





ST BENEDICT'S

SUBJECT	Life Sciences	DATE	3 JULY 2017
GRADE	12	MARKS	200
EXAMINER	L Muller B Zajac S Ramsurwaj	MODERATORS	L Muller B Zajac S Ramsurwaj
NAME		DURATION	3 hours
CLASS			

PAPER 1

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 34 pages. Please check that your question paper is complete.
2. This question paper consists of four questions.
3. Question 1 is to be answered on the question paper in the space provided.
4. Questions 2, 3, and 4 are to be answered in the booklet provided.
5. Read the questions carefully and number the answers exactly as the questions are numbered.
6. Use the total marks that can be awarded for each question as an indication of the detail required.
7. It is in your own interest to write legibly and to present your work neatly.
8. Hand in this question paper.

QUESTION	POSSIBLE MARK	MARK ACHIEVED
1	80	
2	40	
3	40	
4	40	
TOTAL 200		

QUESTION 1:

- 1.1 Select the term in **COLUMN B** that best matches a description in **COLUMN A**. Write the letter of the term in the corresponding space provided between the brackets. Each letter may be used only once.

COLUMN A**COLUMN B**

[]	The number of individuals belonging to the same species per unit area at a specific time.	A	Ecological succession
[]	A direct method of determining population size, where every individual of a specific species is counted.	B	Pioneer Stage
[]	The process of change in the species structure of an ecological community over time.	C	Population Density
[]	Plant life, occurring in an environment in which the new substrate is devoid of previous vegetation and other organisms, usually lacking soil.	D	Intermediate Stage
[]	Stage of ecological succession where the environment is more stable, soil consists of nutrients. Generally characterized by shrub-type plants and medium-sized animals.	E	Symbiosis
[]	Male lions fighting over a territory.	F	Census
[]	Different species found in the same area at the same time.	G	Primary Succession
[]	The role that organisms play in their community.	H	Secondary Succession
[]	Organisms that share a gene pool.	I	Abiotic
[]	All non-living factors that influence an environment and the organisms that inhabit it.	J	Niche
		K	Mark-recapture Method
		L	Intraspecific competition
		M	Species
		N	Community

(10)

1.2 Seven multiple choice questions are given below. Choose the most correct option in each question and write the letter of your choice in the space provided in the table below.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6	1.2.7
Answer							

(10)

1.2.1 Which of the following is a source of new alleles in a population?

- A. Mutation
- B. Isolation
- C. Natural selection
- D. Environmental conditions

(1)

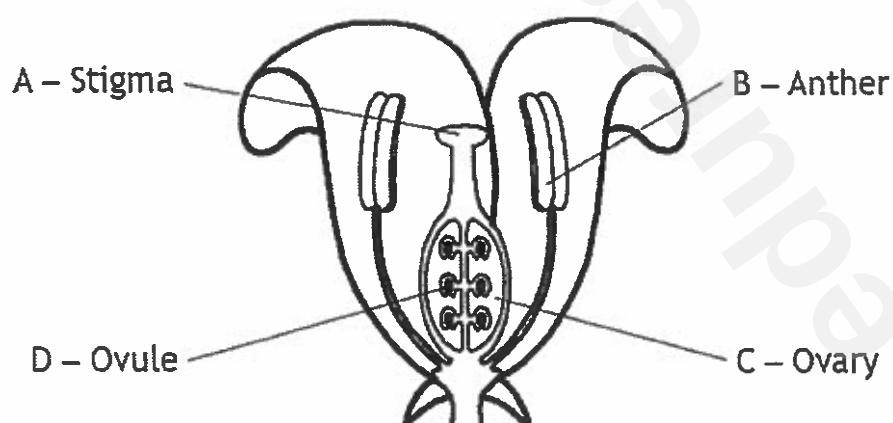
1.2.2 Which of the following is a possible anti-codon?

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

(1)

1.2.3 The diagram below shows the structure of a flower.

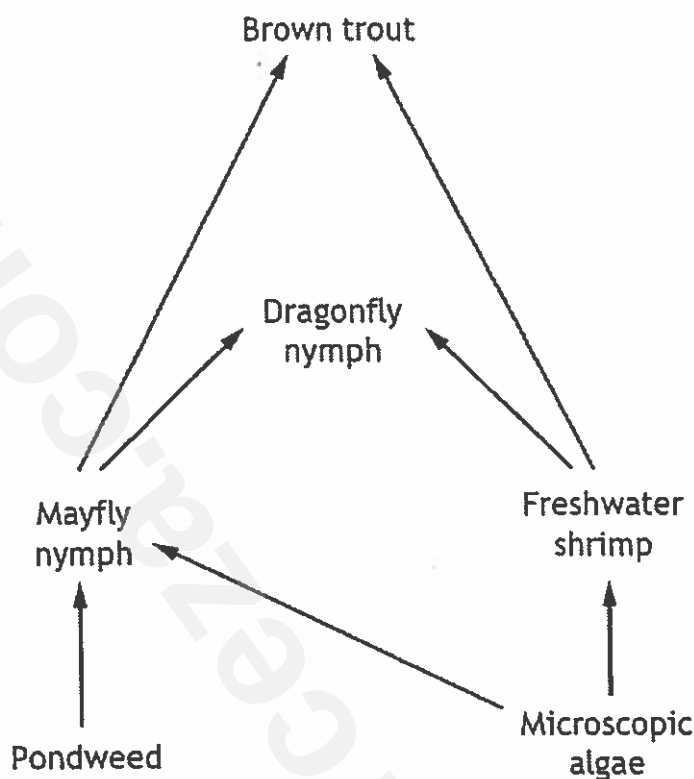
Where are the male gametes produced?



(Source: SQA National Qualification Biology Examination; May 2016)

(1)

1.2.4 The diagram below represents a freshwater food web.



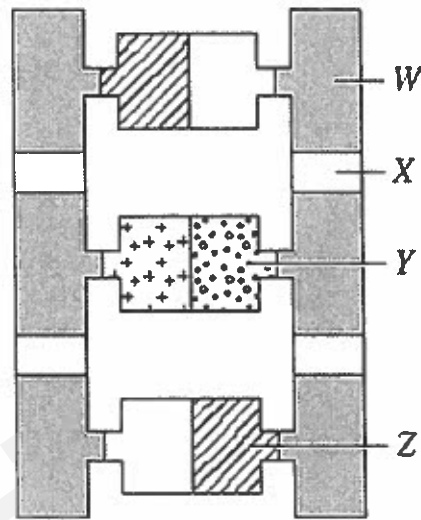
(Source: SQA National Qualification Biology Examination; May 2016)

The number of freshwater shrimps was found to have decreased dramatically. Predict the effect this will have on the numbers of dragonfly nymphs and microscopic algae.

- A. Both populations would decrease.
- B. Both populations would increase.
- C. Microscopic algae would decrease and dragonfly nymphs would increase.
- D. Microscopic algae would increase and dragonfly nymphs would decrease.

(1)

1.2.5 A model of DNA is shown.



(Source: BOSTES NSW; High School Biology Certificate Examination; 2016)

Which row of the table correctly identifies the different components of the model?

	W	X	Y	Z
A.	Sugar	Phosphate	Adenine	Thymine
B.	Phosphate	Sugar	Guanine	Adenine
C.	Sugar	Phosphate	Adenine	Guanine
D.	Phosphate	Sugar	Guanine	Thymine

(2)

1.2.6 The following diagram shows the inheritance of coat colour in guinea pigs.

P Phenotype	Black guinea pig	X	White guinea pig
P Genotype:	BB		bb
F1 Genotype:	Bb		
F2 Genotypes:	BB and Bb and bb		

Which of the following generations contain heterozygous individuals?

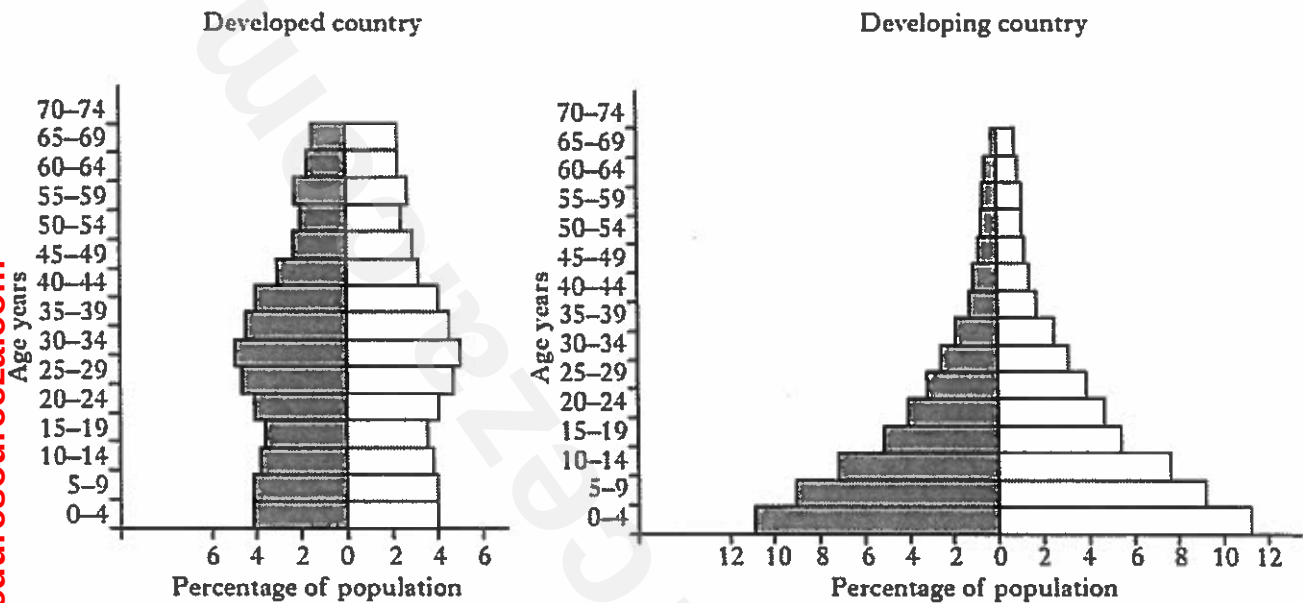
- A. P and F1
- B. P and F2
- C. F1 and F2
- D. P, F1 and F2

(2)

1.2.7 The figures below show the population structure of a developed and a developing country.

■ Male
□ Female

■ Male
□ Female



(Source: SQA Human Biology Examination; May 2013)

The percentage of the population under ten years of age in the developing country exceeds that of the developed country by:

- A. 12%
- B. 14%
- C. 24%
- D. 32%

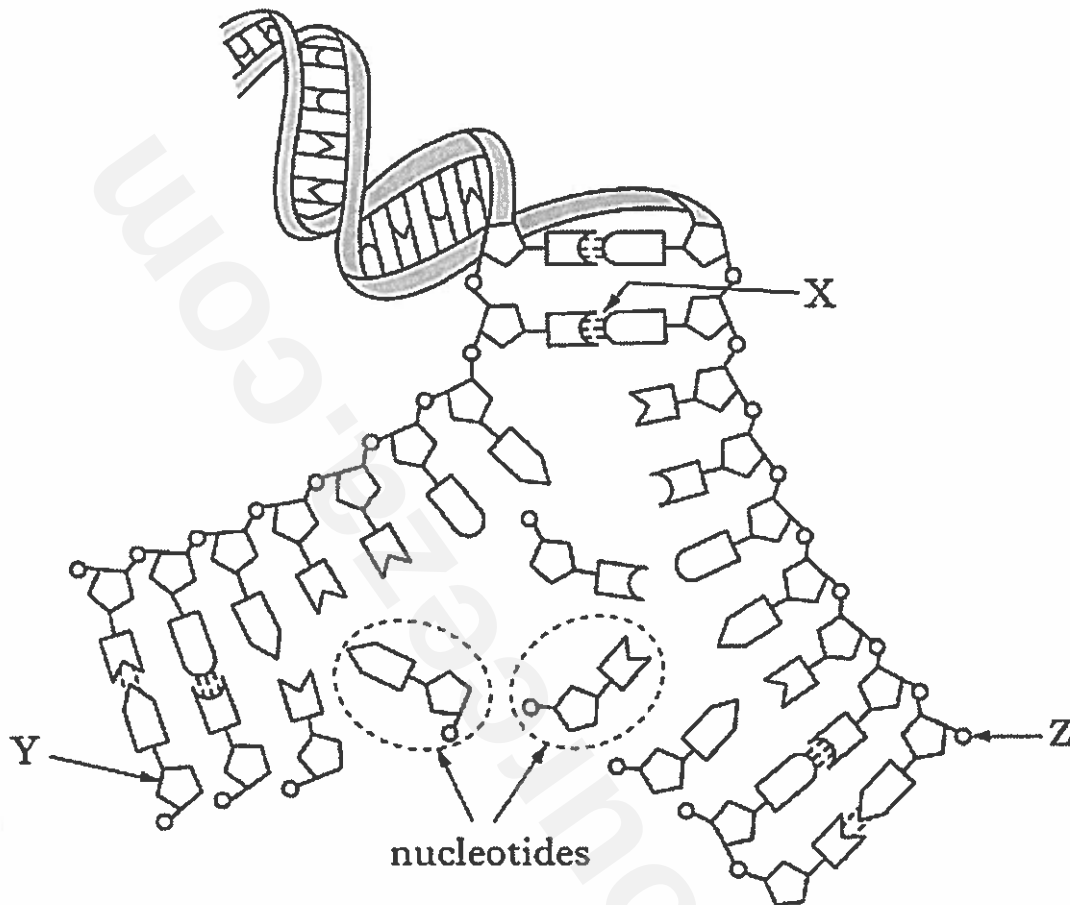
(2)

- 1.3 For each of the statements indicated below, state whether they are **TRUE** or **FALSE**. Do not correct the statement if you decided that it was false.

Statement	TRUE / FALSE
In a test cross, if the offspring all show the dominant characteristic the organism must have been homozygous.	
The products of meiosis are diploid cells with different genetic compositions.	
Some hormones are composed of proteins.	
Most features of the human gene pool's phenotypes are polygenic and show continuous variation.	
If a DNA molecule has 4000 bases and 20% of the base molecules are cytosine, then it would have 80 adenine molecules.	

(5)

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



(Source: SQA Human Biology Examination; May 2015)

1.4.1 During replication, bonds between the two DNA strands are broken.

Name the type of bond labelled X.

(1)

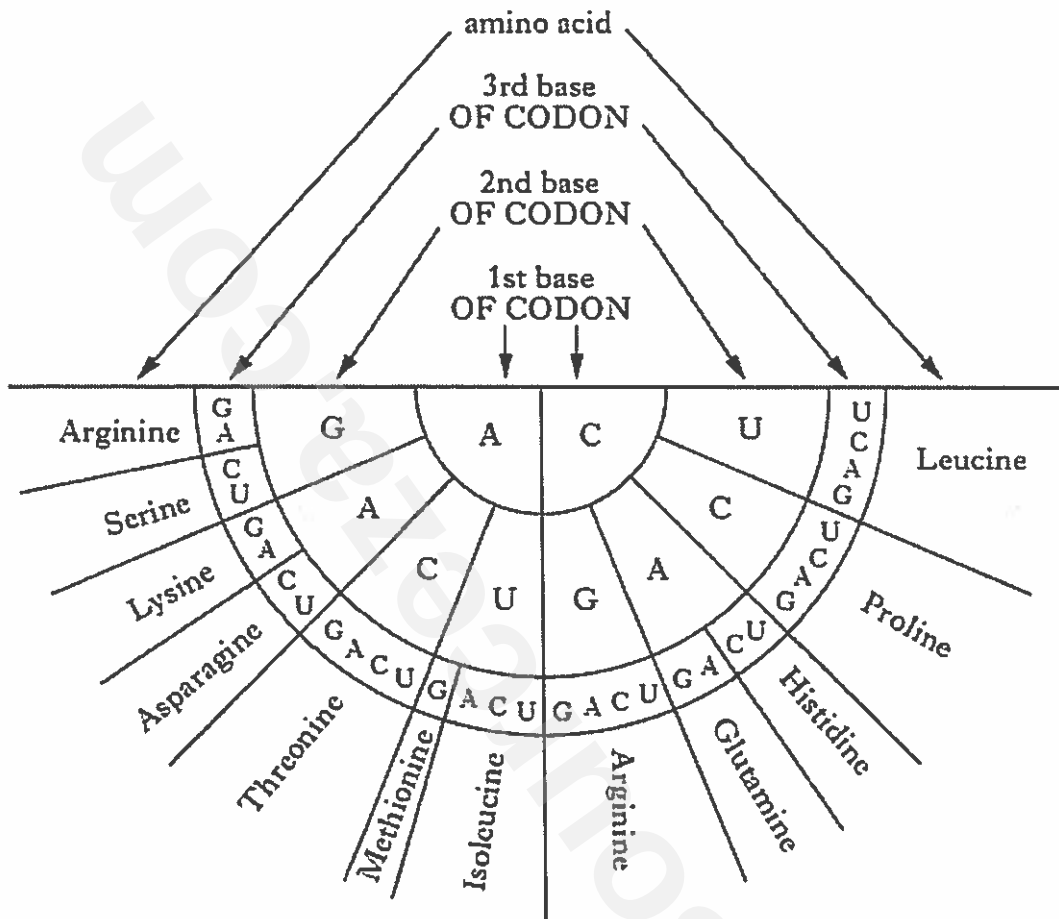
1.4.2 Identify the molecules labelled Y and Z.

(2)

Y: _____

Z: _____

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

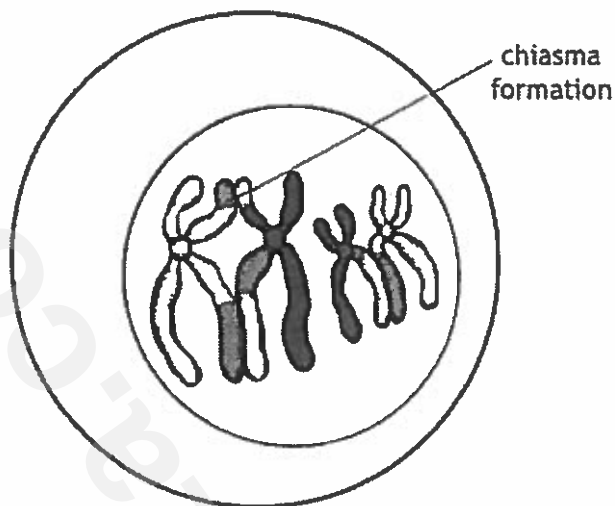


(Source: SQA Human Biology Examination; May 2013)

Use the above diagram to translate the segment of the mRNA strand shown below.

C C A A C U C C U A G A (3)

- 1.5 The diagram below shows the pairing of homologous chromosomes in a cell undergoing meiosis.



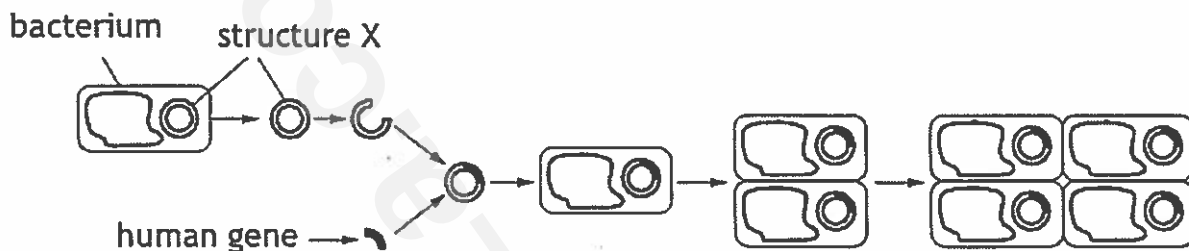
(Adapted from Source: SQA Biology Examination; May 2016)

- 1.5.1 Name the type of cell that undergoes meiosis in human males. (1)

- 1.5.2 Explain how the chiasma formation between the paired homologous chromosomes shown in the diagram leads to variation. (3)

- 1.5.3 Name the stage that occurs **two** stages after the illustrated stage shown on the previous page. State two characteristics of this stage. (3)

- 1.6 The diagram below represents part of the process of genetic engineering.



(Source: SQA National Qualification Biology Examination; May 2016)

The above diagram illustrates how a human gene can be inserted into bacteria to produce human insulin using recombinant DNA technology.

Structure X is removed from the bacterium and modified during this process.

- 1.6.1 Name **one** enzyme used in this process and state its function. (2)

- 1.6.2 The genetically modified bacteria are grown in a fermenter.

Explain why the fermenter must be sterilised using antiseptic techniques before it is used. (2)

1.6.3 The fermenter is controlled to provide optimum conditions.

Name **one** factor which can be controlled.

(1)

1.6.4 The recombinant plasmid also contains a gene for resistance to the antibiotic, ampicillin.

Describe a procedure which would allow only bacteria containing the recombinant plasmid to be selected.

(2)

1.6.5 Name the medical condition that this insulin would be used to treat in humans?

(1)

1.6.6 Describe **one** advantage of using human insulin produced by this process. (1)

- 1.7 In humans, there is a gene which codes for an essential muscle protein called dystrophin.

When this gene is altered, dystrophin is not produced.

An individual with Duchenne's muscular dystrophy cannot make dystrophin.

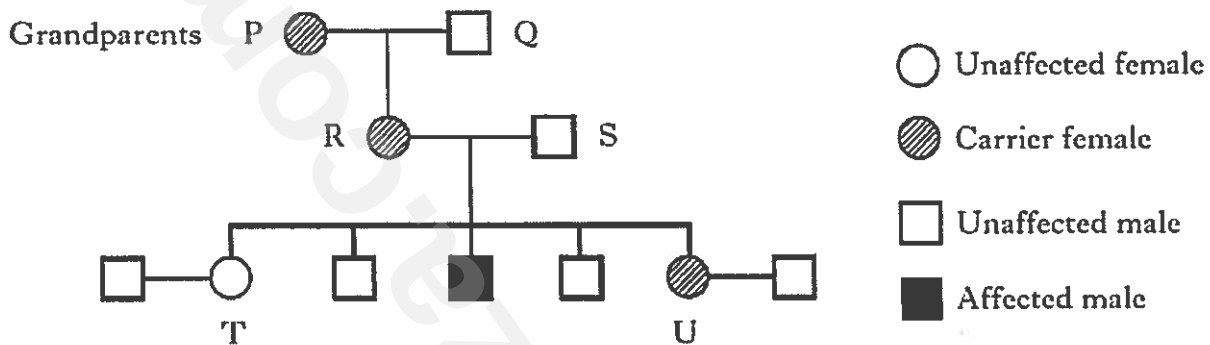
- 1.7.1 What general term is used to describe a gene alteration? (1)

- 1.7.2 Where conditions such as Duchenne's muscular dystrophy exist in a family, the family history can be used to determine the genotypes of its individual members. What term is used for this process? (1)

Duchenne's muscular dystrophy is an inherited condition in which muscle fibers gradually degenerate.

The condition is sex-linked and caused by a recessive allele.

The family tree below shows the inheritance of the condition through three generations of a family.



(Source: SQA Human Biology Examination; May 2012)

- 1.7.3 Using the symbols **D** and **d** to represent the alleles, state the genotypes of individuals R and S. (3)

- 1.7.4 What percentage of the grandsons have muscular dystrophy? (2)

1.8.1 Rearrange the numbered descriptions below and then draw a flow diagram illustrating the changes that occur in the ovary during the menstrual cycle:

1. Corpus luteum forms
2. Ovulation occurs
3. Progesterone is produced
4. Corpus luteum degenerates
5. Graafian follicle develops

(5)

The diagrams below show sections through two structures found in the ovary at different times in the menstrual cycle.



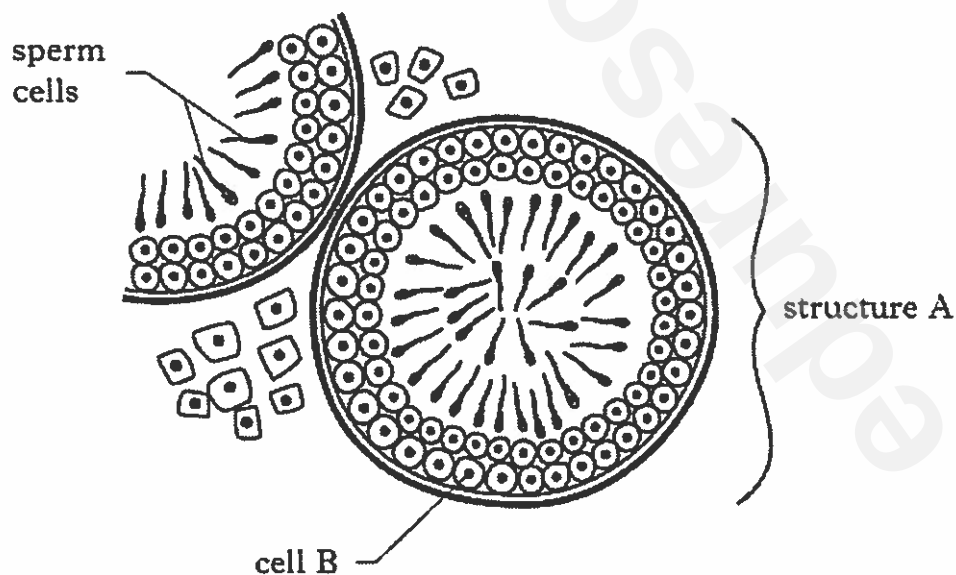
(Source: SQA Human Biology Examination; May 2012)

1.8.2 Identify structures P and Q. (2)

P: _____

Q: _____

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

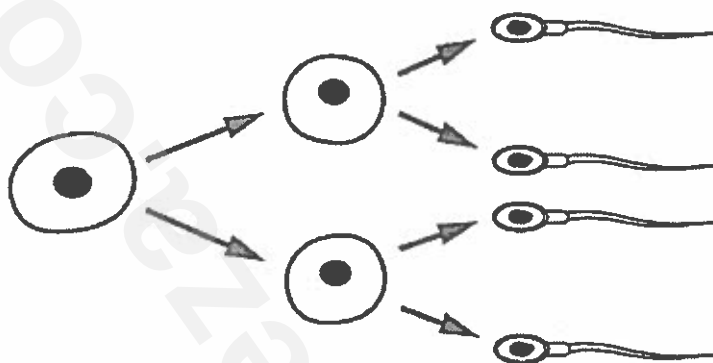


(Source: SQA Human Biology Examination; May 2015)

- 1.8.3 Name the structure in the testis where i) maturation of sperm occurs occurs.
 ii) testosterone is produced (2)

i) _____ ii) _____

The diagram below shows cell B dividing to produce sperm cells.



(Source: SQA Human Biology Examination; May 2015)

- 1.8.4 State how many of the sperm cells shown in this diagram contain: (2)

An X chromosome: _____

Autosomes: _____

The average sperm count in the developed world has fallen by one third over the last 16 years. The present average sperm count is 30 million/cm³ of semen.

- 1.8.5 Give **two** reasons as to why you think that the average sperm count in the developed world has fallen in the last 16 years. (2)

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

A man is considered as fertile if his semen contains at least 20 million sperm/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.

	Men			
	P	Q	R	S
Number of sperm in sample (millions/cm ³)	25	22	20	23
Percentage of active sperm	80	75	85	70
Percentage of misshapen sperm	70	60	65	50

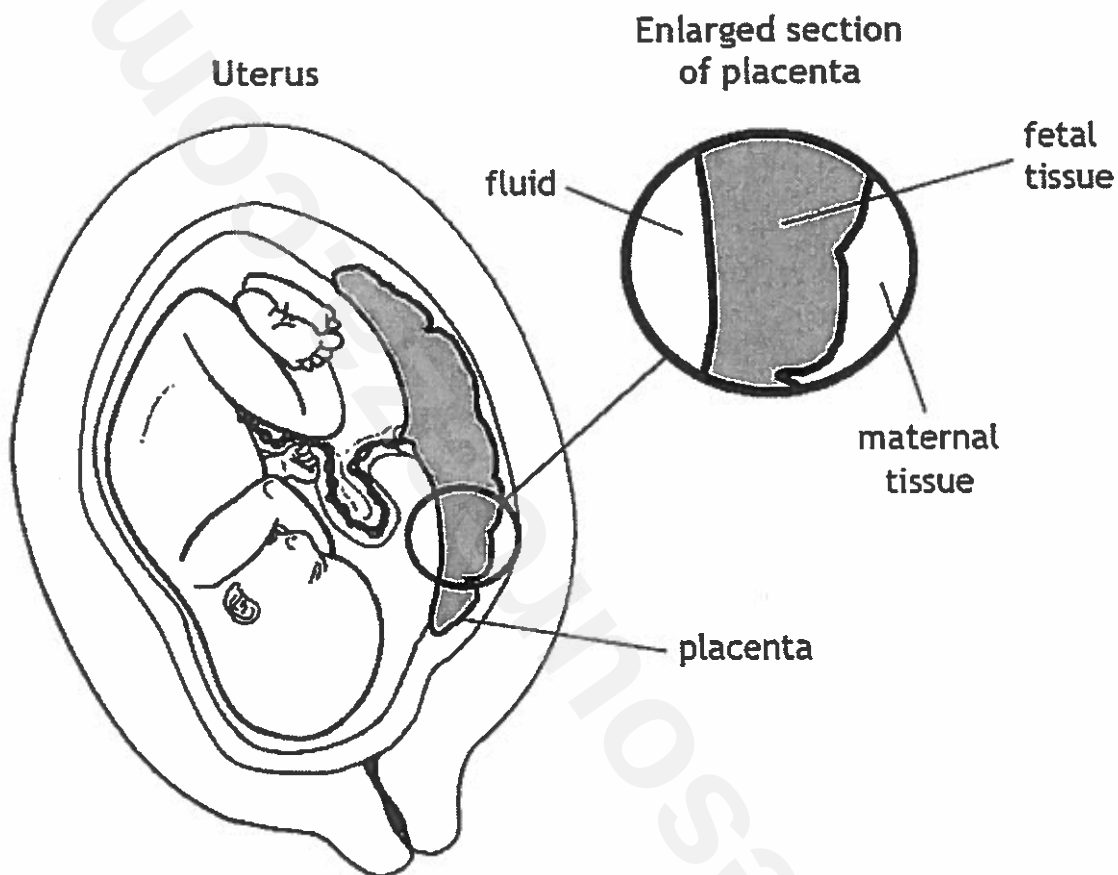
(Adapted from Source: SQA Human Biology Examination; May 2015)

1.8.6 Which of the four men are infertile? (1)

1.8.7 Explain how artificial insemination could be used to enable a couple to have a child when the man has a low sperm count. (2)

- 1.9 Amniocentesis is a technique which can be used during antenatal screening.

The diagram below shows the uterus of a pregnant woman with a section of the placenta enlarged.



(Source: SQA Human Biology NH Level Examination; May 2015)

- 1.9.1 Place a cross (X) on the diagram of the **enlarged section of placenta** to indicate the area from which cells are removed during an amniocentesis. (1)

1.9.2 What is the purpose of this type of antenatal screening.

(2)

1.9.3 What survivorship curve do humans exhibit? Provide **two** advantages of this survivorship curve.

(3)

1.9.4 Humans exhibit live birth as part of their reproductive strategy.

What is the correct term used to describe this? State **one** advantage of a species employing this reproductive strategy.

(2)

1.9.5 Do humans illustrate altricial, or precocial development? Give a reason for your choice. (2)

[80]

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Question 2

2.1 Read the following information and answer the questions.

In each of your cells there is a gene giving instructions about whether or not you can roll your tongue. This gene has two alleles. One kind, called R, allows you to roll your tongue. The other kind, called r, does not.

- 2.1.1 List the three possible combinations of alleles for tongue rolling. (1)
- 2.1.2 Give the term which is used to describe the situation where both alleles are identical. (1)
- 2.1.3 What is the name given to the genetic potential of alleles? (1)
- 2.1.4 Supply the two words used to describe the relationship between alleles. (2)

2.2 Y-linked alleles

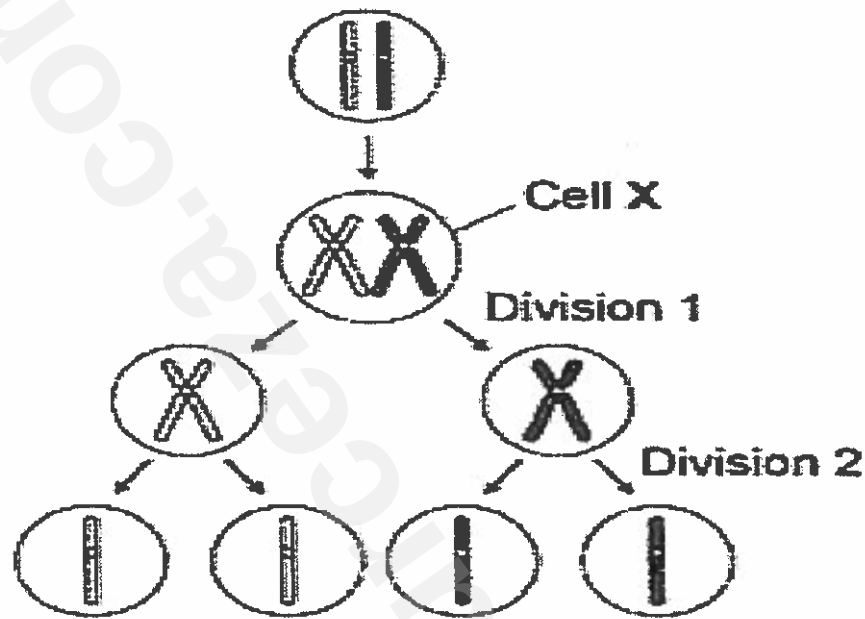
Rarely, sex-linked genes may be found on the Y chromosome so only males are affected, although there are no absolute examples of Y-linked inheritance. Hairy ears are thought to be determined by a sex-linked allele found on the Y chromosome but this has not been confirmed. This trait is common in certain populations, such as India, Pakistan and Israel. If the gene is found only on the Y chromosome, then it should only be found in men and must be inherited by all their sons, who inherit the Y chromosome from their father and the X chromosome from their mothers. A study of hairy ears in Israel showed that 76% of sons inherited the trait from their fathers and none of the daughters. This does seem to confirm that this is a Y-linked gene, but why didn't all the sons develop hairy ears?

It is possible that this is where one gene is inhibited or suppressed by another.

Adapted from A2 level Biology; P Bradfield et al

- 2.2.1 Give an example of a X-linked disease passed on from mothers to their sons. (1)
- 2.2.2 Draw a Punnett square of the example that you gave in question 2.2.1 (6)
- 2.2.3 Explain why sons will always inherit the hairy ear allele from their fathers. (1)
- 2.2.4 Suggest why females would be unaffected by sex-linked genes found on the Y chromosomes? (1)

- 2.3 The diagram below summarises the process of meiosis. The circles represent cells and the structures within each cell represent chromosomes.



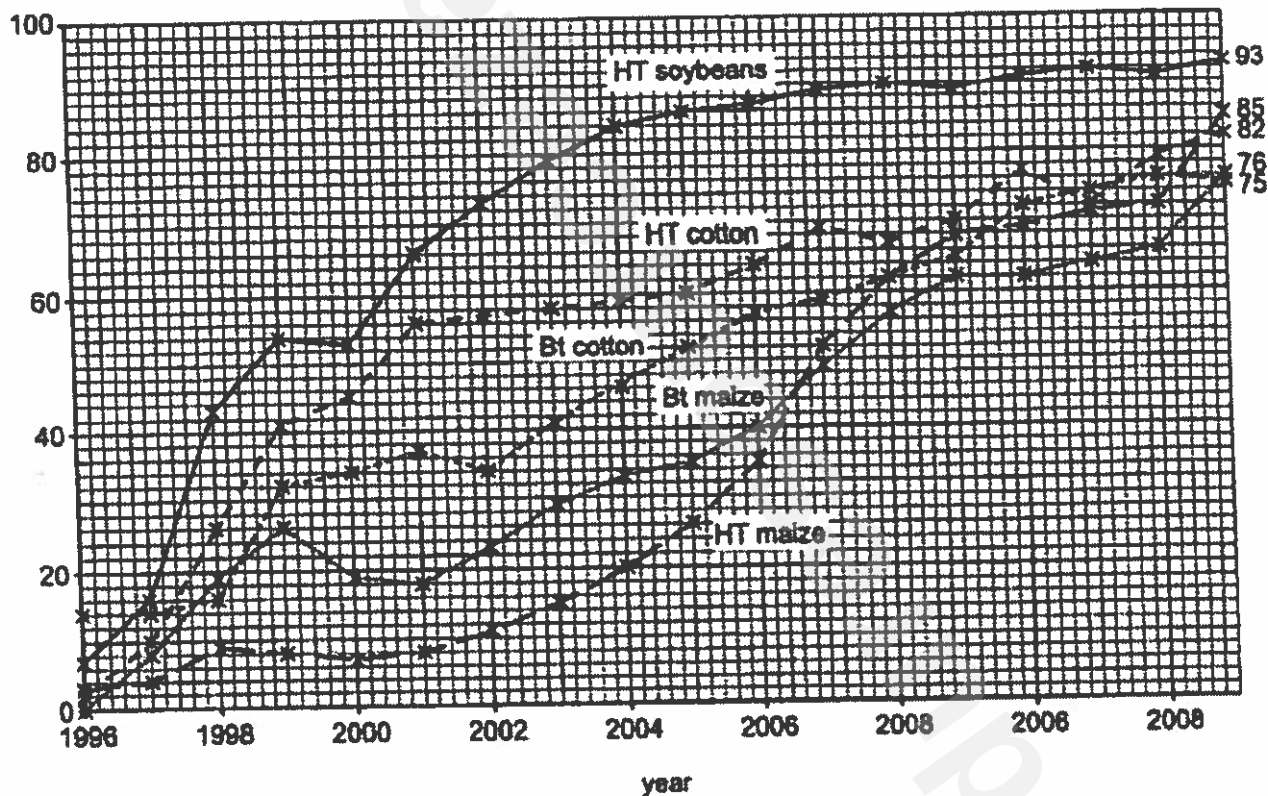
Adapted from AS Biology Paper 1 7401/1

- 2.3.1 Explain what has occurred to change the appearance of the chromosomes in cell X. (2)
- 2.3.2 Describe what has happened during division 1 and the result of that division. (2)
- 2.3.3 Identify one event that has occurred during division 2 but **not** during division 1 (1)
- 2.3.4 Name **two** ways in which meiosis produces genetic variation in offspring. (2)

2.4 The graph below shows the proportion of cotton, maize and soybeans grown in the USA that are genetically modified in two different ways:

- HT crops are modified to be resistant to the herbicide glyphosate
- Bt crops are modified to express the Bt toxin which kills insect pests.

percentage of total
crop grown that is
genetically modified



Adapted from UCLES 2014

- 2.4.1 Provide the aim for this study. (2)
- 2.4.2 What is the dependent variable investigation? (1)
- 2.4.3 Give a suitable heading for the graph. (2)

- 2.4.4 With reference to the graph, describe the change in the percentage of genetically modified cotton grown in the USA since 1996. Use data from the graph in your answer. (2)

- 2.4.5 Crops such as maize and cotton are genetically modified to produce Bt toxins to protect them from insect pests. When these GM crops first became available it was predicted that insect pests would develop resistance to these toxins.

A survey was conducted in 2005 and 2011 to determine the extent of Bt resistance in insect pest species.

The level of resistance in each species was classified according to the highest percentage of resistant individuals recorded in any population anywhere in the world. Three levels of resistance were used.

- <1%
- 1-6%
- >50%

There were no reports of populations of insect pests having between 6% and 50% of resistant individuals.

The results of the survey are shown in the table below:

year	total number of insect pest species surveyed	number of insect pest species susceptible to Bt toxins	number of insect pest species with reported levels of resistance		
			<1%	1-6%	>50%
2005	9	8	0	0	1
2011	13	4	3	1	5

- (i) What do the results of the survey show? (1)
- (ii) Suggest one other piece of information that is needed to assess the significance of the results of the survey. (1)

- 2.5 Read the following passage. Use information from the passage and your own knowledge to answer the questions.

In 2013, the scientific world celebrated the 60th anniversary of Watson and Crick's 1953 paper on the structure of the DNA molecule. Their paper was not an instant success. Their suggested structure for the DNA molecule was not widely accepted until the publishing of another paper 5 years later.

Meselson and Stahl's experiments on the replication of DNA published in 1958 helped reinforce Watson and Crick's suggested structure of the DNA molecule. Meselson and Stahl grew bacteria in a medium containing heavy nitrogen (^{15}N) for several generations. The nitrogen was incorporated into the DNA of the bacteria. They then transferred the bacteria to a growth medium in which the nitrogen source contained light nitrogen (^{14}N). They extracted and analysed DNA from the bacteria at three stages. When the bacteria were grown in the ^{15}N medium, the bacterial DNA settled as a band near the bottom of the test tube. After one division of the bacteria in the ^{14}N medium, the bacterial DNA settled as a band in the middle of the test tube. After two divisions of bacteria in the ^{14}N medium, two DNA bands appeared in the test tube. They concluded that DNA replicates.

In the 1960s, Meselson worked with scientists called Brenner and Jacob on protein synthesis. They performed experiments with bacteria to determine the role that RNA plays in protein synthesis.

Adapted from UCLES 2014

- 2.5.1 Describe the structure of the DNA molecule that Watson and Crick suggested. (2)
- 2.5.2 Into which part of the bacterial DNA was the nitrogen incorporated? (1)
- 2.5.3 State the property of DNA that caused it to settle as bands at different positions in a test tube. (1)
- 2.5.4 DNA is easier to extract from bacteria than from eukaryotic cells. Suggest why Meselson and Stahl extracted and analysed DNA from bacteria. (1)
- 2.5.5 In the 1960s, Meselson worked with Brenner and Jacob on protein synthesis.
- (i) State the monomers of proteins (1)
 - (ii) What role does DNA play in protein synthesis? (1)
- 2.5.6 Describe the role of tRNA in protein synthesis. (1)

2.5.7 DNA profiling has become essential in modern times in helping society in a number of ways.

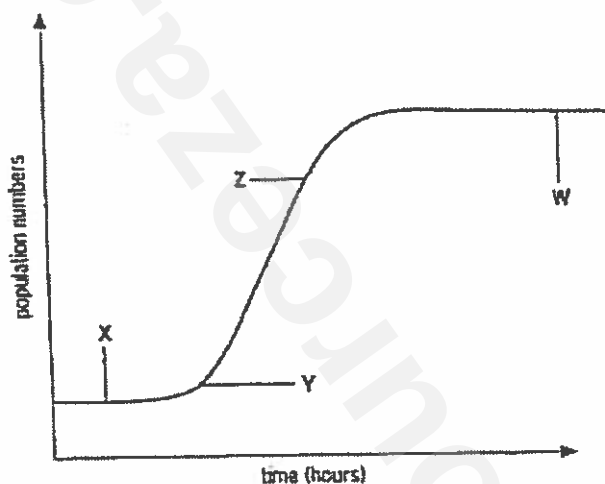
Suggest how the process of DNA profiling has aided society in the 21st century.

(2)

[40]

QUESTION 3

3.1 The graph below shows changes in the size of a population of yeast cells growing in a flask containing nutrient broth with glucose as a source of carbohydrate.



[Adapted from: Advanced Level Biology 2012].

3.1.1 Give the letter from the diagram which represents the following stages in the growth of the population.

- The point at which birth rate and death rate are equal.
- The point where population growth is most rapid.
- The exponential growth phase.
- The lag phase.

(4)

3.1.2 i) Suggest why the rate of growth of the population is less at W than at Z.

(1)

ii) Name a factor which should be kept constant during this experiment.

(1)

iii) The yeast cells were left for a further 24 hours and the population size was then found to have decreased substantially.

Suggest **two** factors which may have caused this decrease.

(2)

3.1.3 The population curve obtained when a single female toad lays eggs in a shallow pool and the surviving offspring breed for many generations would differ from the curve for yeast cells.

- i) Describe why the population curve for toads would differ from that of yeast. (2)
- ii) What factors would affect the survival of the larvae to the breeding stage? (2)

3.2 Harlequin ladybirds, *Harmonia axiridis*, were introduced to the UK from their native habitat in Eastern Asia in order to reduce the population of aphids, which feed on crop plants.

Since their introduction, harlequin ladybirds have spread rapidly and their population has dramatically increased. As a result the population of some ladybird species have dramatically decreased, although the population of native seven-spot ladybirds has remained relatively stable.

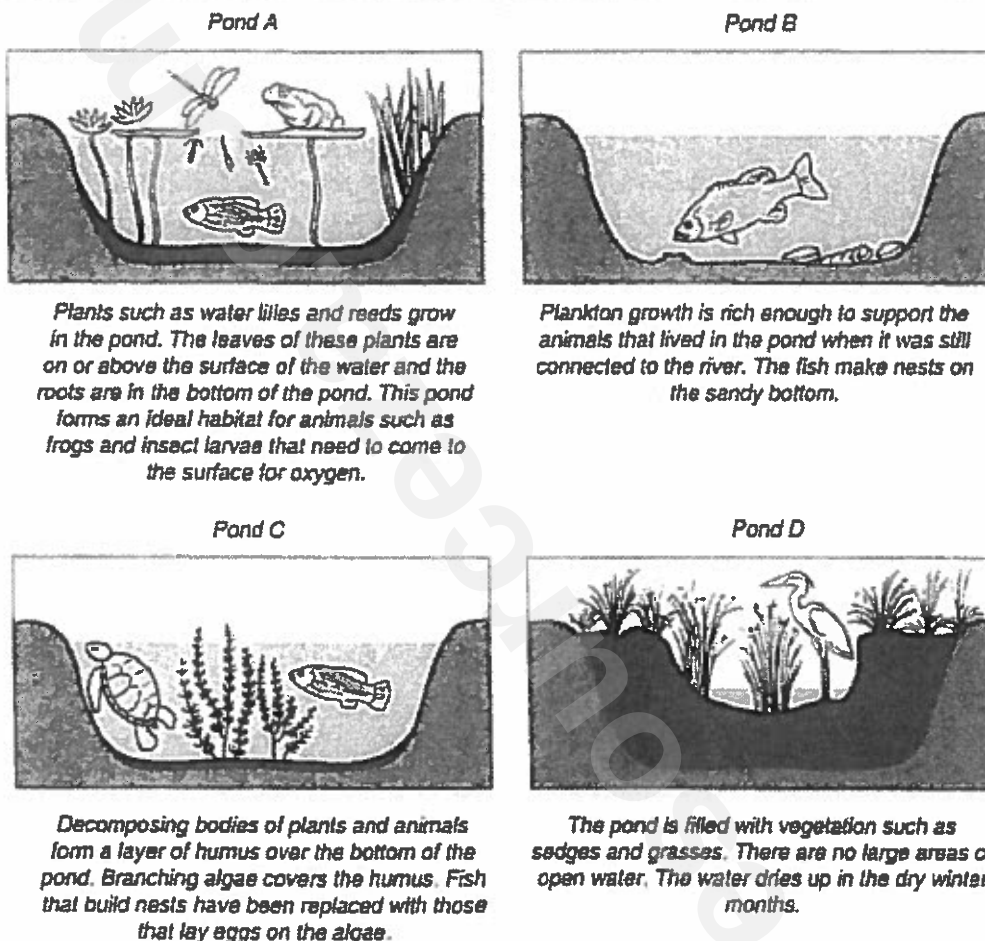
- 3.2.1 Name this control method used to manage the population of aphids. (1)
- 3.2.2 Using the information given, explain why the harlequin ladybird can be described as an invasive species. (1)
- 3.2.3 Suggest **two** reasons why the population size of the seven-spot ladybird has remained relatively stable. (2)
- 3.2.4 Give **two** reasons why the population of harlequin ladybirds has increased more quickly in the UK than in their native habitat. (2)

3.3 The following table shows statistics of human population size in different countries.

	Population (in millions)	Birth rate	Mortality rate	Annual Population Increase %
India	850	33	15	2,1
South Africa	40	38	5	2,9
Mexico	80	38	10	2,8

- 3.3.1 How is the number of people living in a country determined? (1)
- 3.3.2 What is meant by "birth rate"? (2)
- 3.3.3 What must the birth rate be to ensure zero population growth in South Africa? (2)
- 3.3.4 Name **two** factors that could account for the low mortality rate in South Africa. (2)
- 3.3.5 Why does South Africa have a higher annual population increase than Mexico? (1)
- 3.3.6 Name **two** density-independent factors which could account for the high mortality rate in India. (2)
- 3.3.7 Why would a policy of allowing only 1 child per family lead to a reduction in the population? (2)

- 3.4 The succession of a body of water from a pond to a wetland can take thousands of years. During a flood, a river bend was cut off from the river to form a small pond. Some fish and micro-organisms were trapped in the pond. The diagrams below show the succession of this pond to a wetland.



[Adapted from: Shuters LS 2012]

- 3.4.1 Write the letters of the ponds in order from the oldest to the youngest. (1)
- 3.4.2 Bass fish lay their eggs in nests on sandy bottoms. In which pond would you find them? (1)
- 3.4.3 What will happen to the bass when the bottom of the pond is covered with humus? (2)
- 3.4.4 Some frogs can withstand dry conditions by burying themselves in mud.

In which pond or ponds would they survive? (1)

3.4.5 Which producers are pioneers in the succession of the pond ecosystem? (1)

3.4.6 What is the role of these pioneer plants? (2)

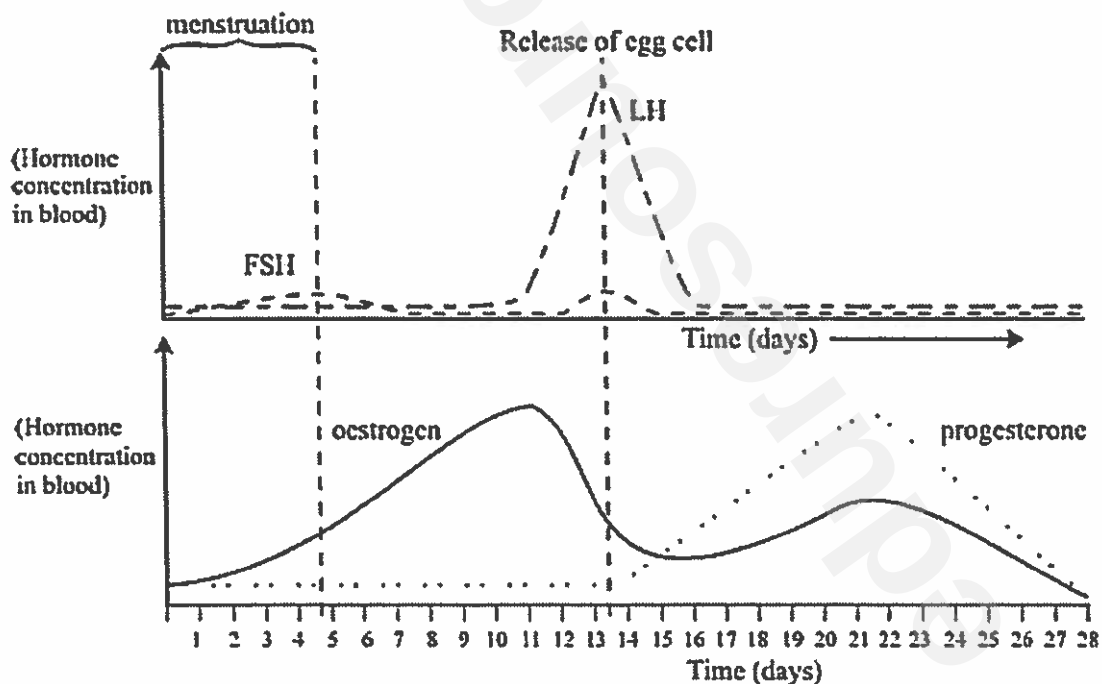
3.4.7 Which plants follow the pioneers? (1)

3.4.8 Which pond has the most developed plants that show that is near its climax? (1)

[40]

QUESTION 4

4.1 The female menstrual cycle is controlled by a number of hormones. The graph below shows the concentration of four of these hormones at different times during the menstrual cycle. Study the graph and then answer the questions that follow.

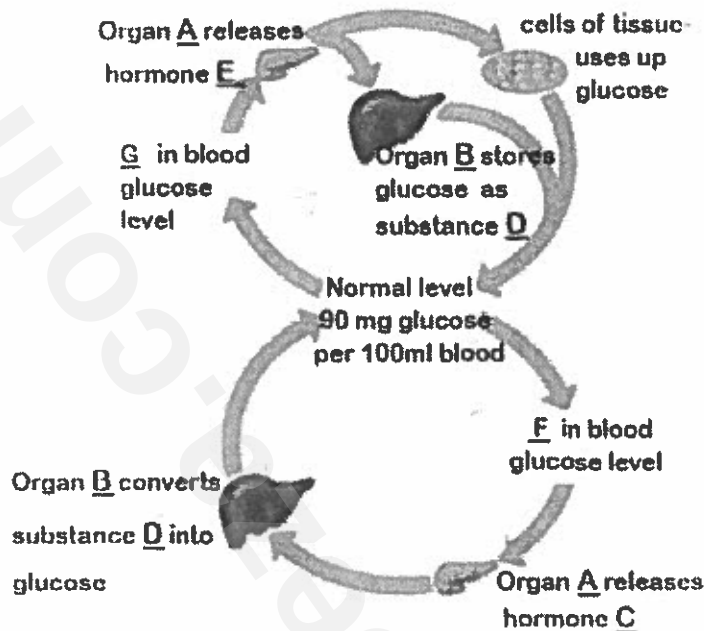


[Adapted from: www.logs.uk.com]

4.1.1 Which one of the four hormones is the first to be secreted at the onset of puberty? (1)

- 4.1.2 The sudden increase in oestrogen levels triggers the release of another hormone.
- a) Provide the name of this hormone. (1)
 - b) On which day does the secretion of this hormone (mentioned in 4.1.2 a) reach its peak and briefly explain the effect this has on the mature Graafian follicle within the ovary. (2)
- 4.1.3 Why would you expect the thickness of the endometrium to be the greatest over the second half of the menstrual cycle? (2)
- 4.1.4 Predict what would happen if oestrogen levels remain level (no spike) throughout the menstrual cycle? (2)
- 4.1.5 What is the function of the corpus luteum during the second half of the menstrual cycle? (2)
- 4.1.6 Name the structure that takes over the production of progesterone from the corpus luteum by the 10th week of pregnancy? (1)
- 4.1.7 As a safeguard against having more children, a 40 year-old man is having a vasectomy.
- a) Will the vasectomy affect his masculinity? (1)
 - b) Is the man's partner justified in insisting he use a condom during intercourse for a few weeks after the procedure? (2)

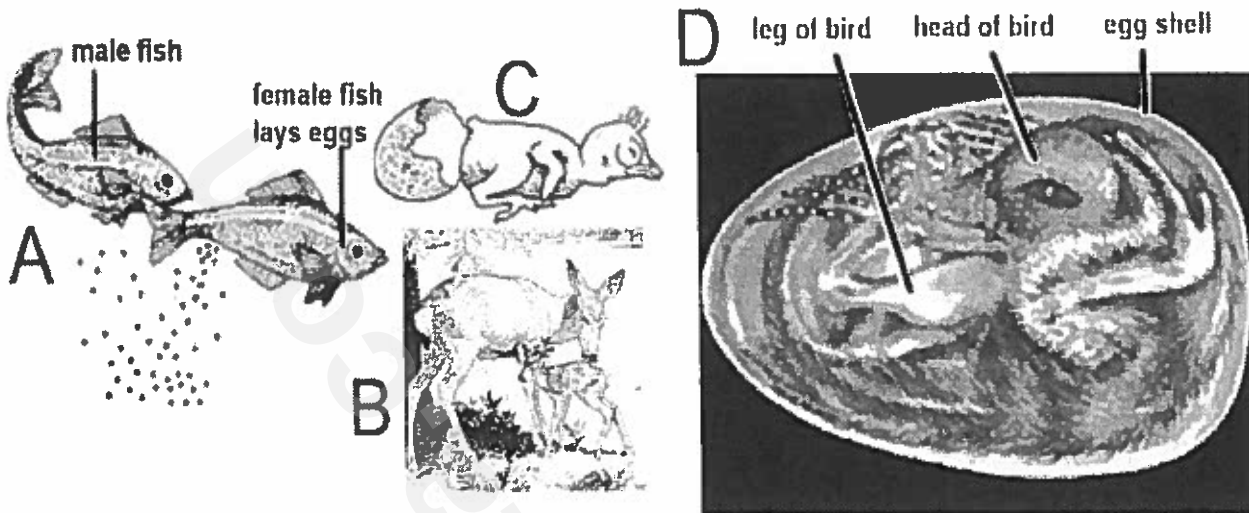
- 4.2 The flow diagram below depicts the homeostatic regulation of the blood glucose level in the human body.



Adapted from: <https://sites.google.com/a/tamaki.ac.nz/mrs-j-s-science/year-13-biology>

- 4.2.1 Write suitable labels for C, D, E and F to show how this homeostatic process takes place in humans. (4)
- 4.2.2 The hormone thyroxine plays a vital role in the human body. It is therefore very important to keep the level of this hormone within the blood constant. This is achieved by a control mechanism known as negative feedback.
- Draw a flow diagram of the negative feedback mechanism controlling thyroxine production. (5)
 - Why do you think in the past it was mostly people living inland that were afflicted with goitres and virtually no one living at the coast suffered from this condition? (2)
 - Recent studies have linked some diseases of the thyroid gland to diabetes mellitus and have shown that there is a correlation between the functioning of the thyroid gland and the pancreas. Use your knowledge of both glands to justify the assertion that the endocrine functioning of the pancreas is regulated to a certain extent by the functioning of the thyroid gland. (2)

4.3 Refer to the pictures below and answer the questions that follow.



A, B & C - Adapted from: Google images and D from:
<http://people.eku.edu/ritchisong/parentalcare.html>

- 4.3.1 The picture D shows A 121 million-year-old baby bird, fossilized in its egg, found in China. The fossil is thought to be the oldest known unborn bird ever discovered.
- Analyse the picture and then determine the type of development (altricial or precocial) that this prehistoric bird displayed. (1)
 - How do you think this type of development (mentioned in 4.3.1 a) would have benefited this bird in its habitat? (1)
- 4.3.2 What survival strategy do the fish in picture A adopt to ensure the continuation of their species? (2)
- 4.3.3 Name the type of survival strategy that deer (refer to picture B) adopt in order to secure a suitable mate. (1)
- 4.3.4 Identify the type of egg that the chick in picture C hatched out of. (1)
- 4.3.5 Select the term from the list below that is applicable to the organism depicted in picture:
- B (1)
 - C (1)

List of terms: Oviparous viviparous ovoviviparous

4.3.6 Read the article below and then answer the questions that follow.

One of the biggest obstacles to creating crop varieties is that conventional plant breeders can only develop new traits from traits that appear naturally. How can they create the new colours, flavours or disease resistance that makes a crop a commercial success if they can't just "breed it in" from another species?

In the late 1940s, plant breeders addressed this problem by using one of the newest tools of the day. Scientists discovered that exposing plants to different types of radiation damages the plant's DNA and causes new mutations. The radiation allows them to generate random mutations at a faster rate, which means a higher likelihood of finding a new useful trait. Ruby Red grapefruits, along with 3,000 other crop varieties consumed by millions every day, were actually created through mutation breeding.

[Source: adapted from <https://www.geneticliteracyproject.org>]

- a) Explain what is meant by the phrase "created through mutation breeding". (2)
- b) Provide the biological term for the process of gene manipulation as described in the article. (1)
- c) Many scientists claim that the use of "mutation breeding" is **not only necessary** but also **safe**. Use information from the article and your own knowledge as a biologist to justify this claim made by the scientists. (2)

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