Duration — 2 hours and 30 minutes

Instructions for the completion of Section 1 are given on Page two of your question and answer booklet.

Record your answers on the answer grid on Page three of your question and answer booklet.

Before leaving the examination room you must give your question and answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.
SECTION 1 — 20 marks
Attempt ALL questions

1. Which of the following diagrams shows correctly some aspects of the structure of DNA?

   5' 5'
   ────
   3' 3'
   A

   5' 3'
   ────
   3' 5'
   B

   3' 5'
   ────
   5' 3'
   C

   3' 5'
   ────
   3' 5'
   D

2. If 10% of the bases in a molecule of DNA are adenine, what is the ratio of adenine to guanine in the same molecule?

   A 1 : 1
   B 1 : 2
   C 1 : 3
   D 1 : 4

3. A parent DNA molecule replicates before meiosis. A cell containing a parent DNA molecule went through two rounds of cell division as shown in the diagram below.

   parent DNA molecule in nucleus
   ─────────────────────────────────
   first cell division
   ─────────────────────────────────
   second cell division
   ─────────────────────────────────
   resulting daughter cells
   ────
   ────
   ────
   ────

   How many of the copies of the parent DNA molecule found in the resulting daughter cells would contain an original strand from the parent molecule?

   A 1
   B 2
   C 4
   D 8
4. The diagram below represents a stage in protein synthesis in a cell.

![Diagram of protein synthesis](image)

Which line in the table below identifies correctly molecules W, X and Y?

<table>
<thead>
<tr>
<th>Molecules</th>
<th>W</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>polypeptide</td>
<td>tRNA</td>
<td>mRNA</td>
</tr>
<tr>
<td>B</td>
<td>tRNA</td>
<td>mRNA</td>
<td>polypeptide</td>
</tr>
<tr>
<td>C</td>
<td>mRNA</td>
<td>tRNA</td>
<td>polypeptide</td>
</tr>
<tr>
<td>D</td>
<td>polypeptide</td>
<td>mRNA</td>
<td>tRNA</td>
</tr>
</tbody>
</table>

5. The graph below shows the temperature changes involved in one thermal cycle of the polymerase chain reaction (PCR).

![Temperature changes graph](image)

Which letter indicates when primers would bind to target sequences of DNA?
6. The graph below shows the effect of substrate concentration on the rate of an enzyme-catalysed reaction.

![Graph showing reaction rate vs substrate concentration]

At which substrate concentration is the reaction rate equal to 75% of the maximum rate?

A 5 units  
B 8 units  
C 12 units  
D 15 units

7. Metabolic pathways can be controlled by feedback inhibition in which

A an end product of a pathway binds to an enzyme involved earlier in the pathway
B an end product of a pathway binds to an enzyme involved in another pathway
C the final substrate in a pathway binds to an enzyme involved earlier in the pathway
D the final substrate in a pathway binds to an enzyme involved in another pathway.
8. The diagram below shows a section through seminiferous tubules in the testes.

Which letter indicates a cell that produces testosterone?

9. Average sperm counts made from semen samples of groups of men from 1940 through to 2000 are shown on the graph below.

What is the average reduction in average sperm count per year?

A 0.67 million per cm³
B 0.75 million per cm³
C 0.92 million per cm³
D 45 million per cm³
10. Phenylketonuria (PKU) is a condition that affects metabolism. PKU is caused by failure to produce enzyme X shown in the metabolic pathway below.

```
enzyme X
phenylalanine → tyrosine → melanin
```

phenylpyruvate

Which line in the table shows correctly the differences in concentrations of the substances in the body of an individual affected by PKU compared with the body of an unaffected individual?

<table>
<thead>
<tr>
<th>Increased concentration</th>
<th>Decreased concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Phenylalanine only</td>
<td>Tyrosine only</td>
</tr>
<tr>
<td>B Tyrosine only</td>
<td>Phenylalanine only</td>
</tr>
<tr>
<td>C Tyrosine and melanin</td>
<td>Phenylalanine and phenylpyruvate</td>
</tr>
<tr>
<td>D Phenylalanine and phenylpyruvate</td>
<td>Tyrosine and melanin</td>
</tr>
</tbody>
</table>

11. Which of the diagrams below best represents correctly a cross-section through a vein?

```
A
```

```
B
```

```
C
```

```
D
```

- = muscle tissue

- = elastic tissue
12. The diagram below shows the relationship between blood capillaries, body cells and lymph capillaries.

![Diagram of blood capillaries]

Which letter indicates the position of tissue fluid?

13. Mean arterial pressure (MAP) is a measure of blood pressure in arteries. Pulse pressure is the difference between systolic and diastolic blood pressure. MAP is calculated using the formula below.

\[ MAP = \text{diastolic pressure} + \left(\frac{\text{pulse pressure}}{3}\right) \]

The MAP of an individual with a blood pressure reading of 122/80 mmHg is

A  42 mmHg  
B  56 mmHg  
C  94 mmHg  
D  136 mmHg.

14. Which line in the table below identifies correctly actions in the autonomic nervous system?

<table>
<thead>
<tr>
<th>Sympathetic</th>
<th>Parasympathetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A decreased secretion of saliva</td>
<td>increased secretion of saliva</td>
</tr>
<tr>
<td>B increased release of gastric juice</td>
<td>decreased release of gastric juice</td>
</tr>
<tr>
<td>C increased peristalsis</td>
<td>decreased peristalsis</td>
</tr>
<tr>
<td>D decreased breathing rate</td>
<td>increased breathing rate</td>
</tr>
</tbody>
</table>
15. Perpetual set influences how an individual perceives an image. Some individuals perceive the image below as that of a young woman looking away and others as an old woman looking left.

Which of the following is not likely to play a part in perpetual set of the individuals in this case?

A  previous experience  
B  binocular disparity  
C  context  
D  expectation

16. A young child is scratched by a cat. After this experience she shows fear of all cats. This type of behaviour is called

A  shaping  
B  internalisation  
C  discrimination  
D  generalisation.

17. The diagram below shows features of the relationship between short and long-term memory.

Which arrow could represent the process of displacement?
18. The graph below shows the number of reported cases of meningitis and the number of deaths due to meningitis in the UK in 1998 to 2001.

In which year was the number of deaths from meningitis less than 10% of the total number of cases in that year?

A 1998
B 1999
C 2000
D 2001

19. Adjuvants are often added to vaccines to

A make the vaccines safer  
B enhance the immune response the vaccines trigger  
C make the immunity the vaccines produce last longer  
D ensure total removal of pathogens from the vaccines.
20. The graphs below show the effects of two injections of an antigen on the concentrations of antibody in the blood.

By what percentage did the concentration of antibody increase 25 days after the second injection compared with 25 days after the first?

A 1%
B 25%
C 50%
D 100%

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET]
Human Biology
Section 1 — Answer Grid and Section 2

Duration — 2 hours and 30 minutes

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 100

SECTION 1 — 20 marks
Attempt ALL questions.
Instructions for completion of Section 1 are given on Page two.

SECTION 2 — 80 marks
Attempt ALL questions.
Write your answers in the spaces provided. Additional space for answers and rough work is provided at the end of this booklet. If you use this space, write clearly the number of the question you are attempting. Any rough work must be written in this booklet. You should score through your rough work when you have written your fair copy.

Use blue or black ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.
SECTION 1—20 marks

The questions for Section 1 are contained on Page 49.
Read these and record your answers on the answer grid on Page three opposite.
Do NOT use gel pens.

1. The answer to each question is either A, B, C or D. Decide what your answer is, then fill in the appropriate bubble (see sample question below).

2. There is only one correct answer to each question.

3. Any rough working should be done on the additional space for answers and rough work at the end of this booklet.

Sample Question
The digestive enzyme pepsin is most active in the
   A  mouth
   B  stomach
   C  duodenum
   D  pancreas.

The correct answer is B—stomach. The answer B bubble has been clearly filled in (see below).

A  B  C  D
   ○  ●  ○  ○

Changing an answer
If you decide to change your answer, cancel your first answer by putting a cross through it (see below) and fill in the answer you want. The answer below has been changed to D.

A  B  C  D
   ○  ●  ○  ●

If you then decide to change back to an answer you have already scored out, put a tick (✓) to the right of the answer you want, as shown below:

A  B  C  D
   ○  ●  ✓  ○  ●  ○  ○
SECTION 1 — Answer Grid

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
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<td>O</td>
<td>O</td>
<td></td>
</tr>
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<td>3</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
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<td>O</td>
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<tr>
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<td>O</td>
<td>O</td>
</tr>
<tr>
<td>10</td>
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<td>11</td>
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<td>12</td>
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<td>O</td>
</tr>
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<td>13</td>
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<td>O</td>
<td>O</td>
<td>O</td>
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<td>14</td>
<td>O</td>
<td>O</td>
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<td>O</td>
<td>O</td>
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<td>O</td>
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<td>18</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>19</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>20</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
1. The diagram below shows the role of embryonic stem cells in the development of a human embryo.

![Diagram of early human embryo leading to embryonic stem cells and cells with specialised functions in later embryo]

(a) Give the term used to describe the process by which a cell develops specialised functions.  

(b) Describe one way in which tissue (adult) stem cells differ from embryonic stem cells.  

(c) Describe how cancer cells form a tumour and explain how secondary tumours arise.  

Description

Explanation
2. The diagram below shows part of a DNA template strand and a part of a primary RNA transcript synthesised from it.

DNA template  
\[3' \quad \quad \quad \quad X \quad \quad \quad \quad 5'\]

Primary RNA transcript  
exon  intron

(a) Give the term used to describe the process shown in the diagram.  

(b) DNA is encoded in triplet sequences. Explain what is meant by this.  

(c) Using information in the diagram:
   (i) Explain what is meant by the term antiparallel.  
   
   (ii) Describe a possible effect on the primary RNA transcript of a single nucleotide mutation at point X on the DNA template.  

3. (a) The table below shows single nucleotide substitution mutations of human genes and the possible effect they may have.

Complete the table by adding correct information to the empty boxes.

<table>
<thead>
<tr>
<th>Name of single nucleotide substitution</th>
<th>Possible effect of the mutation on the protein synthesised</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A correct amino acid replaced by an incorrect one in a polypeptide chain</td>
</tr>
<tr>
<td>Nonsense</td>
<td></td>
</tr>
</tbody>
</table>

(b) One form of Down Syndrome is caused by a translocation chromosome mutation which produces substantial changes to an affected individual’s genetic material.

(i) Describe what is meant by translocation.

(ii) Apart from translocation, name one other type chromosome mutation which can affect the structure of human chromosomes.
4. The diagram below shows some molecules involved in an enzyme-catalysed reaction in the presence of an inhibitor.

![Diagram showing molecules involved in a reaction]

(a) Using **all** the letters from the diagram, complete the table below.

<table>
<thead>
<tr>
<th>Molecules involved in reaction</th>
<th>Letter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enzyme</td>
<td></td>
</tr>
<tr>
<td>Substrate</td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td></td>
</tr>
<tr>
<td>Inhibitor</td>
<td></td>
</tr>
</tbody>
</table>

(b) Identify the type of inhibition occurring in this example and explain how the inhibitor molecules produce their effect.

Type of inhibition

Explanation of effect

---
During strenuous exercise, the following processes occur in muscle cells.

- Creatine phosphate is broken down to release energy and phosphate that are used to produce ATP as shown on the diagram below.

\[
\text{Creatine} \quad \rightarrow \quad \text{ATP} \quad \rightarrow \quad \text{ADP}
\]

- Pyruvate is converted to lactic acid when oxygen becomes deficient.

The graph below shows the concentrations of creatine phosphate and lactic acid in the muscle cells of a middle distance runner over a 20 second period on a treadmill during which he jogged gently for the first 10 seconds then sprinted strenuously for 10 seconds.

(a) (i) Give the lactic acid concentration in muscle cells after 15 seconds.  

\[ \text{mM per litre} \]

(ii) Calculate the average increase in lactic acid concentration per second over the total 20 seconds.  

*Space for calculation*

\[ \text{mM per litre} \]
5. (a) (continued)

(iii) Give the creatine phosphate concentration when the lactic acid concentration was 5 mM per litre.

Space for calculation

____________________ mM per litre

(iv) Explain the reasons for the changes in concentration of the two substances shown in the graph.

Creatine phosphate ___________________________________________ 1

Lactic acid ____________________________________________________ 1

(b) The chart below shows the percentages of fast and slow twitch muscle fibres in the muscles of the middle distance runner compared with those of athletes in other categories and in untrained individuals.

![Graph showing muscle fibre percentages]

(i) Describe the differences in the percentages of muscle types in the middle distance runner compared with:

1 an untrained individual ______________________________________ 1

2 an elite sprinter _____________________________________________ 1
5. (b) (continued)

(ii) Explain how the percentages of the different fibres found in the muscles of power lifters are suitable for their activity.

6. The graph below shows the relative concentrations of three hormones in the blood plasma of a woman during a 28-day menstrual cycle.

(a) Name hormone A.

(b) Describe the effect on the ovaries of the rapid increase in luteinising hormone (LH) concentration up to day 15.

(c) Identify the time interval during which the endometrium would be expected to reach its maximum thickness.

Tick (✓) the correct box

0 – 4 days   6 – 10 days   12 – 16 days   22 –26 days
6. (continued)

(d) Predict how the levels of follicle stimulating hormone (FSH) present in the woman’s blood would be different from those shown, if a blastocyst was implanted during day 24 and explain the advantage of this change.

Prediction __________________________________________

Explanation _________________________________________

7. The pedigree chart below shows the inheritance of haemophilia in a family. The allele for haemophilia (h) is sex-linked and recessive to the normal allele (H).

   Male without the condition
   Male with the condition
   Female without the condition
   Female with the condition

![Pedigree Chart]

(a) (i) Explain why individual R has haemophilia even although her mother was not affected.

____________________________________________________________________________________

(b) Give the genotype of individual S.

____________________________________________________________________________________
7. (continued)

(b) Individuals Q and R are expecting their third child.

Following the results of an amniocentesis test, the parents are told that their expected baby will be male.

(i) Describe what is meant by amniocentesis and explain how the test can reveal the gender of an unborn baby.

Meaning

Explain

(ii) Calculate the percentage chance that the expected male baby of individuals Q and R will have haemophilia.

Space for calculation

\[
\text{\%}
\]

8. The diagram below shows the heart and some of its associated nerves.

![Diagram of heart and nerves]

(a) (i) Name the region of the brain which regulates the sino-atrial node (SAN) through the action of the sympathetic and parasympathetic nerves shown.

(ii) The sympathetic and parasympathetic nerves act antagonistically. Explain the meaning of this statement with reference to heart rate.
8. (continued)

(b) (i) Name region X.  

(ii) Describe the role of region X and nerve fibres Y in the cardiac cycle.  

9. The diagram below show stages in thrombosis within a blood vessel.

(a) Give an example of how damage to the endothelium can occur.  

(b) Name the soluble protein present in blood plasma from which fibrin is produced.  

(c) Describe how a thrombosis can lead to myocardial infarction (MI).
10. The graph below shows changes in the blood glucose concentrations in diabetic and non-diabetic individuals after each had consumed a glucose drink.

![Graph showing blood glucose concentration over time for diabetic and non-diabetic individuals.]

(a) (i) Describe why the blood glucose concentration in the non-diabetic individual increased more slowly than in the diabetic individual.  

(ii) Assuming that no further intake of glucose occurred, explain why the blood glucose of the non-diabetic individual increased after 90 minutes.  

(b) Give two reasons why the blood glucose levels of the diabetic individual decreased after 60 minutes.

1  

2  

(c) Compare insulin production in Type 1 and Type 2 diabetes.
11. Describe the localisation of brain functions within the cerebrum and the role of the corpus callosum.

*Space for answer*


12. The diagram below shows parts of some cells in the central nervous system (CNS).

![Diagram of a neuron with labels: myelin sheath, neurotransmitter substance in vesicle, axon, dendrite, synaptic cleft, glial cell.]

(a) (i) Describe the function of the myelin sheath.  

(ii) The specific glial cell shown in the diagram is involved in the production of the myelin sheath.  

Give one other function of glial cells.  


12. (continued)

(b) (i) Describe how neurotransmitters are involved in the passage of nervous impulses across the synapse.

(ii) Name the neurotransmitters involved in reduction of pain intensity following a trauma.

13. In an investigation into the effects of caffeine on learning, thirty 25 year old volunteers were split into three groups of 10 individuals. Members of each group were given different dosages of caffeine as shown in Table 1 below. Each individual was blindfolded and asked to try a finger maze as shown in the Diagram below. The number of errors made during each trial was recorded and each individual completed six trials consecutively with no breaks between trials.

The results are shown in Table 2 opposite.

Table 1

<table>
<thead>
<tr>
<th>Group</th>
<th>Caffeine dosage given (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>150</td>
</tr>
</tbody>
</table>

Diagram
13. (continued)

Table 2

<table>
<thead>
<tr>
<th>Trial</th>
<th>Average number of errors per group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

(a) Give a hypothesis that could be tested by this experiment.

_____________________________________________________________________________

_____________________________________________________________________________

(b) (i) Identify the dependent variable in this investigation

_____________________________________________________________________________

(ii) Give **one** variable, not already indicated, which would have to be kept constant to ensure valid comparison between the three groups could be made.

_____________________________________________________________________________

(c) Describe a suitable control for this experiment.

_____________________________________________________________________________
13. (continued)

(d)  (i) On the grid below, plot line graphs to show all of the results of this experiment.

(Additional graph paper, if required, can be found on page 79.)

(ii) Explain why any conclusion drawn from the results of this experiment might not be reliable and suggest an improvement which could increase reliability.

Explanation  

Improvement  

14. The bacterial species, *Campylobacter*, *Salmonella* and *E. coli 0157* each cause infections of the digestive system that result in vomiting and diarrhoea.

The chart below shows reported number of cases of these infections in a Scottish health board area between 1991 and 1996.

![Bar chart](chart.png)

(a)  (i) **Use values from the chart** to describe the changes in the numbers of reported cases of *Campylobacter* between 1991 and 1996.  

(ii) Calculate the percentage increase in the **total** numbers of reported cases of these infections between 1991 and 1996.  

*Space for calculation*

\[ \text{%} \]
14. (continued)

(b) Give two precautions which can be taken to reduce the number of cases of these infections.

1

2

15. Note that Question 15 contains a choice.

Answer either A or B in the space below.

A  Describe non-specific defences against disease.  

OR

B  Describe the roles of T and B lymphocytes in specific immune response to disease.

Space for answer
Additional Graph for Question 13 (d) (i).
## Section 1

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>B</td>
<td>1</td>
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<tr>
<td>10.</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>14.</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>15.</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>16.</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>17.</td>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>18.</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>19.</td>
<td>B</td>
<td>1</td>
</tr>
<tr>
<td>20.</td>
<td>D</td>
<td>1</td>
</tr>
</tbody>
</table>

### Question 3

(a) Missense = 1
Protein/polypeptide formed is shorter/contains less amino acids than normal = 1

(b)(i) A part of a chromosome is removed AND becomes attached to another chromosome

(ii) Deletion OR duplication

### Question 4

(a) B
A
D, E (both)
C
All = 2; 3/2 = 1

(b) Non-competitive = 1
Inhibitor molecule binds to the enzyme molecule = 1
Changes the shape of the active site = 1

### Question 5

(a)(i) 3.0 mM per litre

(ii) 0.3 mM per litre

(iii) 1.5 mM per litre

(iv) When activity becomes strenuous more ATP is required and creatine phosphate is broken down to release phosphate and energy for its synthesis = 1
When activity becomes strenuous oxygen becomes deficient in muscle cells some pyruvic acid is converted to lactic acid = 1

### Question 6

(a) Progesterone

(b) Triggers ovulation

(c) 22–26 days
<table>
<thead>
<tr>
<th>Question</th>
<th>Expected Answer(s)</th>
<th>Max mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d)</td>
<td>FSH levels would continue to decrease after day 24 = 1&lt;br&gt;No further follicle would be developed AND no further ova would be released = 1</td>
<td>2</td>
</tr>
<tr>
<td>7. (a)</td>
<td>(i) She has inherited h from her father (who is X^hY)&lt;br&gt;AND from her mother who is a carrier/is X^hY is heterozygous</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) X^hX^h</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) (i) Method to obtain embryonic cells from amniotic fluid before birth (which can be cultured) = 1&lt;br&gt;Sex chromosomes in karyotype resulting from culture of amniotic cells can be examined before birth = 1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(ii) 100%</td>
<td>1</td>
</tr>
<tr>
<td>8. (a)</td>
<td>(i) Medulla</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) sympathetic nerve stimulates/speeds heart rate and parasympathetic nerve inhibits/slow heart rate</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) (i) AVN/atrio-ventricular node</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) AVN receives impulses from the SAN = 1&lt;br&gt;AVN passes impulses down the fibres Y which stimulate contraction of the ventricle walls during ventricular systole = 1</td>
<td>2</td>
</tr>
<tr>
<td>9. (a)</td>
<td>Physical injury OR infection OR accumulation of LDLs</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) Fibrinogen</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(c) Thrombus detaches from the site of thrombosis = 1&lt;br&gt;Thrombus becomes trapped and blocks a coronary artery = 1</td>
<td>2</td>
</tr>
<tr>
<td>10. (a)</td>
<td>(i) Insulin caused conversion of glucose to glycogen in the non-diabetic</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) Glucose being released from glycogen by action of glucagon</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) 1 Usage of glucose in respiration 2 Release of glucose in urine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(c) In Type 1 the pancreas fails to make insulin&lt;br&gt;In Type 2 the pancreas does not produce enough insulin/liver cells less sensitive to insulin</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>1. Sensory area receives incoming impulses from sense organs&lt;br&gt;2. Motor area organizes impulses to muscles for movement&lt;br&gt;3. Association areas process information&lt;br&gt;4. Centres include visual, auditory, language, others Any 1&lt;br&gt;5. Information to and from one side of the body processed by the cerebral hemisphere on the opposite side&lt;br&gt;6. Transfer of information through the corpus callosum which connects the two hemispheres&lt;br&gt;Any 3 from points 1 – 5 AND 1 mark for point 6</td>
<td>4</td>
</tr>
<tr>
<td>12. (a)</td>
<td>(i) Insulates fibres AND speeds up transmission of impulses</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) Support/nutrition/fighting infection/production of CS fluid/maintaining a homeostatic environment/removal of debris&lt;br&gt;Any 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) (i) Vesicle fuses with membrane and releases transmitter into synaptic cleft = 1&lt;br&gt;Transmitter crosses synapse and binds to receptors in post-synaptic membrane (to pass on impulse) = 1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(ii) Endorphins</td>
<td>1</td>
</tr>
<tr>
<td>13. (a)</td>
<td>(That increased) caffeine level in blood improves/reduces has no effect on learning (of motor tasks)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) (i) Average number of errors per group</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) Diet up to the administration of the experiment&lt;br&gt;Time between taking caffeine and trial&lt;br&gt;External stimuli other than the maze task&lt;br&gt;Maximum time allowed to complete trial&lt;br&gt;Method of administering the caffeine&lt;br&gt;Gender balance/health of individuals&lt;br&gt;Any 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(c) Repeat the experiment exactly but with another group of ten 25 year old volunteers and no additional caffeine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(d) (i) Axes scaled AND labelled correctly with units = 1&lt;br&gt;Points plotted accurately AND connected with straight lines = 1&lt;br&gt;Adding key OR labelling lines = 1</td>
<td>3</td>
</tr>
<tr>
<td>Question</td>
<td>Expected Answer(s)</td>
<td>Max mark</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>(i)</td>
<td>Not enough individuals tested OR not enough trials carried out = 1 Increase sample size OR do more trials per individual OR repeat tests on individuals = 1</td>
<td>2</td>
</tr>
<tr>
<td>14. (a)</td>
<td>91–92 increase from 2800 to 3400 reported cases 92–93 decreased from 3400 to 2600 reported cases 93–96 increased from 2600 to 3600 reported cases All $3 = 2; 2 = 1$</td>
<td>2</td>
</tr>
<tr>
<td>(ii)</td>
<td>18%</td>
<td>1</td>
</tr>
<tr>
<td>(b)</td>
<td>1 Good hygiene/hand washing following use of toilets OR appropriate waste disposal system/ quality water supply</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2 Good hygiene/hand washing before preparation of food OR appropriate storage/handling of food</td>
<td>1</td>
</tr>
<tr>
<td>15. A</td>
<td>1 epithelial cells/skin form a physical barrier 2 epithelial cells produce secretions against infection 3 mast cells produce histamine 4 histamine produces inflammation/capillary permeability/increased blood flow 5 phagocytes/natural killer/NK cells release cytokines which stimulate the specific immune response 6 cytoklins lead to accumulation of phagocytes at infection sites 7 cytoklins lead to delivery of antimicrobial proteins to infection sites 8 cytoklins lead to delivery of clotting elements to infection sites 9 phagocytes recognise surface antigens on pathogens 10 in phagocytosis pathogens are engulfed/rendered harmless 11 Natural killer/NK cells induce virally infected cells to undergo apoptosis produce self-destructive enzymes</td>
<td>8</td>
</tr>
</tbody>
</table>

Any $8 = 8$