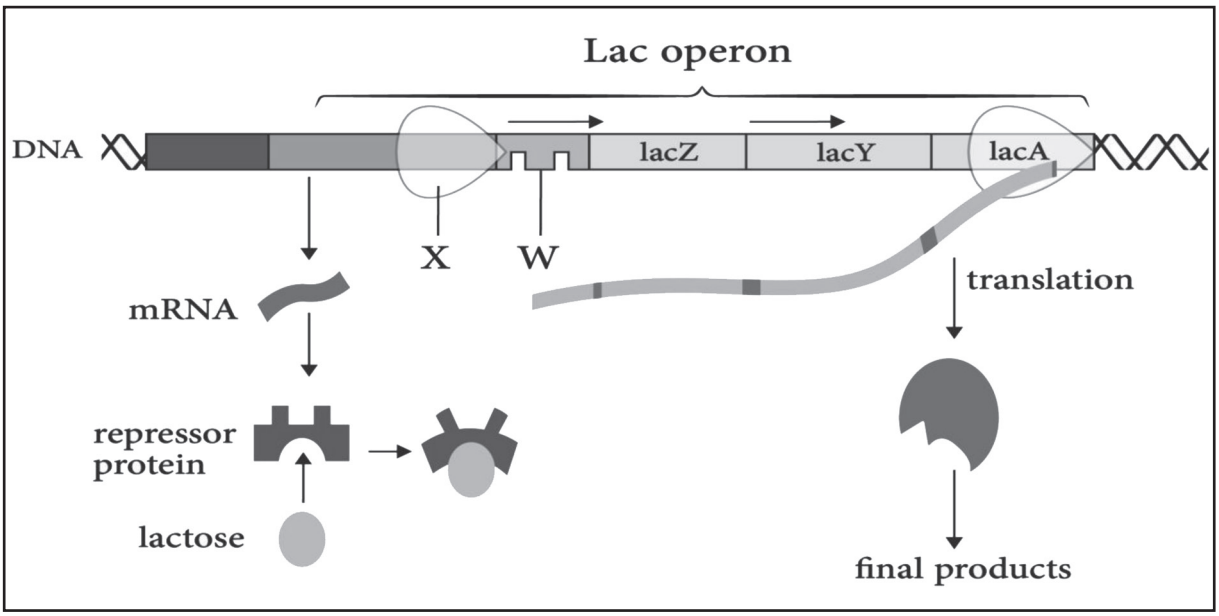
## Question 2 continued

**18) a.** State one difference in **function** between a structural gene and a regulatory gene.

| Structural gene | Regulatory gene |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

[2]

**b.** The diagram below shows one of the processes used to control a gene in prokaryotes.




**(i)** Name the structure labelled (**X**).

_____ [1]

**(ii)** Explain the effect if protein binds to the structure labelled (**W**).

_____

_____

_____ [1]

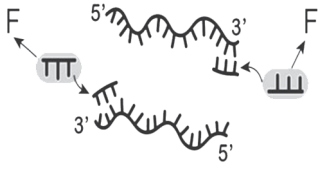
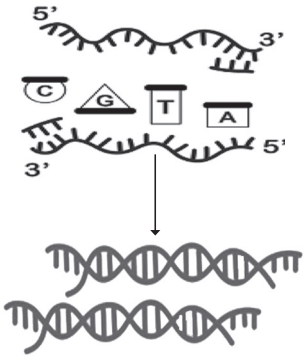
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## Question 2 continued

**19)** The table below shows the steps of a polymerase chain reaction (PCR).

| Temperature | 95° C | 40 - 60° C | 72° C |
|---|---|---|---|
| Step | 1 → | 2 → | 3 |
| |  |  |  |

**a.** In which step does *Taq* polymerase act?

_____ [1]

**b.** Describe what happens in step **(2)**.

_____

_____ [1]

**c.** Suggest what will happen if:

**(i)** there isn't a high temperature in step (**1**).

_____

_____ [1]

**(ii)** the part labelled (**F**) is absent.

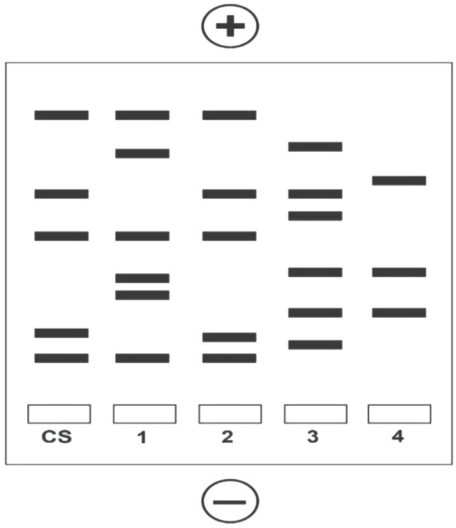
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_____ [1]

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## Question 2 continued

**20) a.** The diagram below shows the result of DNA profile of samples collected from a crime scene (cs) and the four suspects are labelled (1, 2, 3 and 4).




**(i)** Which of the following (1, 2, 3 or 4) is suspected of being the criminal?

_____

Explain your answer.

_____ [2]

**(ii)** Why do the DNA fragments appear as bands at different positions?

_____

_____ [1]

**b.** Crop species can be genetically modified to include the BT toxin which is a natural pesticide produced by a bacterium, (*Bacillus thuringiensis*).

**(i)** For what purpose is this genetic modification used?

_____ [1]

**(ii)** Write one possible harmful effect on the environment resulting from this technology.

_____ [1]

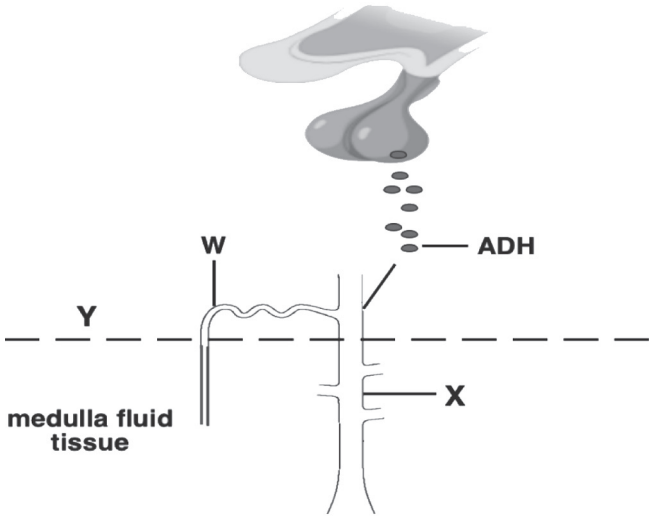
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## Question 2 continued

**21)** The diagram below demonstrates the osmoregulation process.




**a.** Name the following:

- Structure labelled (**W**): _____ [1]

- Region labelled (**Y**): _____ [1]

**b.** State the effect of ADH in the cell membrane of the part labelled (**X**).

_____ [1]

**c.** From the diagram, describe the direction of water movement.

_____

Explain your answer.

_____

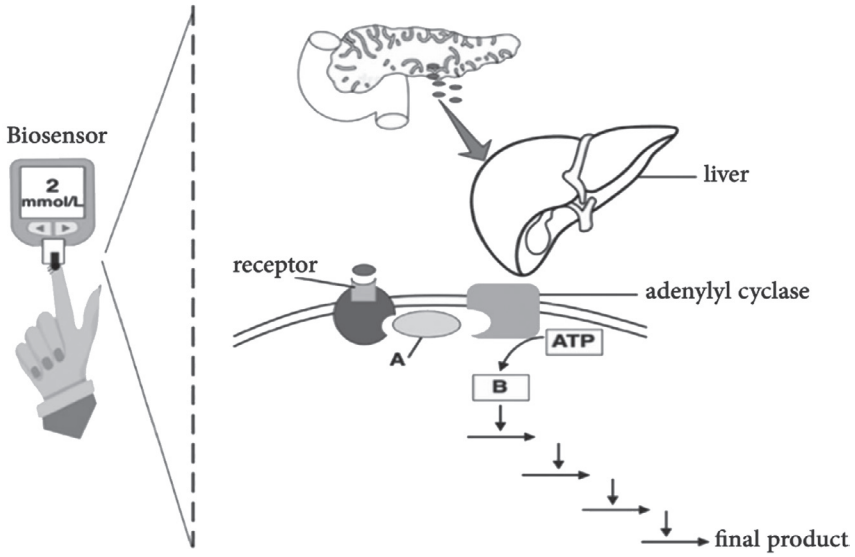
_____

_____ [2]

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## Question 2 continued

**22) a.** The diagram below shows the mechanism for controlling blood glucose, and how it can be monitored by using a biosensor.




**(i)** What is the organ responsible for controlling the blood glucose concentration?

_____ [1]

**(ii)** Name the structure labelled (**A**). _____ [1]

**(iii)** Describe the function of the molecule labelled (**B**).

_____

_____ [1]

**(iv)** How can the final product affect the reading of the biosensor?

_____

_____ [1]

**b.** Explain how test strips operate regarding the **enzymes used**.

_____

_____

_____

_____ [2]

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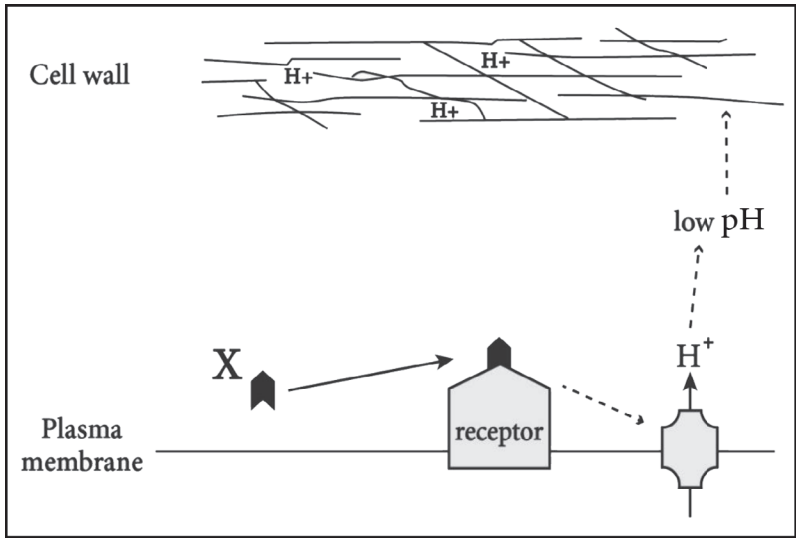
## Question 2 continued

**23) a.** Compare between the nervous system and the endocrine system according to the transmission method and the transmission speed in the following table.

| | The nervous system | The endocrine system |
|---|---|---|
| Transmission method | | |
| Transmission speed | | |

[2]

**b.** The diagram below shows the process of plant growth regulation.




**(i)** Identify the hormone labelled (**X**). _____ [1]

**(ii)** Explain how this hormone stimulates the elongation growth in plant cells.

_____

_____

_____

_____

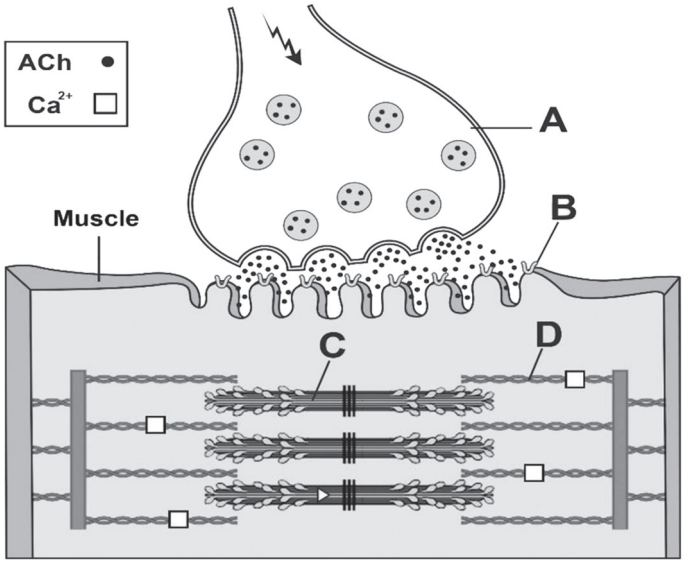
_____

_____ [3]

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## Question 2 continued

**24)** The diagram below shows the movement of an impulse from a neurone cell to muscle.




**a.** Describe the role of $Ca^{+2}$ ions in muscle contraction.

_____

_____

_____ [2]

**b.** Name the type of neurone labelled (**A**). _____ [1]

**c.** Explain the effect of action potential on the filaments (**C**) and (**D**).

Filament (**C**): _____ [1]

Filament (**D**): _____ [1]

**d.** Botulinum toxin A (Botox) is a neurotoxic protein that is used to treat face wrinkles. When it is injected into muscle, it binds to the receptor of acetylcholine (ACh).

Describe the effect of Botox on the transmission of impulse.

_____

Explain your answer. _____

_____ [2]

**[ End of Examination ]**

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سلطنة عمان
وزارة التربية والتعليم



مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٥ - ١٤٤٦ هـ - ٢٠٢٣ / ٢٠٢٤ م

## الدور الثاني - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في ( ١٧ ) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:

س – عاصمة سلطنة عمان هي:

○ القاهرة ○ الدوحة
● مسقط ○ أبوظبي

**ملاحظة:** يتم تظليل الشكل (●) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ● **غير صحيح** ▭ ◉ ◒ ☒ ☑

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## Question 1: Multiple Choice Items (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (○) next to the **correct** answer for each of the following items.

**1)** The process that takes place in the ribosome is:

- ○ DNA replication
- ○ Transcription
- ○ RNA modification
- ○ Translation

**2)** The following statements describe the process of replication.

1. The leading strand is copied in the 5′ to 3′ direction.
2. The enzyme ligase bonds with the neighboring nucleotides.
3. The DNA double helix is unwound and the hydrogen bonds break.
4. The DNA polymerase molecule attaches to each single strand and adds nucleotides.

What is the correct order of this process?

- ○ 1 → 2 → 3 → 4
- ○ 2 → 1 → 4 → 3
- ○ 3 → 4 → 1 → 2
- ○ 2 → 3 → 4 → 1

**3)** The statement below which is **not related** to the transcription process is:

- ○ RNA polymerase attaches to the beginning of the gene.
- ○ The DNA double helix is unwound and the hydrogen bonds break.
- ○ The enzyme ligase joins the disconnected fragments of the developing mRNA.
- ○ RNA polymerase joins the nucleotides in the growing strand by forming phosphodiester bonds.

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## Question 1 continued

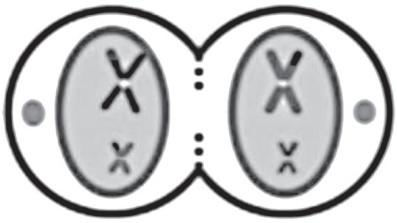
**4)** The statement below which is **not related** to the translation stage is?

- ☐ Anticodons are found on rRNA and amino acids are added accordingly and joined with a peptide bond.
- ☐ Codons on mRNA determine the type of amino acid to be added to the polypeptide chain.
- ☐ tRNA is folded with hydrogen bonds and carries amino acids according to the anticodon type.
- ☐ mRNA in the groove of the ribosome is attached to the tRNA molecule with hydrogen bonds.

**5)** The inherited diseases such as albinism, sickle cell anemia and haemophilia are basically all due to:

- ☐ dominant alleles
- ☐ loss of normal protein's function
- ☐ absence of the functional gene
- ☐ recessive alleles

**6)** The stage of meiotic division in which bivalents are observed for the first time is:

- ☐ 
- ☐ 
- ☐ 
- ☐ 

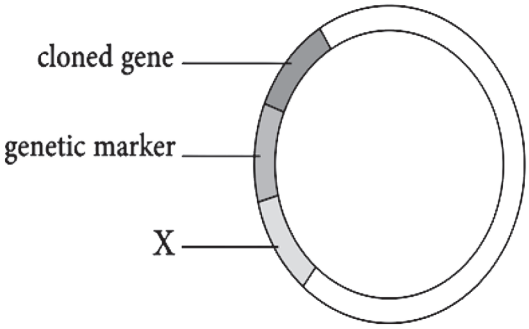
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## Question 1 continued

**7)** The diagram opposite shows modified plasmid.




The region (X) is used to control and help gene expression.

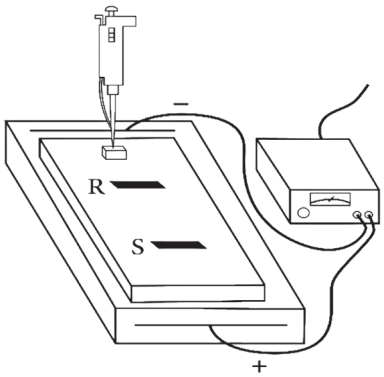
If this region is missed, this will mean that:

- ☐ Transcription will not take place.
- ☐ There will be a high number of cloned gene products.
- ☐ The endonuclease will not recognize its restriction site.
- ☐ It will be difficult to identify the successful transformation procedure.

**8)** The diagram below shows the process of gel electrophoresis.

Which of the following rows represent its longest fragment and its direction?

| | fragment | direction |
|---|---|---|
| ☐ | R | + ⟶ – |
| ☐ | R | – ⟶ + |
| ☐ | S | + ⟶ – |
| ☐ | S | – ⟶ + |



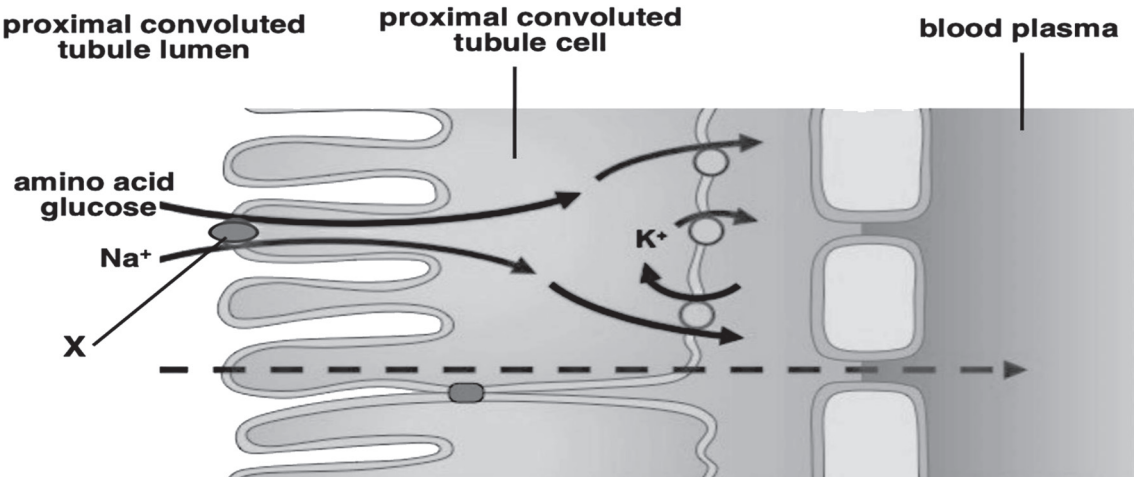

**9)** Which of the following components are not retained during reabsorption in the proximal convoluted tubule during urine formation?

- ☐ Water
- ☐ Glucose
- ☐ Amino acid
- ☐ Blood cells

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## Question 1 continued

**10)** The diagram below show the reabsorption process in the proximal convoluted tubule.



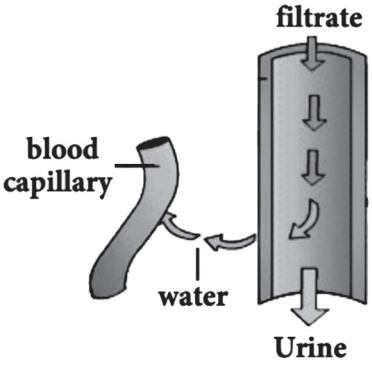

Which of the following rows is correct about **the structure labelled (X)**:

| | Mechanism | Explanation |
|---|---|---|
| ☐ | Active pump | Used ATP to pump the molecules |
| ☐ | Active pump | diffuses the molecules down the concentration gradient |
| ☐ | Secondary active transport | Used ATP to pump the molecules |
| ☐ | Secondary active transport | diffuses the molecules down the concentration gradient |

**11)** The diagram opposite shows the osmoregulation process.

This action is in response to:

- ☐ An increase of water potential in the body cell.
- ☐ A decrease of water potential in the body cell.
- ☐ An increase of water potential in the collecting duct.
- ☐ A decrease of water potential in the collecting duct.




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## Question 1 continued

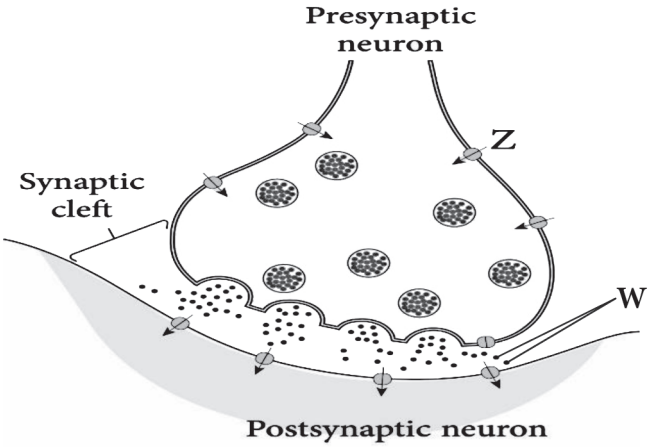
**12** Which of following is **not correct** about the refractory period?

- ☐ There is a minimum time between each successive action potentials.
- ☐ Allows another action potential to generate during this period.
- ☐ The impulse can only travel in one direction along the neurone.
- ☐ The length of the refractory period determines the maximum frequency at which impulses are transmitted.

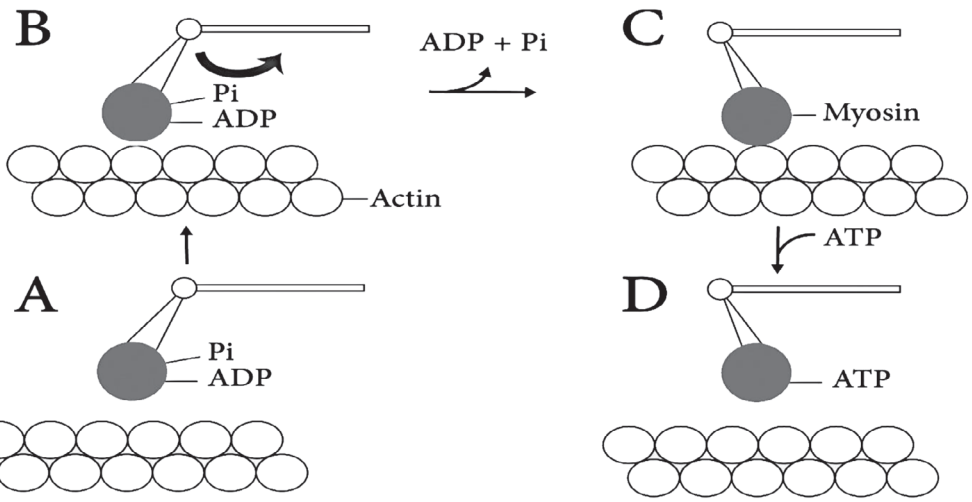
**13)** The diagram opposite shows the synapse transmission.

Which option about **Z** and **W** is true?

| | Z | W |
|---|---|---|
| ☐ | $Ca^+$ | ACh |
| ☐ | $Ca^+$ | $Na^+$ |
| ☐ | $Na^+$ | ACh |
| ☐ | $Na^+$ | $Ca^+$ |




**14)** The diagrams below show the steps of the filament model of muscular contraction. Which step shows the result of the release of calcium ions from the sarcoplasmic reticulum?



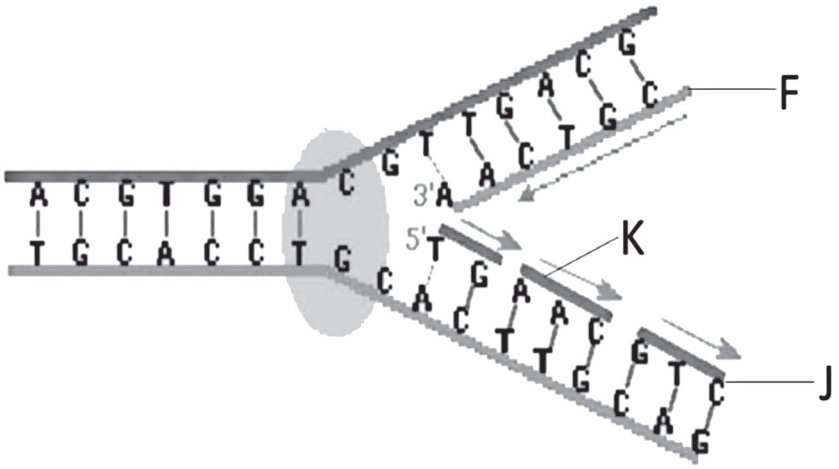

- ☐ A
- ☐ B
- ☐ C
- ☐ D

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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15)** The diagram below shows a part of the replication process.




**a.** Answer the following:

**(i)** Identify the correct label for the leading strand _____ [1]

**(ii)** Name the fragment labeled (**K**) _____ [1]

**(iii)** Write the name of the enzyme that binds the fragments labeled (**K**).

_____ [1]

**b.** Complete the following table.

| | DNA | mRNA |
|---|---|---|
| Shape | | _____ |
| Unique nitrogen bases | _____ | _____ |
| Type of genetic code | _____ | _____ |

[5]

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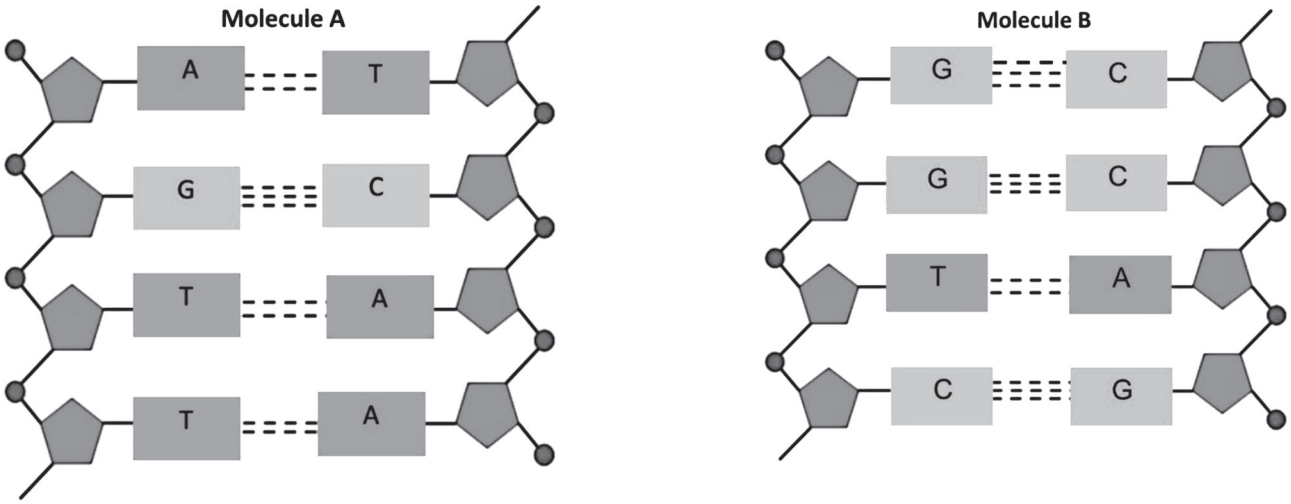


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## Question 2 continued

**c.** The diagrams below represent two molecules of DNA.




Predict which molecule will be more stable i.e. will be more resistant to the separation of strands and therefore will better maintain the double stranded form.

_____

Explain your answer.

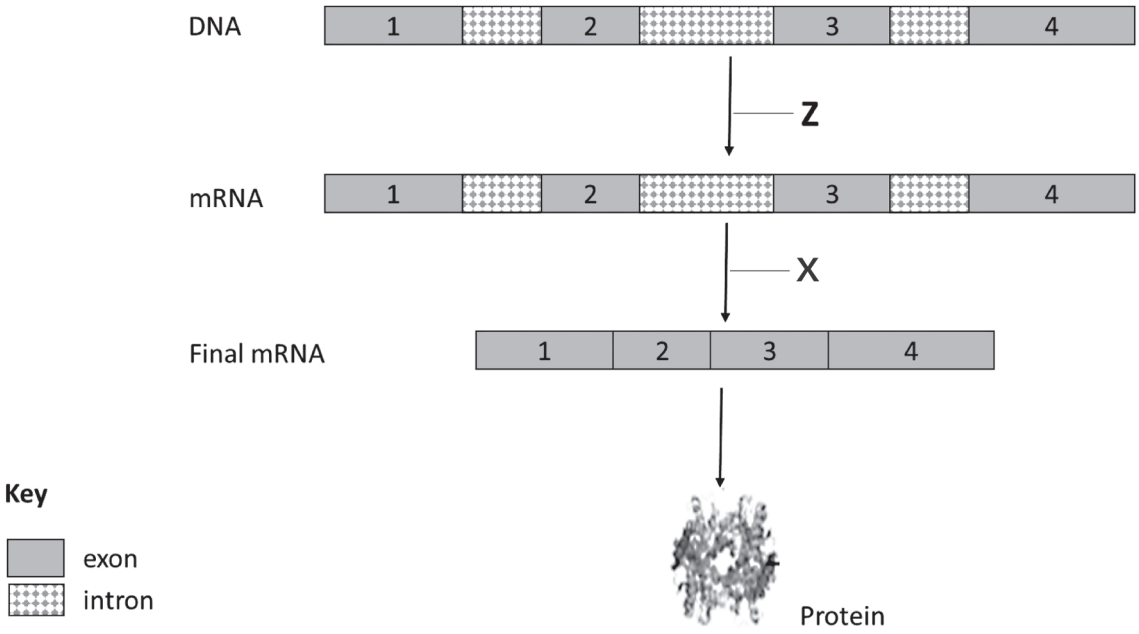
_____

_____ [2]

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## Question 2 continued

**16)** The diagram below shows the molecular processes related to the protein synthesis in living cells.




**a.** Answer the following:

**(i)** Describe the process labelled (**X**).

_____ [1]

**(ii)** Explain the importance of the process labelled (**Z**).

_____ [1]

**(iii)** Why were the introns removed?

_____ [1]

**b. (i)** How can the change in the order of exons in the final mRNA affect the structure of the protein?

_____ [1]

**(ii)** Predict the effect of this change on the function of the protein.

_____ [1]

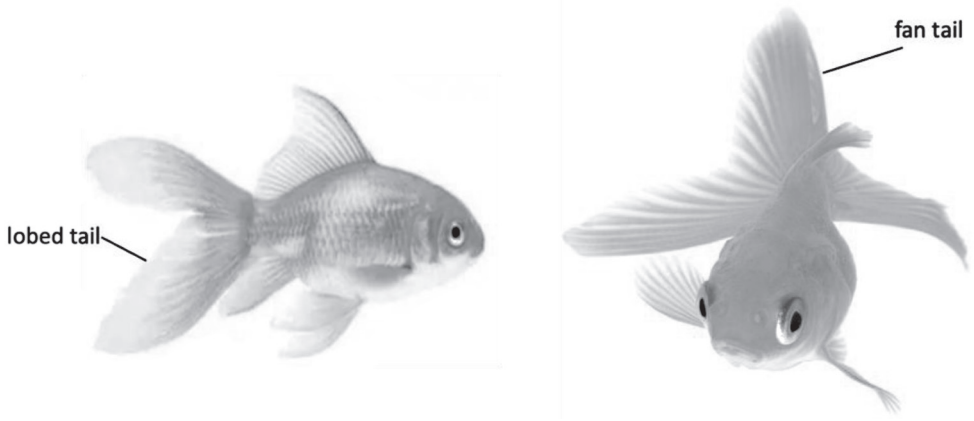
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## Question 2 continued

**17)** The body colour of the goldfish is controlled by the gene **R/r**. The dominant allele (**R**) produces an orange pigment, while the recessive allele (**r**) produces a black pigment. The shape of the tail is controlled by another gene **L/l** and is either a lobed tail due to the dominant allele (**L**) or a fan tail due to the recessive allele (**l**).




**a.** **(i)** Write the type of this cross.

_____ [1]

**(ii)** The genotype of an orange lobed tail, heterozygous for both traits is:

_____ [1]

**(iii)** The phenotype of an individual with the genotype rrLl is:

_____ [1]

**b.** A fish farmer has designed a cross of a black heterozygous lobed tail fish and a heterozygous orange fan tail fish.

Find the genotypes of the individuals labelled (**1**) and (**2**) in the table below.

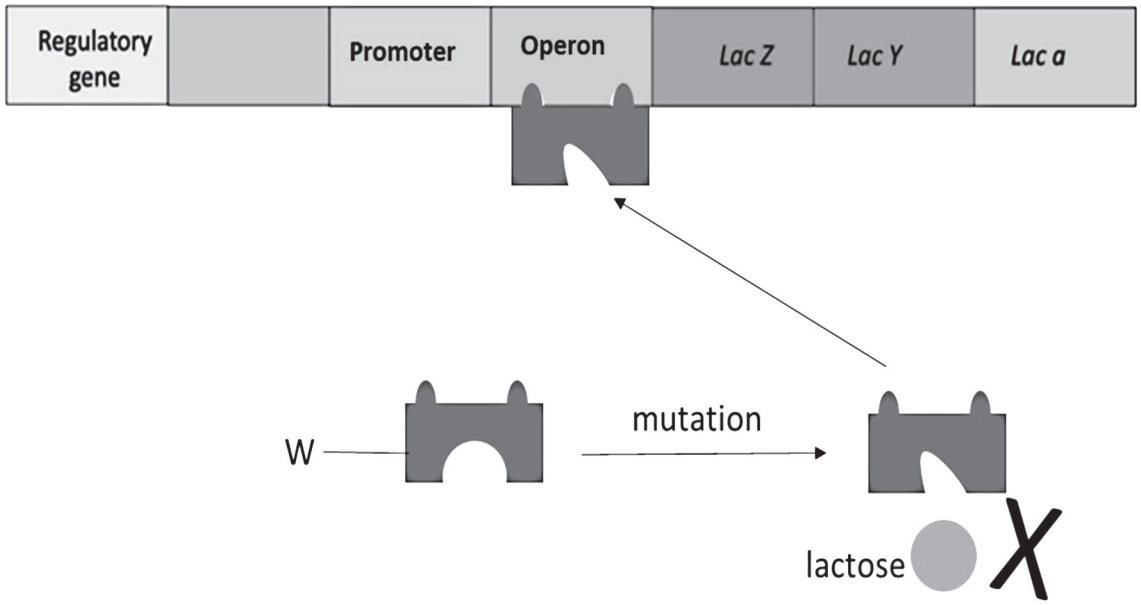
| Gametes | | rl |
|---|---|---|
| | RrLl | **(1)** |
| rl | **(2)** | |

[2]

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## Question 2 continued

**18)** The diagram below represents the *lac* operon in the bacterium *Escherichia coli*




The protein labeled (**W**) has an abnormal lactose binding site due to a mutation in the coding gene.

**a.** Write the importance of *lac* operon for *E.coli*.

_____ [1]

**b.** Discuss the consequences of a mutated form of this protein on a prokaryotic cell when glucose is absent and lactose is available in the medium.

_____

_____ [2]

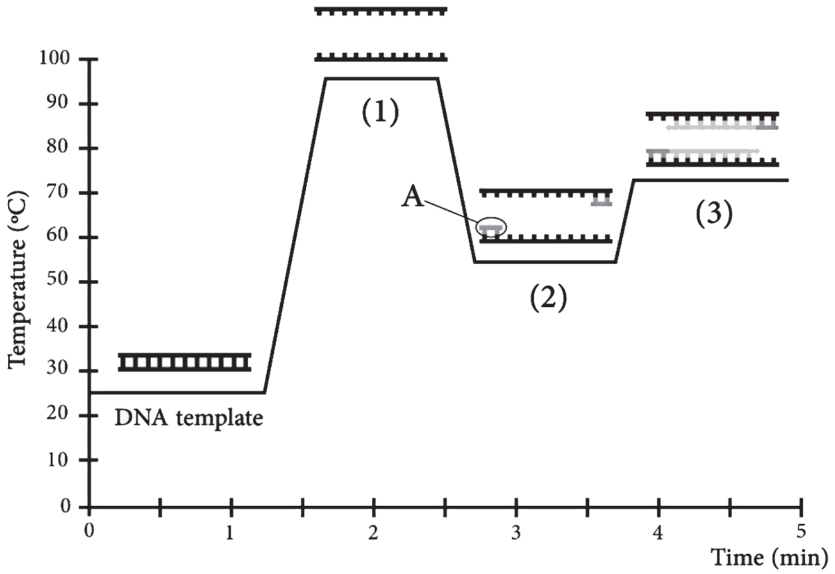
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## Question 2 continued

**19)** The diagram below shows the process of a polymerase chain reaction (PCR).




**a.** Why does this technique require a high temperature in step (1)?

_____ [1]

**b.** In which step do they use *Taq* polymerase? Explain your answer.

Step number: _____

Explain your answer.

_____

_____ [2]

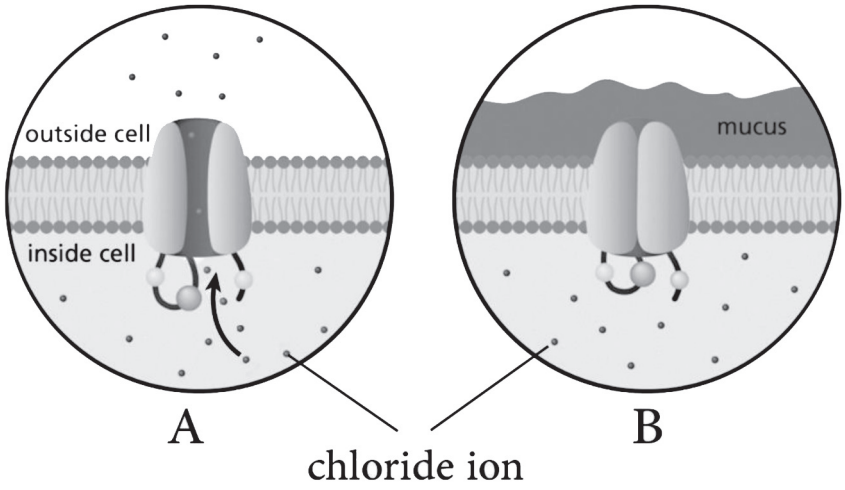
**c.** What is the purpose of using molecule (A)?

_____ [1]

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## Question 2 continued

**20) a.** The diagram below shows a cross section of airways for two people (A and B), one normal and another with cystic fibrosis.




**(i)** Outline the advantage of genetic screening in cystic fibrosis disease?

_____

_____ [1]

**(ii)** Which person has cystic fibrosis?

▢ A ▢ B (Shade the correct answer)

Explain your answer.

_____

_____ [2]

**b.** List two uses of genetic engineering to solve the global food problem?

_____

_____ [2]

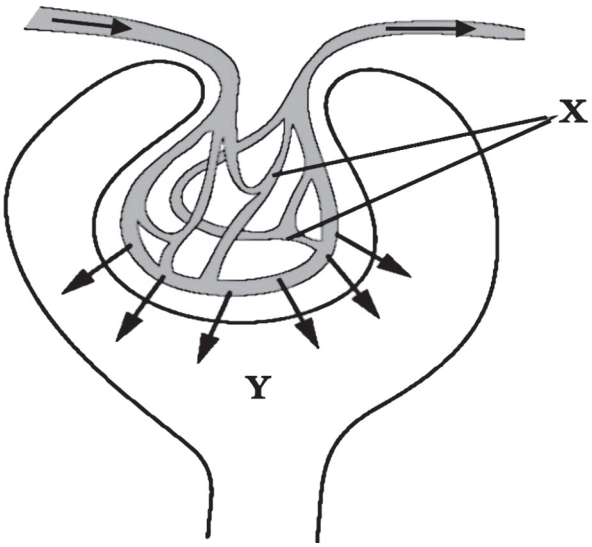
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## Question 2 continued

**21)** The following diagram demonstrates one stage of urine formation.




**a.** Name the network of capillaries labelled (**X**).

_____ [1]

**b.** Apart from water and glucose name two substances that will be present in (**Y**)?

_____ [2]

**c.** Predict the filtration rate if the body loses a large amount of blood?

_____

Explain your answer.

_____

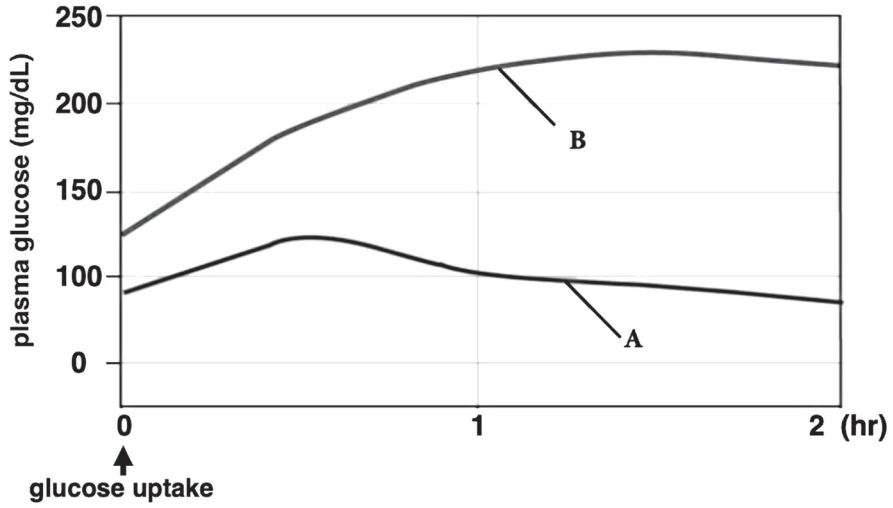
_____ [2]

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## Question 2 continued

**22) a.** The diagram below shows the change in the concentration of glucose in the blood for two people (A and B).

**(Note that the normal level of glucose in the blood is between 80mg – 120 mg per 100 $cm^2$).**




**(i)** What type of mechanism is used to control the concentration of glucose in the diagram above?

_____ [1]

**(ii)** Name the cell that responded to this condition.

_____ [1]

**(iii)** Explain in two steps how the hormone secreted affects the responding organs.

_____

_____ [2]

**b.** Explain what change will happen in the **concentration of $K^+$ and water movement** when there is an increasing light intensity in the guard cells of a stomata.

_____

_____

_____

_____

_____ [2]

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## Question 2 continued

**23) a.** Write the difference between the nervous system and the endocrine system according to the:

**(i)** transmission method:

_____

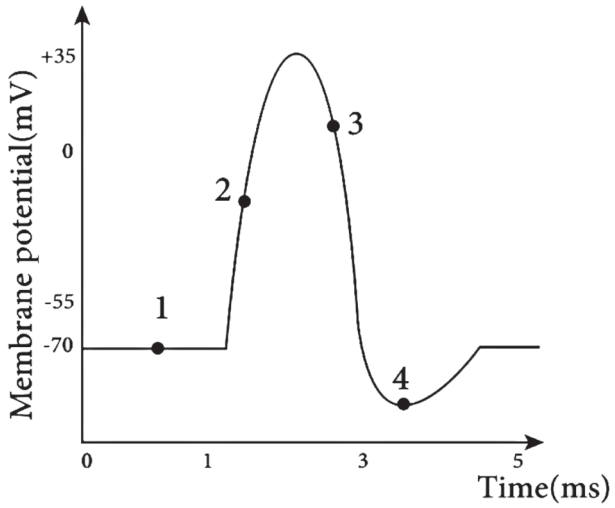
_____ [1]

**(ii)** transmission speed:

_____

_____ [1]

**b.** The diagram below shows the change in membrane potential over time.




Describe the status of ions channels during the period that is labelled (1) and (2).

**(i)** Period (1): _____

_____ [1]

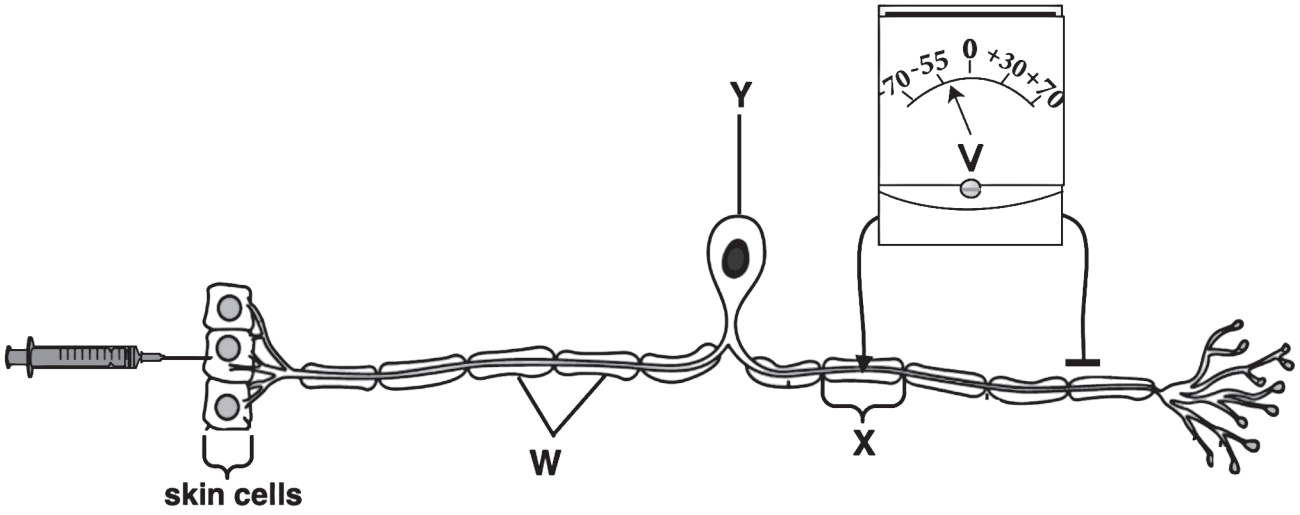
**(ii)** Period (2): _____

_____ [1]

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## Question 2 continued

**24) a.** The diagram below shows one type of neurone cell and the change in the membrane potential.




**(i)** Which type of neurone cell is shown in the diagram?

_____ [1]

**(ii)** Identify the structure labelled (**Y**), (**W**)?

(**Y**): _____ [1]

(**W**): _____ [1]

**(iii)** Predict the state of membrane potential in region (**X**).

☐ Action potential ☐ Rest potential (Shade the correct answer)

Explain your answer.

_____

_____ [2]

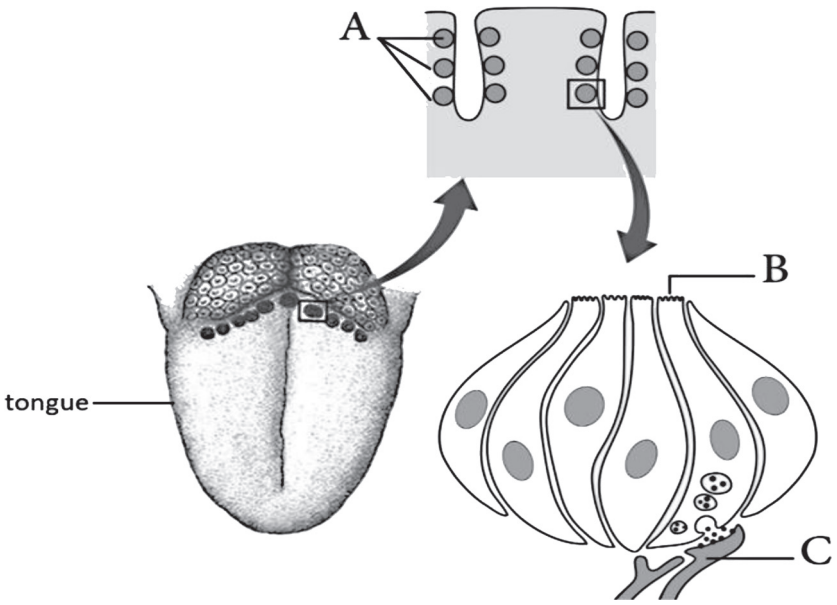
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## Question 2 continued

**b.** The diagram below shows the chemoreceptor of a human taste bud.




**(i)** Identify the structure labelled (**A**)?

_____ [1]

**(ii)** What type of neurone cell is shown by (**C**).

_____

Explain your answer.

_____

_____ [2]

**(iii)** When sodium chloride (NaCl) binds to the receptor protein labeled (**B**) it leads to a release of calcium ions ($Ca^{+2}$). Describe how $Ca^{+2}$ stimulates action potential?

_____

_____ [1]

**[ End of Examination ]**

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# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م

## الدور الأول - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في ( ١٨ ) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

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- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

**ملاحظة:** يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

# مُسَوَّدَة، لا يتم تصحيحها

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## Question 1: Multiple Choice Items (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (○) next to the **correct** answer for each of the following items.

**1)** What is the stage of respiration that takes place in the matrix of mitochondria firstly?

○ Glycolysis
○ Krebs cycle
○ The link reaction
○ Electron transport chain

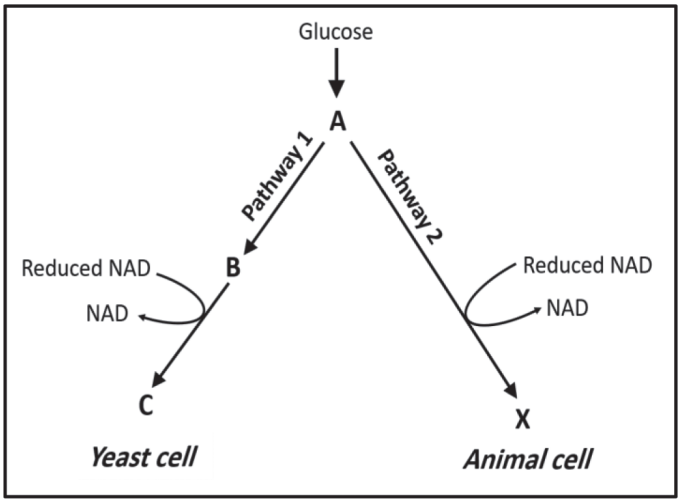
**2)** At the end of glycolysis, 4 molecules of glucose will make the following number of each compound:

| | Pyruvate | net ATP | Reduced NAD |
|---|---|---|---|
| ○ | 8 | 16 | 4 |
| ○ | 4 | 16 | 8 |
| ○ | 8 | 8 | 8 |
| ○ | 4 | 8 | 4 |

**3)** The diagram below demonstrates two respiratory pathways.

In the absence of oxygen,the last electron acceptors in the pathways 1 and 2 are:

| | Pathway 1 | Pathway 2 |
|---|---|---|
| ○ | A | X |
| ○ | X | B |
| ○ | C | X |
| ○ | B | A |




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## Question 1 continued

**4)** What is the net production of ATP molecules from one glucose molecule in aerobic respiration of a cell that lacks the ATP synthase?

- ☐ 2
- ☐ 4
- ☐ 28
- ☐ 32

**5)** Which statement below regarding the Light-independent stage of photosynthesis is correct?

- ☐ NADP is reduced.
- ☐ ATP is produced.
- ☐ $CO_2$ is reduced.
- ☐ $CO_2$ is produced.

**6)** Changes in the atmospheric $CO_2$ concentration, light intensity, and temperature alter the rate of photosynthesis.

What stages of photosynthesis are directly affected by these three factors?

| | $CO_2$ concentration | light intensity | temperature |
|---|---|---|---|
| ☐ | Calvin cycle | photolysis | photolysis |
| ☐ | Calvin cycle | photolysis | Calvin cycle |
| ☐ | photolysis | Calvin cycle | Calvin cycle |
| ☐ | photolysis | photolysis | Calvin cycle |

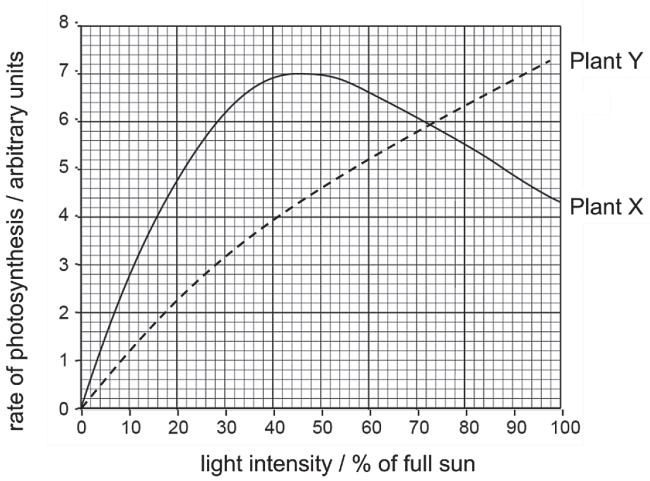
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## Question 1 continued

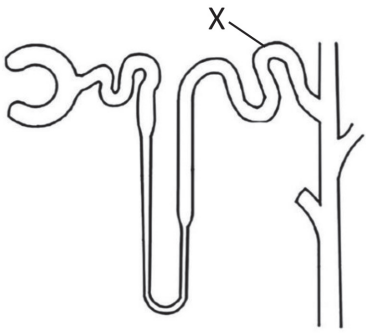
**7)** The graph below shows a change in the rate of photosynthesis with light intensity in two different species of plants (X) and (Y).




Which plant might be damaged by high light intensity and which plant has an optimum rate of photosynthesis of 7?

| | plant might be damaged by high light intensity | plant with an optimum rate of photosynthesis of 7 |
|---|---|---|
| ☐ | plant Y | plant X |
| ☐ | plant X | plant Y |
| ☐ | plant X | plant X |
| ☐ | plant Y | plant Y |

**8)** The part of the nephron labeled (X) as shown in the diagram opposite is called the:

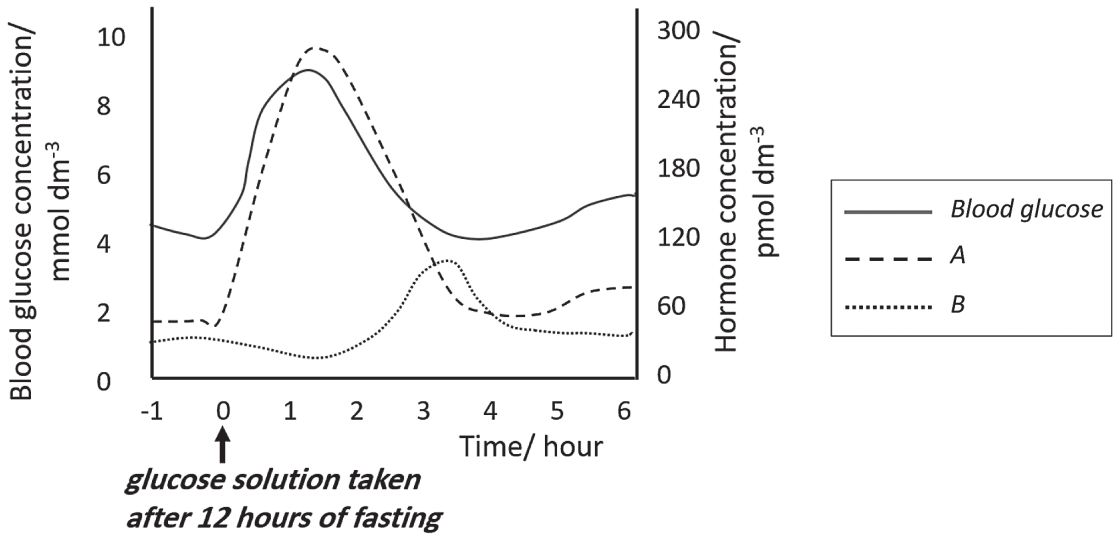



- ☐ loop of Henle.
- ☐ Bowman's capsule.
- ☐ distal convoluted tubule.
- ☐ proximal convoluted tubule.

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## Question 1 continued

**9)** The levels of glucose and two glucose-homeostasis related hormones (A) and (B) in the blood of a person are demonstrated in the graph below.




The decrease in the blood glucose level between the hours of 2 and 3 is due to:

- ☐ an increase in the level of insulin as represented by curve A.
- ☐ an increase in the level of insulin as represented by curve B.
- ☐ a decrease in the level of glucagon as represented by curve A.
- ☐ an increase in the level of glucagon as represented by curve B.

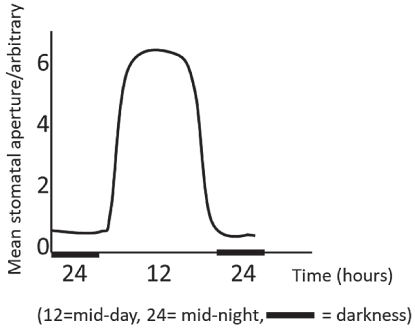
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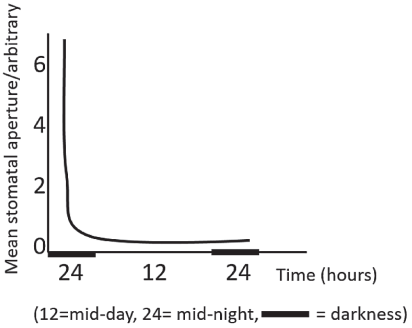
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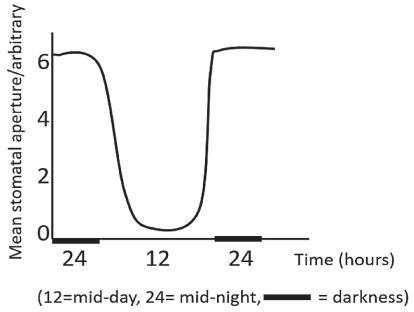
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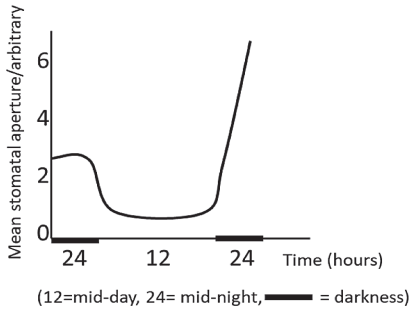
## Question 1 continued

**10)** Which diagram represents the correct rhythm of stomatal aperture in response to day and night?



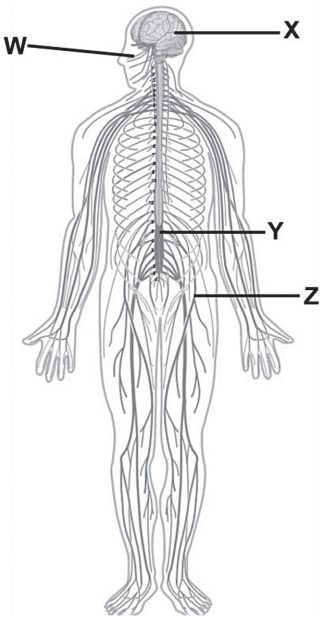




**11)** The diagram opposite shows the human nervous system.

Which labels represent the peripheral nervous system?

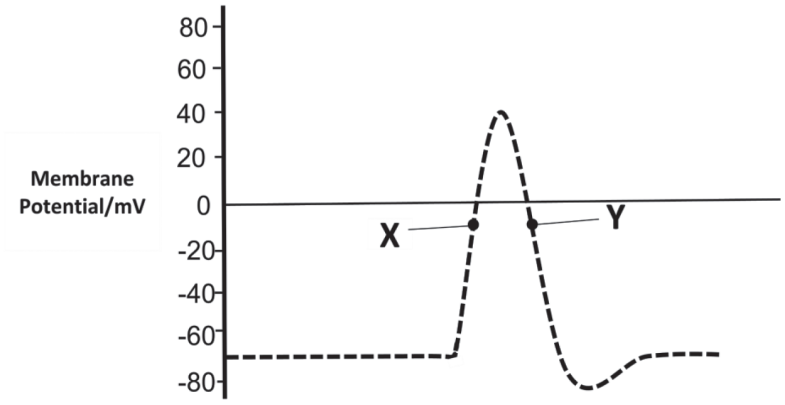
- Y and Z.
- W and Z.
- X and Y.
- W and Y.




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## Question 1 continued

**12)** The graph below shows the changes in the membrane potential of an axon.




Which of the following represents the correct events at the points labeled (X) and (Y)?

| | Point (X) | | Point (Y) | |
|---|---|---|---|---|
| ☐ | depolarisation | $K^+$ ions out | repolarisation | $Na^+$ ions in |
| ☐ | repolarisation | $K^+$ ions out | depolarisation | $Na^+$ ions in |
| ☐ | depolarisation | $Na^+$ ions in | repolarisation | $K^+$ ions out |
| ☐ | repolarisation | $Na^+$ ions in | depolarisation | $K^+$ ions out |

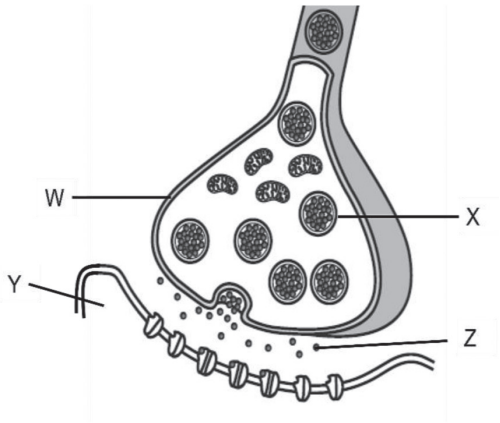
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## Question 1 continued

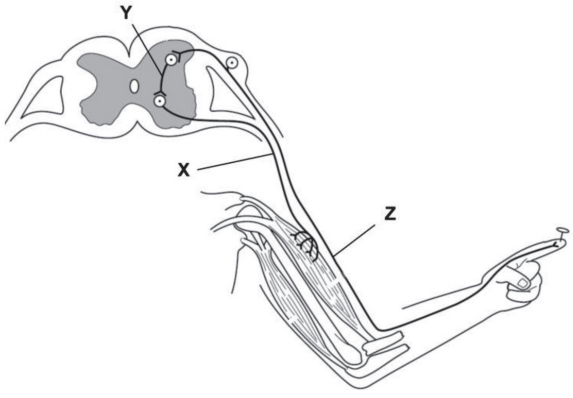
**13)** The diagram below shows a synaptic cleft.




What are the names of the parts labeled W, X, Y and Z?

| | W | X | Y | Z |
|---|---|---|---|---|
| ○ | Dendrite | Neurotransmitter | Synaptic knob | Vesicle |
| ○ | Synaptic knob | Neurotransmitter | Dendrite | Vesicle |
| ○ | Dendrite | Vesicle | Synaptic knob | Neurotransmitter |
| ○ | Synaptic knob | Vesicle | Dendrite | Neurotransmitter |

**14)** The diagram below shows the reflex arc.




Which of the following sequences correctly shows the order of cells that an impulse passes through during a reflex action?

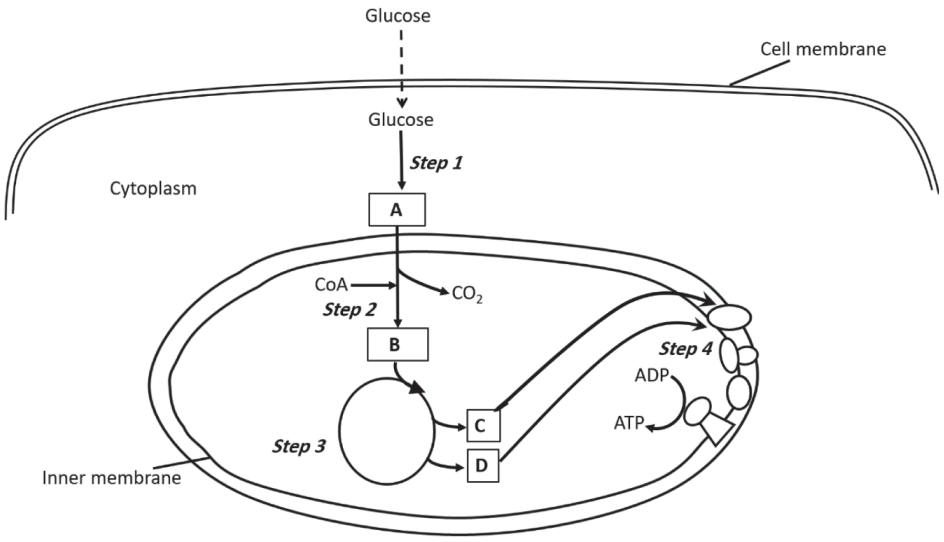
- ○ X ⟶ Y ⟶ Z
- ○ Z ⟶ Y ⟶ X
- ○ X ⟶ Z ⟶ Y
- ○ Z ⟶ X ⟶ Y

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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15)** The diagram below summarizes the sequence of reactions in aerobic respiration. (5 marks)




**a.** Define the substrate linked phosphorylation reaction that takes place in ***Step 1***.

_____

**b.** Name the following:

**(i)** the stage labeled (***Step 1***): _____

**(ii)** compound (**A**): _____

**c.** **(i)** What is the role of compounds (**C**) and (**D**) in ***Step 4***?

_____

**(ii)** If **6** molecules of compound (**B**) enter the cycle in ***Step 3***, find the number of ATP molecules that will be produced at the end of ***Step 3***.

_____

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## Question 2 continued

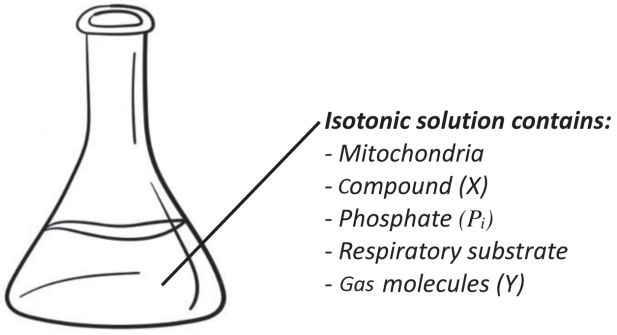
**16)** (5 marks)

**a.** State one use of ATP in a living organism.

_____

**b.** The diagram below demonstrates a lab experiment to investigate the production of ATP by mitochondria.

The mitochondria were isolated and suspended in an isotonic solution that is made up of: Compound (X), phosphate, respiratory substrate, and gas molecules (Y).




**(i)** Compound (X) will react in the cristae of the mitochondria as follows:

**X + Phosphate (Pi) ⟶ ATP**

What is Compound (X)?

_____

**(ii)** State the name of the gas molecules (Y) which are necessary to produce the ATP in the mitochondria.

_____

**(iii)** Explain why the respiratory substrate in the isotonic solution cannot be glucose.

_____

_____

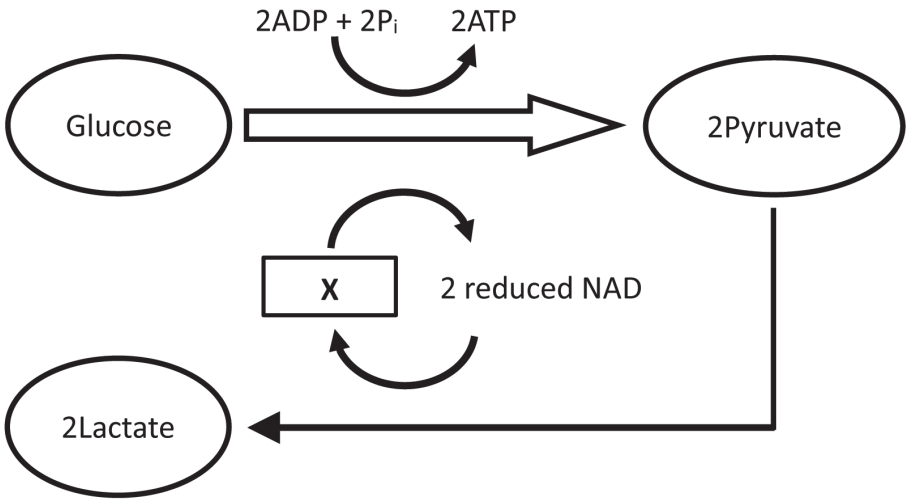
**(iv)** Identify the respiratory substrate that the suspended mitochondria can use to produce ATP.

_____

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## Question 2 continued

**17)** The diagram below shows an anaerobic respiration process in a human cell. (4 marks)




**a.** Name the anaerobic pathway shown above.

_____

**b.** State in which condition would muscle cells respire by using this pathway

_____

**c.** **(i)** Name the compound labeled (X).

_____

**(ii)** Why would a person breathe more deeply than normal after exercising?

_____

_____

_____

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## Question 2 continued

**18)** (6 marks)

**a.** **(i)** Identify the precise location of photosynthetic pigments in a chloroplast.

_____

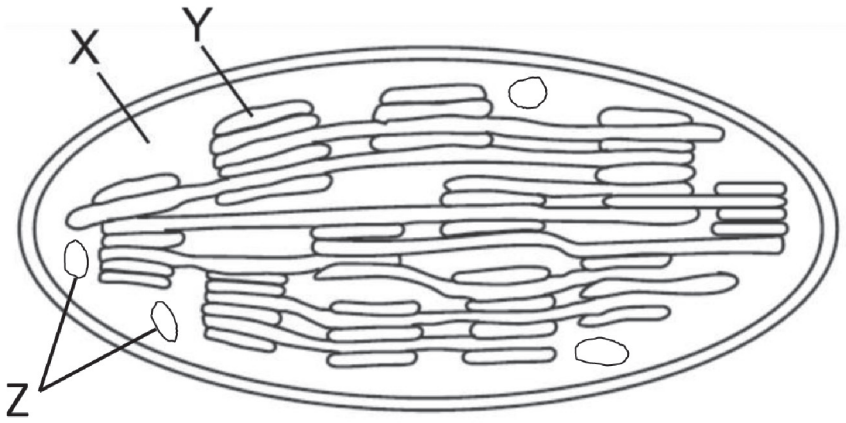
**(ii)** Describe the role of the photosynthetic pigments in photosynthesis.

_____

**(iii)** What is the practical technique that is used to separate photosynthetic pigments?

_____

**b.** The diagram below shows the structure of a chloroplast.




**(i)** Name the types of photosynthesis reactions that take place in the structures labeled (X) and (Y).

(X): _____

(Y): _____

**(ii)** Identify the sugar that is labeled (Z).

_____

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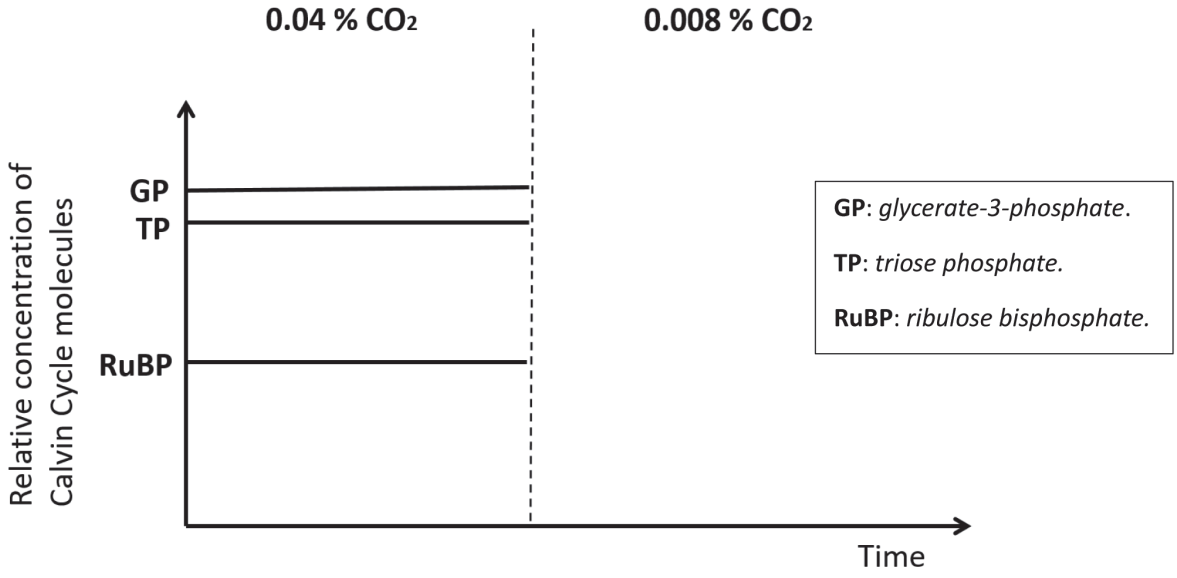
## Question 2 continued

19) (7 marks)

**a.** Compare between cyclic photophosphorylation and non-cyclic photophosphorylation in the table below.

| | cyclic photophosphorylation | non-cyclic photophosphorylation |
|---|---|---|
| **Photosystems involved** | | |
| **Products** | | |

**b.** The graph below shows the concentration of the Calvin Cycle molecules at CO2 concentration of 0.04% (atmospheric).




Predict what will happen to the concentrations of GP, TP and RuBP (increases or decreases) when the concentration of $CO_2$ is reduced to 0.008%.

**GP:** _____

**TP:** _____

**RuBP:** _____

_____

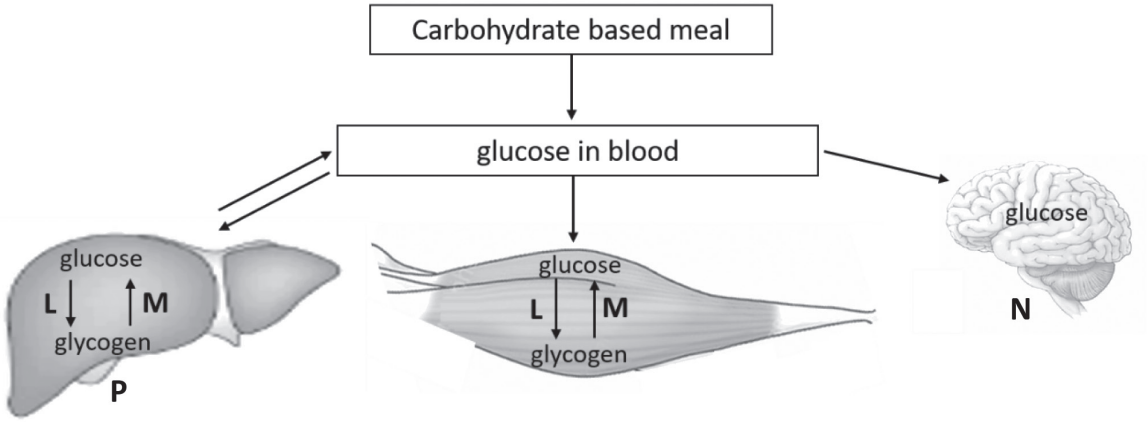
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## Question 2 continued

**20)** The diagram below shows some of the pathways related to the homeostasis of glucose. (5 marks)




**a.** State the following:

**(i)** The purpose of the mechanism as represented in the diagram.

_____

**(ii)** Name of the hormone that triggers the uptake of glucose by the cells in the organ labeled (**N**).

_____

**b.** Identify the label in the diagram above that indicates:

glycogenesis: _____

gluconeogenesis: _____

**c.** Explain how this homeostasis mechanism will be affected if the organ labeled (**P**) cannot perform the process labeled (**M**).

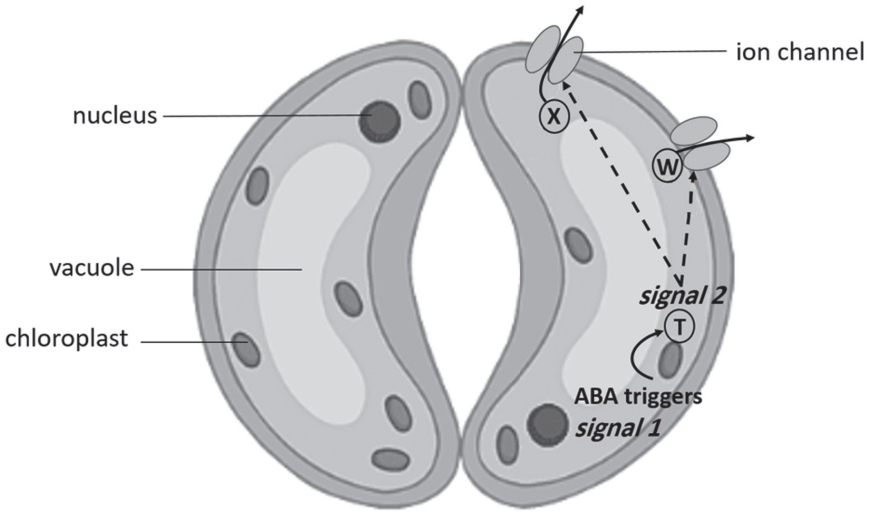
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## Question 2 continued

**21)** The diagram below represents the regulation of stomatal closure in plants. (6 marks)

Under stress conditions plant cells produces the stress hormone abscisic acid (ABA) which triggers the stomatal closure mechanism.




**a.** Write an example of a stress condition in which this mechanism is used.

_____

**b.** Name the cells that open and close the stomatal aperture.

_____

**c.** Identify the ions labeled (T), (W) and (X).

(T): _____

(W): _____

(X): _____

**d.** Explain how the prolonged exposure of the cells to ABA shown in the diagram above may interfere with some of the important biological processes. (Mention an example of these processes).

_____

_____

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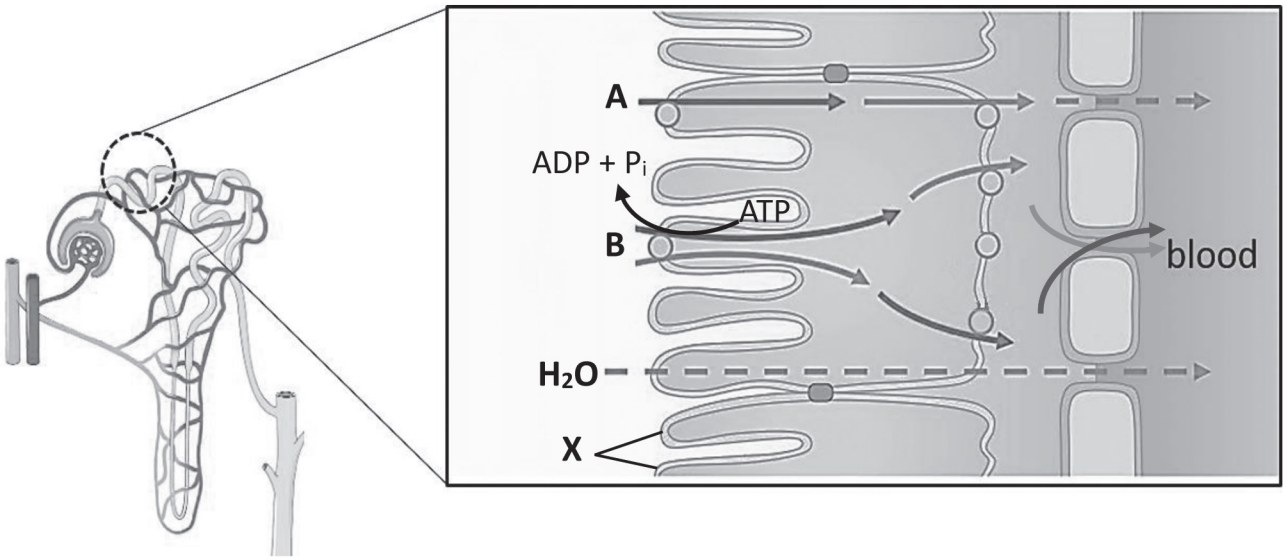


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## Question 2 continued

**22)** The diagram below represents a section of the nephron where most of the reabsorption takes place. (4 marks)




**a.** Name the part of the nephron where this process takes place.

_____

**b.** Complete the following table:

| Substance | Mechanism of movement across membrane (facilitated diffusion/ active transport/ osmosis) |
|---|---|
| A | |
| B | |

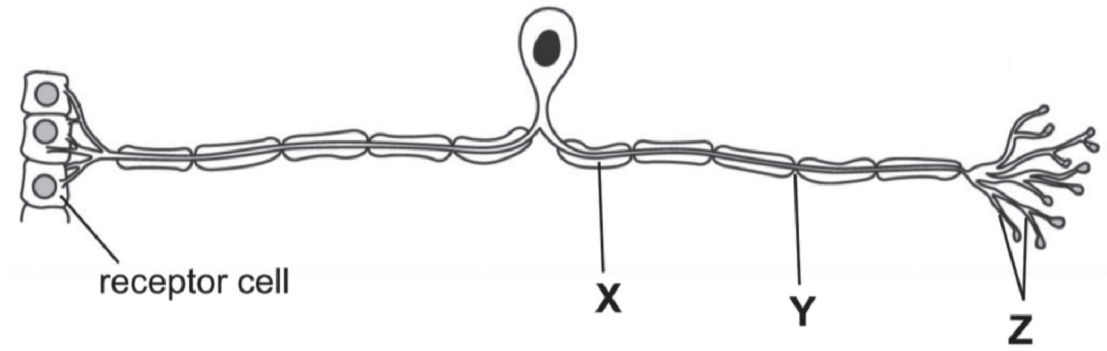
**c.** Suggest one effect if the structure labeled (X) was missing.

_____

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## Question 2 continued

**23)** The diagram below shows a neurone and some receptor cells. (6 marks)




**a.** What type of neurone is shown in the diagram above?

_____

**b.** Name the part labeled (Z), and the region labeled (Y).

(Z): _____

(Y): _____

**c.** Explain how the part labeled (X) increases the speed of conduction of nerve impulses.

_____

_____

_____

**d.** Mitochondria can move freely within the axons of neurones.

Explain the importance of this.

_____

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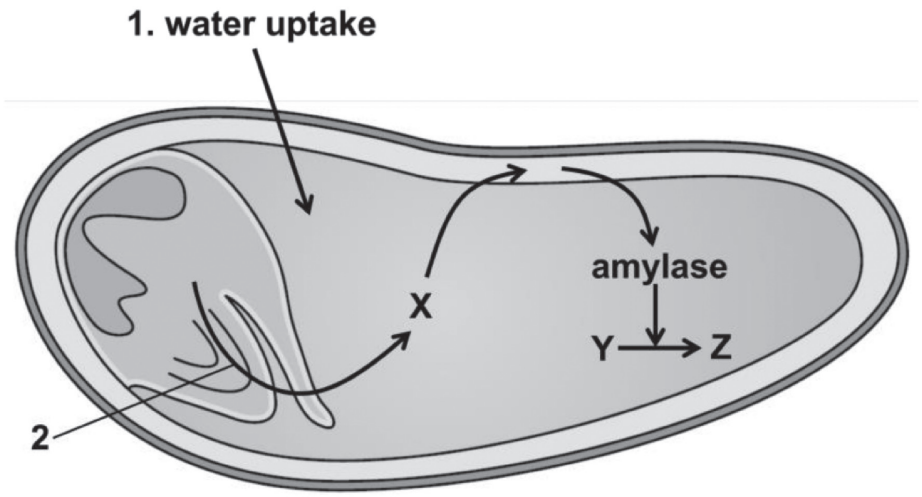
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## Question 2 continued

**24)** (8 marks)

**a.** The diagram below shows the steps that takes place in a barley seed before germination.




**(i)** Describe the process in step 2.

_____

**(ii)** Identify substances (X), (Y) and (Z).

X: _____

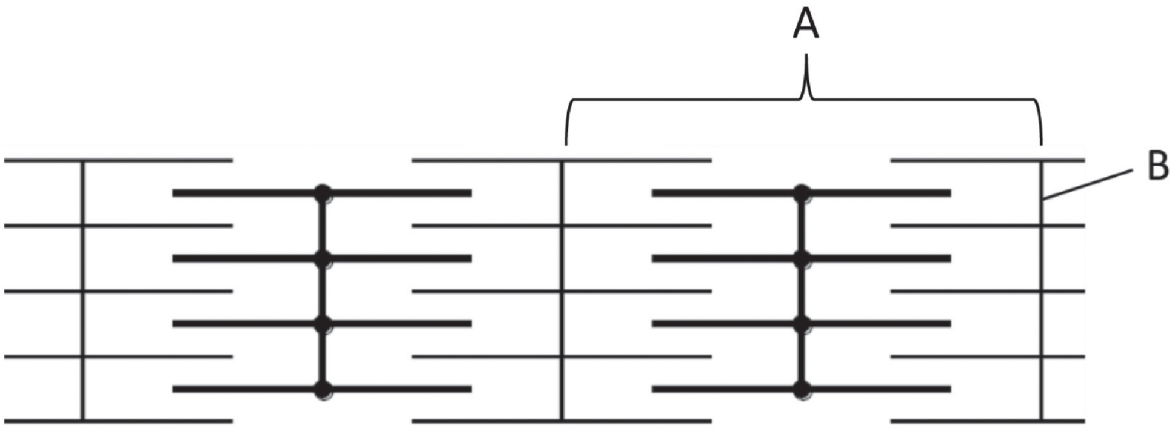
Y: _____

Z: _____

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## Question 2 continued

**b.** The diagram below shows a part of a myofibril.




**(i)** Identify the parts labeled (A) and (B).

(A): _____

(B): _____

**(ii)** Describe the role of calcium ions in muscle contraction.

_____

_____

_____

**[ End of Examination ]**

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مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م

## الدور الثاني - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في ( ١٥ ) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

○ القاهرة ○ الدوحة
● مسقط ○ أبوظبي

**ملاحظة:** يتم تظليل الشكل (●) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ● **غير صحيح** ▭ ◉ ◒ ☒ ☑

# مُسَوَّدَة، لا يتم تصحيحها

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## Question 1: Multiple Choice Items (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (○) next to the **correct** answer for each of the following items.

**1)** Which of the following is a component of ATP?

- ○ deoxyribose
- ○ ribose
- ○ glucose
- ○ glyceraldehyde

**2)** The chemical equation for the aerobic respiration of palmitic oil is:

$$C_{16}H_{32}O_2 + 23O_2 \longrightarrow 16CO_2 + 16H_2O.$$

The respiratory quotient (RQ) for this substrate is:

- ○ 0.696
- ○ 0.710
- ○ 0.900
- ○ 1.000

**3)** The utilization of yeast to produce puffy dough is based on the concept that:

- ○ $CO_2$ produced causes swelling and rising of the dough.
- ○ Lactic acid produced causes swelling and rising of the dough.
- ○ Alcoholic fermentation produces $O_2$ which will produce a puffy dough.
- ○ Lactate fermentation leads to the production of $CO_2$ which will produce a puffy dough.

**4)** The net gain of ATP molecules produced in aerobic respiration in a cell that lacks the ATP synthase is:

- ○ 4
- ○ 8
- ○ 28
- ○ 32

**5)** Which statement is correct in relation to the light-dependent stage of photosynthesis?

- ○ NADP is produced.
- ○ ATP is produced.
- ○ $CO_2$ is reduced.
- ○ $CO_2$ is produced.

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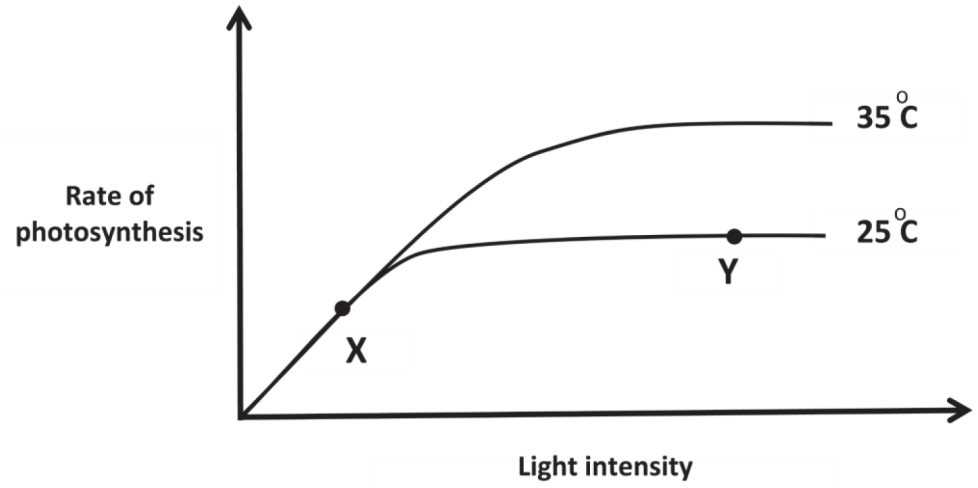
## Question 1 continued

**6)** Changes in the atmospheric $CO_2$ concentration, and temperature alter the rate of photosynthesis.

What are the stages of photosynthesis directly affected by these two factors?

| | $CO_2$ concentration | Temperature |
|---|---|---|
| ☐ | Calvin cycle | Calvin cycle |
| ☐ | photophosphorylation | Calvin cycle |
| ☐ | photophosphorylation | photophosphorylation |
| ☐ | Calvin cycle | photophosphorylation |

**7)** The graph below shows the rate of photosynthesis at two different temperatures and constant concentration of carbon dioxide.




What are the factors most likely to be limiting the rate of photosynthesis at points (X) and (Y)?

| | Point (X) | Point (Y) |
|---|---|---|
| ☐ | $CO_2$ concentration | Temperature |
| ☐ | Temperature | Light intensity |
| ☐ | Light intensity | Temperature |
| ☐ | Light intensity | $CO_2$ concentration |

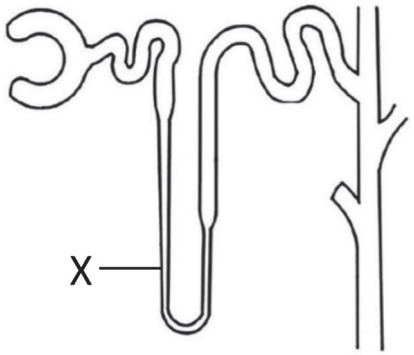
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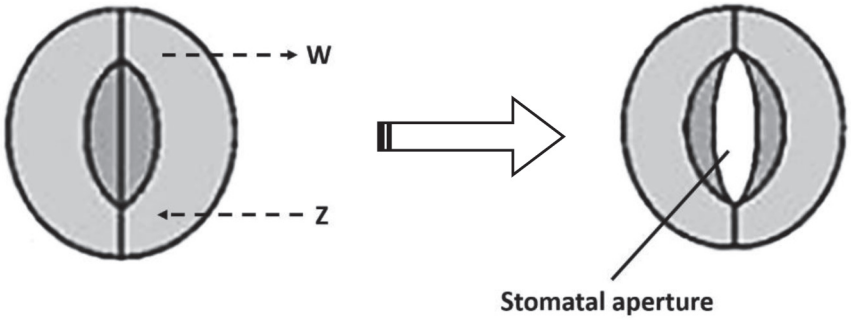
## Question 1 continued

**8)** The part labelled (X) in the diagram below is responsible for:




- ☐ Hormone-mediated osmoregulation.
- ☐ Re-absorption of water by creating osmotic gradient.
- ☐ Ultrafiltration of blood plasma.
- ☐ Selective reabsorption of amino acids and glucose.

**9)** The diagram below shows the process of opening of stomatal aperture.



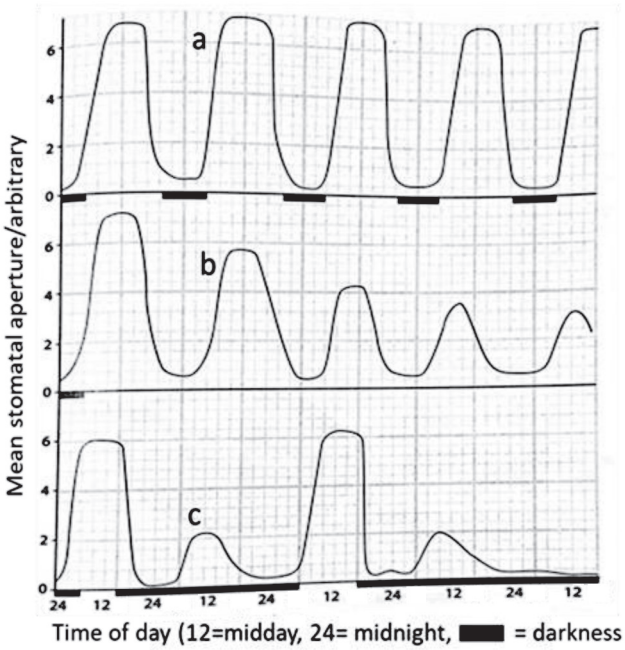

The first event that initiates this process inside the guard cells is:

- ☐ Entry of the ion particles labelled (Z) along their concentration gradient.
- ☐ Entry of the ion particles labelled (Z) against their concentration gradient.
- ☐ Exit of the proton particles labelled (W) along their concentration gradient.
- ☐ Exit of the proton particles labelled (W) against their concentration gradient.

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## Question 1 continued

**10)** In a study of the rhythm of stomatal apertures over several days, the diagram below was obtained.




Which statement about the status of stomatal aperture is true?

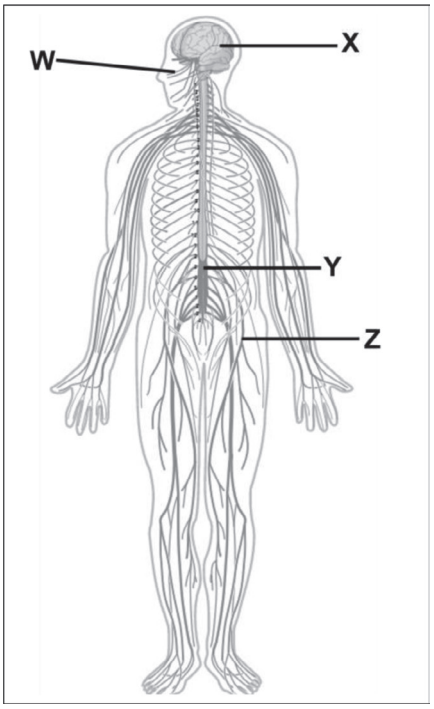
- ☐ The stomatal apertures lack daily rhythm of opening and closing over the period.
- ☐ The stomatal apertures are closed during the day with minimum size at midday.
- ☐ The stress conditions in curves **a** and **b** have no effect on the stomatal aperture.
- ☐ The stomatal apertures are opened during the day with maximum size at midday.

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## Question 1 continued

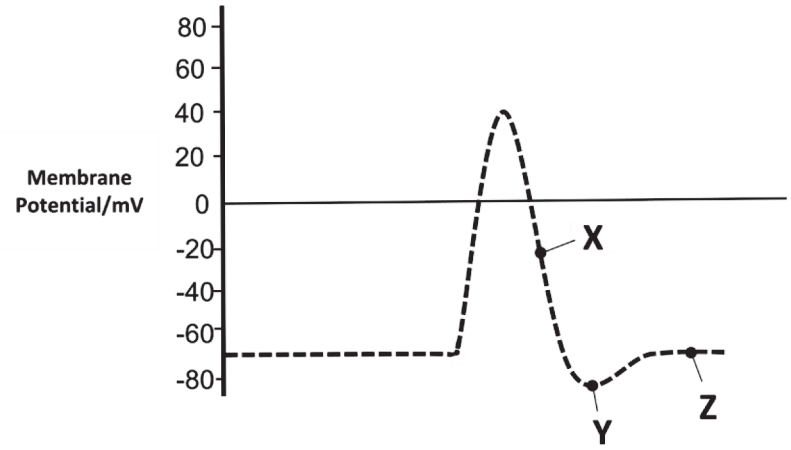



**11)** The diagram opposite shows the human nervous system.

Which labels represent the central nervous system?

- ☐ Y and Z.
- ☐ W and Z.
- ☐ X and Y.
- ☐ W and Y.

**12)** The diagram below shows the changes in the membrane potential of an axon.



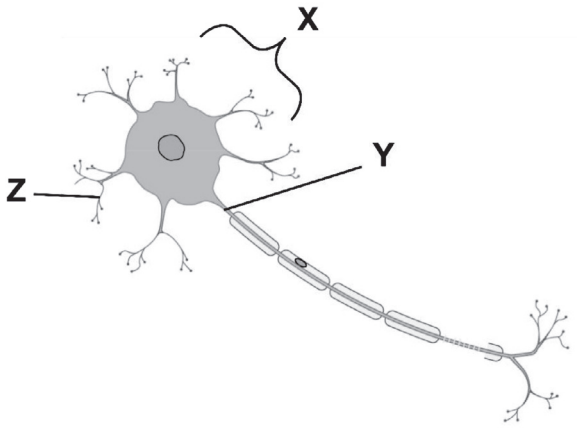

Which of the following represents the correct events at the points labelled (X), (Y) and (Z)?

| | Point (X) | Point (Y) | Point (Z) |
|---|---|---|---|
| ☐ | Depolarisation | Refractory period | Resting potential |
| ☐ | Repolarisation | Refractory period | Resting potential |
| ☐ | Refractory period | Depolarisation | Resting potential |
| ☐ | Repolarisation | Resting potential | Refractory period |

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## Question 1 continued

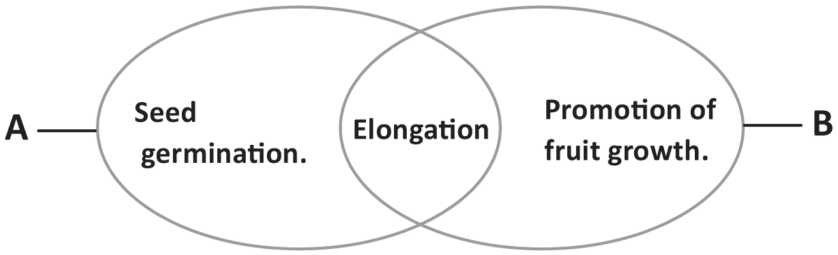
**13)** The diagram below shows the structure of a neurone.




What are the parts labeled (X), (Y) and (Z)?

| | Z | Y | X |
|---|---|---|---|
| ○ | Dendrites | Axon | Cell body |
| ○ | Cell body | Axon | Dendrites |
| ○ | Cell body | Dendrites | Axon |
| ○ | Axon | Dendrites | Cell body |

**14)** The diagram below shows some effects of two plant growth regulators in plants.




Identify the regulators (A) and (B).

| | (A) | (B) |
|---|---|---|
| ○ | Abscisic acid | Auxins |
| ○ | Gibberellins | Abscisic acid |
| ○ | Auxins | Gibberellins |
| ○ | Gibberellins | Auxins |

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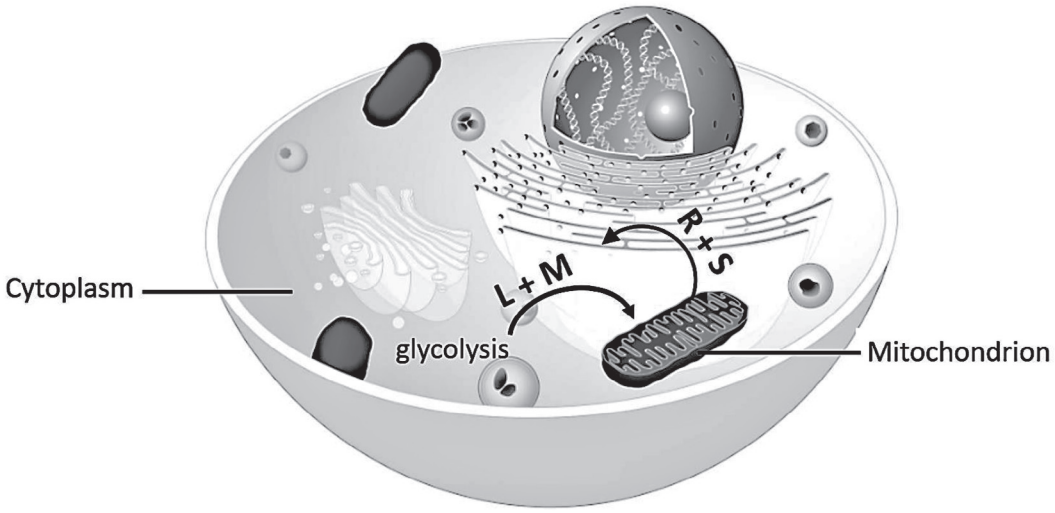
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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15)** The diagram below summarizes the inputs and outputs of aerobic respiration.

(5 marks)




**a.** Name the first stage that occurs in mitochondria in the aerobic respiration.

_____

**b.** List the inputs labelled (L) and (M):

(L): _____

(M): _____

**c.** List the outputs labelled (R) and (S):

(R): _____

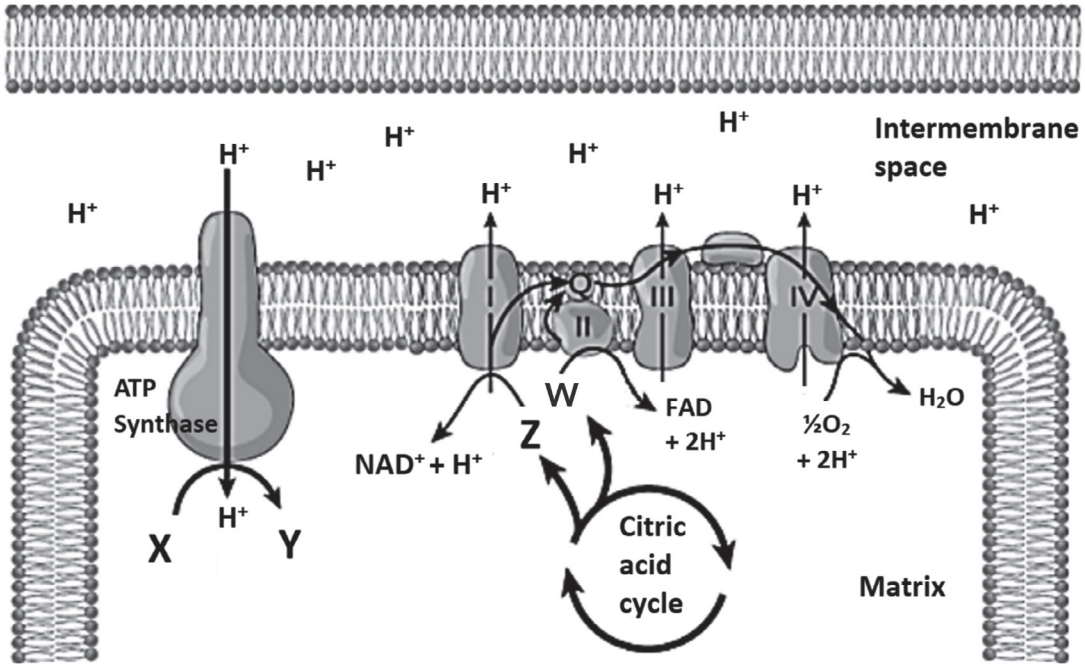
(S): _____

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## Question 2 continued

**16)** The diagram below demonstrates the electron transport chain in a human cell.

(5 marks)




**a.** State the site of these reactions.

_____

**b.** Identify the substances labelled (X) and (Y):

(X): _____

(Y): _____

**c.** **(i)** How many molecules of the compound (Y) will be produced from both compounds (Z) and (W) from 2 molecules of glucose by chemiosmosis?

_____

**(ii)** If the cell undergoes anaerobic respiration, what would be the last electron acceptor in this cell?

_____

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## Question 2 continued

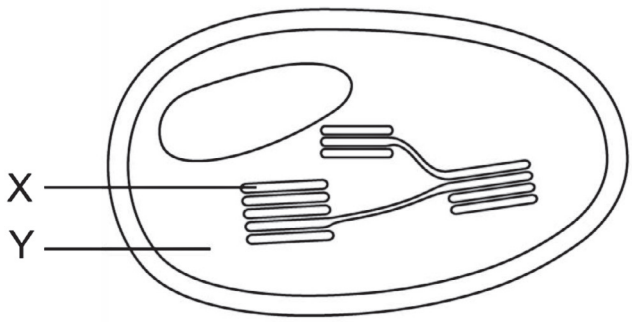
**17)** In a respiration of lipid substrate 102 molecules of carbon dioxide were produced and 145 molecules of oxygen were used. (4 marks)

**a.** What would be the number of Oxygen molecules if this substrate was a carbohydrate?

**b.** Why do lipids produce the highest level of energy compared to carbohydrates and proteins?

**c.** Calculate the RQ for this substrate.

**18)** The diagram below shows the structure of chloroplast. (4 marks)




**a.** Name the structure labelled (X).

**b.** What type of photosynthesis reactions occurs in the region labelled (Y)?

**c.** Predict the change in amount of GP after a photosynthesising plant has been in darkness for a short time.

**d.** Assuming there are two glucose molecules produced in Calvin cycle, how many RuBP molecules are entering the cycle?

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## Question 2 continued

**19)** Describe the role of the following in the photosynthesis. (3 marks)

- water: _____

_____

- RUBISCO: _____

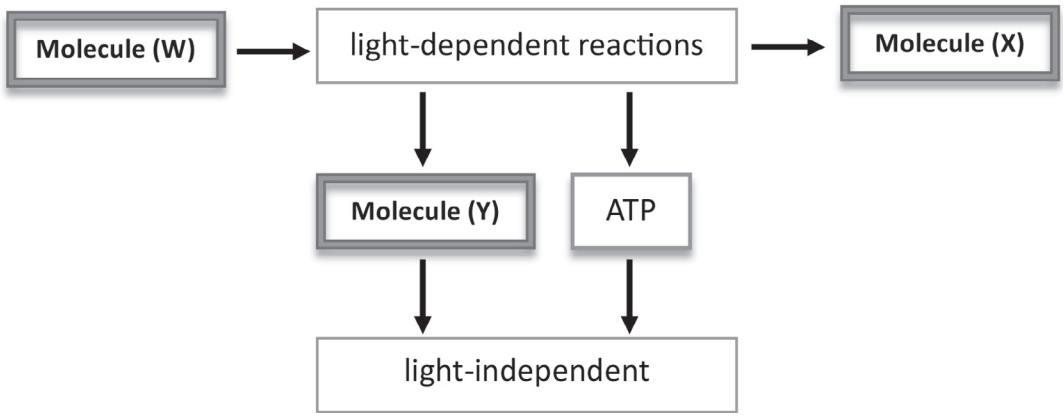
_____

- photosynthetic pigments: _____

_____

**20)** The diagram below shows some of the steps in the process of photosynthesis.

(6 marks)




**a.** Name the molecules (W), (X) and (Y).

(W): _____

(X): _____

(Y): _____

**b.** Where in the chloroplast does the following reaction takes place?

$RuBP + CO_2 \longrightarrow 2 \times GP$

_____

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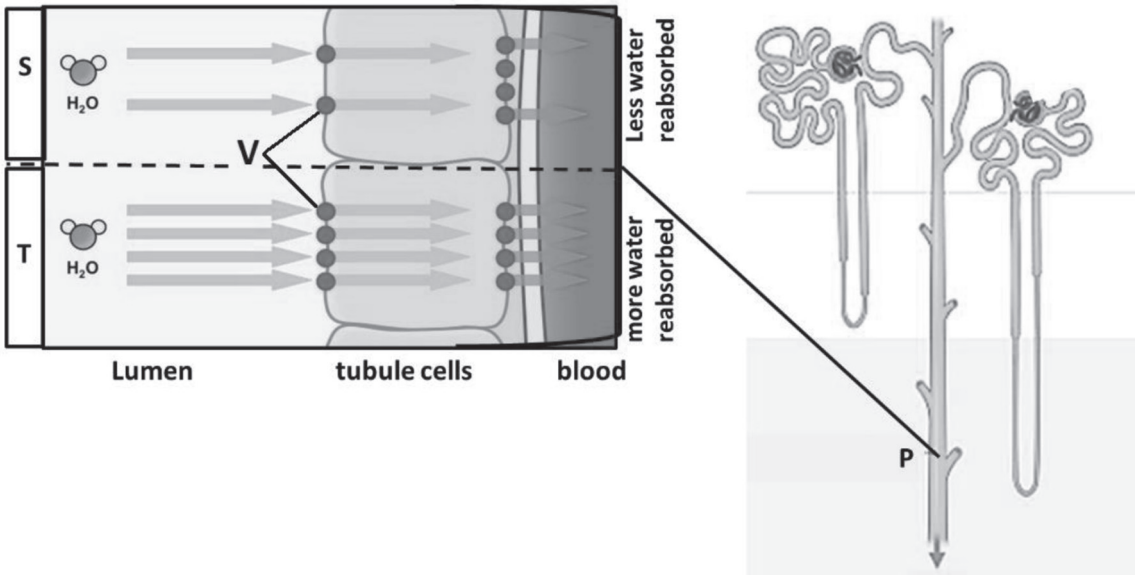
## Question 2 continued

**c.** Name the process in the light-dependent stage of photosynthesis that produces oxygen. _____

**d.** Explain why the volume of oxygen released from the plant does not give a true rate of photosynthesis.

_____

**21)** The diagram below represents the role of the anti-diuretic hormone (ADH) in the osmoregulation. (5 marks)




**a.** Name the following:

- The gland that secretes (ADH) into the blood: _____

- The parts labelled (V): _____

**b.** Identify the labels that represent the following conditions:

- Feeling of thirst: _____

- Excess water in the body: _____

**c.** Predict the effect of high salt intake in the levels of (ADH) in blood.

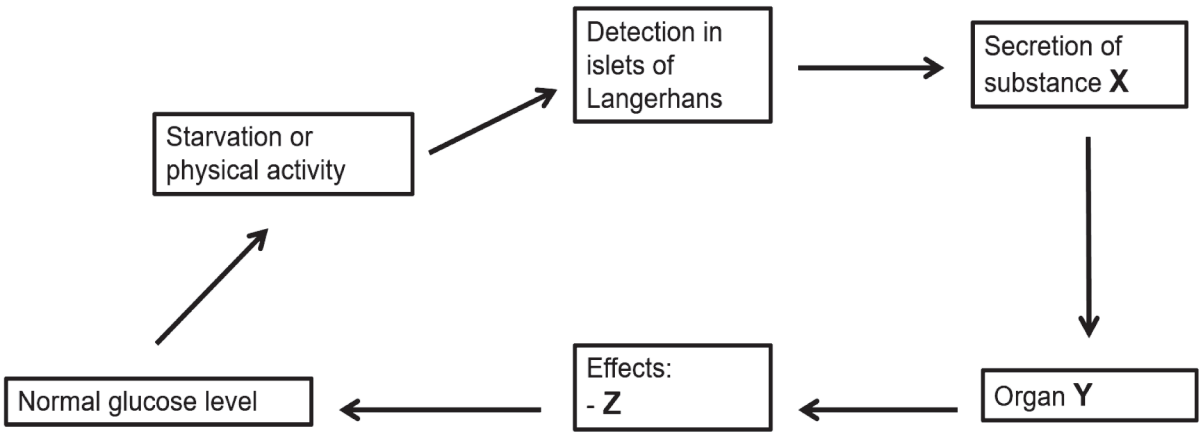
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## Question 2 continued

**22)** **(10 marks)**

**a.** The diagram below demonstrates a mechanism to regulate the glucose level in blood.




**(i)** Name this type of feedback. _____

**(ii)** Name a disease that associated with chronic high level of glucose in blood. _____

**(iii)** Identify the following:

(X): _____

(Y): _____

(Z): _____

**(iv)** Suggest a reason why muscles (unlike organ (Y)) do not contribute to elevating the glucose concentration to normal level in blood in this mechanism.

_____

_____

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## Question 2 continued

**b.** The diagram below shows the procedure for measuring glucose level in urine using dip-sticks.



**(i)** State the advantage of using this test.

_____

**(ii)** Identify the names of the substances labelled (K) and (L) in the following equations:

$$\text{glucose} + O_2 \xrightarrow{K} \text{gluconic acid} + H_2O_2$$

$$H_2O_2 + \text{reduced chromogen } (DH_2) \xrightarrow{L} H_2O + \text{oxidized chromogen}$$

- (K): _____

- (L): _____

**(iii)** Suggest how might the application of this test in a place with low oxygen pressure (for example on elevated places) affects the results of this test.

_____

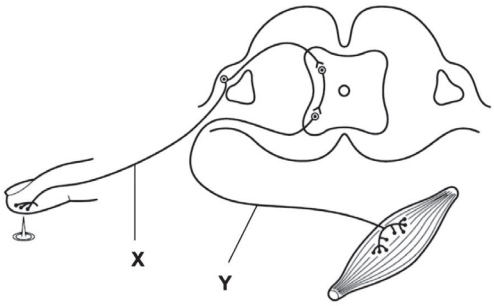
_____

_____

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## Question 2 continued

**23)** The diagram below shows a simple reflex arc. (6 marks)




**a.** What type of neurones are labelled (X) and (Y)?

(X): _____

(Y): _____

**b.** Reflexes are described as being rapid, automatic responses.

Use the information in the diagram to explain these features of a reflex arc which result in the response being rapid and automatic.

_____

_____

**24)** **a.** When a dormant seed absorbs water it will start to germinate and its rate of respiration will increase. (8 marks)

**(i)** Name the plant growth regulator involved in the initiation of the germination of seeds.

_____

**(ii)** In which part of the plant is this regulator present?

_____

**(iii)** Outline the role of amylase in seed germination.

_____

_____

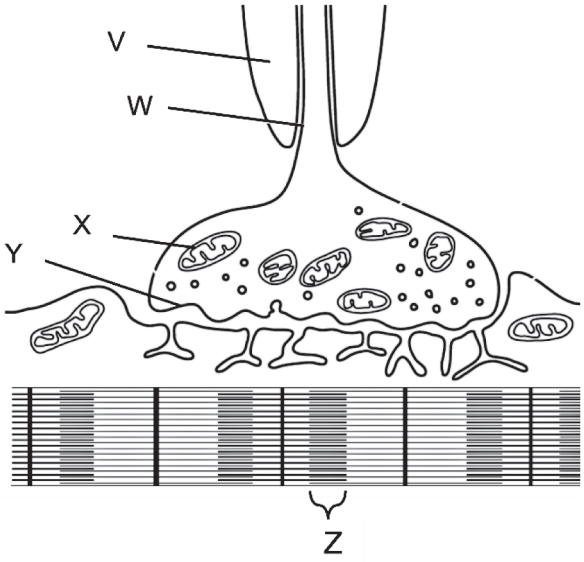
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## Question 2 continued

**b.** The diagram below shows a neuromuscular junction.




**(i)** Identify the following parts:

(V): _____

(W): _____

(Y): _____

**(ii)** Describe the role of the part labelled (X) in muscle contraction.

_____

**(iii)** Name the filaments located in the part labelled (Z).

_____

**[ End of Examination ]**

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# مُسَوَّدَة

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# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م

## الدور الأول - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في (١٦) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

**ملاحظة:** يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

# مُسَوَّدَة، لا يتم تصحيحها

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## Question 1: Multiple Choice Items (14 marks)

There are 14 multiple-choice items worth two marks each.
Shade in the bubble (⬭) next to the **correct** answer for each of the following items.

**1)** Which sugar is found in the ADP molecule?

⬭ Ribose ⬭ Hexose

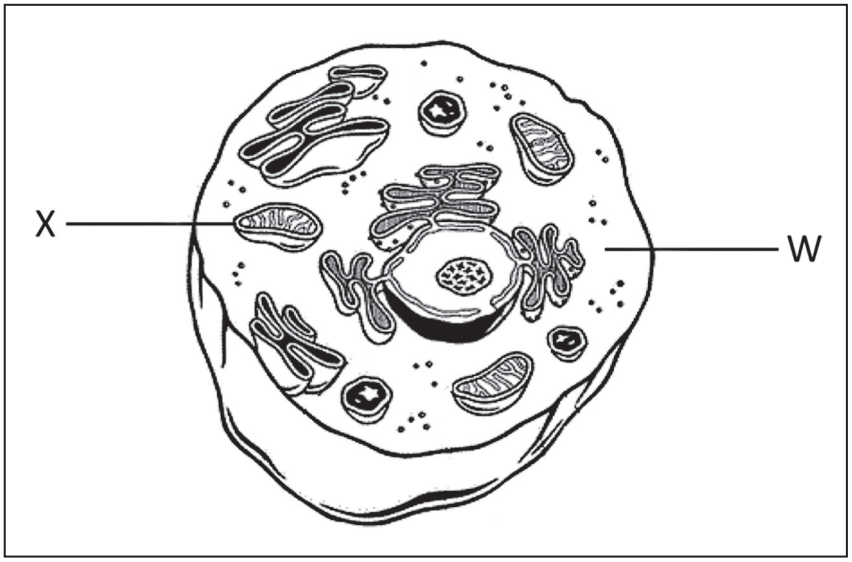
⬭ Glucose ⬭ Fructose

**2)** The substrate that uses 364 molecules of $O_2$ in aerobic respiration to produce 252 molecules of $CO_2$ is:

⬭ sucrose. ⬭ amino acid.

⬭ glucose. ⬭ lipids.

**3)** The following diagram shows an animal cell, where anaerobic respiration takes place.



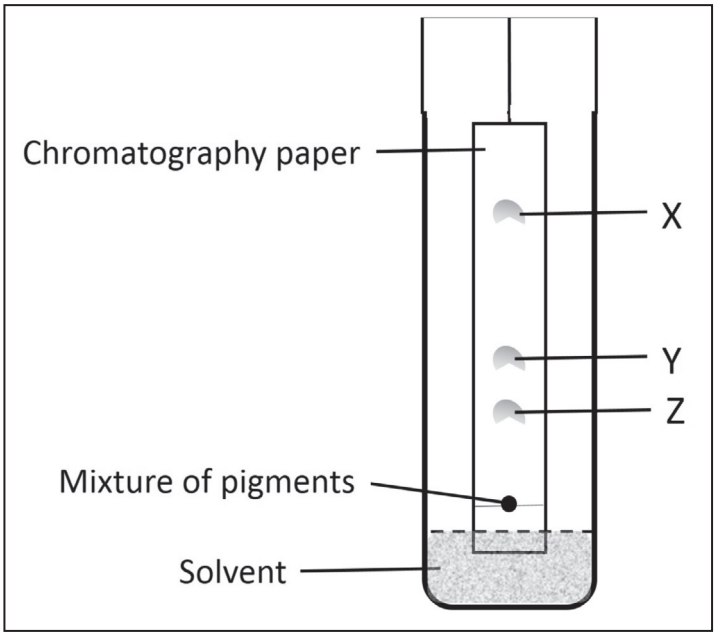

The correct option about the toxin and its site of production is:

| | The toxin | Site of production |
|---|---|---|
| ⬭ | Lactic acid | W |
| ⬭ | $CO_2$ | X |
| ⬭ | Ethanol | W |
| ⬭ | Pyruvate | X |

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## Question 1 continued

**4)** The diagram below shows the chromatography of pigments in chloroplast.




What type of pigments are labeled (X), (Y) and (Z)?

| | X | Y | Z |
|---|---|---|---|
| ☐ | Carotenoids | Chlorophyll b | Chlorophyll a |
| ☐ | Chlorophyll a | Chlorophyll b | Carotenoids |
| ☐ | Chlorophyll b | Chlorophyll a | Carotenoids |
| ☐ | Carotenoids | Chlorophyll a | Chlorophyll b |

**5)** Assuming there are three glucose molecules produced in the Calvin cycle, how many RuBP molecules enter the cycle?

☐ 3 ☐ 6

☐ 12 ☐ 18

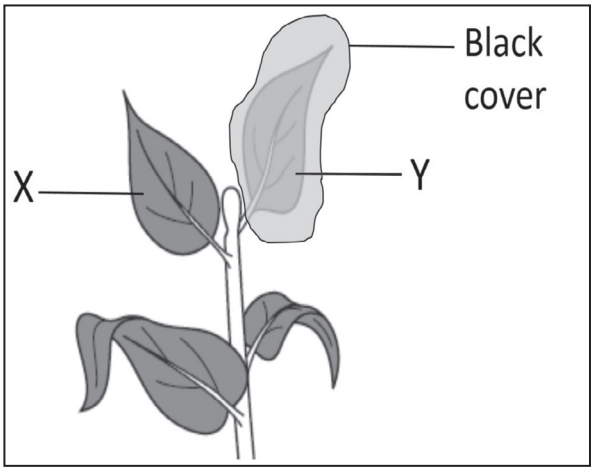
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## Question 1 continued

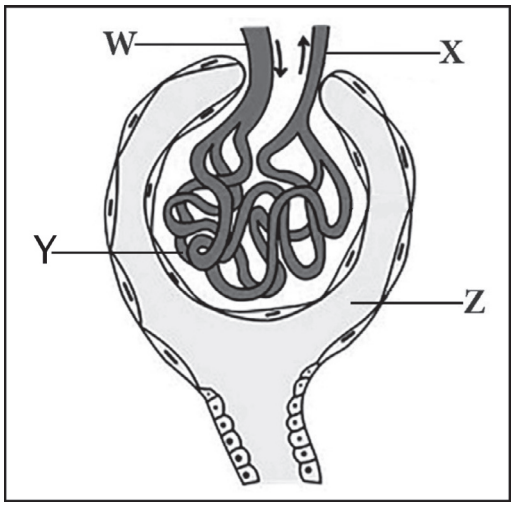
**6)** The figure opposite shows a plant with two leaves (X) and (Y).




Which of the following is correct about the concentration of TP in leaves (X) and (Y)?

| | Leaf (X) | Leaf (Y) |
|---|---|---|
| ☐ | High concentration of TP | High concentration of TP |
| ☐ | Low concentration of TP | Low concentration of TP |
| ☐ | High concentration of TP | Low concentration of TP |
| ☐ | Low concentration of TP | High concentration of TP |

**7)** In the diagram below, the part known as afferent arteriole is:



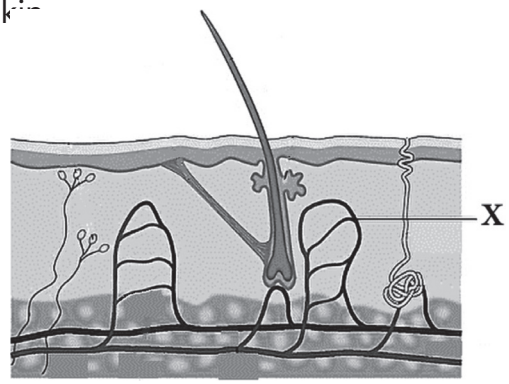

☐ W ☐ X

☐ Y ☐ Z

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## Question 1 continued

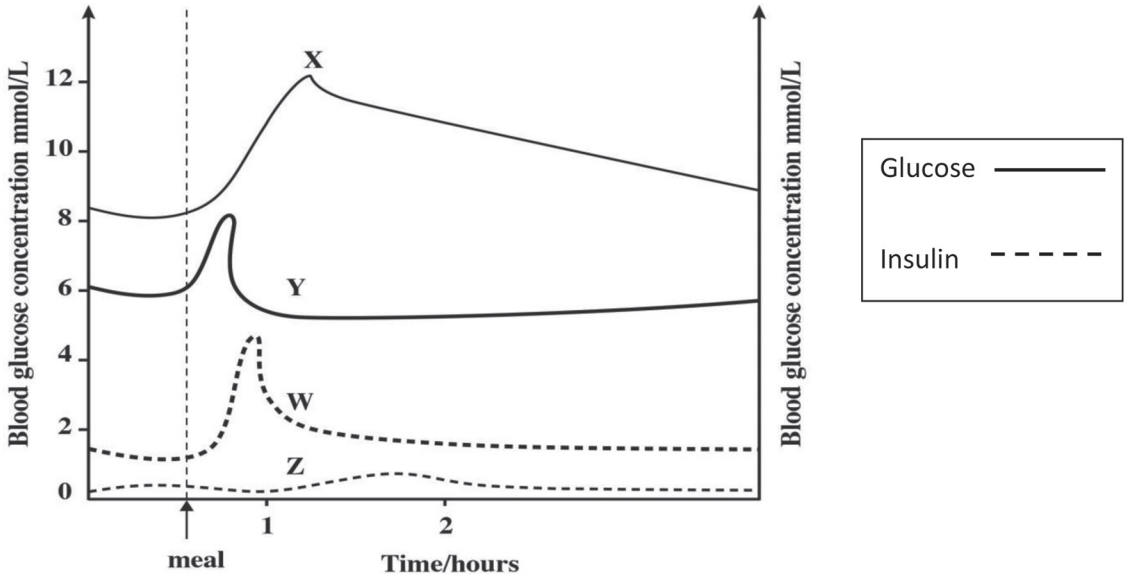
**8)** The diagram opposite shows a cross section of the skin.




What is the role of the part labeled (X) in warm conditions?

- ☐ Increasing sweat production.
- ☐ Vasocontraction.
- ☐ Vasodilation.
- ☐ Raising body hair.

**9)** The statement that summarizes the graph below correctly is:




- ☐ (W) and (X) represent glucose and insulin concentration in a diabetic person.
- ☐ (W) and (Y) represent glucose and insulin concentration in a non-diabetic person.
- ☐ (Y) and (Z) represent glucose and insulin concentration in a diabetic person.
- ☐ (Y) and (Z) represent glucose and insulin concentration in a non-diabetic person.

**10)** Which part of a neurone has the most metabolic reactions?

- ☐ Dendrites.
- ☐ Cell body.
- ☐ Axon.
- ☐ Dendrone.

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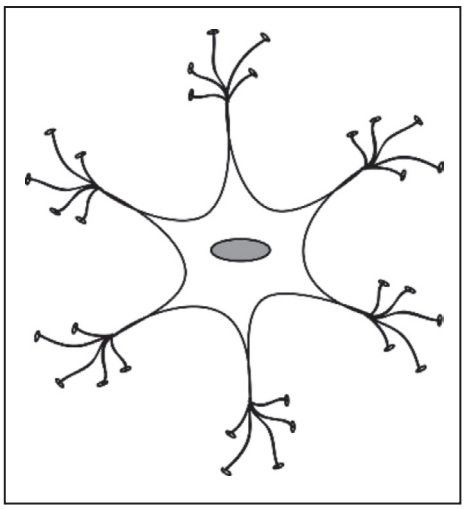
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## Question 1 continued

**11)** The diagram opposite shows one type of neurone.

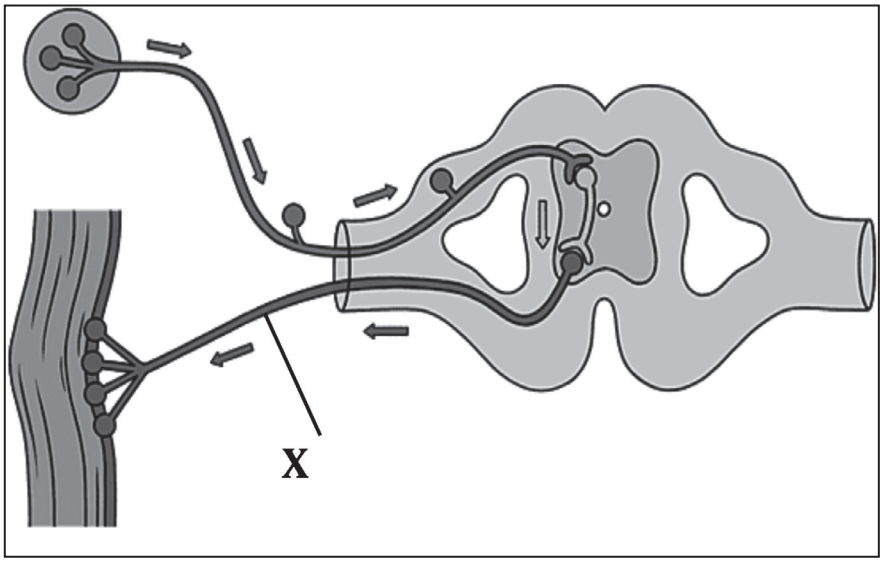
Which of the following is correct about the type of neurone and its location?



| | Neurone | Location |
|---|---|---|
| ☐ | Motor | Peripheral nervous system |
| ☐ | Motor | Central nervous system |
| ☐ | Relay | Peripheral nervous system |
| ☐ | Relay | Central nervous system |

**12)** The diagram below shows the reflex arc.

If the part labeled (X) was cut, which of the following is correct?




☐ There is a sense and a response.

☐ There is no sense but there is a response.

☐ There is a sense with no response.

☐ There is no sense and no response.

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## Question 1 continued

**13)** Diagram (A) below shows the change in the membrane potential of a neurone, and table (B) shows the ionic changes.

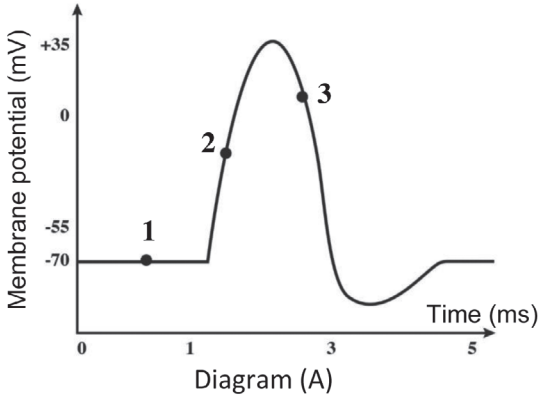


Diagram (A)

| The events |
|---|
| **W**: The membrane potential decreases below -70 mV. |
| **X**: $K^+$ channels open and $K^+$ ions exit out of the axon. |
| **Y**: $Na^+$ and $K^+$ pump is working, $Na^+$ ions move out and $K^+$ ions move in. |
| **Z**: $Na^+$ channels open and $Na^+$ ions enter the axon. |

Table (B)

Which of the following represents the correct match between the stage's number and the event?

| | Stage 1 | Stage 2 | Stage 3 |
|---|---|---|---|
| ☐ | W | Z | X |
| ☐ | Y | Z | X |
| ☐ | W | X | Y |
| ☐ | Z | X | Y |

**14)** The table below shows the concentration of $Na^+$ and $K^+$ ions along the membrane of a neurone's axon.

| Ions | Ions concentration ($mmol.dm3^-$) | |
|---|---|---|
| | Inside the axon | Outside the axon |
| **$Na^+$** | 45 | 450 |
| **$K^+$** | 380 | 15 |

Which of the following is correct about the neurone at this state?

| | Axon's state | $Na^+$ and $K^+$ pump | $Na^+$ channels | $K^+$ channels |
|---|---|---|---|---|
| ☐ | Polarized | Working | Closed | Closed |
| ☐ | Depolarized | Not working | Open | Open |
| ☐ | Polarized | Not working | Closed | Open |
| ☐ | Depolarized | Working | Open | Closed |

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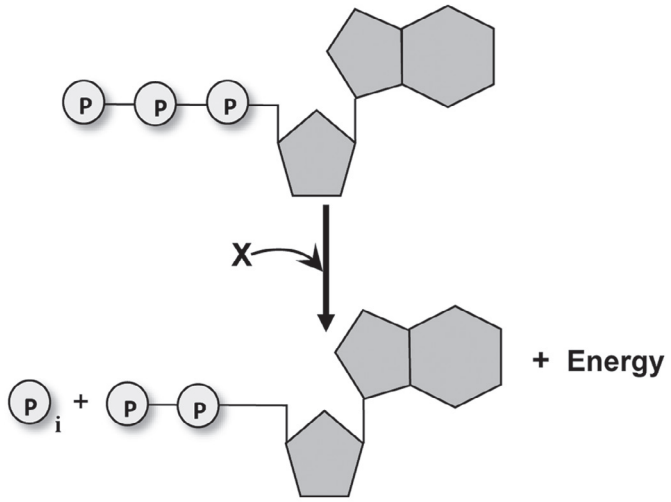
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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15)** The diagram below shows a part of a process in the ATP/ADP cycle. (5 marks)




**a.** Name the process that is shown in the diagram.

_____

**b.** State the role of the molecule labeled (X).

_____

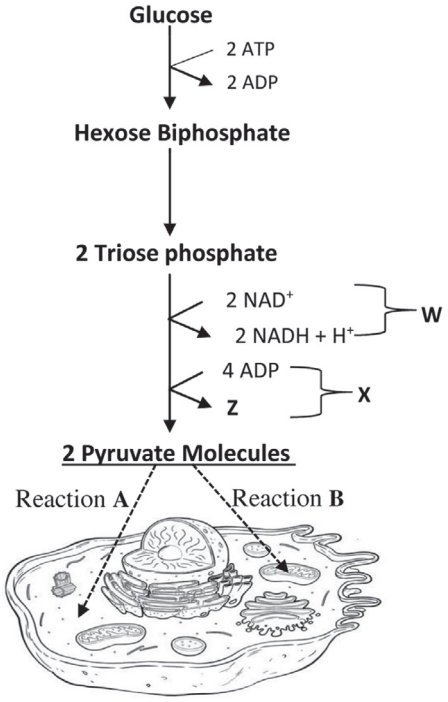
**c.** The table below shows 3 types of respiratory substrates A, B and C. Identify the type of each substrate in the following table:

| | Substrate A | Substrate B | Substrate C |
|---|---|---|---|
| Amount of energy released KJ/g | 39400 KJ/1000g | 15800 KJ/1000g | 17000 KJ/1000g |
| Type of substrate | | | |

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## Question 2 continued

**16)** The diagram below shows the glycolysis stage. (5 marks)




**a.** What is the site of this stage in an animal cell?

_____

**b.** **(i)** What will happen to the process labeled (X) if the amount of ATP is at a high concentration?

_____

**(ii)** State the importance of the process labeled (W).

_____

_____

**(iii)** What is the fate of the molecule labeled (Z)?

_____

**c.** What is the difference between reaction **(A)** and reaction **(B)** types in term of oxygen presence?

_____

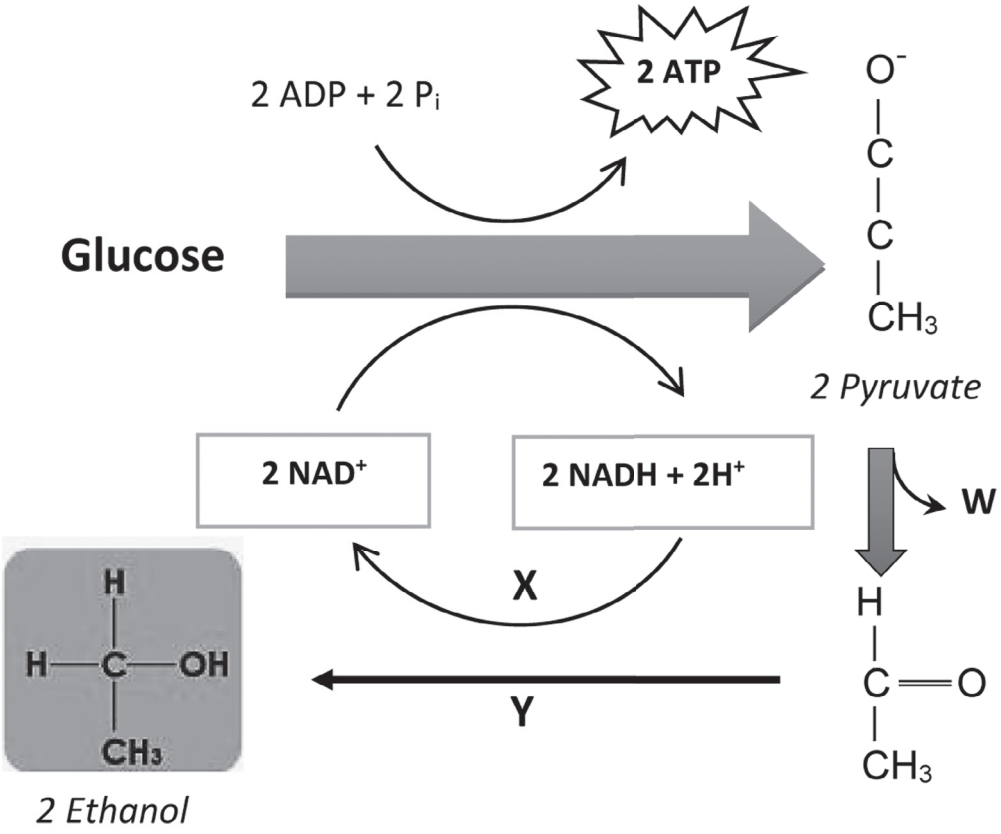
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## Question 2 continued

**17)** The diagram below shows one type of anaerobic respiration. (4 marks)




**a.** Which organism carries this type of respiration?

_____

**b.** Identify the compound labeled (W).

_____

**c.** Name the processes labeled (X) and (Y).

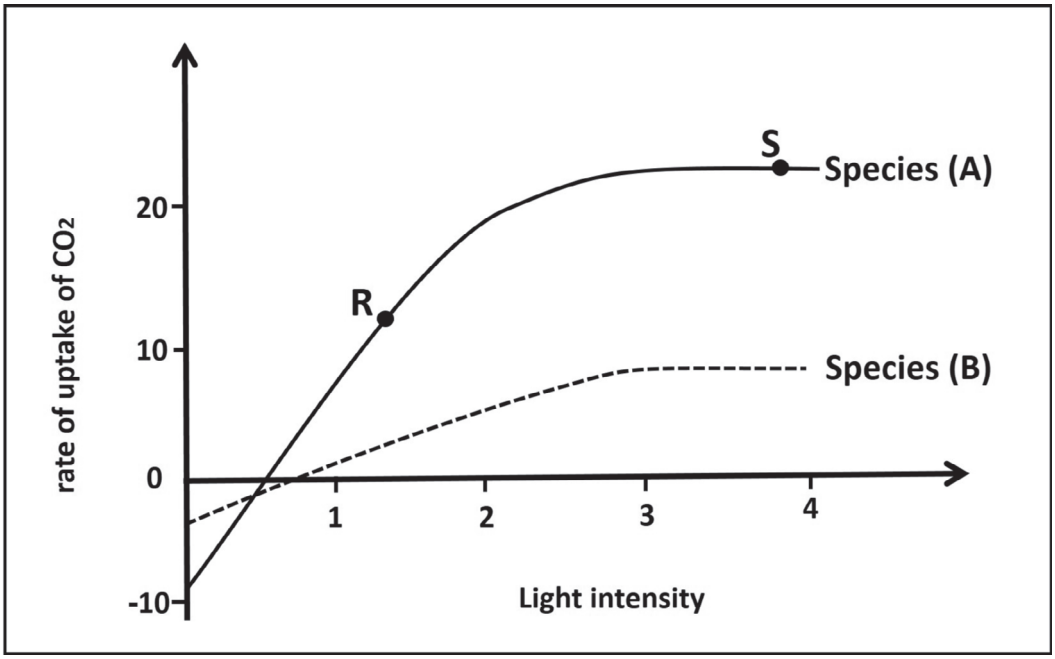
X: _____

Y: _____

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## Question 2 continued

**18) a.** The graph below shows a change in the rate of $CO_2$ uptake with light intensity in two different species of plants (A) and (B). (7 marks)




**(i)** Which species is a shade plant?

_____

**Explain** your answer.

_____

**(ii)** What is the factor that is limiting the rate of photosynthesis at point (R)?

_____

**(iii)** Explain why there is no further increase in the rate of photosynthesis beyond point (S).

_____

_____

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## Question 2 continued

**b.** The table below shows the relationship between the rate of photosynthesis and the temperature in a specific plant.

| Temperature | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|---|---|---|---|
| The rate of photosynthesis | 10 | 20 | 30 | 40 | 50 | 40 | 30 | 30 | 10 |

What is the optimum temperature for photosynthesis in this plant?

_____

**c.** Why does the light independent reaction slow down at low temperatures?

_____

_____

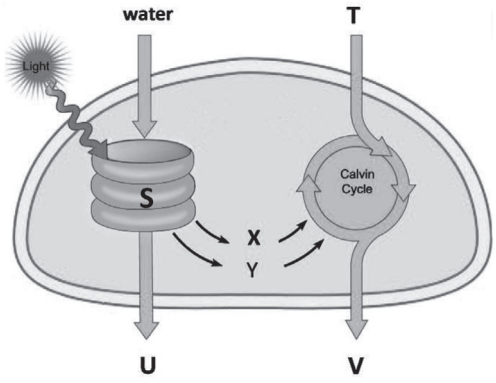
**19)** The diagram opposite shows the two stages of photosynthesis. (7 marks)

**a.** Identify the substances labeled (T), (U) and (V).

(T): _____

(U): _____

(M): _____




**b.** Describe the role of water in light reactions.

_____

_____

_____

**c.** Describe how the products of the process labeled (S) are used in the Calvin cycle.

_____

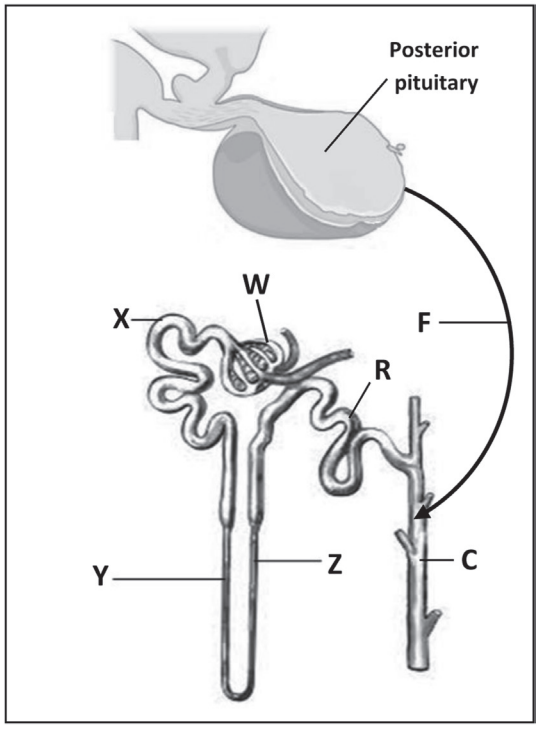
**d.** Where does the Calvin cycle take place in the chloroplast?

_____

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## Question 2 continued

**20)** The diagram opposite shows the osmoregulation in the nephron. (9 marks)




**a.** Name the parts labeled (W) and (R).

W: _____

R: _____

**b.** How does the part labeled (Z) maintain the following:

- Low levels of salt?

_____

- High levels of water?

_____

**c.** State the importance of the part labeled (X).

_____

**d.** Describe the water permeability (high or low) through the walls of the parts labeled (Y) and (Z):

Y: _____

Z: _____

**e.** Caffeine which is found in coffee and tea blocks the secretion of the substance labeled (F).

**Explain** what will happen in the part labeled (C) after drinking a cup of coffee?

_____

_____

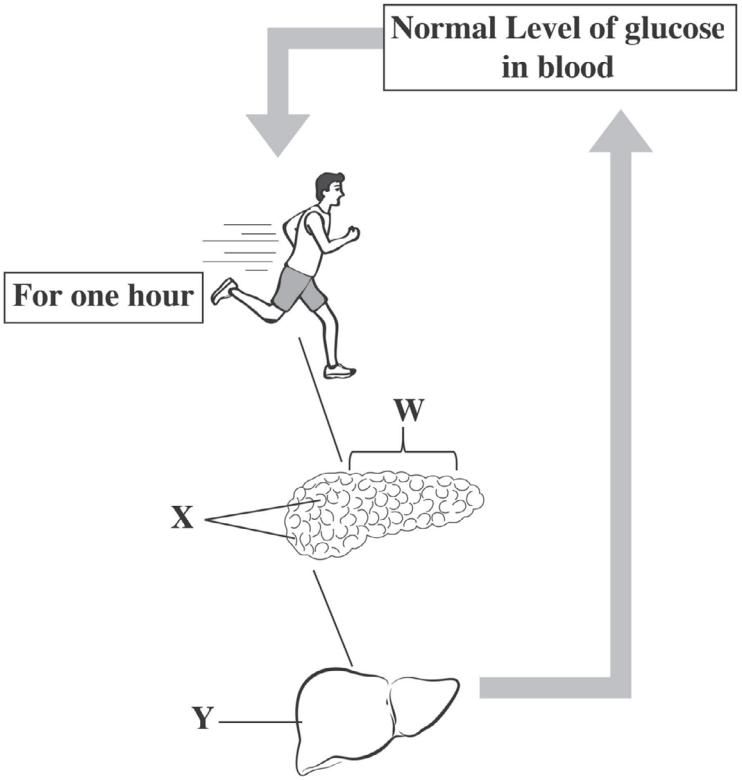
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## Question 2 continued

**21)** The diagram below shows the homeostasis of glucose. (4 marks)




**a.** Name the organ labeled (W).

_____

**b.** State the names of the following referring to this homeostasis process:

**(i)** The substance produced by the parts labeled (X).

_____

**(ii)** The process which is taking place in the part labeled (Y).

_____

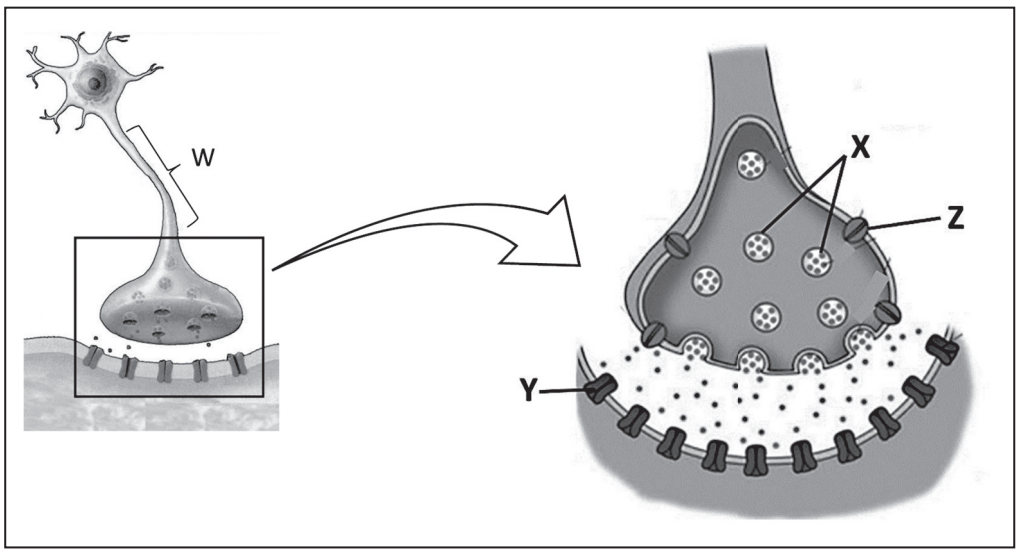
**c.** What type of cells will be activated in the organ labeled (W) after eating a sugary meal?

_____

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## Question 2 continued

**22)** The diagram below shows the synaptic area between two neurons. (6 marks)




**a.** Name the parts labeled (X) and (W).

X: _____

W: _____

**b.** What is the role of the parts labeled (Z) and (Y):

Z: _____

Y: _____

**c.** Predict what will happen in the following cases:

**(i)** The parts labeled (Y) are denatured.

_____

**(ii)** The stimulus affecting the part labeled (W) has an intensity below the threshold value.

_____

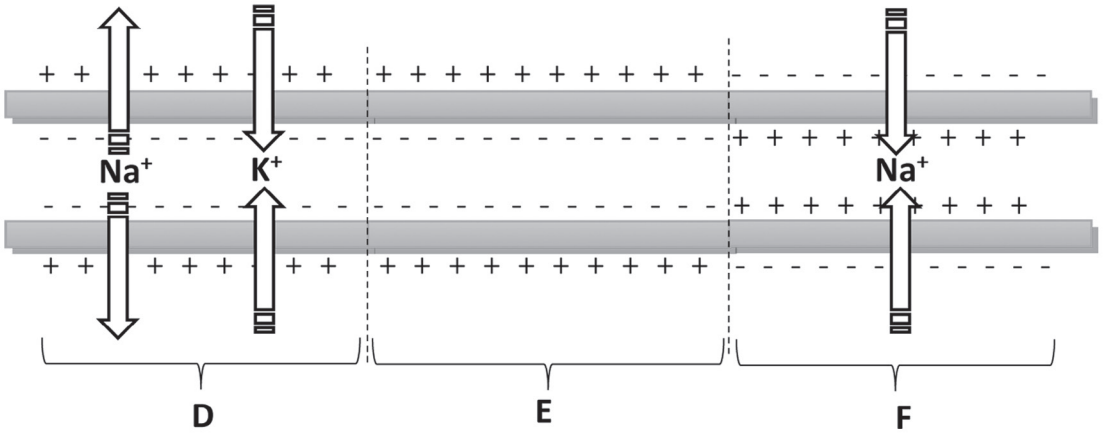
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## Question 2 continued

**23)** The diagram below shows the change in the membrane potential in the axon of a neurone. (4 marks)



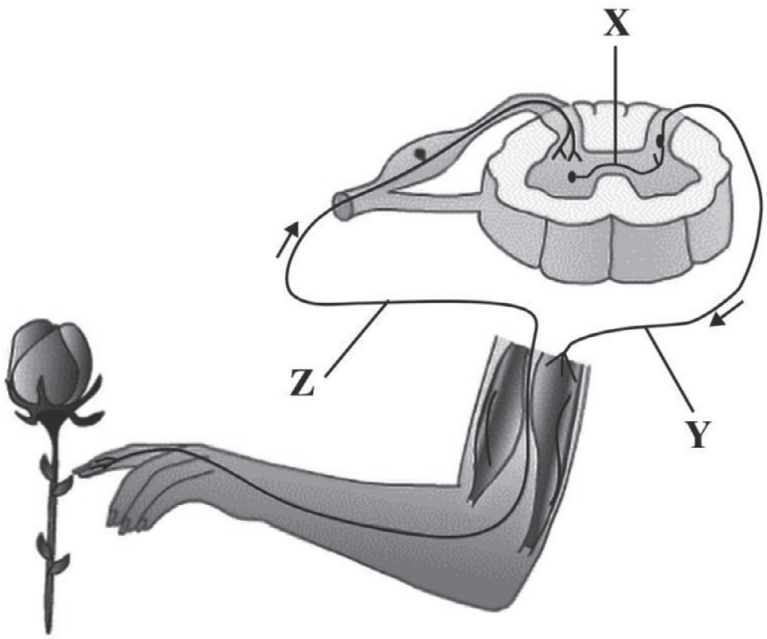

Complete the table below for the sites labeled (D) and (F).

| Site | Status of the membrane potential. | Type of the membrane transport for $Na^+$ ions. |
|---|---|---|
| D | | |
| F | | |

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## Question 2 continued

**24)** The diagram below shows a simple reflex arc. (5 marks)




**a.** Name the types of neurones labeled (X), (Y) and (Z).

X: _____

Y: _____

Z: _____

**b.** What type of response actions is coordinated by reflex arc?

_____

**c.** State one advantage of simple reflexes.

_____

_____

**[ End of Examination ]**

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# مُسَوَّدَة

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# امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

## للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م

## الدور الثاني - الفصل الدراسي الأول

**تنبيه:**
- المادة: الأحياء.
- الأسئلة في (١٧) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

**تعليمات مهمة:**

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

**ملاحظة:** يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

**صحيح** ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

# مُسَوَّدَة، لا يتم تصحيحها

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## Question 1: Multiple Choice Items (14 marks)

There are 14 multiple-choice items worth two marks each.
Shade in the bubble (⬭) next to the **correct** answer for each of the following items.

**1)** The number of carbon atoms in the sugar part of an ATP molecule is:

⬭ 3 ⬭ 4

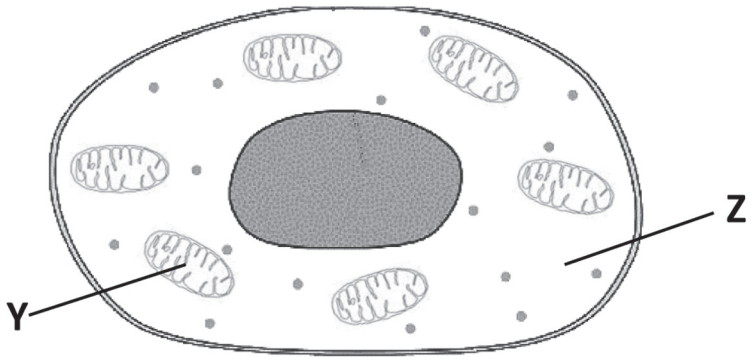
⬭ 5 ⬭ 6

**2)** What is the substrate that requires 400 molecules of $O_2$ in aerobic respiration to be converted to 400 molecules of $CO_2$?

⬭ glucose ⬭ amino acid

⬭ protein ⬭ fat

**3)** The following diagram shows an animal cell where anaerobic respiration takes place.



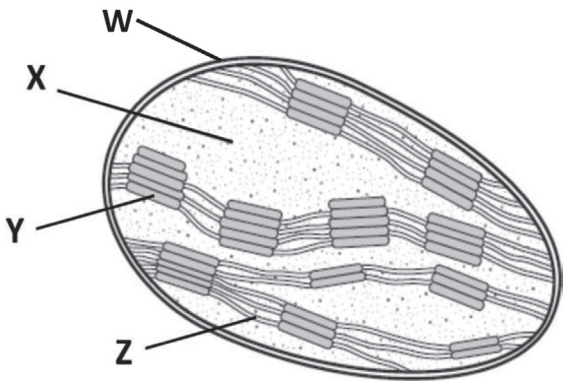

Which of the following is correct about the respiration site and the number of ATP molecules produced from **3** glucose molecules?

| | Site of respiration | Number of ATP |
|---|---|---|
| ⬭ | Z | 2 |
| ⬭ | Y | 4 |
| ⬭ | Z | 6 |
| ⬭ | Y | 8 |

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## Question 1 continued

**4)** The diagram below shows the structure of chloroplast.




In which parts labeled (W, X, Y and Z) does the light- independent reactions take place?

- ☐ W
- ☐ X
- ☐ Y
- ☐ Z

**5)** Which substances are required in a cell for light-dependent and light-independent reactions of photosynthesis to occur?

| | Light-dependent reactions | Light-independent reactions |
|---|---|---|
| ☐ | $O_2$ | Reduced NADP |
| ☐ | $CO_2$ | $H_2O$ |
| ☐ | $H_2O$ | Reduced NADP |
| ☐ | $H_2O$ | $O_2$ |

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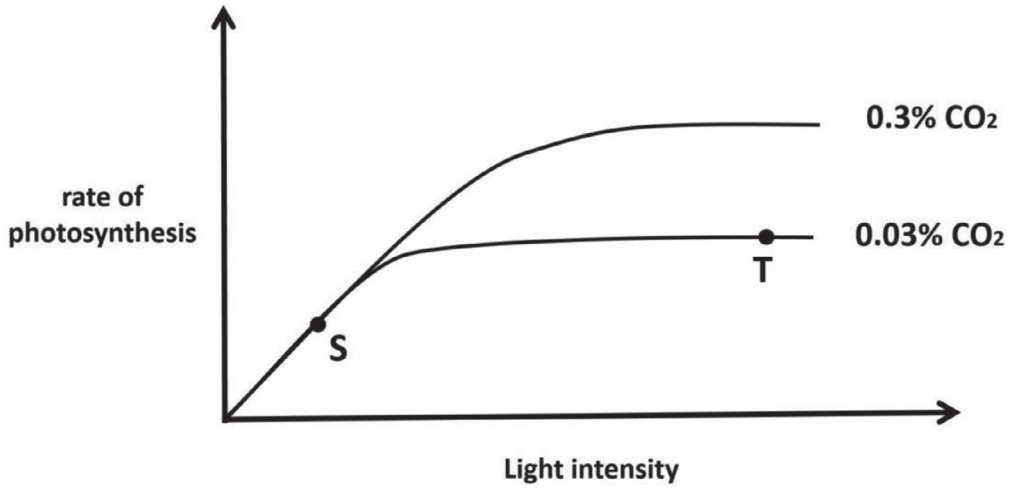


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## Question 1 continued

**6)** The graph below shows the rate of photosynthesis in two different carbon dioxide concentrations at 25 °C.

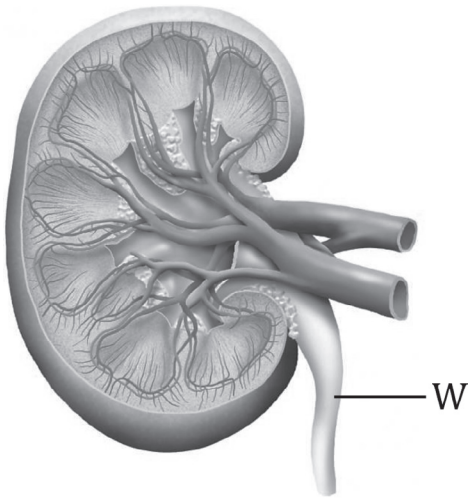



What factors are most likely to limit the rate of photosynthesis at the points labeled (S) and (T)?

| | Point (S) | Point (T) |
|---|---|---|
| ☐ | Light intensity | Temperature |
| ☐ | Temperature | Light intensity |
| ☐ | $CO_2$ concentration | Temperature |
| ☐ | Light intensity | $CO_2$ concentration |

**7)** In the diagram opposite, the part labeled (W) is a:

- ☐ cortex
- ☐ ureter
- ☐ medulla
- ☐ collecting duct




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## Question 1 continued

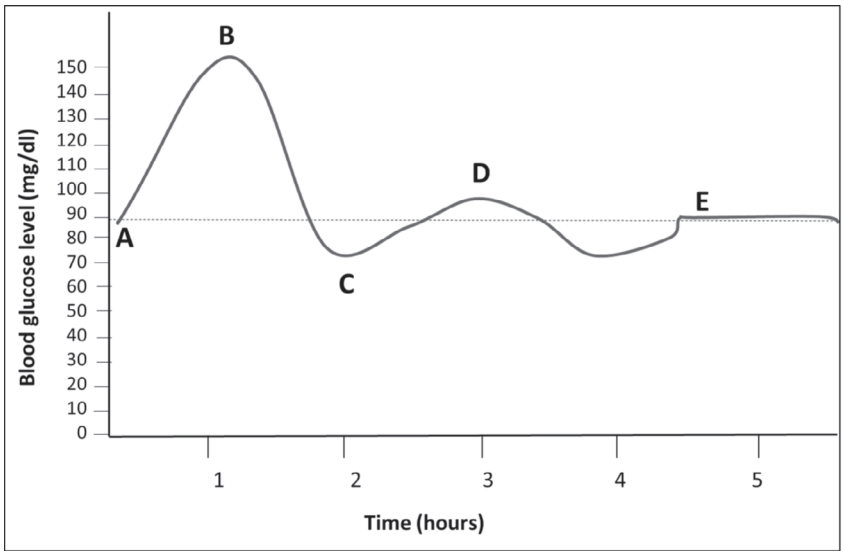
**8)** The diagram opposite, shows the structure of a nephrone.




What process takes place in the part labeled (X)?

- ☐ Reabsorption of water.
- ☐ Reabsorption of proteins.
- ☐ Absorption of amino acids.
- ☐ Adjustment of $K^+$ ions concentration.

**9)** The graph below shows the blood glucose levels over different periods of time.




The secretion of insulin was at a higher level between:

- ☐ A and B.
- ☐ B and C.
- ☐ C and D.
- ☐ D and E.

**10)** The neurone/s that carries impulses from CNS to the peripheral nervous system is:

- ☐ sensory.
- ☐ relay.
- ☐ motor.
- ☐ sensory and motor.

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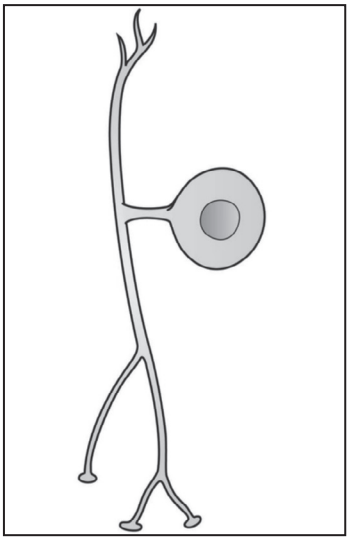


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## Question 1 continued

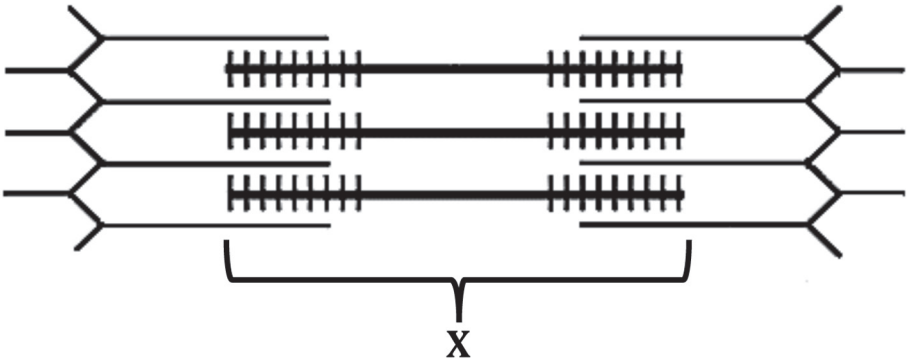
**11)** The diagram opposite shows one type of neurone.



Which of the following is correct about the type of the neurone and its location?

| | Neurone | Location |
|---|---|---|
| ☐ | Motor | Peripheral nervous system |
| ☐ | Sensory | Central nervous system |
| ☐ | Sensory | Peripheral nervous system |
| ☐ | Motor | Central nervous system |

**12)** The diagram below shows the structure of a sarcomere.



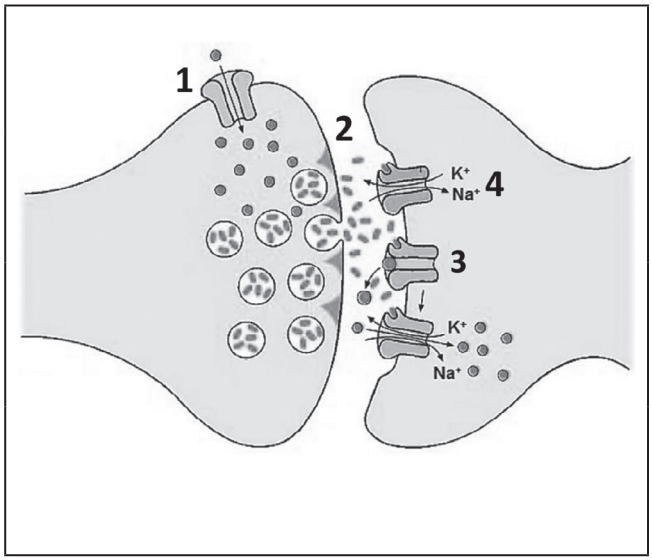

Which of the following is correct about the name of the part labeled (X) and its state during muscle contraction?

| | The name | State |
|---|---|---|
| ☐ | Dark band | Becomes shorter |
| ☐ | Light band | No change |
| ☐ | Dark band | No change |
| ☐ | Light band | Becomes longer |

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## Question 1 continued

**13)** Diagram (A) below shows steps of the synapse transmission (1, 2, 3 and 4), and Table (B) shows the descriptions of the steps.




**(A)**

| | |
|---|---|
| **W** | $Na^+$ channels are open and $Na^+$ ions diffuse into the neurone. |
| **X** | $Ca^{2+}$ diffuse into the presynaptic neurone. |
| **Y** | The neurotransmitter binds with the receptors in the postsynaptic membrane. |
| **Z** | The neurotransmitter diffuse from presynaptic neurone into the cleft. |

**(B)**

Which of the following represents the correct match between the steps (1, 2, 3, 4) and its description?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| ○ | X | Z | W | Y |
| ○ | Y | X | Z | W |
| ○ | W | Y | X | Z |
| ○ | X | Z | Y | W |

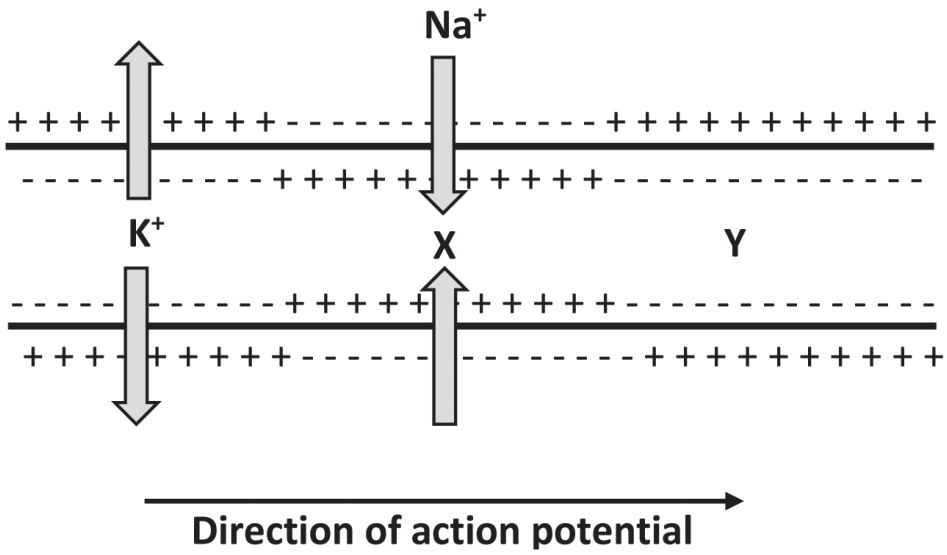
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## Question 1 continued

**14)** The diagram below shows the movement of an impulse along a myelinated neurone axon.




What will happen to the area labeled (X) when the action potential moves to the area labeled (Y)?

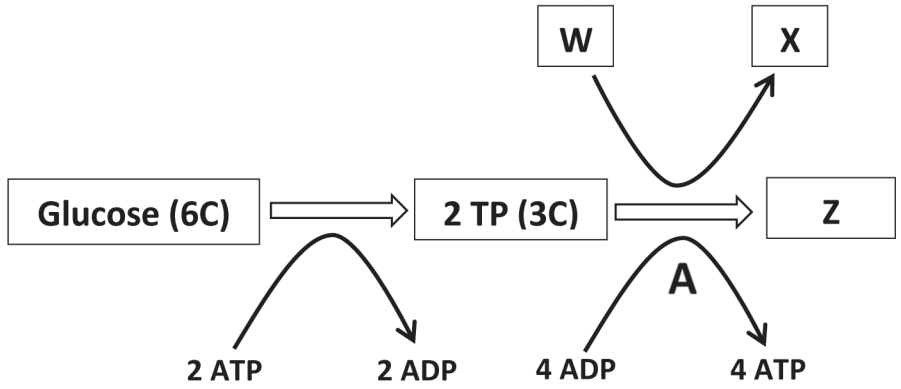
- ☐ $K^+$ ions will diffuse into the axon.
- ☐ $Na^+$ ions will diffuse into the axon.
- ☐ $K^+$ ions will diffuse out of the axon.
- ☐ $Na^+$ ions will diffuse out of the axon.

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## Question 2: Extended Responses (56 marks)

Write your answer for each of the following questions in the space provided.
Be sure to show all your work, including the correct units where applicable.

**15)** The diagram below shows one stage of aerobic respiration. (5 marks)




**a.** What is the stage that is shown in the diagram?

_____

**b.** Name the molecules labeled (W) and (X).

W: _____

X: _____

**c.** **(i)** If the number of glucose is **5** molecules, find the number of the molecules labeled (Z).

_____

**(ii)** Name the process labeled (A).

_____

_____

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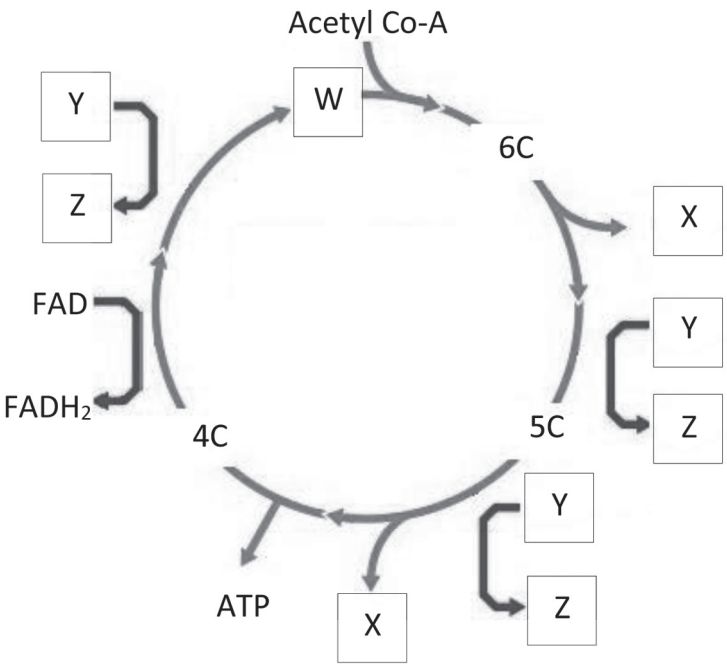


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## Question 2 continued

**16)** The diagram below shows the Krebs cycle. (5 marks)




**a.** What is the site of this stage in an animal cell?

_____

**b.** State what will happen to Acetyl Co-A if the amount of the compound labeled (X) is at a high concentration.

_____

**c.** Name the process used to produce the compound labeled (Z) from the compound labeled (Y).

_____

**d.** Name the process that produces the compound labeled (X).

_____

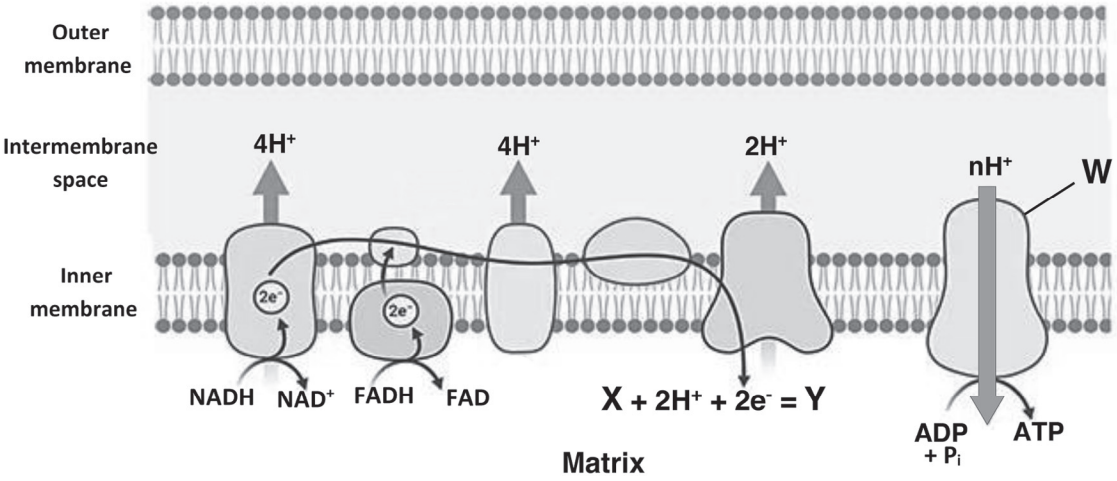
**e.** What is the total number of carbon atoms in the compound labeled (W) if the ATP molecules released are 4?

_____

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## Question 2 continued

**17)** The diagram below shows one stage of aerobic respiration. (4 marks)




**a.** What is the type of phosphorylation that is shown in the diagram?

_____

**b.** Name the process that causes $H^+$ ions to flow through the part labeled (W).

_____

**c.** **(i)** What is the function of the molecule labeled (X)?

_____

**(ii)** If the number of the molecule labeled (X) is **12**, how many molecules of the part labeled (Y) will be produced?

_____

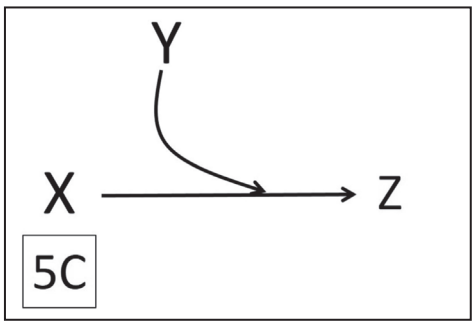
**18)** The diagram below shows a reaction during the light independent stage of photosynthesis. (4 marks)

**a.** Name the molecules labeled (X), (Y) and (Z).

(X): _____

(Y): _____

(Z): _____




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## Question 2 continued

**b.** How many carbon atoms are there in the compound labeled (Z)?

_____

**19)** Photosynthesis can be divided into two main stages, the light-dependent stage and the light-independent stage. (6 marks)

**a.** Describe the role of light in the light dependent reactions.

_____

_____

_____

**b.** In order to maximize production, market gardeners often grow plants in glasshouses. Light conditions can be controlled along with a number of other factors.

How can factors (state two factors) **other than light conditions** be controlled to increase the rate of photosynthesis and maximize production?

_____

_____

_____

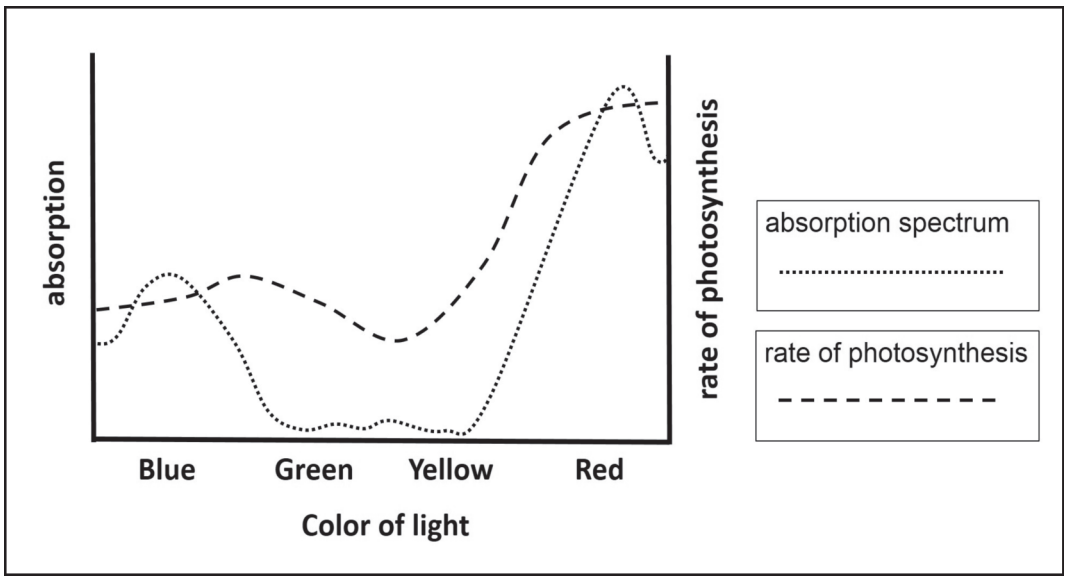
**c.** Complete the table below by writing the stage of photosynthesis reactions.

| | **Stage of the photosynthesis reaction.** |
|---|---|
| ATP is produced. | _____ |
| Process takes place in a mesophyll cell of a leaf which has been in the dark for 12 hours. | _____ |

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## Question 2 continued

**20)** The graph below shows the absorption spectrum of one of the photosynthetic pigments from a plant and the rate of photosynthesis of the plant in different light colors. (4 marks)




**a.** What type of photosynthesis pigment is illustrated in the graph?

**b.** Explain the rate of photosynthesis as observed in this graph in the yellow and green color zones.

**c.** Name the technique that is used to separate photosynthesis pigments.

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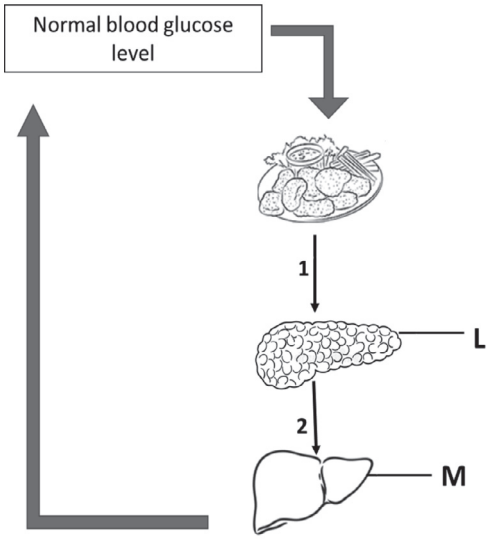
## Question 2 continued

**21)** The diagram below demonstrates the control of blood glucose level. (5 marks)

**a.** Write the names of the organs labeled (L) and (M).

L: _____

M: _____




**b.** State the changes that will occur in the blood glucose level after steps labeled (1) and (2). (Increases or decreases).

1. _____

2. _____

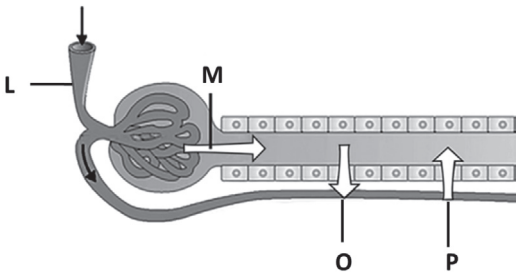
**c.** What is the name of the substance that has an opposite effect to the substance produced in the step labeled (2)?

_____

**22)** **a.** The diagram below shows some of the exchange processes that occur in the excretory system. (4 marks)

**(i)** Name the part labeled (L).

_____




**(ii)** Name the (non-ionic) molecules that are actively transported.

O: _____

P: _____

**(iii)** Predict what will happen to the flow rate of the fluid labeled (M) if the person is having hypotension (Hypotension is a decrease in blood pressure).

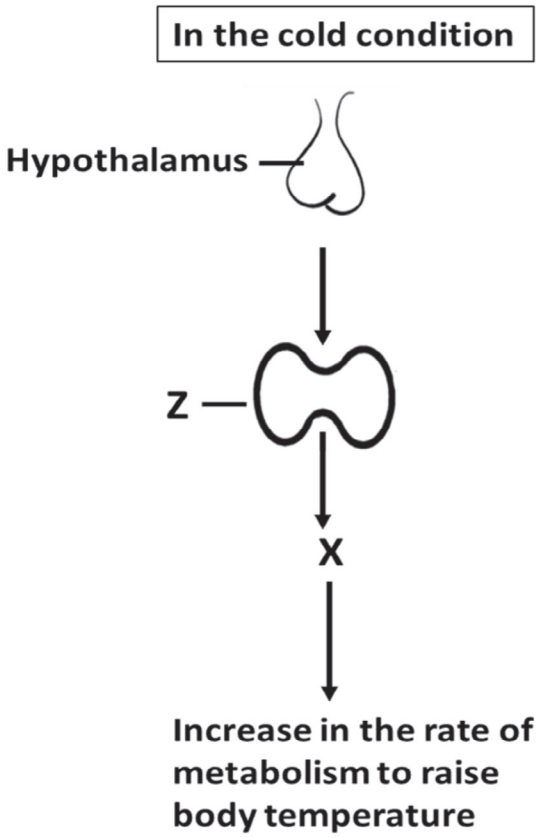
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## Question 2 continued

**b.** The diagram below demonstrates a homeostasis mechanism in mammals.

(4 marks)




**(i)** State the specific name of this homeostasis process.

_____

**(ii)** Write the name of the substance labeled (X).

_____

**(iii)** What is the type of feedback used to regulate the secretion of the substance labeled (X)?

_____

**(iv)** Predict what will happen if the part labeled (Z) was removed from the body.

_____

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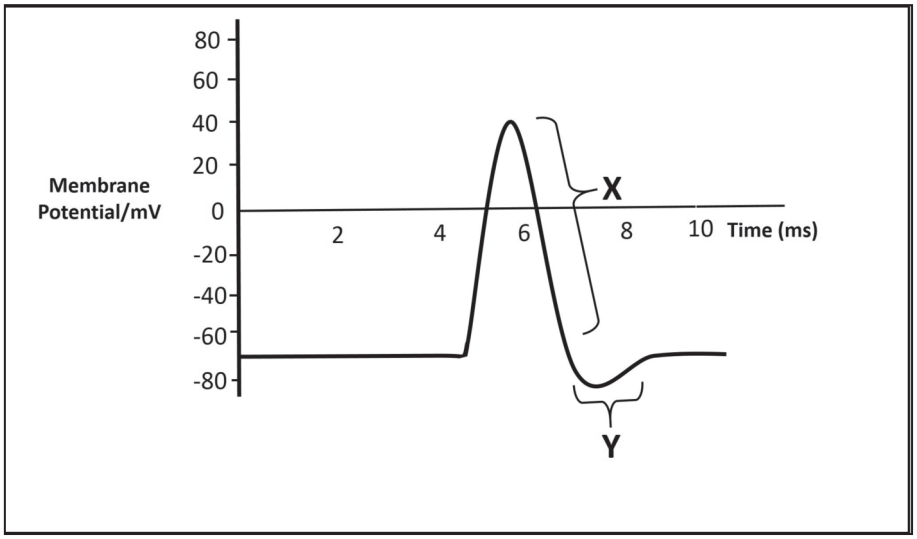
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## Question 2 continued

**23)** The diagram below shows the changes in the membrane potential of an axon.

(6 marks)




**a.** Name the periods labeled (X) and (Y).

(X): _____

(Y): _____

**b.** Explain how the resting potential of (–70 mV) is maintained.

_____

_____

_____

**c.** Explain why another action potential cannot be generated during the period labeled (X).

_____

_____

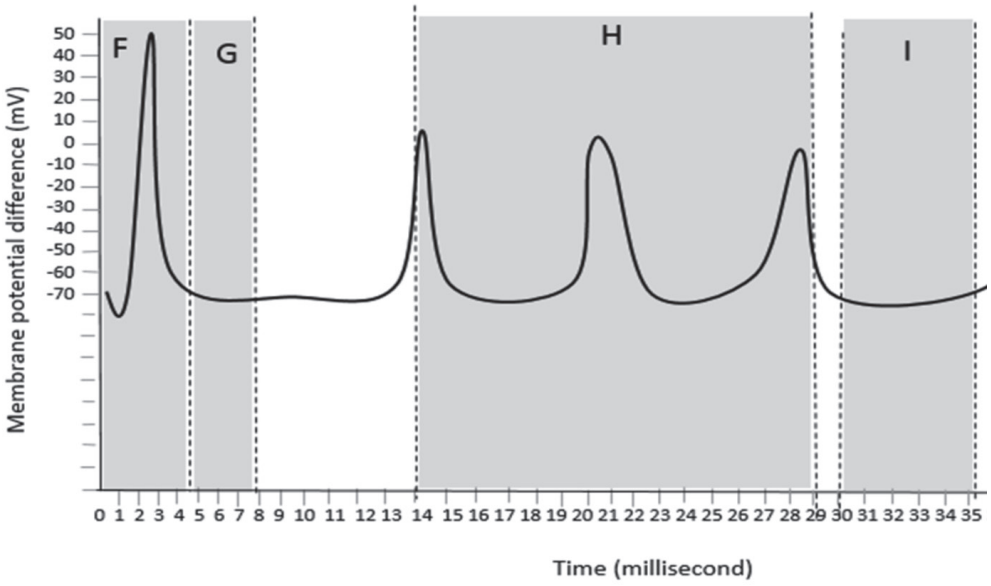
_____

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## Question 2 continued

**24) a.** The graph below shows the changes in the status in the membrane potential over time. (4 marks)




**(i)** What type are the following:

- The cells in which the membrane potential can change as shown in the graph above?

- The membrane potential over the period labeled (F)?

**(ii)** Explain the status of the membrane in the periods labeled (G) and (I) given that:

- In the period labeled (G) the stimulus is as strong as the stimulus in the period labeled (H).

- In the period labeled (I) the strength of the stimulus is unknown however the membrane remains polarized.

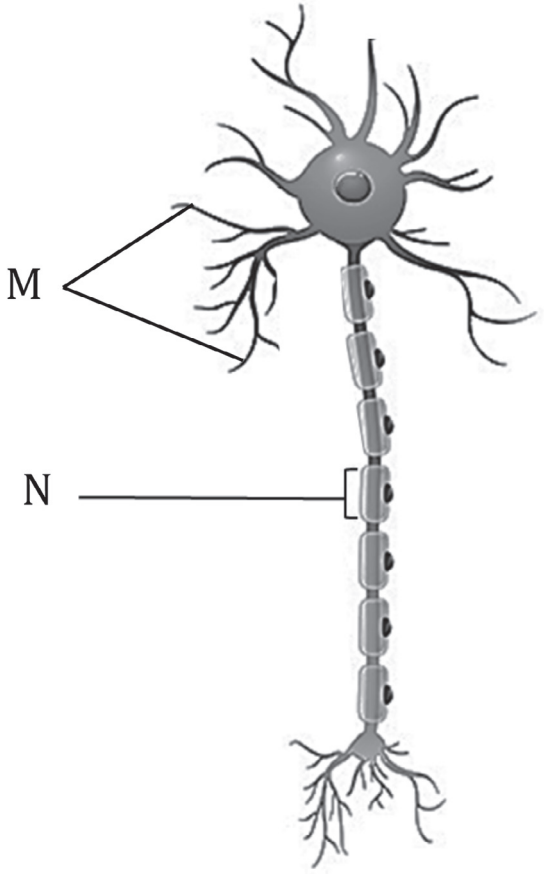
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## Question 2 continued

**b.** The diagram below shows the structure of a neurone. (5 marks)




**(i)** Name the part labeled (M).

_____

**(ii)** State the following parts for this neurone.

- Pre-synaptic part: _____

- Post-synaptic part: _____

**(iii)** Write what will happen to the received impulse (faster/slower) if the substance labeled (N) is:

- present: _____

- absent: _____

**[ End of Examination ]**

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