

FOR OFFICIAL USE

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Totals for
Sections
B and C

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X275/12/02

NATIONAL WEDNESDAY, 13 MAY
QUALIFICATIONS 1.00 PM – 3.30 PM
2015

HUMAN BIOLOGY
HIGHER (REVISED)

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

--

Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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SECTION A—Questions 1–30 (30 Marks)

Instructions for completion of Section A are given on Page two.

For this section of the examination you must use an **HB pencil**.

SECTIONS B AND C (100 Marks)

- (a) All questions should be attempted.
(b) It should be noted that in **Section C** questions 1 and 2 each contain a choice.
- The questions may be answered in any order but all answers are to be written in the spaces provided in this answer book, **and must be written clearly and legibly in ink**.
- Additional space for answers will be found at the end of the book. If further space is required, supplementary sheets may be obtained from the Invigilator and should be inserted inside the **front** cover of this book.
- The numbers of questions must be clearly inserted with any answers written in the additional space.
- Rough work, if any should be necessary, should be written in this book and then scored through when the fair copy has been written. If further space is required, a supplementary sheet for rough work may be obtained from the Invigilator.
- Before leaving the examination room you must give this book to the Invigilator. If you do not, you may lose all the marks for this paper.



Read carefully

- 1 Check that the answer sheet provided is for **Human Biology Higher (Revised) (Section A)**.
- 2 For this section of the examination you must use an **HB pencil**, and where necessary, an eraser.
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate Number) and **Centre Name** printed on it.
Do not change any of these details.
- 4 If any of this information is wrong, tell the Invigilator immediately.
- 5 If this information is correct, **print** your name and seat number in the boxes provided.
- 6 The answer to each question is **either** A, B, C or D. Decide what your answer is, then, using your pencil, put a horizontal line in the space provided (see sample question below).
- 7 There is **only one correct** answer to each question.
- 8 Any rough working should be done on the question paper or the rough working sheet, **not** on your answer sheet.
- 9 At the end of the examination, put the **answer sheet for Section A inside the front cover of this answer book**.

Sample Question

The digestive enzyme pepsin is most active in the

- A stomach
- B mouth
- C duodenum
- D pancreas.

The correct answer is **A**—stomach. The answer **A** has been clearly marked in **pencil** with a horizontal line (see below).



Changing an answer

If you decide to change your answer, carefully erase your first answer and using your pencil fill in the answer you want. The answer below has been changed to **D**.



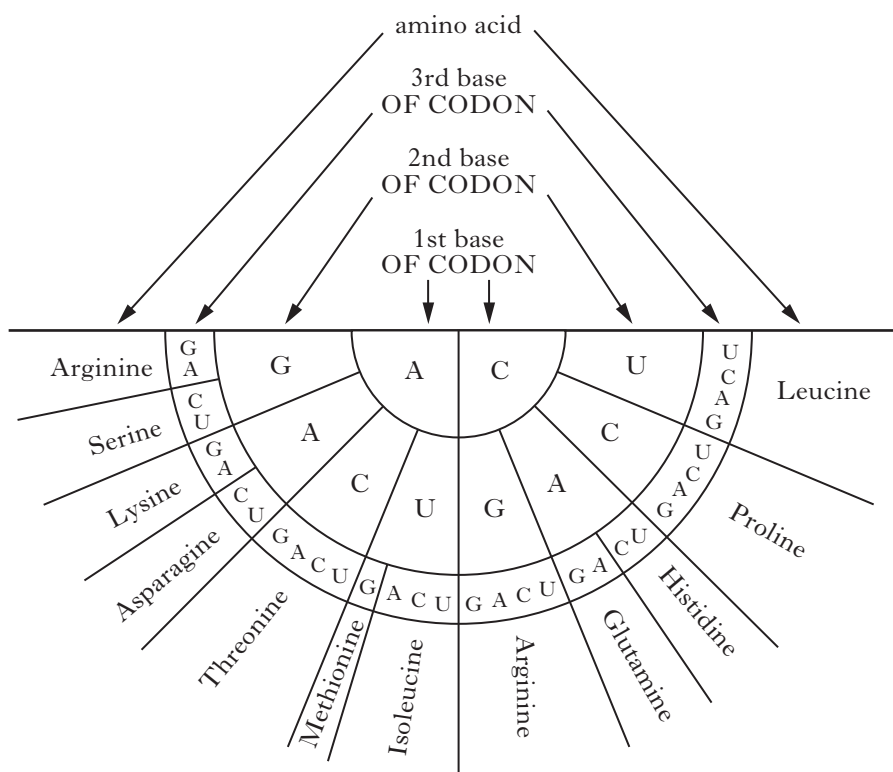
SECTION A

All questions in this section should be attempted.

Answers should be given on the separate answer sheet provided.

- | | |
|---|--|
| <p>1. Stem cells in the red bone marrow</p> <p>A are already differentiated</p> <p>B can differentiate into all cell types</p> <p>C can only differentiate into bone cells</p> <p>D can differentiate into platelets and lymphocytes.</p> <p>2. During DNA replication, new nucleotides are added to the DNA strand at the</p> <p>A 3' phosphate end</p> <p>B 3' deoxyribose end</p> <p>C 5' phosphate end</p> <p>D 5' deoxyribose end.</p> | <p>3. A primary transcript is a strand of</p> <p>A RNA comprising just exons</p> <p>B DNA comprising just exons</p> <p>C RNA comprising introns and exons</p> <p>D DNA comprising introns and exons.</p> |
|---|--|

4. The diagram below can be used to identify amino acids coded for by mRNA codons.



How many different amino acids are coded for by the following mRNA strand?

A U G C C A A C U C C U A G A C G A A U A

- A 4
- B 5
- C 6
- D 7

5. Which of the following is a possible anticodon found on a tRNA molecule?

- A GGG
- B TTT
- C ATC
- D GTU

6. The following are descriptions of three single gene mutations.

Description 1: exon-intron codons are created or destroyed

Description 2: one amino acid codon is replaced with another

Description 3: one amino acid codon is replaced with a stop codon

Which line in the table below matches the descriptions with the correct gene mutation?

	<i>Gene mutation</i>		
	<i>Missense</i>	<i>Nonsense</i>	<i>Splice site</i>
A	1	2	3
B	1	3	2
C	2	1	3
D	2	3	1

7. Bioinformatics is the study of information from

- A DNA transcription
- B DNA sequencing
- C nerve impulses in the brain
- D the receptors of nerve endings.

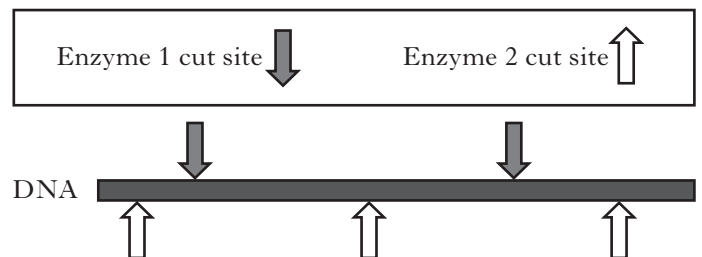
8. Some of the following are steps used in the amplification of DNA by PCR.

- 1 Decrease temperature to separate the DNA strands
- 2 Increase temperature to separate the DNA strands
- 3 Increase temperature for primers to bind to target sequences
- 4 Decrease temperature for primers to bind to target sequences
- 5 Increase temperature for DNA polymerase to replicate the DNA
- 6 Increase temperature for DNA ligase to replicate the DNA

Which line in the table below identifies the correct order of steps involved in a PCR cycle?

	<i>First stage</i>	<i>Second stage</i>	<i>Third stage</i>
A	3	1	6
B	3	1	5
C	2	4	5
D	2	4	6

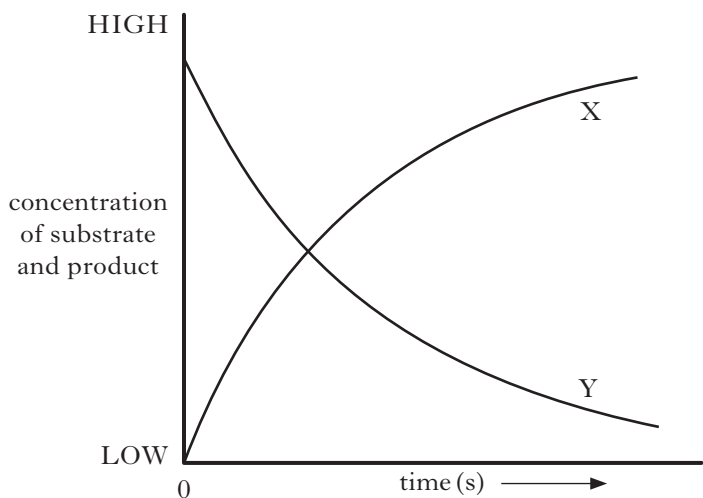
9. DNA profiling may be used in criminal investigations. During this procedure DNA is cut into fragments by two different enzymes. Each enzyme cuts DNA at a specific point.



Which line in the table below gives the correct number of DNA fragments produced from this DNA strand?

	<i>Number of fragments produced using</i>		
	<i>enzyme 1 only</i>	<i>enzyme 2 only</i>	<i>enzymes 1 and 2</i>
A	2	3	5
B	2	3	6
C	3	4	7
D	3	4	6

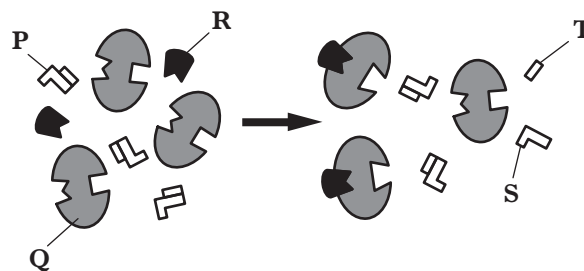
10. The graph below shows the changes to the concentrations of substrate and product during an enzyme-controlled reaction.



Which line in the table below correctly identifies the substrate, product and the change in the rate of the reaction during the process?

	<i>Substrate</i>	<i>Product</i>	<i>Rate of reaction</i>
A	X	Y	increasing
B	X	Y	decreasing
C	Y	X	increasing
D	Y	X	decreasing

11. The diagram below shows an enzyme-catalysed reaction taking place in the presence of an inhibitor.

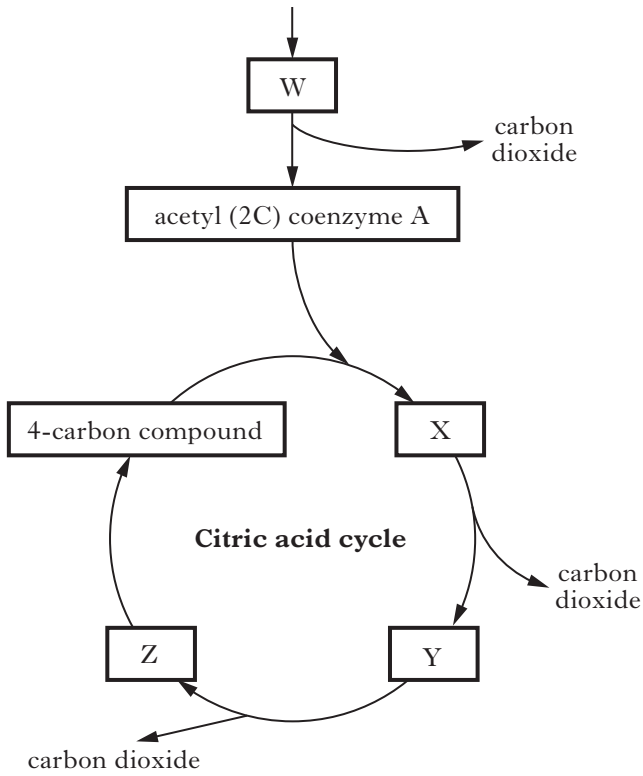


Which line in the table below correctly identifies the molecules in the reaction?

	<i>Inhibitor</i>	<i>Substrate</i>	<i>Product</i>
A	P	R	S
B	Q	P	S
C	R	P	T
D	R	Q	T

[Turn over

12. The diagram below illustrates some stages during respiration.



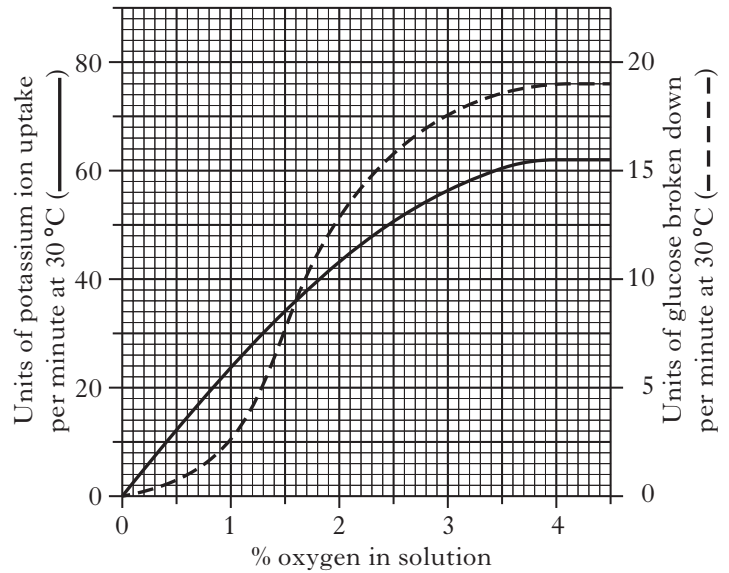
Which line in the table below correctly identifies the number of carbon atoms in compounds W, X, Y and Z?

	Number of carbon atoms			
	W	X	Y	Z
A	6	6	5	4
B	3	4	3	2
C	3	6	5	4
D	6	4	3	2

13. Which line in the table below describes correctly the function and location of dehydrogenase enzymes in respiration?

	Substance removed from substrate	Location
A	electrons	citric acid cycle
B	electrons	electron transport chain
C	phosphate	electron transport chain
D	phosphate	citric acid cycle

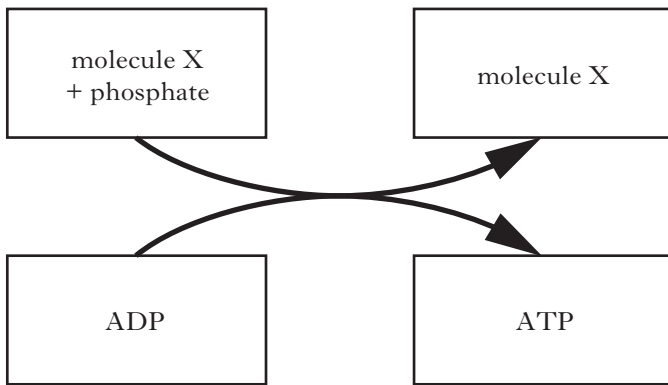
14. The graph below shows the rate of potassium uptake and glucose breakdown by muscle tissue in solutions of different oxygen concentrations.



How much glucose is broken down per minute when the oxygen concentration is 1%?

- A 2.5 units
- B 6 units
- C 10 units
- D 24 units

15. The diagram below summarises the production of ATP in a muscle cell during exercise.



What is molecule X?

- A Glucose
 B Pyruvate
 C Creatine
 D NAD
16. Which line in the table below identifies correctly the properties of slow twitch muscle fibres?

	<i>Relative number of mitochondria</i>	<i>Concentration of myoglobin</i>	<i>Major storage fuel</i>
A	many	low	fats
B	many	high	fats
C	few	low	glycogen
D	few	high	glycogen

17. A 40 g serving of a breakfast cereal contains 2 mg of iron. Only 25% of this iron is absorbed into the bloodstream.

If a pregnant woman requires a daily uptake of 6 mg of iron, how much cereal would she have to eat each day to meet this requirement?

- A 60 g
 B 120 g
 C 240 g
 D 480 g

18. The following are three forms of antenatal screening.

- 1 Anomaly scan
- 2 Amniocentesis
- 3 Chorionic villus sampling

Which of these involve the production of a karyotype?

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

19. The table below shows some genotypes and phenotypes associated with forms of sickle-cell anaemia.

<i>Genotype</i>	<i>Phenotype</i>
AA	unaffected
AS	sickle-cell trait
SS	acute sickle-cell anaemia

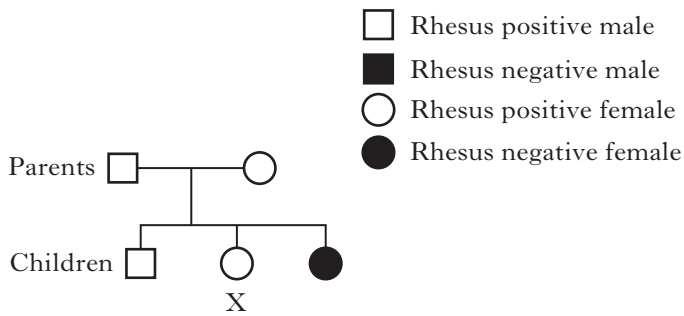
A woman with sickle-cell trait and an unaffected man have a child together.

What are the chances that their child will have acute sickle-cell anaemia?

- A None
 B 1 in 1
 C 1 in 2
 D 1 in 4

[Turn over

20. The family tree below shows the transmission of the Rhesus D-antigen. The gene for the Rhesus D-antigen is not sex-linked.



The chance of daughter X being heterozygous is

- A 0%
- B 25%
- C 50%
- D 100%.
21. Which of the following statements describes correctly the role of lipoprotein in the transport and elimination of excess cholesterol?
- A Low density lipoprotein transports excess cholesterol from the liver to the body cells.
- B Low density lipoprotein transports excess cholesterol from the body cells to the liver.
- C High density lipoprotein transports excess cholesterol from the liver to the body cells.
- D High density lipoprotein transports excess cholesterol from the body cells to the liver.

22. Which of the following describes correctly typical features of Type 1 diabetes?

<i>Feature of Type 1 diabetes</i>		
A	occurs in childhood	cells unable to produce insulin
B	develops later in life	cells unable to produce insulin
C	occurs in childhood	cells less sensitive to insulin
D	develops later in life	cells less sensitive to insulin

23. The following are types of neural pathways.

- 1 Diverging
- 2 Converging
- 3 Reverberating

Which of these pathways involve nerve impulses being sent back through a circuit of neurons?

- A 3 only
- B 1 and 2 only
- C 1 and 3 only
- D 1, 2 and 3
24. Which of the following is a cause of increased secretion of the neurotransmitter endorphin?
- A Increased stress
- B Euphoric feelings
- C Appetite modulation
- D Release of sex hormones

25. One group of drugs used to treat neurotransmitter-related disorders are called agonists.

Their mode of action is to

- A block the action of the neurotransmitter
- B mimic the action of the neurotransmitter
- C inhibit the re-uptake of the neurotransmitter
- D inhibit the degradation of the neurotransmitter.

26. After drinking, alcohol is removed from the blood at a constant rate.

The table below shows the average time it takes to remove different alcohol concentrations from the blood.

Blood alcohol concentration (mg/100 cm ³)	Removal time (hours)
16	1.0
50	3.125
80	5.0
100	6.25
160	10.0
200	12.5

The legal maximum blood alcohol concentration for driving in some regions of the UK is 80 mg/100 cm³.

Predict how long it would take before a person with a blood alcohol concentration of 240 mg/100 cm³ would legally be able to drive in these regions.

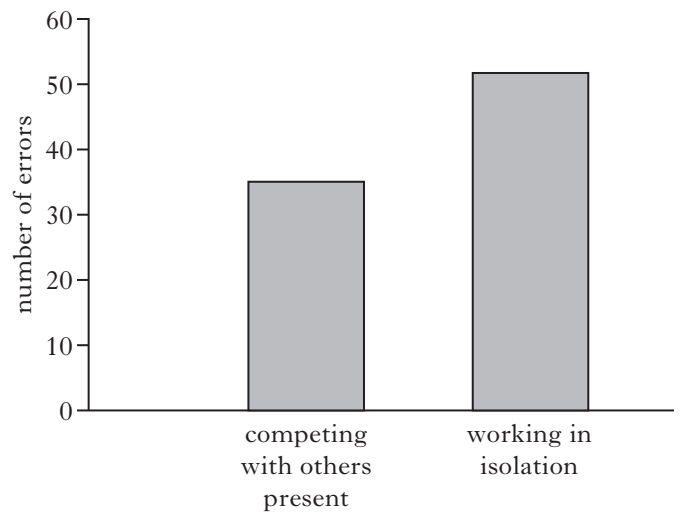
- A 5 hours
- B 10 hours
- C 15 hours
- D 20 hours

27. Which of the following terms describes the processes by which a person learns to distinguish between different but related stimuli?

- A Generalisation
- B Imitation
- C Discrimination
- D Identification

28. A number of students were trained to carry out a complex task. Some competed with one another, others worked in isolation.

The graph below shows the number of errors recorded in the training process.



Which process is likely to have caused the difference in the results?

- A Deindividuation
- B Social facilitation
- C Shaping
- D Internalisation

29. Which of the cells of the immune system are mainly involved in an autoimmune response?

- A Mast cells
- B Phagocytes
- C B-lymphocytes
- D T-lymphocytes

30. New vaccines are subject to clinical trials before being licensed for use.

Which of the following is **not** a feature of the protocol used for clinical trials?

- A A placebo is used.
- B Many trial groups are used.
- C A randomised procedure is used.
- D A double-blind procedure is used.

Candidates are reminded that the answer sheet MUST be returned INSIDE the front cover of this answer booklet.

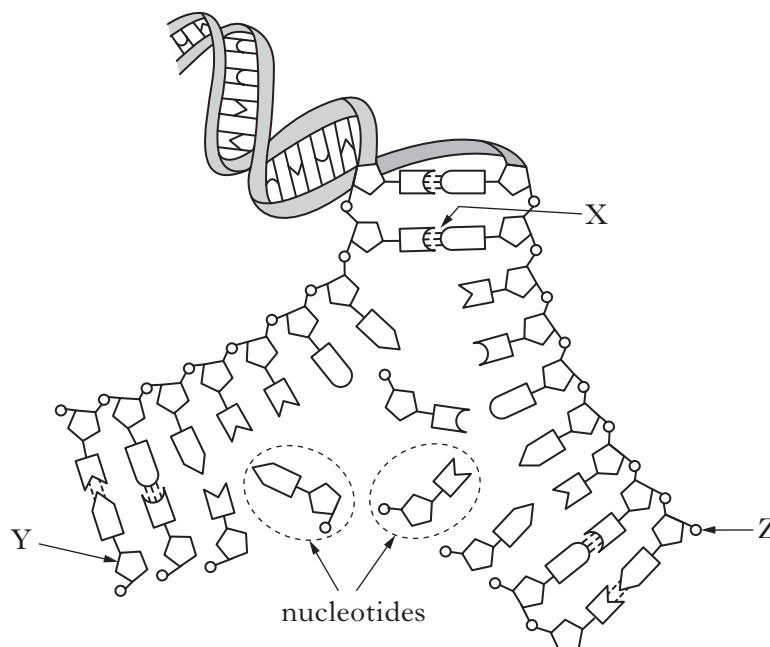
Marks

SECTION B

All questions in this section should be attempted.

All answers must be written clearly and legibly in ink.

1. The diagram below shows part of a DNA molecule during replication.



(a) (i) During replication, bonds between the two DNA strands are broken.
Name the type of bond labelled X.

1

(ii) Identify the molecules labelled Y and Z.

Y _____ Z _____

1

(iii) Name **two** molecules **not shown on the diagram** which are essential for DNA replication.

1 _____ 2 _____

1

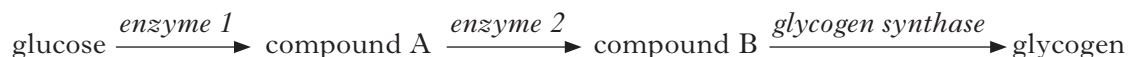
(b) Explain why DNA replication must take place before a cell divides.

1

Marks

2. Glycogen storage disease is an inherited condition in which the enzyme glycogen synthase does not function.

This enzyme normally catalyses one step in the conversion of glucose to glycogen, as shown in the diagram below.



- (a) State the term which describes a metabolic pathway in which simple molecules are built up into complex molecules.

1

- (b) (i) Describe how the genetic code for glycogen synthase might be altered in an individual with the disease.

1

- (ii) Explain why this altered genetic code fails to produce glycogen synthase.

1

- (c) Suggest why individuals with glycogen storage disease might develop abnormally low blood glucose levels during exercise.

1

- (d) One form of glycogen storage disease is caused by a gene which is recessive and sex-linked.

Describe a pattern of inheritance, shown by a family history, which would indicate that the condition is

recessive _____

1

sex-linked _____

1

Marks

3. Prostate-specific antigen (PSA) is a chemical produced by cells within the prostate gland. PSA is secreted into the seminal fluid where it thins the fluid, making it less viscous.

(a) Explain why it is important that the seminal fluid is less viscous.

1

(b) Increased levels of PSA can be detected in the blood plasma of men with prostate cancer.

(i) Suggest why the presence of cancer in the prostate gland would lead to increased production of PSA.

1

(ii) Describe how prostate cancer can lead to the development of secondary tumours.

2

(c) Some research has suggested that testing blood plasma for PSA is unreliable, as it may produce a result which indicates that cancer is present when it is not.

State the term used to describe the result of a test which indicates that a condition is present when it is not.

1

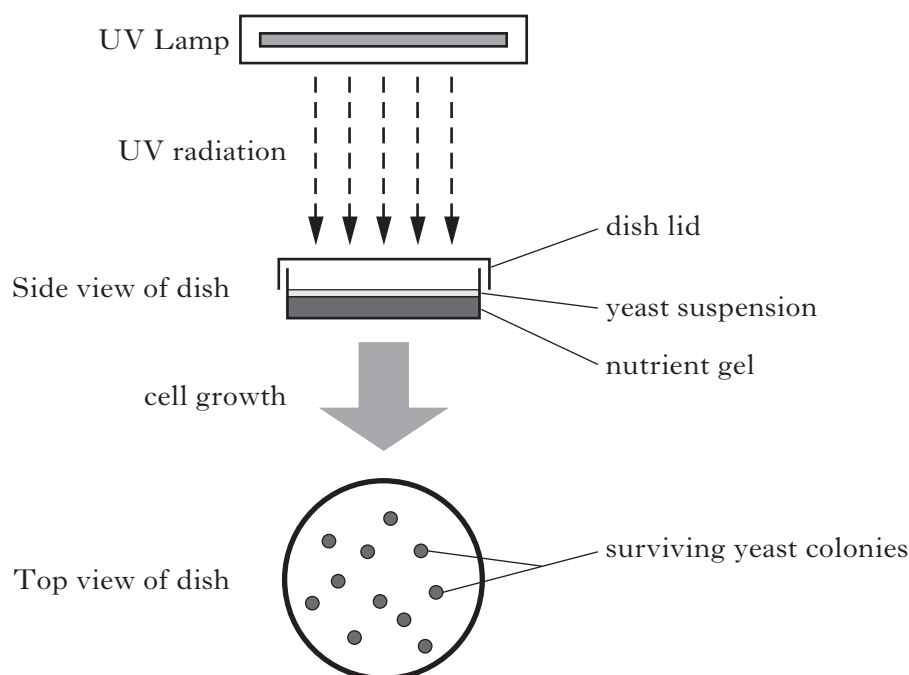
Marks

4. Most skin cancers are caused by overexposure to ultraviolet (UV) radiation from the sun or sunbeds. UV radiation damages the DNA in skin cells. Cells normally repair this damage but those which cannot may become cancerous.

A student designed an investigation which used UV-sensitive yeast cells to show the damaging effect of UV radiation. These yeast cells cannot repair DNA damage and die after exposure to UV radiation.

A suspension of UV-sensitive yeast cells was added to dishes which contained a gel that had all the nutrients the yeast needed to grow. The dishes were then exposed to UV radiation for different lengths of time. After exposure, the dishes were placed in an incubator and each of the surviving yeast cells left to grow into a colony on the gel. The number of these colonies was then counted.

The diagram below illustrates this procedure.



- (a) List **two** variables which should be kept constant during this investigation.

1 _____

2 _____

2

[Turn over

4. (continued)

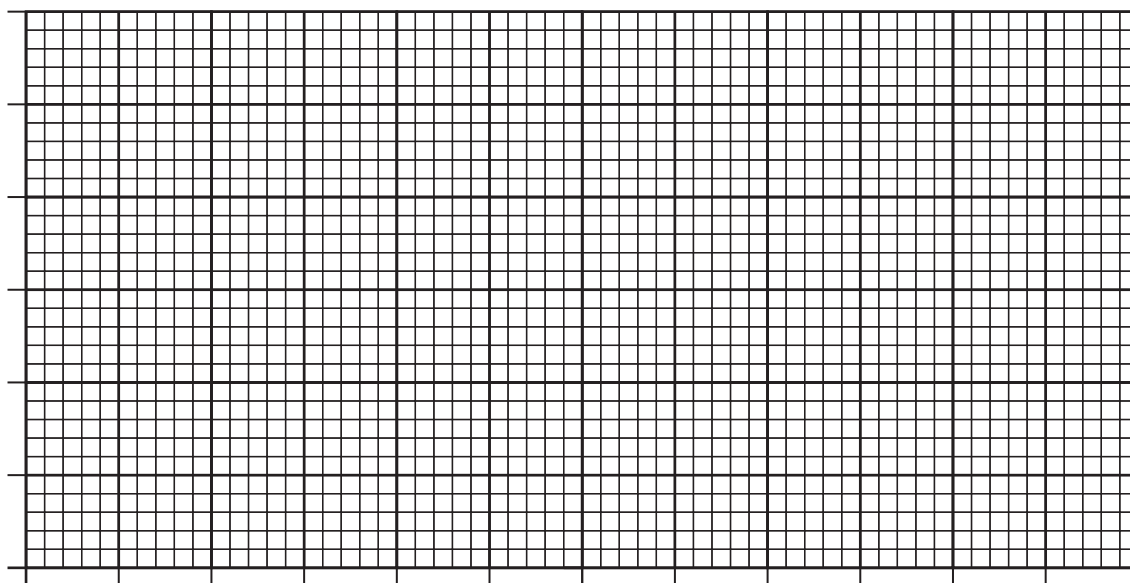
- (b) The results of the investigation are shown in **Table 1** below.

Table 1—Yeast growth after exposure to UV radiation

<i>Length of time of exposure (minutes)</i>	<i>Number of yeast colonies growing</i>
10	58
20	32
30	15
40	4
50	1
60	0

- (i) Plot a line graph to illustrate the results of the investigation.

(Additional graph paper, if required, can be found on *Page thirty-six*.)



2

- (ii) State a conclusion that can be drawn from these results.

1

- (iii) State how the reliability of the results in this investigation could be improved.

1

4. (continued)

Marks

- (c) Sunscreens work by blocking UV radiation, preventing it from entering skin cells and causing damage to the DNA, which results in sunburn.

Sunscreens are labelled with a Sun Protection Factor (SPF). When a sunscreen of SPF 15 is applied to the skin, it will take 15 times longer to burn compared to having no sunscreen applied.

The student carried out a second investigation using UV-sensitive yeast. The dishes were prepared as before but this time the lids of the dishes were coated with sunscreens of different SPFs. The dishes were then exposed to UV radiation for 30 minutes. After exposure, the dishes were placed in an incubator and the surviving yeast cells left to grow into colonies. The results are shown in **Table 2** below.

Table 2—Yeast growth after the use of sunscreen protection

<i>Sunscreen used to coat lid (SPF)</i>	<i>Number of yeast colonies growing</i>
6	20
15	72
35	74
50	75

- (i) Use the information from **Tables 1 and 2** to calculate the percentage increase in yeast cell survival when a sunscreen of SPF 50 is used to coat the lid.

Space for calculation

_____ % **1**

- (ii) Official health advice recommends that people should use a sunscreen of SPF 15 when sunbathing for 30 minutes.

State how the results of this investigation support this recommendation.

_____ **1**

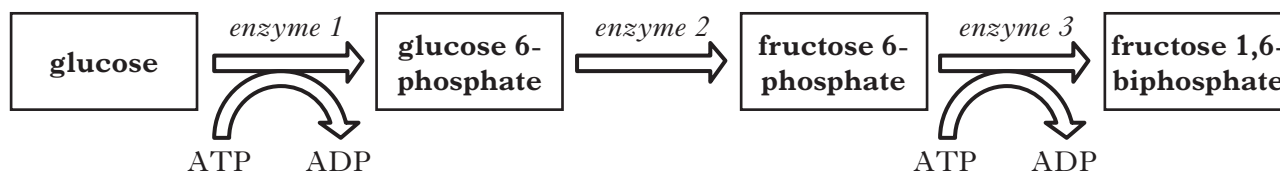
- (iii) If skin starts to burn after 10 minutes in strong sunlight, calculate for how long a sunscreen of SPF 35 would protect the skin.

Space for calculation

_____ **1**

Marks

5. The diagram below represents **three** chemical reactions in the energy investment phase of glycolysis.



- (a) Identify the information, **shown in the diagram**, which confirms that this is the energy investment phase of glycolysis.

1

- (b) Enzyme 1 is activated by the binding of magnesium ions. Suggest how the binding of these ions leads to an increase in enzyme activity.

1

- (c) Choose an enzyme **shown in the diagram** which is catalysing a phosphorylation reaction.

Circle **one** enzyme- Enzyme 1 Enzyme 2 Enzyme 3

Explain what is meant by phosphorylation.

1

- (d) The conversion of glucose 6-phosphate to fructose 6-phosphate is a reversible reaction.

Describe the circumstances under which this reaction would go in the opposite direction to that shown in the diagram.

1

- (e) Following the energy investment phase, glycolysis enters the energy pay off stage, during which ATP is produced.

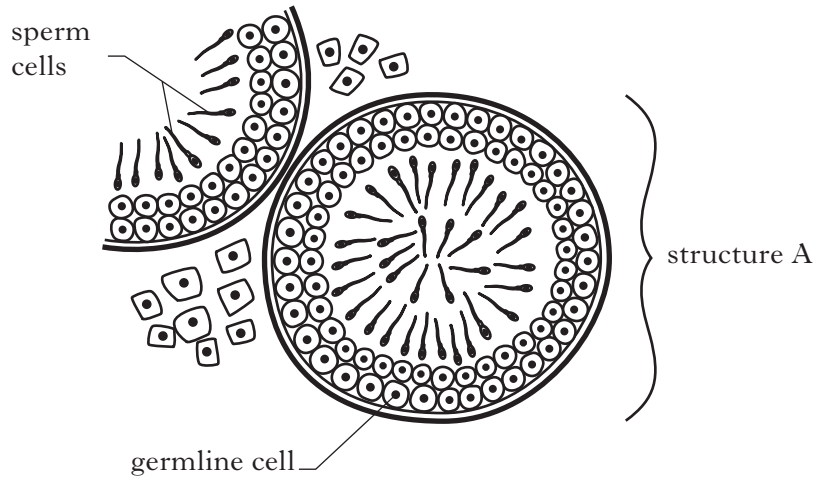
Enzyme 3 is phosphofructokinase which is inhibited by a build-up of ATP.

Explain how this feedback mechanism conserves the cell's resources.

1

6. The diagram below represents sperm production in a cross section through part of a testis.

Marks



(a) (i) Name structure A.

1

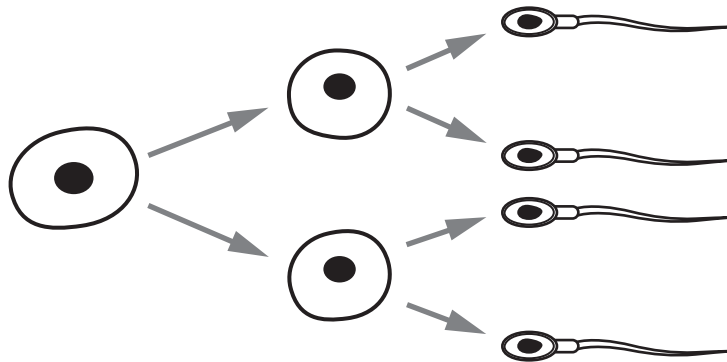
(ii) Describe **two** ways that the pituitary gland stimulates sperm production in structure A.

1 _____

2 _____

2

(b) The diagram below shows a germline cell dividing to produce sperm cells.



(i) Name this type of cell division.

1

(ii) State how many of the sperm cells shown in this diagram contain

1 an X chromosome _____

2 autosomes _____

1

Marks

6. (continued)

- (c) The average sperm count in the developed world has fallen by one third over the last 15 years.

The present average sperm count is 30 million/cm³ of semen.

Calculate the average yearly fall in sperm production over the 15 year period.

Space for calculation

_____ million/cm³/year **1**

- (d) In fertility clinics, samples of semen are collected to determine if a man is fertile or not.

A man is fertile if his semen contains at least 20 million sperm per cm³. In addition, 75% of the sperm cells must be active and 30% must be of normal shape.

The table below shows the results of semen analysis from four men.

	<i>Men</i>			
	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
<i>Number of sperm in sample (millions/cm³)</i>	25	22	20	23
<i>Percentage of inactive sperm</i>	20	25	15	30
<i>Percentage of misshapen sperm</i>	70	60	65	50

- (i) State how many of the men are infertile.

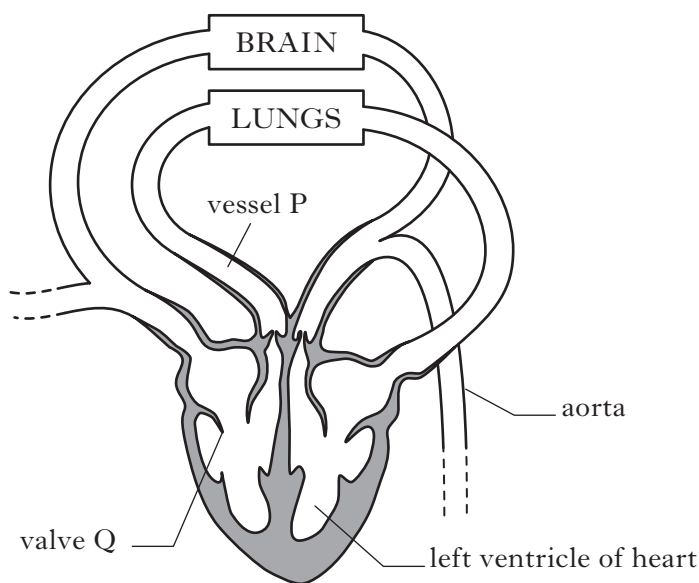
1

- (ii) Explain how artificial insemination could be used to enable a couple to have a child when the man has a low sperm count.

2

Marks

7. The diagram below represents part of the human circulatory system.



(a) State whether blood vessel P is the pulmonary artery or the pulmonary vein.
Give a reason for your answer.

Name of P _____

Reason _____

_____ 1

(b) Describe **one** difference in the structure of arteries and veins.

_____ 1

(c) Explain why the carbon dioxide concentration of the blood increases as it flows through the brain.

_____ 1

(d) Name valve Q and describe its function within the heart.

Name _____

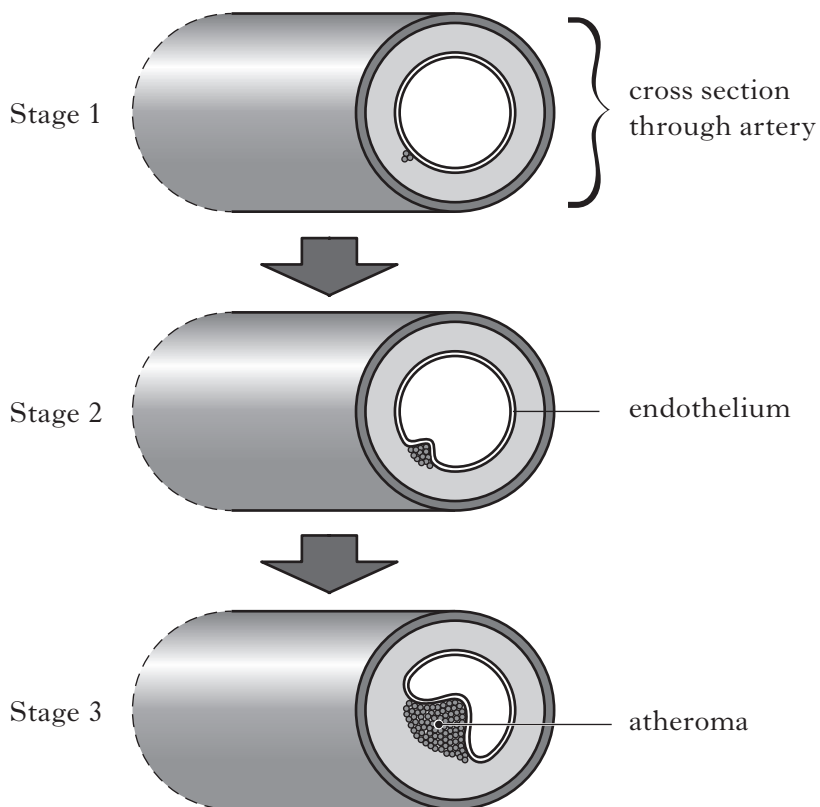
Function _____

_____ 1

[Turn over

Marks

8. The diagram below shows **three** stages in the formation of an atheroma in an artery.



- (a) Name **one** substance which may accumulate in an artery resulting in the formation of an atheroma.

_____ 1

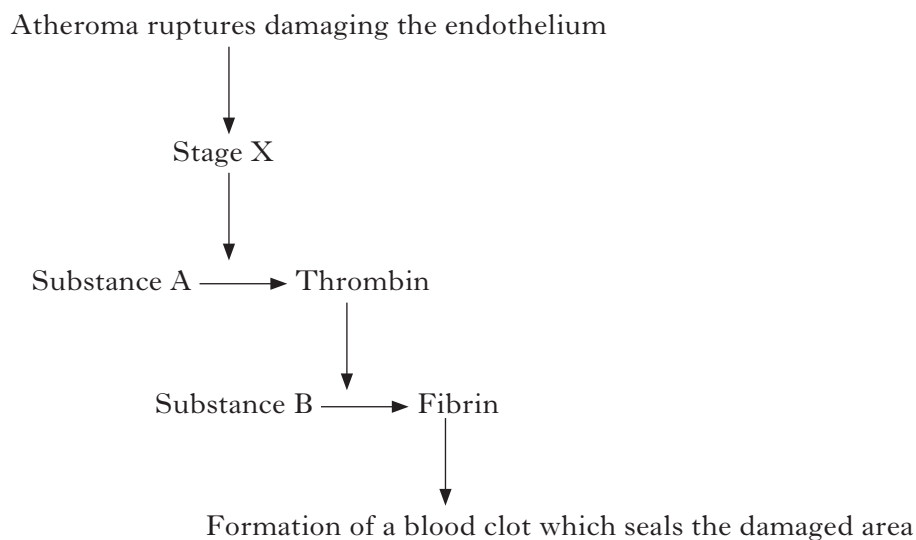
- (b) Suggest why the blood pressure in an artery at Stage 3 is likely to be raised.

_____ 1

8. continued

- (c) If an atheroma ruptures there is a high risk of blood clot formation.

The flow diagram below shows the cascade of reactions involved in the formation of a blood clot in an artery.



- (i) Describe what happens during Stage X.

1

- (ii) Name substances A and B.

A _____

B _____

1

- (d) A blood clot can break away from its site of formation and enter the general circulation.

- (i) Name this type of blood clot.

1

- (ii) Describe how the movement of a blood clot can lead to a heart attack.

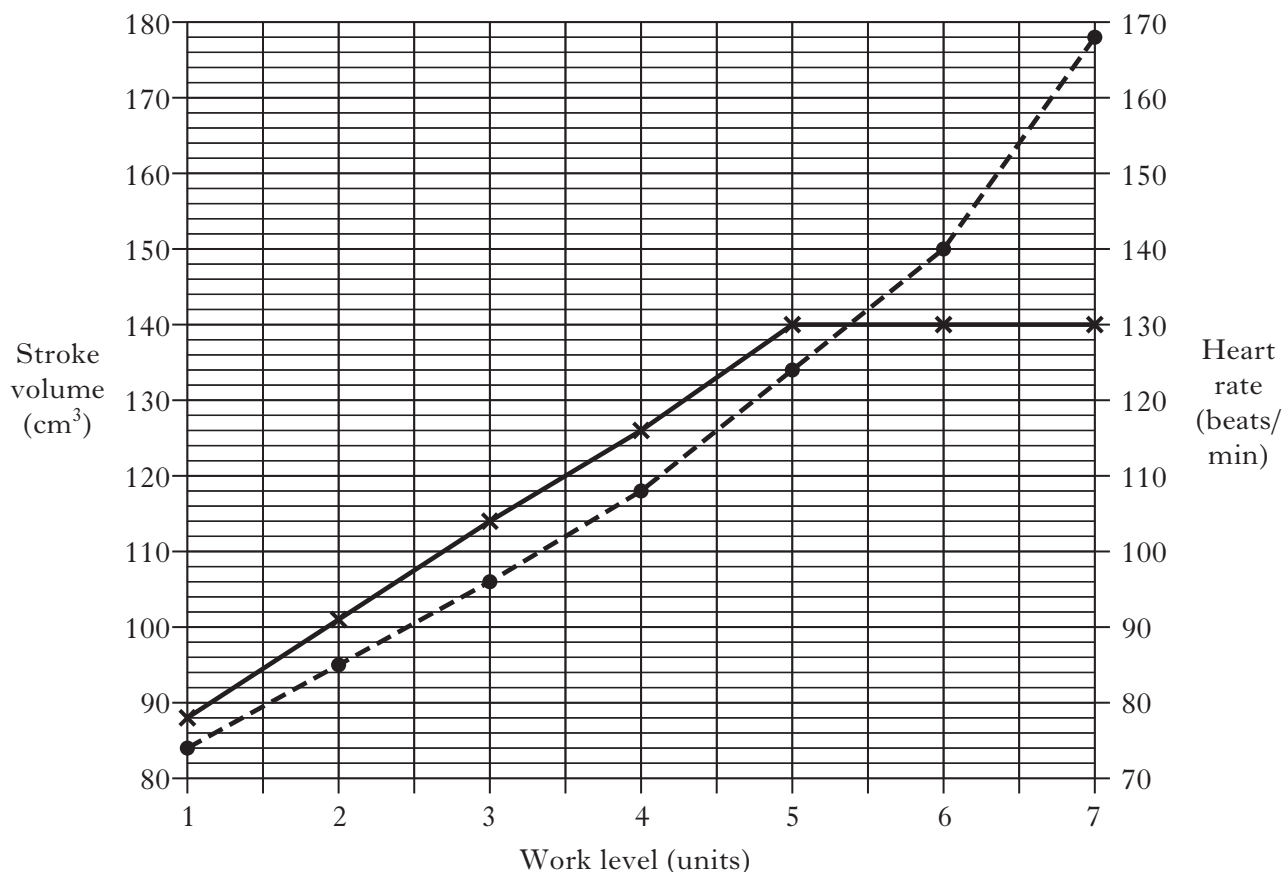
2

9. The heart rate and stroke volume of a 40 year old cyclist were monitored as he used an exercise bike. Marks

The cyclist was told to pedal at a constant rate as his work level was gradually raised by increasing the resistance to pedalling.

The graph below shows the changes that occurred in the cyclist's heart rate and stroke volume at seven different work levels.

- ✕ ——— ✕ stroke volume – volume of blood pumped out per heartbeat
- - - - - ● heart rate – beats of heart per minute



- (a) Use data from the graph to describe the changes that occurred in the cyclist's stroke volume when the work level increased from 1 to 7 units.

2

9. (continued)

Marks

(b) State what the cyclist's heart rate was when his stroke volume was 120 cm^3 .

_____ beats/min **1**

(c) Cardiac output is the volume of blood leaving the heart in one minute.
It is calculated using the formula shown below.

$$\text{cardiac output} = \text{heart rate} \times \text{stroke volume}$$

Calculate the cyclist's cardiac output when his work level was 6 units.

Space for calculation

_____ cm^3/min **1**

[Turn over

Marks

9. (continued)

- (d) The table below shows the recommended minimum heart rates that cyclists of different ages should maintain in order to either metabolise fat or improve their fitness.

<i>Age</i>	<i>Minimum heart rate for metabolising fat (beats/min)</i>	<i>Minimum heart rate for improving fitness (beats/min)</i>
10	136	168
20	130	160
30	123	152
40	116	144
50	110	136
60	104	128

- (i) Use information from the **table** and the **graph** to determine the work level that the cyclist should maintain in order to metabolise fat.

_____ units **1**

- (ii) Use information from the **table** to predict the minimum heart rate for improving the fitness of a 70 year old.

_____ **1**

- (iii) As an individual gets older, their minimum heart rate for improving fitness decreases.

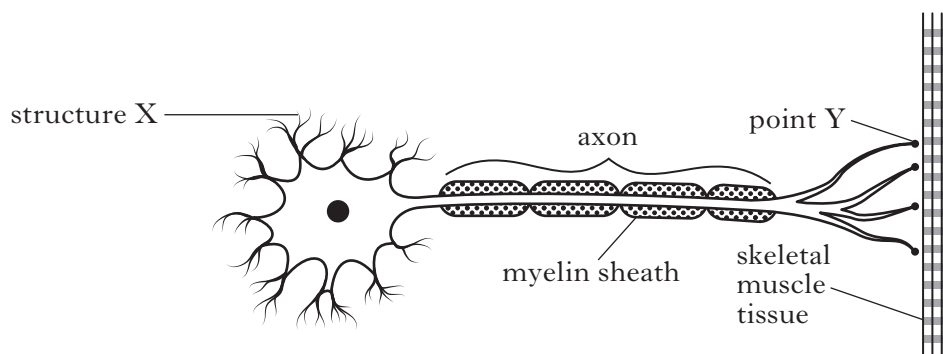
Use the information from the **table** to calculate the percentage decrease that occurs between the ages of 10 and 60 years.

Space for calculation

_____ % **1**

Marks

10. The diagram below represents a motor nerve cell and a neuromuscular junction.



(a) Name structure X and state its function.

Name _____

Function _____

1

(b) (i) Name the cells that produce the myelin sheath.

1

(ii) State **one** other function of this type of cell.

1

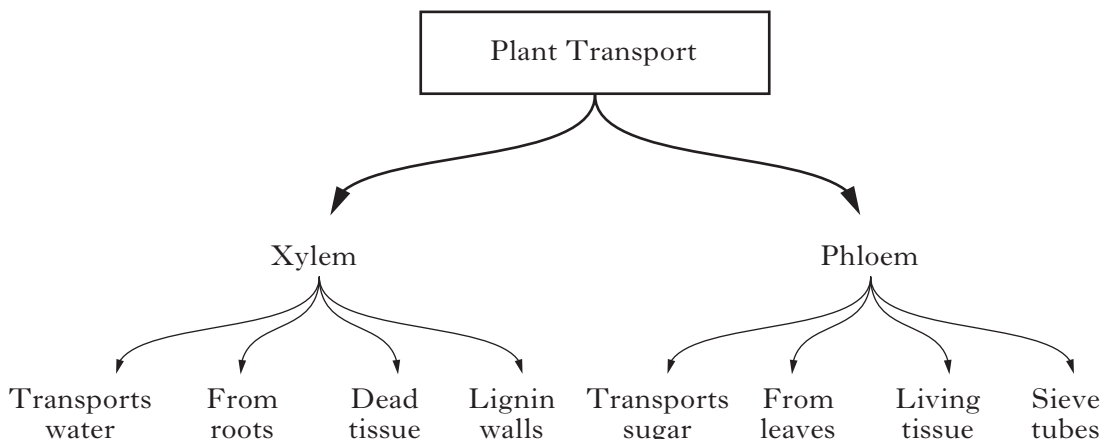
(c) Describe how the arrival of an impulse at point Y causes muscle contraction.

2

[Turn over

Marks

11. A biology student produced the following diagram as a memory aid to help her learn about transport in plants.



- (a) In producing this diagram the student used various methods to learn the information.

Other than rehearsal, name **two** methods that she used and describe how they helped her transfer the information into her long-term memory.

1 Method _____

Description _____

1

2 Method _____

Description _____

1

- (b) Any information which is not transferred into long-term memory is displaced. Explain why displacement occurs.

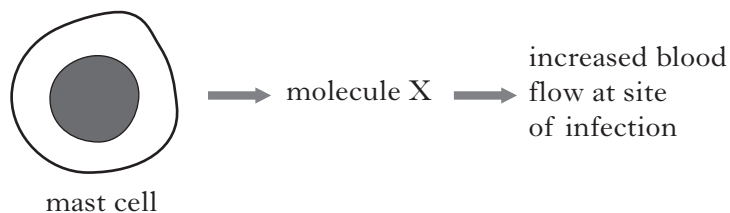
1

- (c) The student is storing a record of facts as she learns this information. State the part of the brain in which such memories are stored.

1

Marks

12. The diagram below shows a response to a viral infection by a type of cell called a mast cell.



- (a) (i) Name molecule X.

1

- (ii) Give **one** reason why increased blood flow to the infection site is beneficial in stopping the infection.

1

- (b) A type of lymphocyte called a natural killer cell induces apoptosis in infected cells.

Describe what happens during apoptosis.

1

- (c) Another type of lymphocyte is a B-lymphocyte.

Describe how B-lymphocytes become active and respond to viral infection.

3

[Turn over

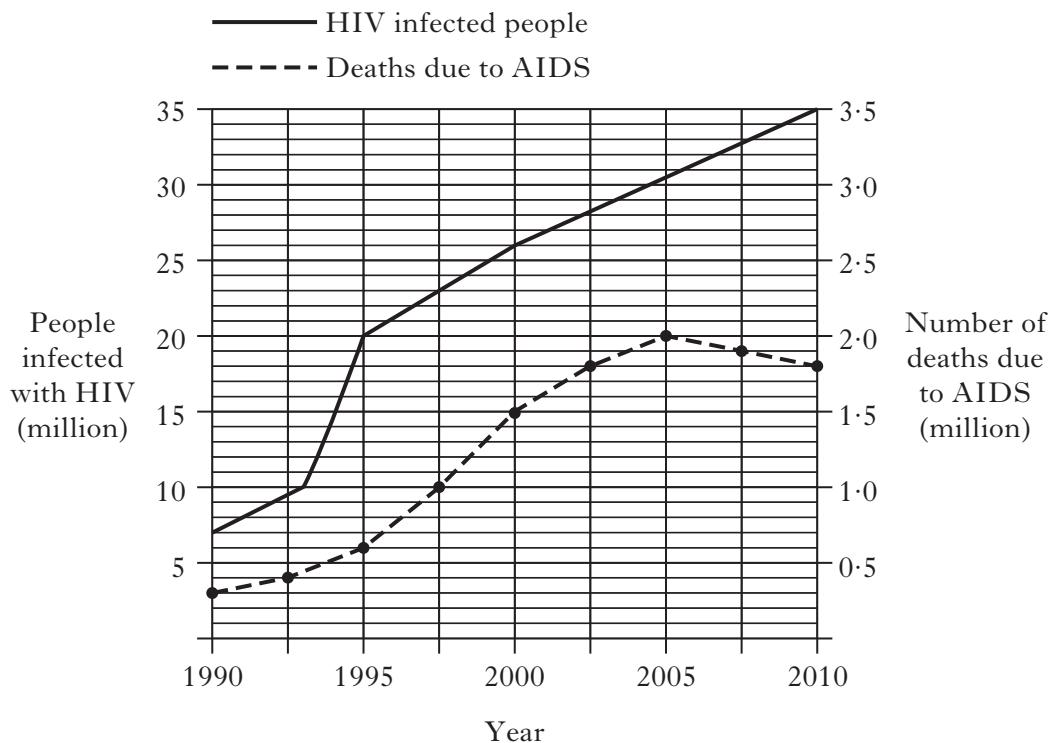
13. HIV is a virus which invades the cells of the immune system.

Marks

People infected with HIV may not show symptoms for many years.

AIDS is the condition which may develop from HIV infection, resulting in death.

The graph below shows the number of people in the world infected with HIV, from 1990 to 2010. It also shows the number of these people who died from AIDS during this period.



(a) State how many people were infected with HIV in the year 2000.

1

(b) State how many people died from AIDS when 20 million people in the world were infected with HIV.

1

(c) Calculate the percentage of HIV-infected people who died from AIDS in 2010.

Space for calculation

_____%

1

(d) Describe the evidence from the graph which suggests that the rate of people becoming infected with HIV was greatest between 1993 and 1995.

1

Marks

14. A scientist investigated the effectiveness of four different types of influenza vaccine. A total of 2000 volunteers from a Scottish community were divided into four groups.

Each group was injected with a different vaccine.

The number who developed influenza during the following year was recorded.

The results are shown in the table below.

<i>Type of influenza vaccine</i>	<i>Developed influenza</i>	<i>Did not develop influenza</i>	<i>Total</i>
P	35	495	530
Q	25	455	480
R	24	496	520
S	17		

- (a) (i) Suggest **one** way in which the scientist could minimise variation between the four groups of volunteers.

1

- (ii) **Complete the table** for the volunteers who received type S vaccine.

1

- (iii) State which of the vaccines P, Q or R was most effective in this investigation.

1

- (b) Explain why vaccines usually contain an adjuvant.

1

- (c) In 1918 fifty million people died in a global outbreak of influenza.

State the term used to describe such an outbreak.

1

[Turn over for Section C on Page thirty

SECTION C

Both questions in this section should be attempted.

Note that each question contains a choice.

Questions 1 and 2 should be attempted on the blank pages which follow.

Supplementary sheets, if required, may be obtained from the Invigilator.

Labelled diagrams may be used where appropriate.

1. Answer either A or B

A Describe hormonal control of the menstrual cycle under the following headings:

(i) events leading to ovulation; 6

(ii) events following ovulation. 4

OR (10)

B Describe the cardiac cycle under the following headings:

(i) the conducting system of the heart; 5

(ii) nervous control of the cardiac cycle. 5

(10)

In question 2, ONE mark is available for coherence and ONE mark is available for relevance.

2. Answer either A or B

A Give an account of how perception allows the brain to analyse incoming sensory information. (10)

OR

B Give an account of the transmission and control of infectious diseases. (10)

[END OF QUESTION PAPER]

SPACE FOR ANSWERS

Marks

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SPACE FOR ANSWERS

Marks

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Marks

SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

Marks

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Marks

ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

Marks

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ADDITIONAL GRAPH PAPER FOR QUESTION 4(b)(i)

