

Pearson BTEC Level 3 National in Health and Social Care

Unit 3: Anatomy and
Physiology for Health and
Social Care

Sample Assessment Materials (SAMs)

*For use with Extended Diploma in Health and
Social Care*

First teaching from September 2016

Issue 1



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Pearson BTEC Level 3 Nationals

Write your name here

Surname	Forename
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Learner Registration Number

Centre Number

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3

Health and Social Care

Unit 3: Anatomy and Physiology for Health and Social Care

Extended Diploma in Health and Social Care

Sample Assessment materials for first teaching September 2016

Time: 1 hour 30 minutes

Total



marks

You do not need any other materials.

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in grey boxes.
– *use this as a guide as to how much time to spend on each question.*
- You may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Paper reference

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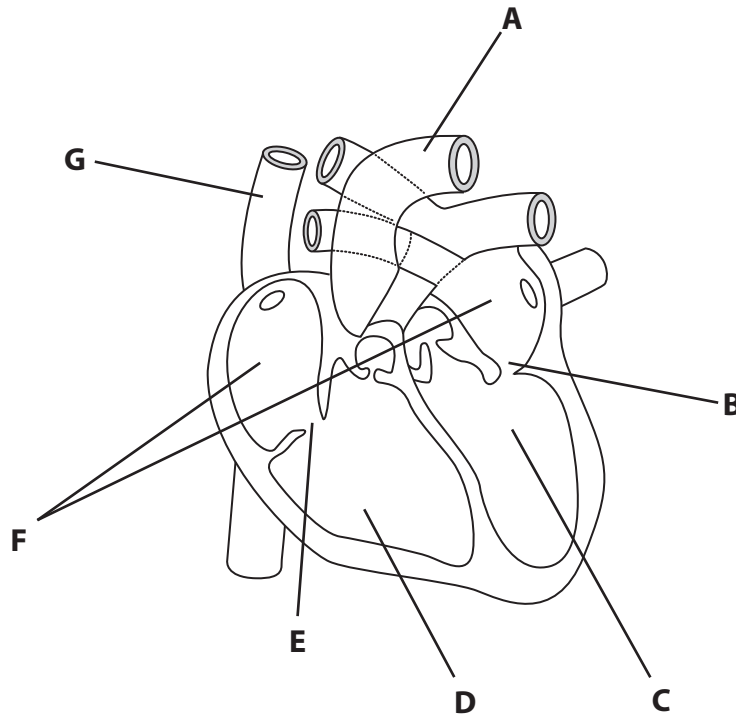
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PEARSON

Answer ALL questions. Write your answers in the spaces provided.

Questions 1–3 are about the heart.

1 The diagram shows a section through a human heart as positioned in the body.



(a) Which letter points to the left ventricle?

1 mark

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(b) State the name of structures **A**, **F** and **G**.

3 marks

A

F

G

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These are descriptions of blood carried by vessels.

- A** deoxygenated with a high level of carbon dioxide
- B** oxygenated with a high level of carbon dioxide
- C** deoxygenated with a low level of carbon dioxide
- D** oxygenated with a low level of carbon dioxide

(c) Which statement describes blood vessel **G**?

1 mark

Total for Question 1 = 5 marks

2 In a condition called hypertrophic cardiomyopathy (HCM) heart muscle becomes thickened. This leads to a reduction in the size of the lumen of chamber **C**, a narrowing of the opening of blood vessel **A** and a leaky heart valve **B**.

(a) Explain how HCM leads to lightheadedness.

4 marks

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(b) HCM is an inherited condition. Define the term *inherited condition*.

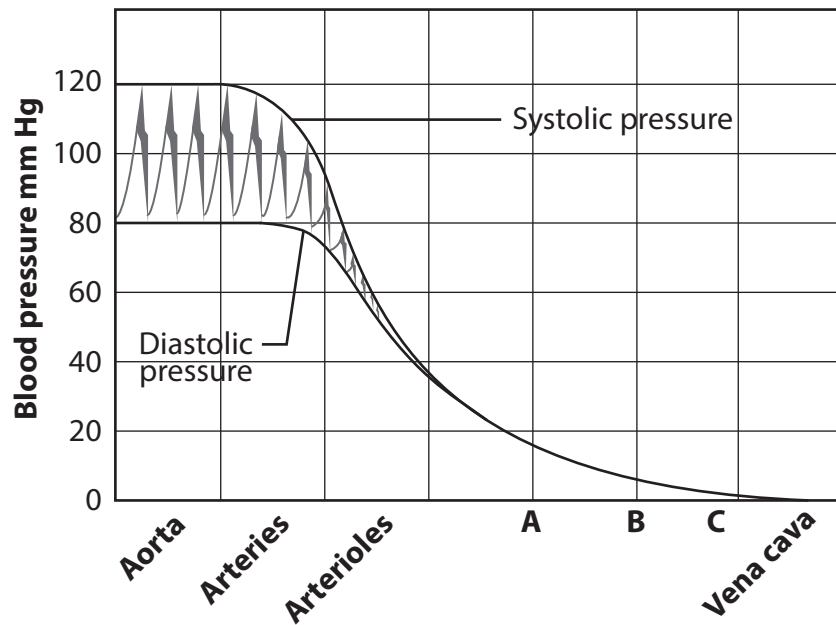
1 mark

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Total for Question 2 = 5 marks

- 3 The graph shows changes in blood pressure, from it leaving the heart to arriving at the vena cava.



- (a) Explain why blood pressure fluctuates only along the aorta, arteries and arterioles.

2 marks

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- (b) State the names of the blood vessels at **A** and **B**.

2 marks

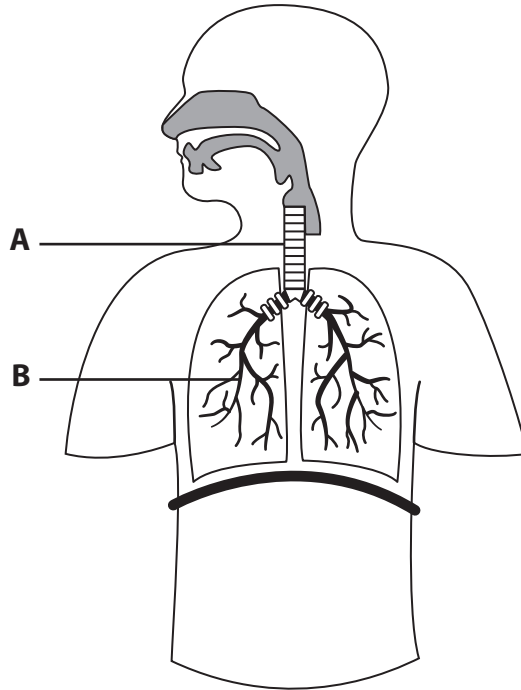
A

B

Total for Question 3 = 4 marks

Questions 4–6 are about the respiratory system.

4 The diagram shows the human thorax.



State the names of structures **A** and **B**.

A

B

Total for Question 4 = 2 marks

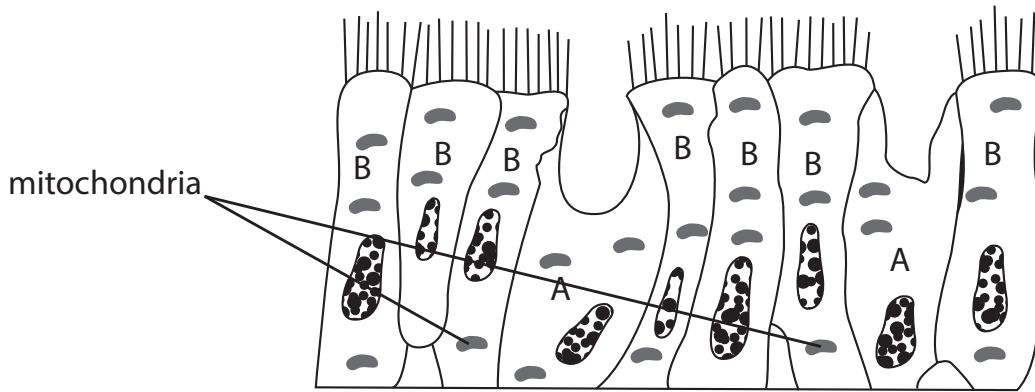
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The diagram shows some cells from the lining of the trachea. These are labelled **A** and **B**.



- A cuboidal
- B keratinised
- C squamous
- D ciliated

(a) To which kind of epithelium do the cells labelled **B** in the diagram belong to?

1 mark

.....

(b) Outline why both cells **A** and **B** have many mitochondria.

3 marks

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Total for Question 5 = 4 marks

- 6 Asthma is a common disorder of the respiratory system. The symptoms of asthma are wheezing and shortness of breath.

(a) Explain what happens in asthma to cause these symptoms.

2 marks

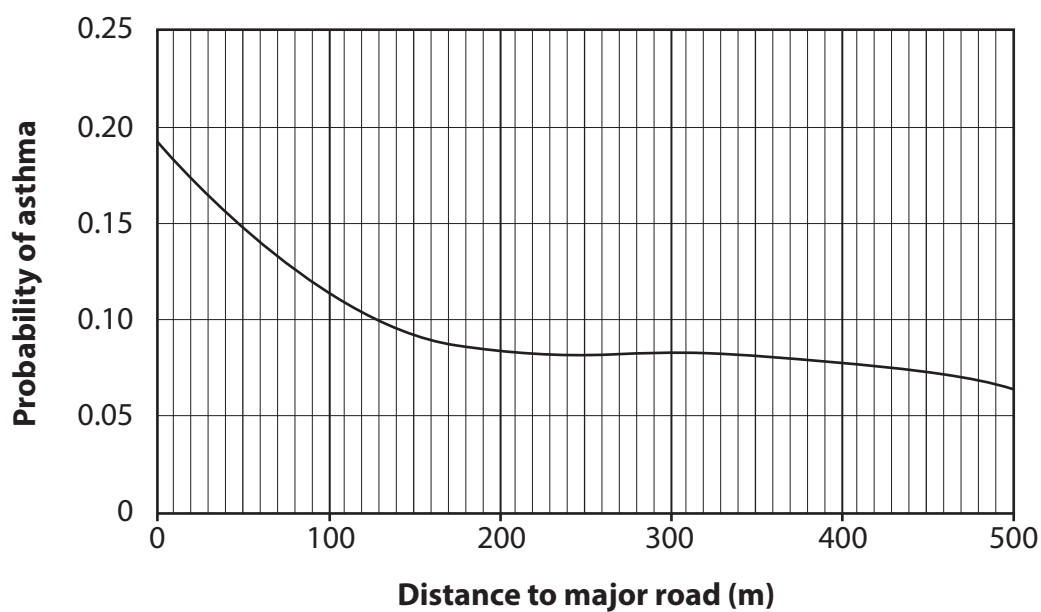
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A study was done on the probability of children living at different distances from major roads being asthmatic. The results are shown in the table.



(b) By how many times has the probability of getting asthma increased for children living by the major road (0 m), compared with children living 400 m away from it?

2 marks

Answer

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(c) To what extent do these data support the conclusion that traffic pollution causes asthma?

3 marks

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Total for Question 6 = 7 marks

Question 7 is about energy in the body.

7 (a) Define *catabolism*.

1 mark

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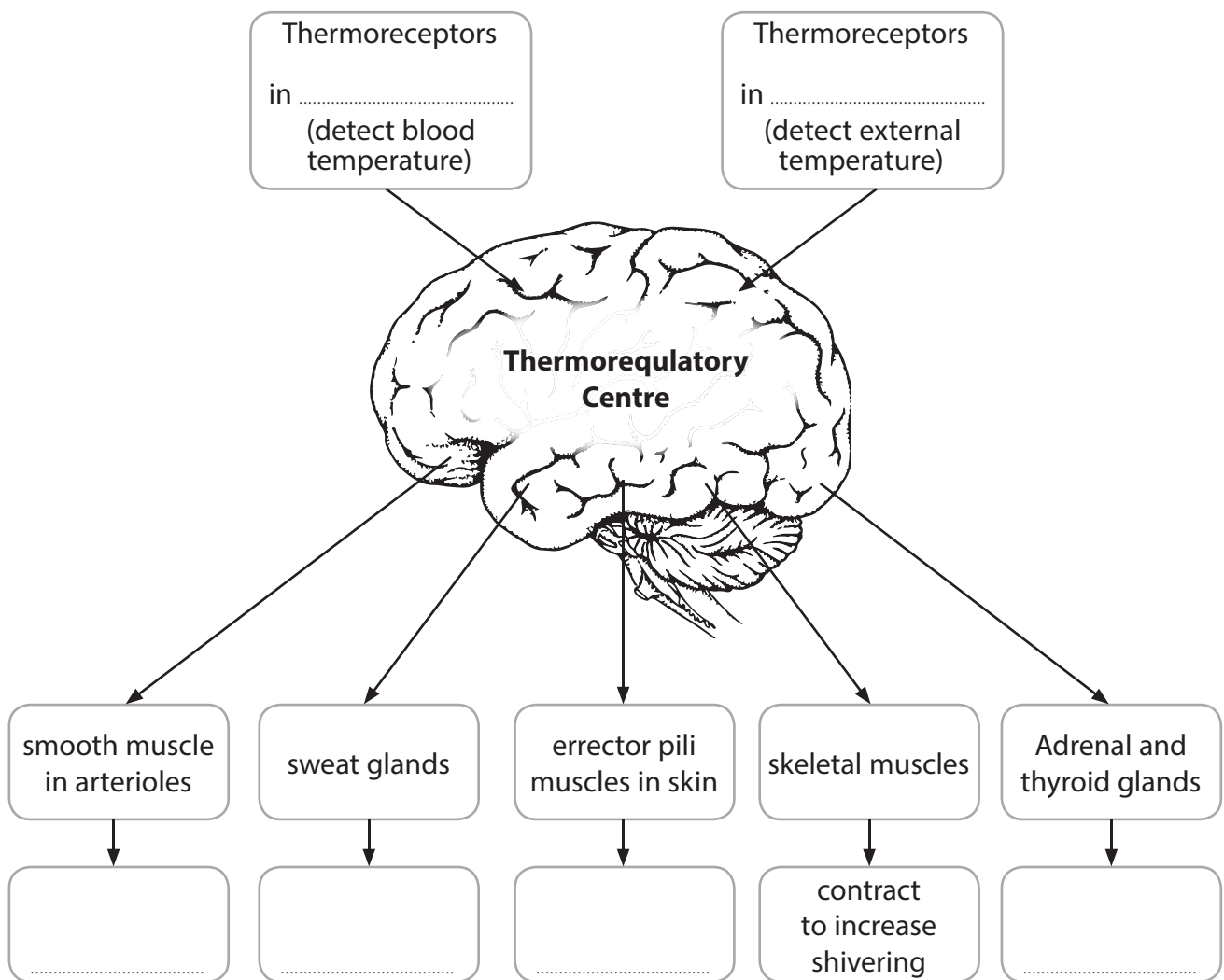
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One use that the body makes of energy is to produce heat when blood temperature falls. This is part of the process of **thermoregulation**. The diagram shows the main parts of the thermoregulatory system.



(b) State the location of thermoreceptors for detecting blood temperature and external temperature on the diagram.

2 marks

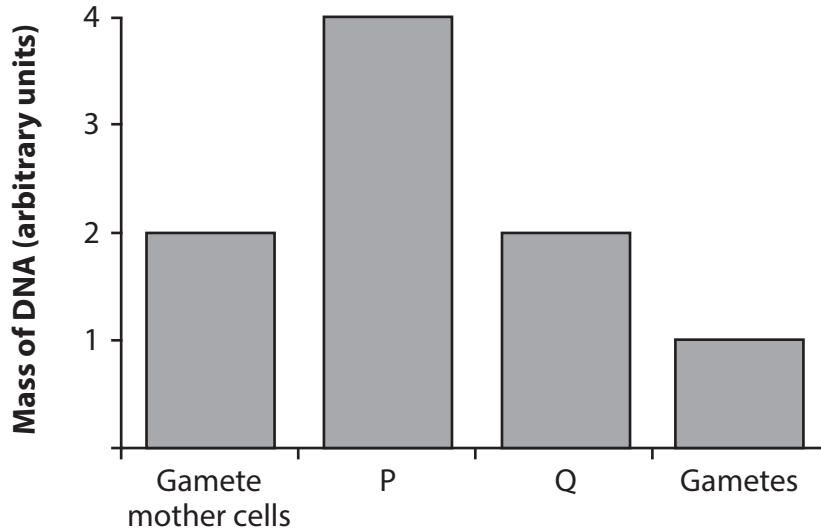
(c) Identify how the system would react to a fall in blood temperature by completing the diagram. One has been done for you.

4 marks

Total for Question 7 = 7 marks

Questions 8–11 are about the reproductive system.

- 8** Gamete mother cells give rise to sperm cells in the testis and to eggs cells in the ovary. The graph shows the quantity of DNA at various stages in this process.



- (a) Explain the change in DNA amount between each stage.

4 marks

Gamete mother cells to P

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Q to gametes

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(b) State the type of cell division that occurs after fertilisation.

1 mark

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(c) Describe the events that occur during prophase of cell division.

4 marks

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Total for Question 8 = 9 marks

9 Pregnancy is divided into stages called trimesters.

(a) In which trimester is the woman likely to first feel the foetus moving?

1 mark

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(b) In which trimester does the most development occur?

1 mark

.....

Total for Question 9 = 2 marks

10 A number of problems can occur during birth.

Define the term *breech birth*.

.....

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Total for Question 10 = 1 mark

11 Amniocentesis and chorionic villus sampling are methods used in prenatal tests.

(a) Compare and contrast the procedures used in amniocentesis and in chorionic villus sampling to obtain foetal cells in prenatal tests.

3 marks

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(b) A woman is 12 weeks pregnant and wants to use one of these prenatal tests. Explain the issues she needs to consider before deciding which prenatal test to use.

4 marks

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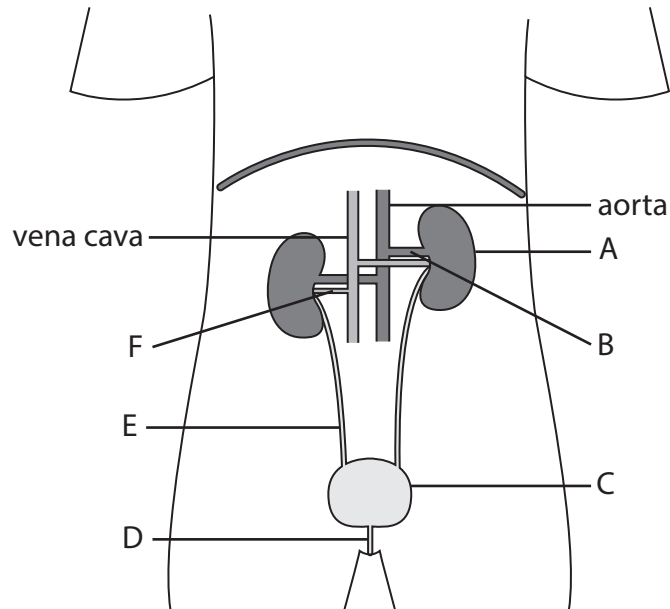
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Total for Question 11 = 7 marks

Questions 12–13 are about the urinary system.

12 The diagram shows the excretory or urinary system of a human.



(a) State the letters that label the ureter and renal artery.

2 marks

Ureter

Renal artery

A healthy person's kidney deals with these substances in one of four ways:

- A** filters out and then reabsorbs all
- B** filters out and then reabsorbs some of them
- C** does not filter out
- D** filters out and then reabsorbs none

(b) Complete the table with the relevant letter for each substance.

6 marks

Substances in blood	Size	Needed by body?	How substance is treated by kidney (A,B, C or D)
water	small	some	
glucose	small	yes	
amino acids	small	yes	
protein	large	yes	
salts	small	some	
urea	small	no	

Total for Question 12 = 8 marks

13 Over the last 40 years, doctors have noted an increase in the incidence of diabetes. This condition can cause extreme thirst.

(a) Explain why type 1 diabetes causes extreme thirst.

4 marks

Handwriting practice area with 10 horizontal dotted lines.

There has also been a rise in the occurrence of a condition called proteinuria, which is protein in the urine, at the same time as diabetes has been on the rise.

(b) Explain why some doctors think that diabetes may be a cause of proteinuria.

4 marks

Area for writing the answer, consisting of a large rectangular box with horizontal dotted lines for writing.

Total for Question 13 = 8 marks

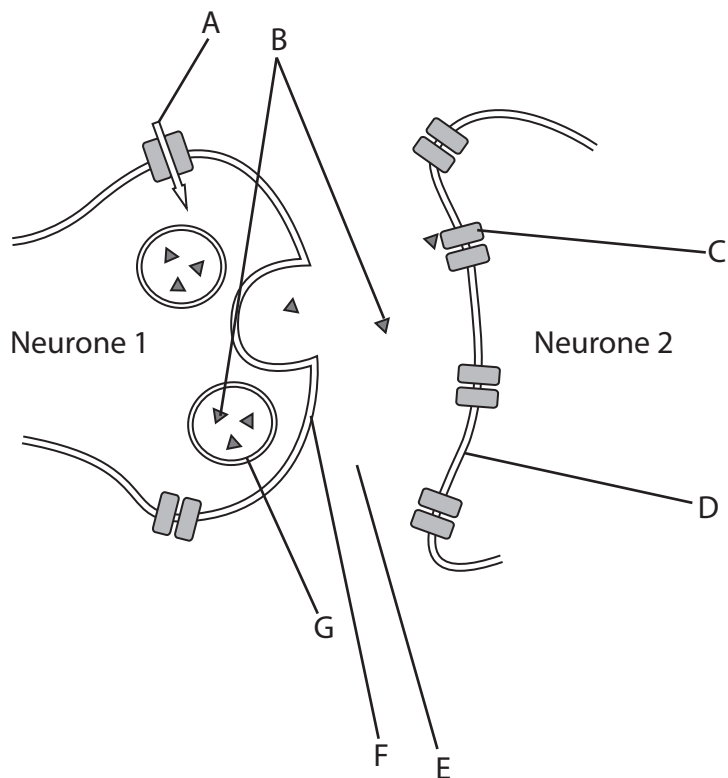
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Questions 14–16 are about the nervous system.

14 Nerve impulses travel along neurons (nerve cells) as electrical impulses and across synapses as chemicals called neurotransmitters to the next neuron in sequence. The diagram shows a synapse.



State the letters that label the neurotransmitter receptor and a calcium channel.

Neurotransmitter receptor

Calcium channel

Total for Question 14 = 2 marks

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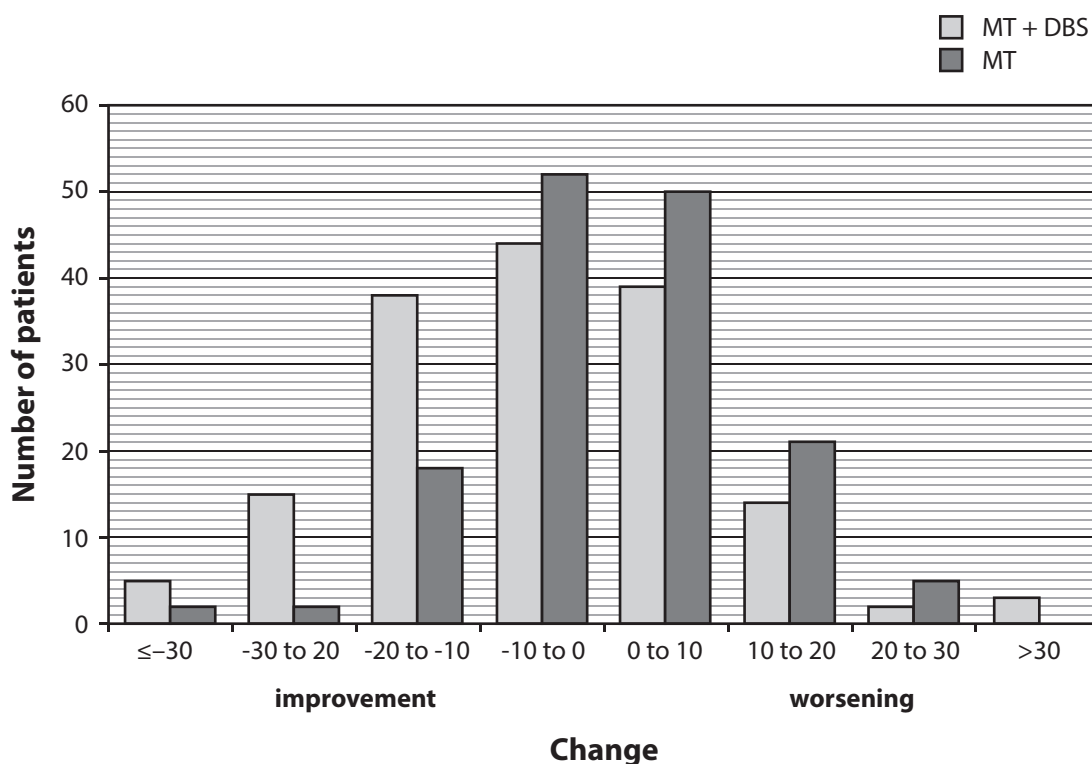
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15 Parkinson's disease can be treated in a number of ways. A study was carried out to compare the success of two treatment types: medical therapy (MT) and surgery (deep brain stimulation (DBS)). Patients were assessed at the beginning of the study using the Parkinson's Disease Questionnaire (PDQ-39), which consists of 39 questions to score the quality of life. The questionnaire covers eight areas of health status:

- mobility
- ADL
- emotions
- stigma
- social
- cognitions
- communication
- body pain.

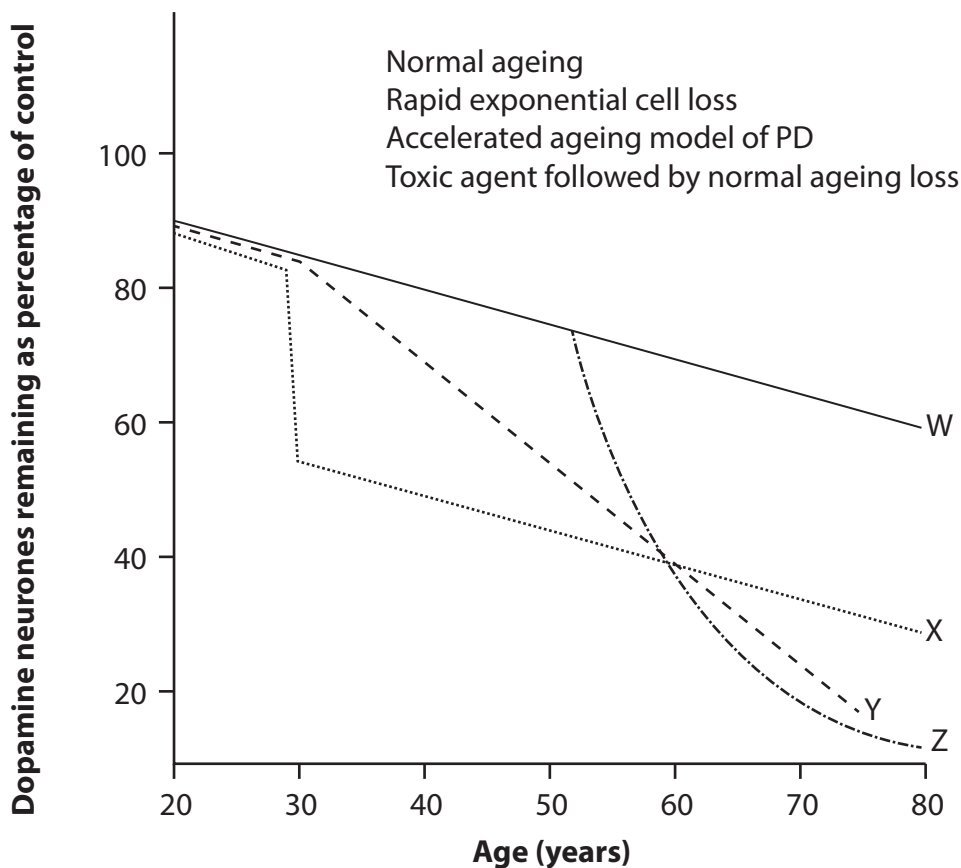
After one year of either *MT and DBS* or just *MT*, patients were reassessed and the differences in PDQ-39 scores calculated.

The data are shown. The larger the score, the less improvement the patient showed. Therefore, highly negative scores show a great improvement and positive ones show a worsening condition.



- 16 Parkinson's disease (PD) is caused by a reduction in the levels of a neurotransmitter called dopamine. This reduction is due to death of the cells which make it, the neurons of the substantia nigra. Most treatments only reduce the symptoms, but a goal of recent research has been to find ways to protect against this cell death.

Models of cell death



- (a) Using all the information given, provide a key for the graph. One has been done for you.

2 marks

Normal ageing **W**

Rapid exponential cell
 Rapid exponential cell

Accelerated ageing model of PD

Toxic agent followed by normal ageing loss

- (b) All the people in the models shown in the graph, except those showing normal ageing, would start to show Parkinson's symptoms at age 60. What is the percentage of dopamine making neurons lost before symptoms appear (the symptom threshold)?

1 mark

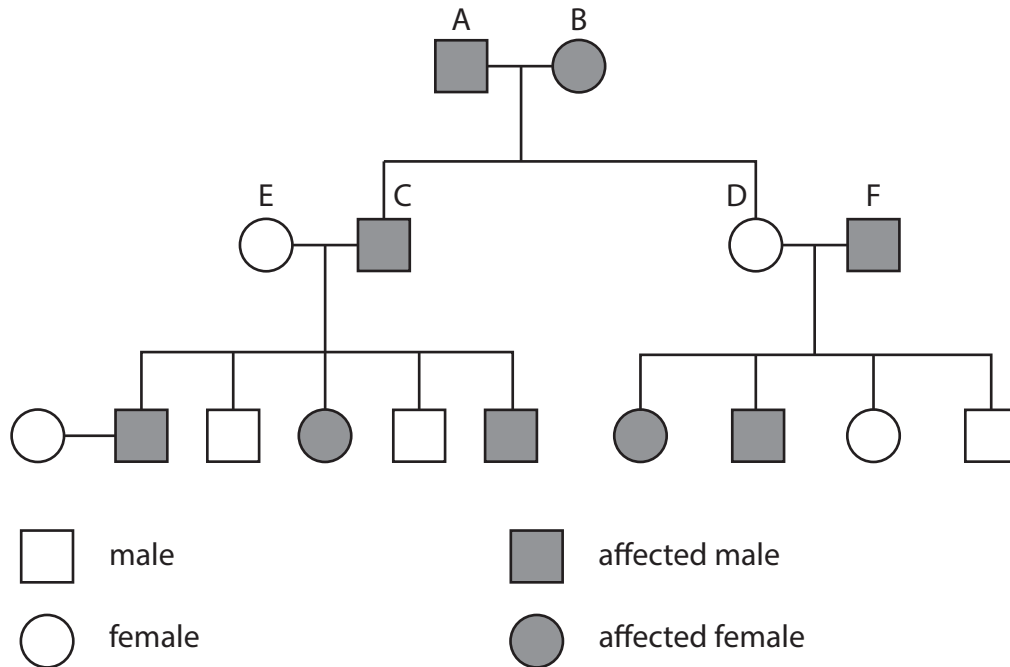
Answer

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Total for Question 16 = 3 marks

Question 17 is about human genetics.

17 Studies of a family with a genetically inherited condition, Huntington's chorea, revealed a family tree as shown below.



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Deduce the probability of an individual with C's genotype being born to parents A and B. You must include a suitable genetic diagram in your answer.



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Total for Question 17 = 8 marks

END OF EXAM

TOTAL FOR PAPER = 90 MARKS

Unit 3: Anatomy and Physiology for Health and Social Care - sample mark scheme

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Learners must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark scheme, not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the learner's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a learner's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the learner has replaced it with an alternative response.

Specific marking guidance for levels-based mark schemes*

Levels-based mark schemes (LBMS) have been designed to assess learners' work holistically. They consist of two parts: indicative content, and levels-based descriptors. Indicative content reflects specific content-related points that a learner might make. Levels-based descriptors articulate the skills that a learner is likely to demonstrate in relation to the assessment outcomes being targeted by the question. Different rows in the levels represent the progression of these skills.

When using a levels-based mark scheme, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

Question number	Answer	Mark
1(a)	C	(1)

Question number	Answer	Mark
1(b)	A – aorta (1) F – atria/atrium/atria (1) G – vena cava/superior vena cava (1) Do not accept inferior vena cava.	(3)

Question number	Answer	Mark
1(c)	A – deoxygenated with a high level of carbon dioxide	(1)

Question number	Answer	Mark
2(a)	Award 1 mark for identification of the fact that: light-headedness is due to the lack of oxygen to the brain. Award 1 mark for each extension that includes the symptoms of HCM listed below, up to a maximum of 3 marks: <ul style="list-style-type: none"> • chamber C/left ventricle pumps blood to the brain and if the lumen is small, less blood is pumped out (1) • narrowing of A/aorta leads to it being able to carry less blood (1) • leaky B/heart valve/L atrioventricular valve mean when blood is pumped out of C some goes back into F/L atrium (1). Learners can be awarded marks for explanations that do not refer to a lack of oxygen.	(4)

Question number	Answer	Mark
2(b)	The condition is passed from parents to offspring via genes/DNA (1) . Do not accept answers that do not mention genes/DNA.	(1)

Question number	Answer	Mark
3(a)	Each time the heart muscles contract, blood pressure rises and when the muscles relax, blood pressure falls (1) but this is damped by elastic artery/arteriole walls by the time A is reached (1) .	(2)

Question number	Answer	Mark
3(b)	A – capillaries (1) B – venules (1)	(2)

Question number	Answer	Mark
4	A – trachea/windpipe (1) B – bronchiole (1)	(2)

Question number	Answer	Mark
5(a)	D – ciliated	(1)

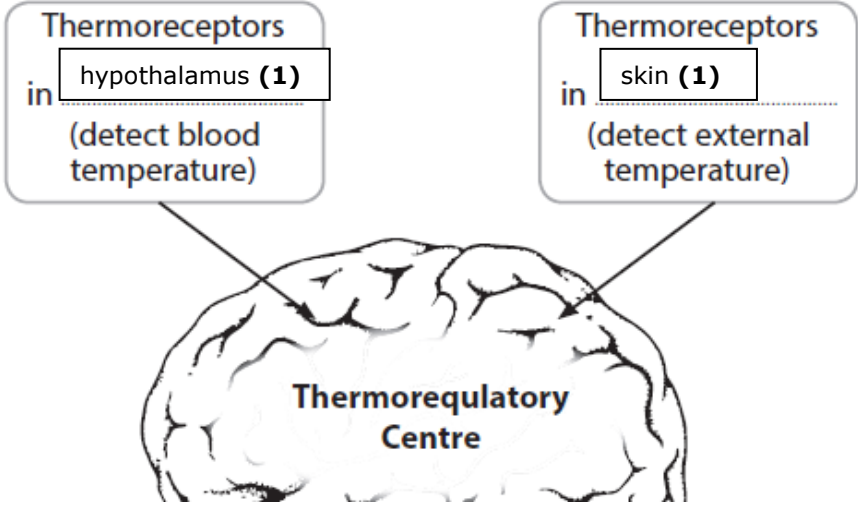
Question number	Answer	Mark
5(b)	Award 1 mark for each reason why the cells have many mitochondria up to a maximum of 3 marks. Mitochondria supply energy (1) . A needs it to make mucus (1) . B needs it to move cilia (1) . Accept any other appropriate answers.	(3)

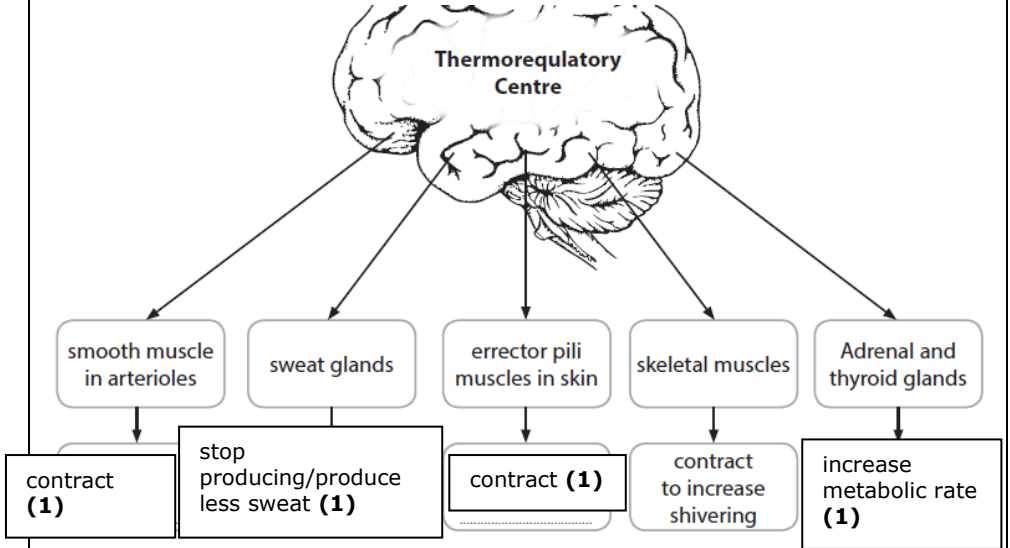
Question number	Answer	Mark
6(a)	Smooth muscle can contract in tubes called (bronchi/bronchioles)/The lining of the tubes becomes (inflamed/more mucus) is produced (1) . This causes the tubes to become narrow making it harder to get air in and out of the lungs (1) .	(2)

Question number	Answer	Mark
6(b)	<ul style="list-style-type: none"> • $\frac{0.19}{0.075}$ (1) • = 2.53 x or 253% (1) <p>Learners will still be awarded full marks for a correct answer without showing workings.</p>	(2)

Question number	Answer	Mark
6(c)	There is correlation between asthma risk and distance (1) and it is only up to 200 m (1) . Data doesn't tell us anything about the cause (1) .	(3)

Question number	Answer	Mark
7(a)	The breakdown of substances in the body which usually releases energy (1) .	(1)

Question number	Answer	Mark
7(b)	<p>Award 1 mark for each correctly stated location of thermoreceptors.</p> 	(2)

Question number	Answer	Mark
7(c)	<p>Award 1 mark for each correctly identified system reaction to a fall of blood temperature.</p> 	(4)

Question number	Answer	Mark
8(a)	Gamete mother cells to P: <ul style="list-style-type: none"> • DNA replicates (1) • but stays all in one cell at P (1). Q to gametes: <ul style="list-style-type: none"> • the daughter cells divide again to give gametes/haploid cells (1) • the sister chromatids go to separate gametes thus halving the DNA quantity (1). 	(4)

Question number	Answer	Mark
8(b)	Mitosis	(1)

Question number	Answer	Mark
8(c)	Award answers which include any four of the following: <ul style="list-style-type: none"> • chromatin/DNA condenses (1) • chromosomes condense/become visible (1) • idea of nuclear membrane/envelope breaking down (1) • nucleolus disappears (1) • reference to centrioles moving to poles or opposite ends of cell (1) • reference to formation of spindle (1). 	(4)

Question number	Answer	Mark
9(a)	Second	(1)

Question number	Answer	Mark
9(b)	First	(1)

Question number	Answer	Mark
10	Legs/buttocks first through vagina (1) . Do not accept answers that say upside down.	(1)

Question number	Answer	Mark
11(a)	Award answers that makes reference to the following: <ul style="list-style-type: none"> • foetal cells obtained from amniotic fluid in amniocentesis/foetal cells obtained from placental cells in chronic villus sampling (CVS) (1) • use of needle in both amniocentesis and CVS (1) • amniocentesis via abdomen and CVS either via abdomen or vagina (1). 	(3)

Question number	Answer	Mark
11(b)	<p>Award answers that include an explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> CVS can be performed earlier/amniocentesis is later (1). CVS allows {earlier decision to abort/termination is less physically traumatic}/with amniocentesis {later decision to abort/termination is more physically traumatic} (1) CVS results are available sooner/amniocentesis results are not available until 2–3 weeks after the test (1), so CVS less stressful for parents (1) with CVS there is {greater risk/risk is between 1–2% of miscarriage}/with amniocentesis there is a {lower risk (1% risk of miscarriage)} (1) less {chance of loss of a healthy foetus/risk of miscarriage complications} (1) CVS cannot detect gene problems on X chromosomes (because they are inactivated in foetal placental cells) (1), so may lead to false negatives (1). 	(4)

Question number	Answer	Mark
12(a)	Ureter E Renal artery B	(2)

Question number	Answer	Mark
12(b)	water B glucose A amino acids A protein C salts B urea D	(6)

Question number	Answer	Mark
13(a)	<p>An explanation of why type 1 diabetes increases thirst, which includes the following points causally linked in a logical order.</p> <ul style="list-style-type: none"> Increases osmotic potential in the blood (1) detected by osmoreceptors (1), increasing water intake (1) to reduce osmotic potential (1). Lack of hormone insulin (1), which stops a person being able to regulate blood glucose level (1), leading to glucose being excreted (1), the glucose is excreted in solution in water (1). <p>Accept any other appropriate answers, up to a maximum of 4 marks.</p>	(4)

Question number	Answer	Mark
13(b)	Because there is a correlation between the two rising (1) , diabetes leads to increased filtering of blood (1) , damages the filtering membrane/Bowman's capsule/glomerulus (1) , which leads to loss of large protein molecules (1) .	(4)

Question number	Answer	Mark
14	Neurotransmitter receptor – C Calcium channel – A	(2)

Question number	Indicative content
15	<p>Answers will be credited according to the learner’s demonstration of knowledge and understanding of the material using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but should be rewarded for other relevant answers.</p> <ul style="list-style-type: none"> • 103 show improvement with both, 73 with MT alone. • Total score of improved is (–1850/–1340/–830) with both, (–910/–645/–280) with MT. • 56 worse with both, 77 with MT. • Total score of worse is (with both (820/675/260) with MT alone (1090/705/370). • Overall improvement is (–1850/–1340/–830) minus (–645/–910/–280) (ignore sign). • So with both, more patients show a greater improvement. • Might want to know what type of improvement and in which of the 8 areas it was most/least. • Want to know risk/safety of surgery in relation to MT alone. • Were there any negative consequences of surgery or MT?

Mark scheme (award up to 8 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	<ul style="list-style-type: none"> • Demonstrates isolated knowledge and understanding of relevant information; there may be major gaps or omissions. • Provides little evidence of application and links between relevant information. Response likely to consist of basic description of information. • Arguments may be presented, but are likely to be generic assertions rather than supported by evidence. • Meaning may be conveyed but in a non-specialist way; response lacks clarity and fails to provide an adequate answer to the question.
Level 2	2–5	<ul style="list-style-type: none"> • Demonstrates accurate knowledge and understanding of relevant information with a few omissions. • Evidence of application demonstrating some linkages and interrelationships between factors leading to a judgement/judgements being made. • Arguments are presented leading to conclusions being arrived at, but some may be lacking support. • Demonstrates the use of logical reasoning, clarity, and appropriate specialist technical language.

Level	Mark	Descriptor
Level 3	6–8	<ul style="list-style-type: none"> • Demonstrates accurate and thorough knowledge and understanding of relevant information; any gaps or omissions are minor. • Evidences thorough application containing linkages and interrelationships between factors leading to a judgement/judgements being made. • Displays a well-developed and balanced argument leading to rationalised conclusions. • Demonstrates the use of logical reasoning, clarity, and appropriate specialist technical language.

Question number	Answer	Mark
16(a)	<p>Normal ageing W</p> <p>Rapid exponential cell loss Z</p> <p>Accelerated ageing model of PD Y</p> <p>Toxic agent followed by normal ageing loss X</p> <p>Award: 3 right for 2 marks 2 right for 1 mark 0 or 1 right for 0 marks</p>	(2)

Question number	Answer	Mark
16(b)	60%	(1)

Question number	Answer	Mark
17	<p>Answers which use the pedigree diagram to work out C’s genotype and the probability of him being born with that genotype will be awarded 1 extra mark.</p> <p>C’s genotype is Hh (1) because he has children who are unaffected (1). A and B are both Hh (1) because they have a daughter (D) who is unaffected (1), therefore the gene for Huntington’s chorea must be dominant (1). Parents of genotype Hh could have children of genotypes HH, Hh and hh (1) in the ratio 1 : 2 : 1, so C had a probability of 50% of being born to these parents (1).</p>	(8)

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