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|---------------|---------------|------------------|
| Surname       | Centre Number | Candidate Number |
| First name(s) |               | 4                |



## LEVEL 3 CERTIFICATE / DIPLOMA

4463U10-1



S24-4463U10-1

**MONDAY, 20 MAY 2024 – MORNING**

## MEDICAL SCIENCE

### UNIT 1: Human Health and Disease

2 hours

#### Section A

| For Examiner's use only |              |              |
|-------------------------|--------------|--------------|
| Question                | Maximum Mark | Mark Awarded |
| 1–9.                    | 25           |              |
| 10.                     | 4            |              |
| 11.                     | 13           |              |
| 12.                     | 12           |              |
| 13.                     | 12           |              |
| 14.                     | 8            |              |
| 15.                     | 16           |              |
| <b>Total</b>            | <b>90</b>    |              |

#### ADDITIONAL MATERIALS

You will need the resource folder that contains the pre-release article.

You will need a calculator and ruler for this examination.

#### INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

#### INFORMATION FOR CANDIDATES

The total number of marks for this paper is 90.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

Questions in Section A are based on the pre-release article.

You should show your working to calculations.



JUN244463U10101

**SECTION A**Answer **all** questions.

1. List **three** symptoms of Parkinson's disease. [1]

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2. Describe the effect of Parkinson's disease on the nervous system. [2]

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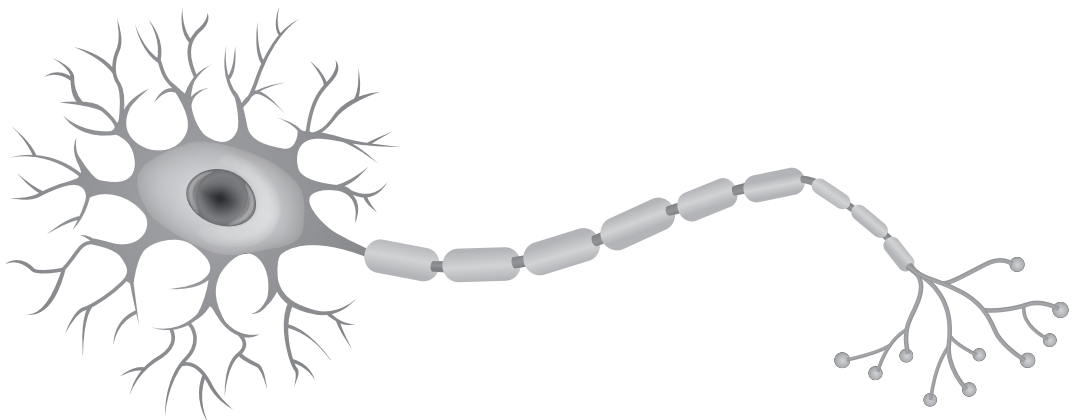
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3. State **two** factors that increase a person's risk of developing Parkinson's disease. [2]

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4. A diagram of a motor neurone is shown below.

Label the **axon**, **cell body**, and **dendrite**.

[3]



5. Describe the actions of the three types of medication used to treat Parkinson's disease. [3]

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6. Many clinical trials for treatments for Parkinson's disease are carried out in the UK.

(a) Give **three** ethical considerations that must be made before conducting a clinical trial. [3]

1. ....

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2. ....

.....

3. ....

.....

(b) State **three** different methods that could be used to communicate the findings of the clinical trial. [3]

1. ....

.....

2. ....

.....

3. ....

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7. Use **Figure 3** and your own knowledge to answer this question.

Explain **two** trends in the data for the number of individuals with Parkinson's disease, by age group, in the UK in 2020. [2]

1. ....

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2. ....

.....

8. **Figure 4** shows the typical financial impact, per annum, of living with Parkinson's disease in the UK.

Suggest how the true cost could be higher than that shown in **Figure 4**. [1]

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9. **Figure 5** shows the projected prevalence of Parkinson's disease in the UK from 2025 to 2065, for people 50 years old and above.

- (a) Plot the data for both **2025** and **2065** on the graph paper below. Include a key to show which data belongs to each year. [4]



- (b) Suggest a reason for the projected increase in prevalence of Parkinson's disease between 2025 and 2065. [1]

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**Section B**

10. Athlete's foot is a very common skin infection that causes the skin on the foot to crack and peel.



- (a) Name the type of pathogen that causes athlete's foot. [1]

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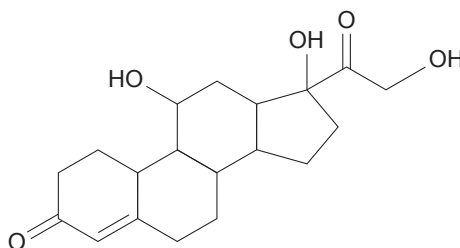
- (b) Describe the mode of transmission of athlete's foot. [1]

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 .....

- (c) Suggest how athlete's foot can be prevented. [1]

.....  
 .....

- (d) Athlete's foot can be treated using a medication which contains the following active ingredient.



Identify the class of biological molecules to which this active ingredient belongs. [1]

.....



11. The endocrine system is made up of a number of glands.

- (a) (i) Name the gland that releases ADH. [1]

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- (ii) Describe how hormones such as ADH move through the body. [1]

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- (iii) Name the part of the nephron that is affected by ADH. [1]

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- (iv) Describe the role played by ADH during osmoregulation. [4]

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 .....  
 .....  
 .....  
 .....  
 .....

- (b) Urodynamic testing can be used as a physiological measurement of parts of the endocrine system.

- (i) Describe the three **simple** methods used for urodynamic testing. [3]

1. ....

2. ....

3. ....

- (ii) Describe the **precise** measurements that can be taken during urodynamic testing. [3]

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 .....  
 .....  
 .....



12. The breakdown of food involves chemical and mechanical digestion.

(a) Describe the process of mechanical digestion in the mouth. [2]

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(b) The stomach is involved in the chemical digestion of proteins.

(i) Name the products of protein digestion. [1]

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(ii) Name the reaction in which proteins are broken down during digestion. [1]

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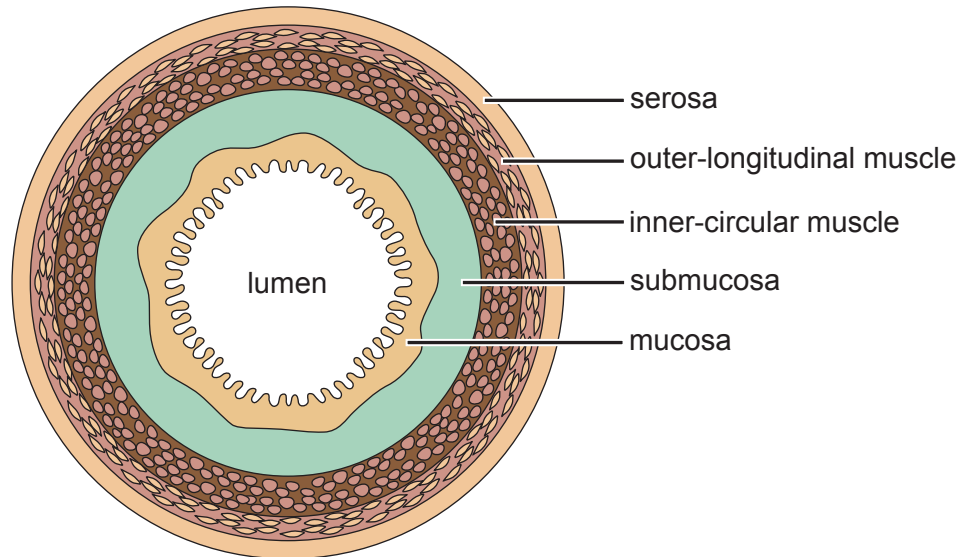
(iii) Name **one** enzyme responsible for protein digestion in the stomach. [1]

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- (c) The gut wall is made up from many different layers of tissue.

A cross section of the gut wall is shown below.



Describe the functions of the following tissue layers of the gut wall.

- (i) muscle layers

[1]

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- (ii) mucosa

[2]

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- (iii) submucosa

[2]

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- (iv) serosa

[2]

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13. The prevalence of type 2 diabetes is expected to increase significantly in Wales over the next 10 years. The table below shows the true figures for 2010 and 2020 and the expected figures for 2030 in children that are clinically obese.

| Health board           | Prevalence of type 2 diabetes in clinically obese children (%) |      |       |
|------------------------|----------------------------------------------------------------|------|-------|
|                        | 2010                                                           | 2020 | 2030  |
| Abertawe Bro Morgannwg | 5.61                                                           | 7.96 | 11.30 |
| Aneurin Bevan          | 5.70                                                           | 8.09 | 11.50 |
| Betsi Cadwaladr        | 4.90                                                           | 6.95 | 9.86  |
| Cardiff and Vale       | 4.32                                                           | 6.13 | 8.70  |
| Cwm Taf                | 5.02                                                           | 7.12 | 10.11 |
| Hywel Dda              | 5.15                                                           | 7.31 | 10.38 |
| Powys                  | 5.03                                                           | 7.14 | 10.13 |

- (a) (i) Calculate the mean % prevalence of diabetes in all health boards in Wales for 2020. [2]

mean % prevalence = .....

- (ii) There were approximately 562 000 children in Wales in 2020. Calculate the approximate number of children in Wales with type 2 diabetes in 2020. [2]

number of children = .....

- (b) Suggest **two** reasons for the predicted increase in the prevalence of type 2 diabetes in Wales by 2030. [2]

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- (c) Describe **two** other possible effects that obesity could have on health. [4]

Condition: .....

Effect: .....

.....

Condition: .....

Effect: .....

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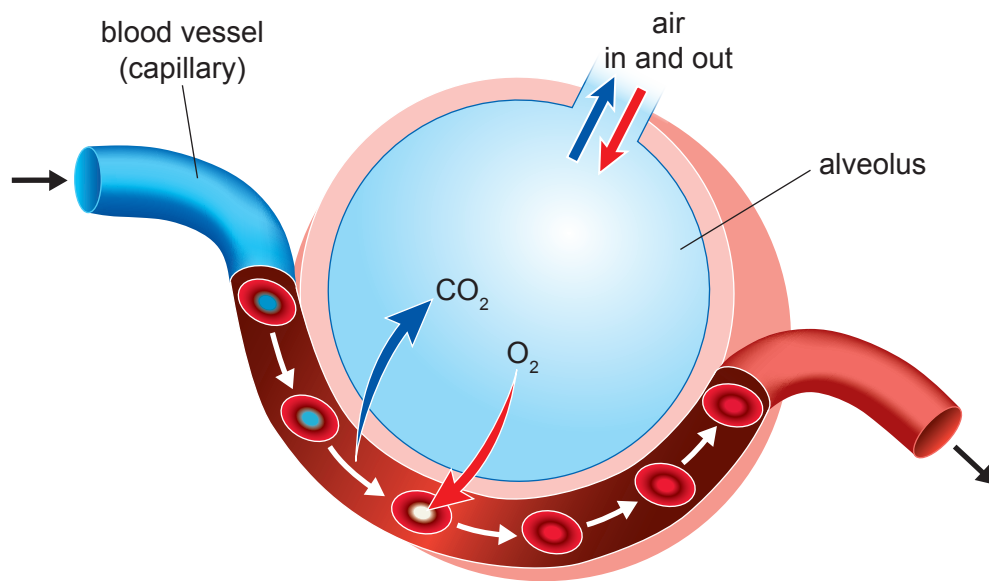
- (d) Suggest **two** measures that could reduce the numbers of people developing type 2 diabetes. [2]

1. ....

2. ....



14. Oxygen and carbon dioxide are exchanged in the alveoli of the lungs.



(a) Describe the process of gas exchange in the alveoli.

[3]

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(b) Spirometry is used to test lung function.

(i) Describe the principles of spirometry.

[3]

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(ii) Describe how the spirometer trace of someone with asthma would be different to that of somebody without the condition.

[2]

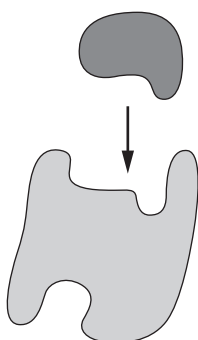
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15. A diagram of an enzyme and its substrate is shown below.

8



(a) Describe the lock and key model of enzyme activity.

[3]

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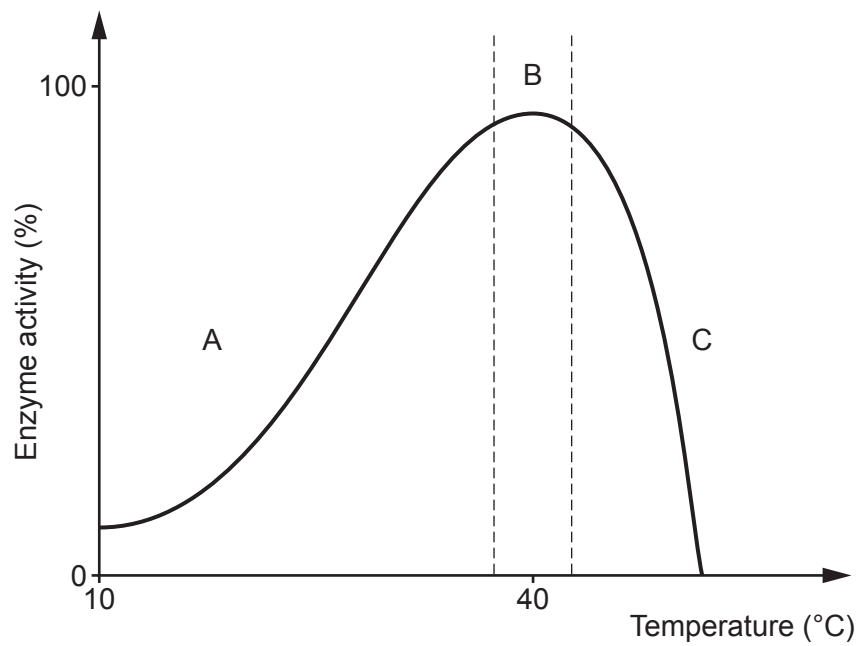
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(b) The graph below shows how enzyme activity is affected by temperature.



(i) Describe the effect of temperature on the activity of this enzyme.

[3]

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(ii) Explain the trend seen in part A of the graph.

[3]

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- (c) High temperature causes denaturation of enzymes. Explain why denaturation reduces enzyme activity. [2]

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- (d) Enzyme activity is affected by competitive and non-competitive inhibition.

- (i) Describe the process of competitive inhibition. [2]

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- (ii) State how the process of non-competitive inhibition is different to competitive inhibition. [1]

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- (iii) State how increasing substrate concentration affects the amount of inhibition that occurs in the presence of competitive and non-competitive inhibitors. [2]

Competitive .....

.....

Non-competitive .....

.....

**END OF PAPER**

16



[illegible]