Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 14 May 2019

Afternoon (Time: 1 hour 45 minutes) | Paper Reference **1BI0/1H**

Biology

Paper 1

Higher Tier

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

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.

Turn over ▶

P56432A

1/1/1/1/1/1/1/

P 5 6 4 3 2 A 0 1 2 8

Pearson

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

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) A student had solutions of four different foods labelled W, X, Y and Z.

Each solution was tested for starch and protein.

The colour of the solutions after the tests are shown in Figure 1.

solution	colour after testing for starch	colour after testing for protein
W	orange	purple
X	blue/black	purple
Y	blue/black	blue
Z	orange	blue

Figure 1

(i) Which solution contains starch but **not** protein?

(1)

☒ **A** solution W

☒ **B** solution X

☒ **C** solution Y

☒ **D** solution Z

(ii) Describe how a solution of food can be tested for reducing sugars.

(2)

add Benedict's (reagent)
(1)

• heat the solution / the solution turns (brick) red
(1)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) Figure 2 shows a calorimeter.

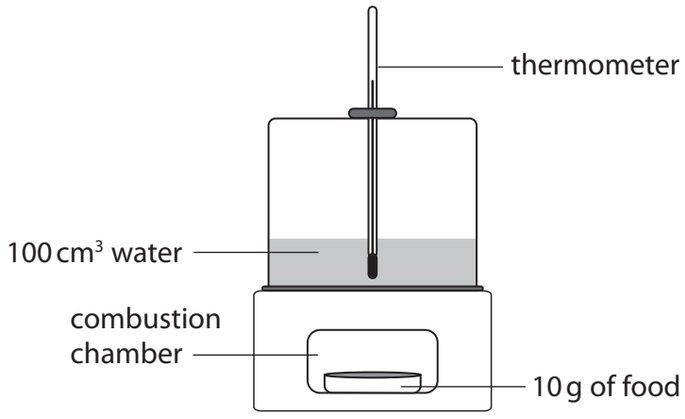


Figure 2

Describe how this calorimeter can be used to find the energy content of 10 g of food.

(3)

measure the start and end temperature (of the water) (1)

• burn the food (in the chamber) (1)

• use the increase in the temperature of water to calculate the energy content (1)

(Total for Question 1 = 6 marks)

2 (a) A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms.

(1 nanogram = 1000 picograms)

(2)

unit conversion

0.0031 x 1000 / 0.0062 x 1000 (1)

3.1 (picograms)

..... picograms

(b) A student used the method shown in Figure 3 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

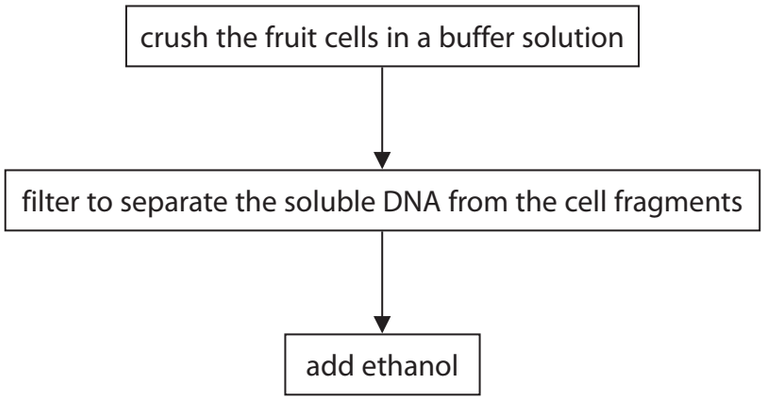


Figure 3

(i) State why ethanol is used.

(1)

to precipitate the DNA

.....

.....

(ii) State **two** variables the student needs to control when using this method to compare the mass of DNA from these two fruits.

(2)

mass of fruit (1)

1 .....

.....

• volume of buffer (1)

2 .....

.....

(iii) The student repeated the experiment.

Give **one** reason why.

(1)

to obtain more data (1)

.....

.....

.....

(c) Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

(3)

.....

mitosis produces 2 cells and meiosis produces 4 cells (1)

.....

• mitosis produces genetically identical cells and meiosis produces genetically different cells (1)

.....

• mitosis produces diploid cells and meiosis produces haploid cells (1)

.....

.....

.....

.....

(Total for Question 2 = 9 marks)

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

they are immune (to Clostridium tetani) (1)

• because the vaccination contained an antigen / bacteria have antigens (1)

• memory lymphocytes (1)

(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

people do not finish their course (of Colistin) (1)

• natural selection /evolution (occurs) (1)

• some bacteria have a mutation/ (genetic) variation (1)

• (these) resistant bacteria survive /resistant bacteria reproduce (1)

(Total for Question 3 = 7 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

4 (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 4 shows the results.

age of volunteers	distance (mm)			mean distance (mm)
	person 1	person 2	person 3	
40	256	261	257	258
45	282	275	280	279
50	292	301	297	?
55	311	309	307	309

Figure 4

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

(3)

(292 + 301 + 297) = 890 (1)

(890÷3) 296.7 (1)
given to 3 s.f. (1)

297 mm

(ii) Give **one** conclusion that can be made from the data in Figure 4.

(1)

as age increases focusing distance increases /ORA (1)

(iii) Give **two** improvements that are needed in this investigation before a valid conclusion can be made.

(2)

1 use more people /repeat the test (with more people) (1)

2 • use more ages (1)

(b) Which part of the eye detects coloured light?

(1)

☒ **A** iris

☒ **B** lens

☒ **C** cones

☒ **D** cornea

(c) Figure 5 shows light rays entering the eye of a person with normal vision.

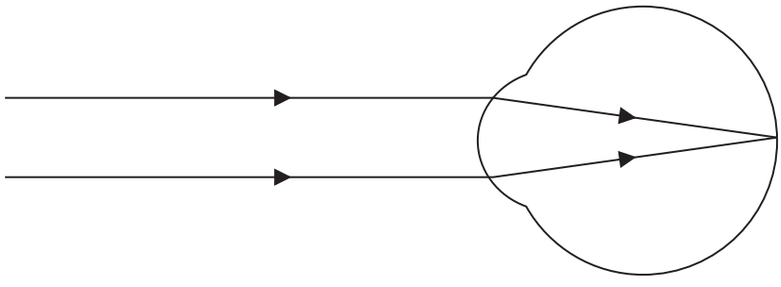


Figure 5

(i) Describe how light rays are focused to give normal vision.

(2)

light rays {refracted / bent} {at the cornea /by the lens} (1)

• (light rays) {converge / focus} on the retina / focal point is on the retina (1

(ii) Figure 6 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

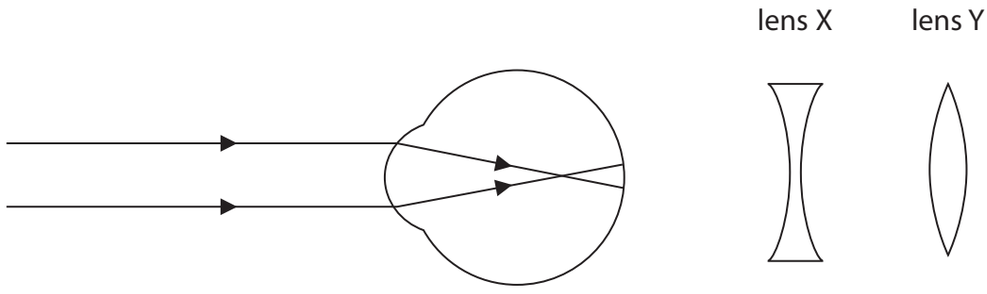


Figure 6

Explain which lens would correct the eye defect shown in Figure 6.

(2)

lens X which is a {diverging/concave lens} (1)

• {lens X/a diverging lens/a concave lens} will {diverge/spread} out the light rays (1)

(Total for Question 4 = 11 marks)

5 (a) Organisms can be classified by the five kingdom or three domain method.

(i) What is the name of the domain that plants belong to?

(1)

- ☒ **A** Eukarya
- ☒ **B** Archaea
- ☒ **C** Monera
- ☒ **D** Protista

(ii) Plant cells contain chloroplasts.

What happens in a chloroplast?

(1)

☒	**A**	oxygen produced	sunlight absorbed by chlorophyll
☒	**B**	carbon dioxide produced	sunlight absorbed by mitochondria
☒	**C**	oxygen produced	sunlight absorbed by mitochondria
☒	**D**	carbon dioxide produced	sunlight absorbed by chlorophyll

(iii) Give a reason why the three domain method of classification has been suggested.

(1)

(improved) genetic analysis (1)

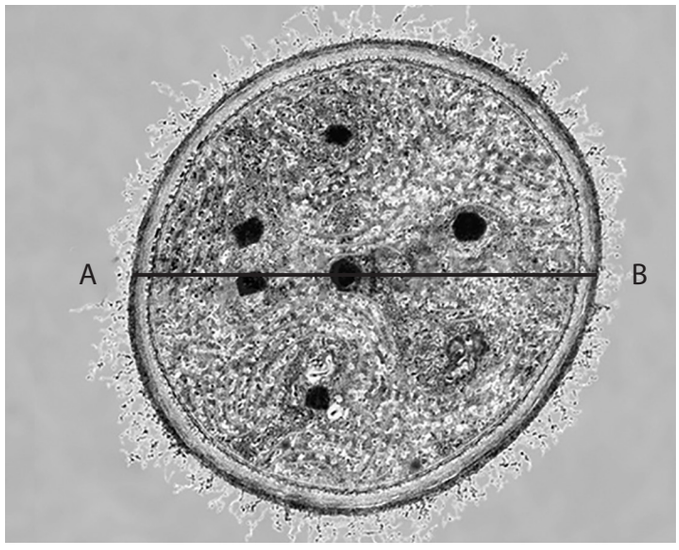
.....

.....

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) Figure 7 shows a cyanobacterium magnified 50 000 times.

The line AB shows the diameter of the bacterial cell.



(Source: © The Christian Science Monitor)

Figure 7

(i) Calculate the actual diameter of the cyanobacterium.

Give your answer in micrometres (μm).

(3)

Measurement
65 (mm) / 6.5 cm (1)
Conversion

65 mm = 65 000 μm (1)
Division
65 000 ÷ 50 000 (1)

1.3 (μm)

..... μm

(ii) Bacterial cells contain plasmids.

Describe **three** other features of a bacterial cell.

(3)

no nucleus /chromosomal DNA (1)

• cell wall (1)

• flagellum (1)

(c) Figure 8 shows a plasmid containing the human insulin gene.

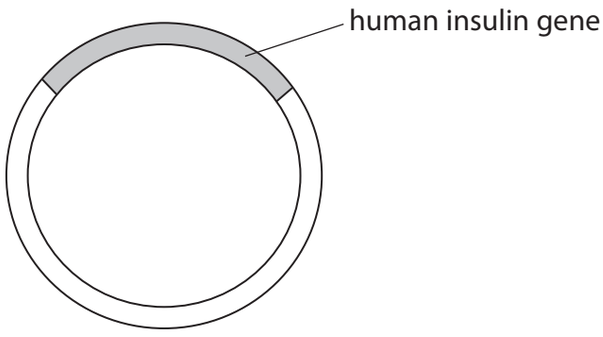


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

(3)

cut the gene (from the genome) using restriction enzymes (1)

• cut the plasmid with a restriction enzyme (1)

• to leave {complementary / matching} sticky ends (1)

(Total for Question 5 = 12 marks)

6 (a) Lactase is an enzyme that breaks down lactose into glucose and galactose.

A student made some alginate beads containing lactase.

The student added 10 beads to 20 cm^3 of a solution of lactose, as shown in Figure 9.

The student timed how long it took for glucose to be produced.

The experiment was repeated using 15, 20 and 25 beads.

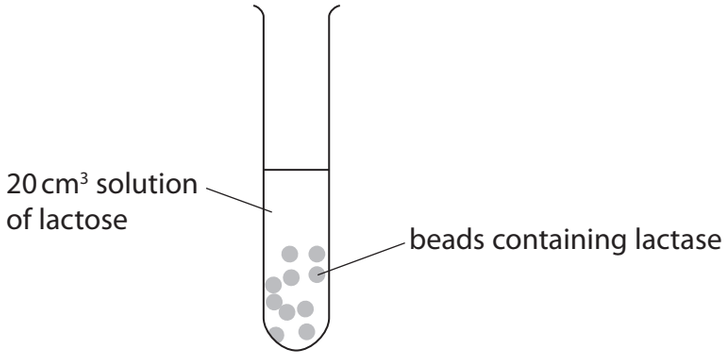


Figure 9

The results are shown in Figure 10.

number of beads containing lactase	time taken to produce glucose in seconds
10	240
15	210
20	150
25	120

Figure 10

(i) What is the rate of reaction for 25 beads?

(1)

☒ **A** 0.008 s^{-1}

☒ **B** 0.04 s^{-1}

☒ **C** 0.21 s^{-1}

☒ **D** 4.8 s^{-1}

(ii) Explain the conclusion that can be made from these results.

(3)

increasing the {beads /enzyme/lactase} {decreases the time taken for glucose to be produced / increases the rate of reaction} (1)

• more beads increases the concentration of enzyme / more {enzyme / lactase} present (1)

• increased chance of collisions (1)

(iii) Explain why the same volume of lactose solution was used for each test.

(2)

lactose is the substrate (1)

• to control a variable / it is a controlled variable (1

(b) Devise a method to find the optimum temperature for the enzyme lactase.

(3)

Mix equal {number of beads/volume of lactase} with equal volume of lactose (1)

• (incubate the tubes) at different temperatures (1)

• test for (the presence of) glucose (at regular intervals) / time how long it takes to produce glucose (1)

(Total for Question 6 = 9 marks)

7 Measles is a disease caused by a virus.

(a) Describe the lytic pathway for a virus.

(3)

the viruses use host cell machinery (1)

• {viral genetic material / viral proteins} are made by the cell (1)

• new virus particles assemble (1)

(b) A measles infection can cause inflammation of the brain.

Figure 11 shows a brain.

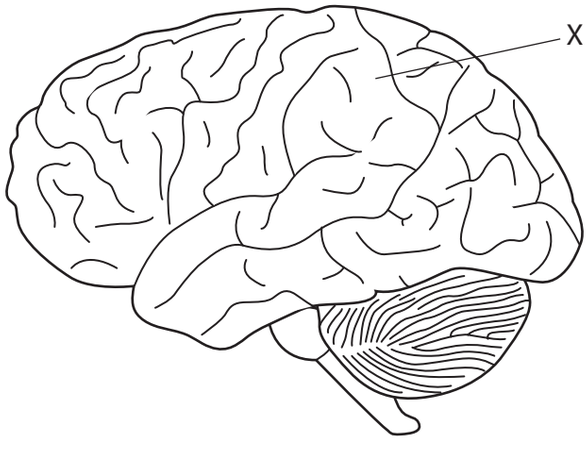


Figure 11

(i) Name the part of the brain labelled X.

(1)

cortex /cerebral {hemisphere/cortex} / cerebrum

(ii) The death rate from measles is 0.15%.

In 2015, 134 250 people died from measles.

Calculate the number of people infected with measles in 2015.

Give your answer in standard form.

(3)

0.15 ÷ 100 = 0.0015 (1)

134 250 ÷ 0.0015 = 89 500 000 (1)

8.95 × 107 or 9.0 x 107

..... people

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 .....

concerns over side effects of immunisation / concerns over the risk of allergic reactions (1)

.....

2 .....

• medical reason for not being immunised (1

.....

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

most people are immunised/ high level of immunity in the population (1)

.....

so non-immunised people are protected from measles infection as they are {less likely to come into contact

with the pathogen/someone with measles/measles is less likely to spread through the population} (1)

.....

.....

(Total for Question 7 = 11 marks)

8 (a) LDL cholesterol is a type of cholesterol which increases the risk of heart disease.

Statins are drugs used to reduce LDL cholesterol levels.

Figure 12 shows the cholesterol levels in the blood of a man.

He started taking statins at the beginning of February and stopped taking them four months later.

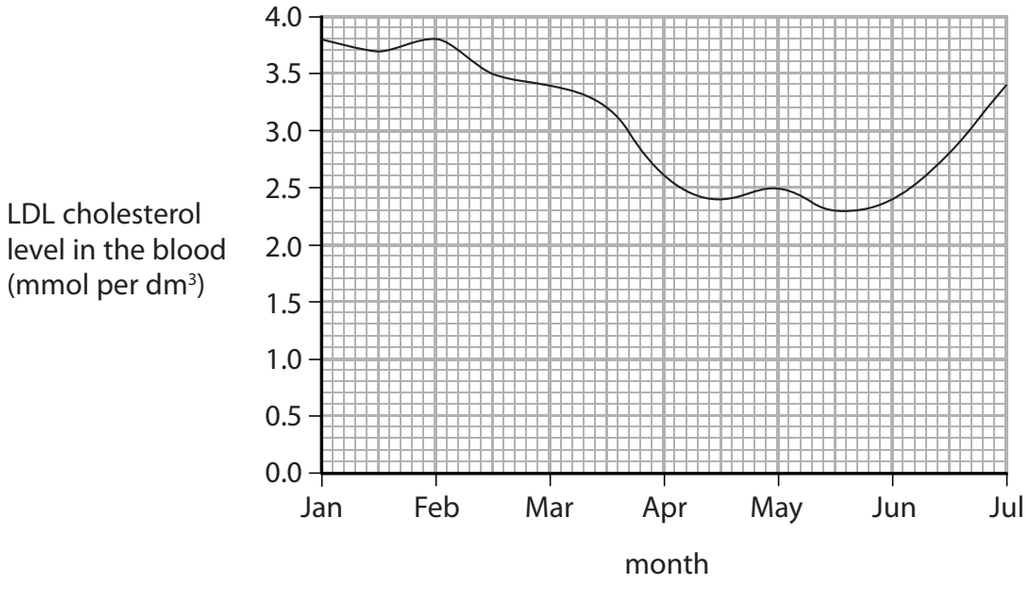


Figure 12

(i) Describe the effect of statins on LDL cholesterol levels in the blood.

Use data from the graph to support your answer.

(2)

(statins) reduce the level of LDL cholesterol (1)

• by 1.4 mmol per dm3 / from 3.8 mmol per dm3 to 2.4 mmol per dm3

(ii) Use evidence from the graph to explain why statins are usually prescribed as life-long medication.

(2)

level of LDL increases after the medication is stopped (1)

• increases risk of {heart disease/heart attack/stroke/cardiovascular diseases/high blood pressure} (1)

(b) Which data can be used to calculate the man's BMI?

(1)

☒ **A** waist circumference and height

☒ **B** waist circumference and hip circumference

☒ **C** mass and height

☒ **D** mass and hip circumference

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

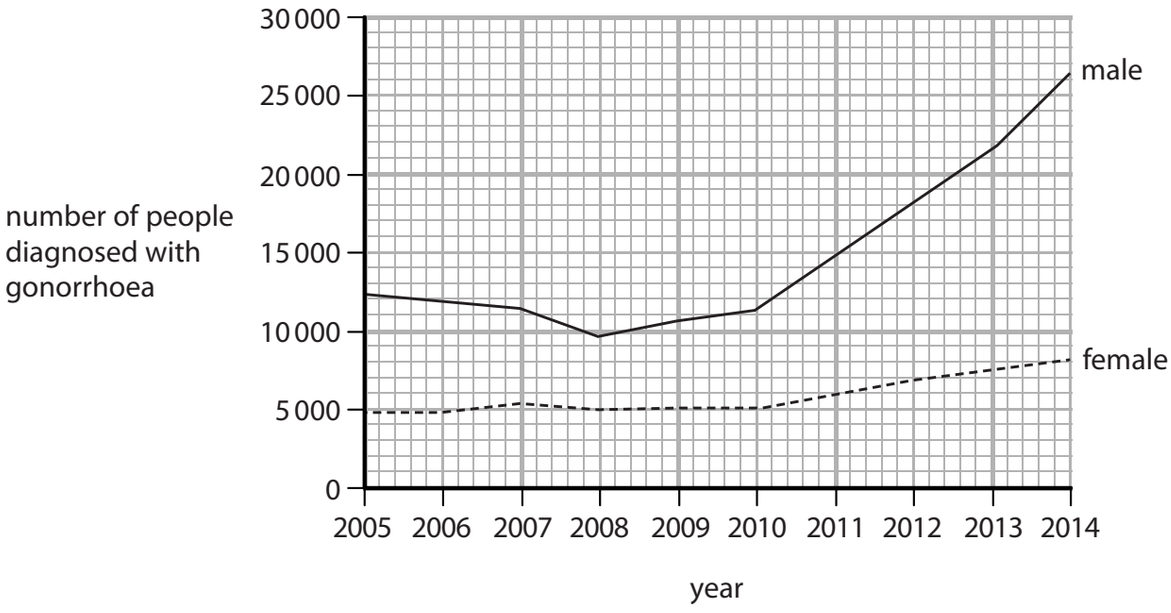


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

gonorrhoea is spread by exchange of bodily fluids / sexual contact
- from mother to child during childbirth
- barrier contraception methods/condoms will reduce spread
- abstinence prevents infection
- screening for infections
- contact tracing partners of infected individuals
- education on the disease and ways to reduce its spread
- treating infections with antibiotics

AO3
- number of cases in males higher than females
- number of cases in males has increased since 2008
- number of cases in males has increased rapidly since 2010
- number of cases in females has increased since 2010
- rate of increases in cases is higher in men than women
- comparative manipulation of data

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(Total for Question 8 = 11 marks)

9 Transcription and translation are stages in the synthesis of proteins.

(a) (i) Which enzyme is involved in the process of transcription?

(1)

- ☒ **A** DNA ligase
- ☒ **B** lysozyme
- ☒ **C** RNA polymerase
- ☒ **D** restriction endonuclease

(ii) Describe how a mutation in the non-coding region of the DNA can prevent a gene being transcribed.

(2)

{prevents/reduces} binding of RNA polymerase (to non-coding DNA) (1)

• meaning that mRNA can not be produced/less mRNA is produced (1)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) A gene coding for a protein has two alleles.

Figure 14 shows the first 5 codons of an mRNA strand for these alleles.

Allele 1 – AUG CCA CAG GAG UUC

Allele 2 – AUG CCA GAG GAG UUC

Figure 14

Allele 2 has a mutation.

Figure 15 shows the key needed to predict the translated amino acid sequence of the protein.

codon	AUG	CCA	CAG	GAG	UUC
amino acid	Met	Pro	Gln	Glu	Phe

Figure 15

Explain how the mutation in allele 2 could affect the functioning of this protein.

(3)

7th base is C-G mutation /changes the (codon) from CAG to GAG (1)

• changes the amino acid from Gln to Glu (1)

• sequence of the amino acids is different (1)

*(c) The inheritance of different alleles affects the phenotype of an individual.

A child is blood group O.

The child's mother is blood group A and the child's father is blood group B.

Explain how this child is blood group O.

Use the Punnett square and probability in your answer.

(6)

	I^B	I^o
I^A	$I^A I^B$	$I^A I^o$
I^o	$I^o I^B$	$I^o I^o$

o is recessive to IA or IB
• mothers genotype must be IAIo
• fathers genotype must be IBIo
• child must inherit two recessive Io alleles
• child genotype of IoIo
• offspring have 25% chance of being blood group O

(Total for Question 9 = 12 marks)

10 (a) Figure 16 shows the number of neurones in the brain of different animals.

animal	number of neurones in the brain
lobster	1.0×10^5
frog	1.6×10^7
rat	2.0×10^8
human	8.6×10^{10}

Figure 16

(i) Calculate the difference between the number of neurones in the brain of the rat and the brain of the frog.

Give your answer in standard form.

(2)

2.0 x 108 - 1.6 x 107 /
200 000 000 – 16 000 000 /184
000 000 (1)

1.84 × 108 / 1.8 x 108

..... neurones

(ii) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain.

(3)

(myelination) speeds up impulses (1)

• insulates the {axon/neurone} (1)

• motor neurones transmit information from the CNS / motor neurones transmit information to effectors / neurones in the brain connect to other neurones in the brain (1

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

(b) Figure 17 shows a sensory neurone.

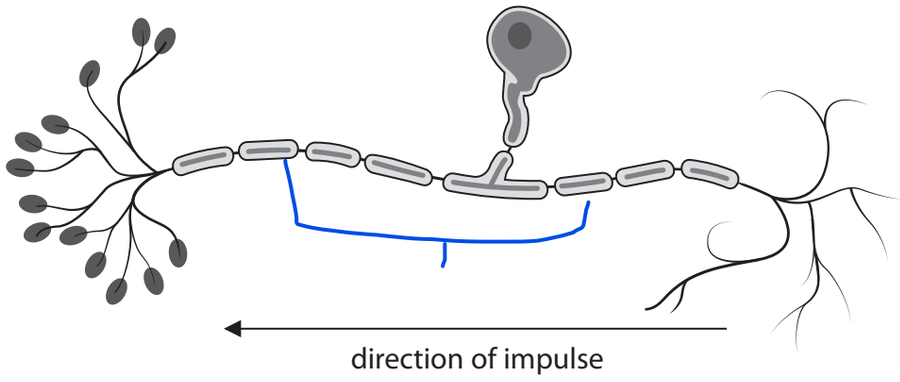


Figure 17

(i) Label the axon on Figure 17.

(1)

(ii) Describe the role of sensory neurones.

(2)

transmit electrical impulses (1)

• from {receptors / sense organ / named sense organ} to the {CNS /brain / spinal cord / relay neurone} (1)

(c) Explain how impulses are transmitted at synapses.

(4)

synapse is a gap between neurones (1)

• (electrical) impulse stimulates the release of chemical (1)

• ~~neurotransmitter (1)~~

• (chemical/neurotransmitter) diffuses across the {gap/synapse} (1)

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

BLANK PAGE

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA