



LIFE SCIENCES: PAPER I

EXAMINATION NUMBER

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ANSWER BOOKLET

There are eleven (xi) pages in this Answer Booklet. Please write your examination number in the spaces above.

QUESTION 1

1.1 Select the term in Column B that best matches the 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

- | | |
|---|----------------------|
| [] Genetic material formed by combining genes from two or more sources. | A Gonosomes |
| [] Enzyme that breaks or cuts sections of DNA. | B Clones |
| [] When both forms of a gene in a cell are identical. | C Recombinant DNA |
| [] The physical outward expression of a pair of alleles. | D Surrogate |
| [] Chromosomes containing information relating to the sex of the individual. | E Genotype |
| [] Different forms of the same gene. | F Plasmid |
| [] A condition in which more than two sets of genes are present in a cell. | G Restriction enzyme |
| [] Genetically identical individuals. | H Phenotype |
| [] A mother who carries and gives birth to an individual that is not her own. | I Homozygous |
| [] A circular strand of DNA found in bacteria often used to transfer genes to other organisms. | J Polyploidy |
| | K Ligase enzyme |
| | L Alleles |

1.2 Six 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
Answer						

1.2.1 The following scientists have done research in the field of DNA and/or genetics:

- (1) Rosalind Franklin
- (2) Francis Crick
- (3) James Watson
- (4) Gregor Mendel

The scientists who contributed to the discovery of the molecular structure of DNA were

- A (1), (3) and (4)
- B (2), (3) and (4)
- C (2) and (3) only
- D (1), (2) and (3)

(1)

1.2.2 The following events occur in the animal cloning process. The events are listed in no specific order.

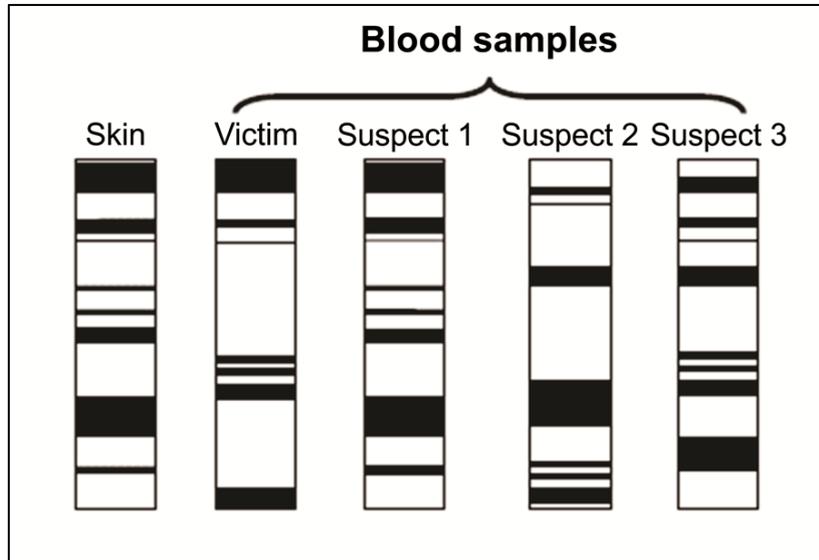
- P. Donor nucleus is placed in an egg from which the nucleus has been removed.
- Q. Cell is given a shock to begin mitotic divisions.
- R. Donor nucleus is removed from desired cell.
- S. Nucleus is removed from egg cell and discarded.
- T. Cell is removed from desired organism (donor).
- U. Embryo is placed in surrogate.

A correct sequence of events is:

- A $R \rightarrow U \rightarrow P \rightarrow T \rightarrow S \rightarrow Q$
- B $S \rightarrow T \rightarrow R \rightarrow P \rightarrow Q \rightarrow U$
- C $T \rightarrow Q \rightarrow R \rightarrow S \rightarrow U \rightarrow P$
- D $U \rightarrow Q \rightarrow T \rightarrow S \rightarrow P \rightarrow R$

(2)

1.2.3 In a rape investigation, skin cells from under the victim's fingernails were analysed and a DNA profile was produced. Three suspects were brought in for questioning and their DNA profiles were determined using blood samples. The results of the DNA profiles were as follows:



Which suspect was possibly the rapist?

- A Suspect 1
 - B Suspect 2
 - C Suspect 3
 - D None of the suspects
- (1)

1.2.4 How is natural variation used in artificial selection?

- A In nature there is variation among different organisms and humans select from these differences.
 - B Nature only produces the fittest species.
 - C Humans chose to breed animals with little or no natural variation.
 - D Natural variation is not used in artificial selection.
- (1)

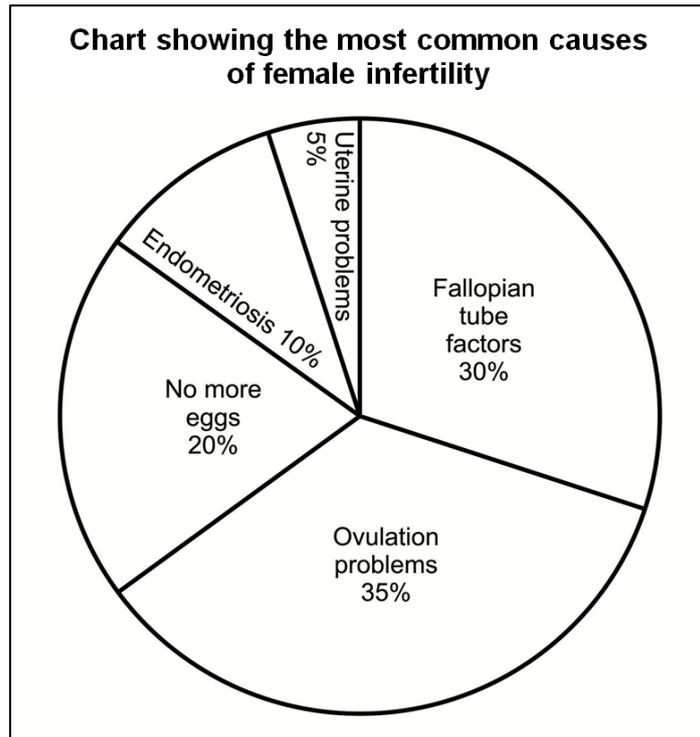
1.2.5 Critically endangered cheetah populations are found in small remote areas in many African countries. This isolation leads to inbreeding. Which of the following could result from inbreeding?

- A Decreased occurrences of genetic defects
 - B Increased gene pool
 - C Decreased biological fitness
 - D Decreased homozygosity
- (1)

1.2.6 A man with an X-linked dominant disorder marries a woman without the disorder. What proportion of their daughters will be affected by the disorder?

- A 0%
 - B 25%
 - C 50%
 - D 100%
- (2)

1.3 Study the chart below, which was drawn up based on statistics obtained at fertility clinics, and answer the questions that follow:



[Adapted from: <<http://www.indoreinfertilityclinic.com>>]

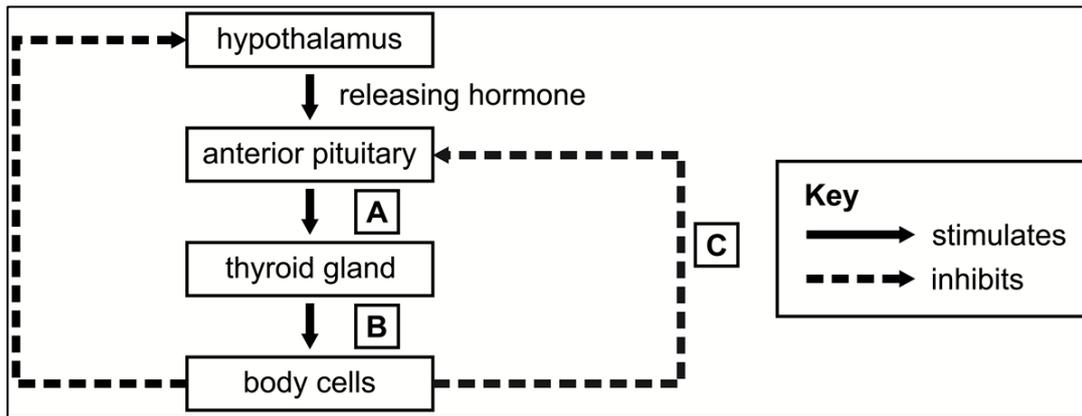
Consider the five statements below and then for each statement decide whether:

- A the statement is supported by the information in the chart.
- B the statement is contradicted by the information in the chart.
- C the statement is neither supported nor contradicted by the information in the chart.

STATEMENT		A, B OR C
1.3.1	Infertility can be due to problems in both women and men.	
1.3.2	The majority of fertility problems in women are due to endometriosis.	
1.3.3	The single largest contributing factor to female infertility relates to ovulation.	
1.3.4	Stress contributes to female infertility.	
1.3.5	There may be factors affecting female fertility that are not mentioned in the pie chart above.	

(5)

1.4 Study the flow chart below and answer the questions that follow:



1.4.1 Provide labels for hormones A and B.

A _____ B _____ (2)

1.4.2 What is the function of hormone B?

 _____ (2)

1.4.3 (a) This flow chart is an example of a self-regulating mechanism in the body. Name the self-regulating mechanism evident in the flow chart.

_____ (1)

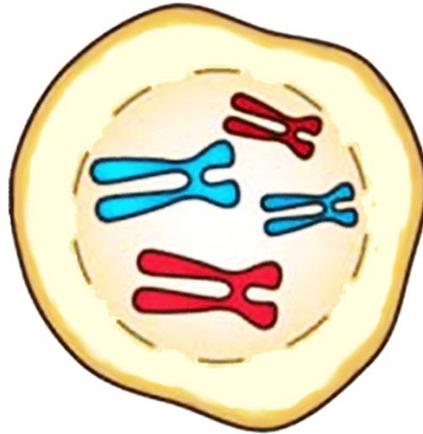
(b) Explain the importance of pathway C as seen on the flow chart.

 _____ (3)

1.4.4 List TWO other hormones released by the pituitary gland.

- _____
- _____ (2)

1.5 The following diagram is of a cell in early Prophase I of meiosis:



[Adapted from: <<http://ejdio.weebly.com>>]

1.5.1 Is this cell haploid or diploid?

(1)

1.5.2 How many of the following are present in the cell?

STRUCTURES	NUMBER PRESENT
Chromosomes	
Homologous pairs	
Bivalents	

(3)

1.5.3 Using the above cell as the parent cell, draw ONE of the daughter cells as it would appear during metaphase II of this meiotic division. Provide a suitable heading but no labels are needed. The chromosomes must be very clearly visible. Use the space provided below.

(6)

1.6 Read the text below about the Sand Scorpion found in the Mojave Desert of California:

The Sand Scorpion, which spends its days in a burrow underground, emerges to capture prey at night. If it's the right time of year, scorpions might also be seen dancing the night away. Males grasp the females by their pincers, and move them around in circles. After dancing for a while, the male deposits a packet of sperm on a stick or other surface. Then he moves the female until she is on top of the sperm. She takes in the sperm, which fertilise her eggs. The dance ends here, and the male usually skitters off to find more mates.

Young Sand Scorpions spend about 12 months developing inside eggs in their mother before they are born live. After they're born, they quickly crawl onto their mother's back where they stay until they're big enough to leave the burrow. On average, a Sand Scorpion mother has about 33 newborns hitching rides on her back.

[Adapted from: <<http://teach.genetics.utah.edu>>]

Male Sand Scorpion



[Source: <<http://www.vaejovidae.com>>]

Female Sand Scorpion with young on her back



[Source: <<http://answersdot.blogspot.co.za>>]

1.6.1 Study the following table, which consists of two items (numbered 1 and 2) in the first column. **Decide which item(s) describes the Sand Scorpion.** Write down your choice in the space provided in the 'answer' column, making use of the following codes:

- A Only Item 1 is true of Sand Scorpions.
- B Only Item 2 is true of Sand Scorpions.
- C Both Items 1 and 2 are true of Sand Scorpions.
- D Neither Item 1 or 2 is true of Sand Scorpions.

ITEM	ANSWER
1. Oviparous 2. Viviparous	
1. Sexual reproduction 2. Asexual reproduction	
1. External fertilisation 2. Internal fertilisation	
1. Courtship behaviour absent 2. Courtship behaviour present	
1. Evidence of parental care 2. No parental care evident	

(5)

1.6.2 Define the term 'reproductive strategies'.

(2)

1.6.3 Identify TWO reproductive strategies described in the text above and discuss how these reproductive strategies are advantageous for the Sand Scorpion.

Strategy 1: _____

Strategy 2: _____

(6)

1.7 A biology student carried out an experiment to determine the reproductive success of apple trees in the Western Cape. She chose a species commonly known as 'Golden Delicious' and focused her study on five cultivars/varieties of this species to determine which cultivar showed greater reproductive success in the Western Cape. In order to determine reproductive success, the student randomly selected 10 trees from each cultivar found in the Western Cape. She revisited these orchards a number of times throughout the season, and calculated the percentage of flowers that developed into fruit in a season.

She recorded her observations in the table below.

Cultivar/ variety	Average number of flowers per tree	Average number of fruit that develop per tree	% reproductive success (to nearest whole number)
1	950	600	63
2	700	480	69
3	860	750	87
4	800	520	x
5	920	670	73

[Hypothetical data]

1.7.1 Calculate the value of the x in the table. Show all workings in the space provided below.

(3)

1.7.2 Provide a suitable hypothesis for the experiment.

(3)

1.7.3 Identify the following variables:

(a) Independent variable:

(2)

(b) Dependent variable:

(2)

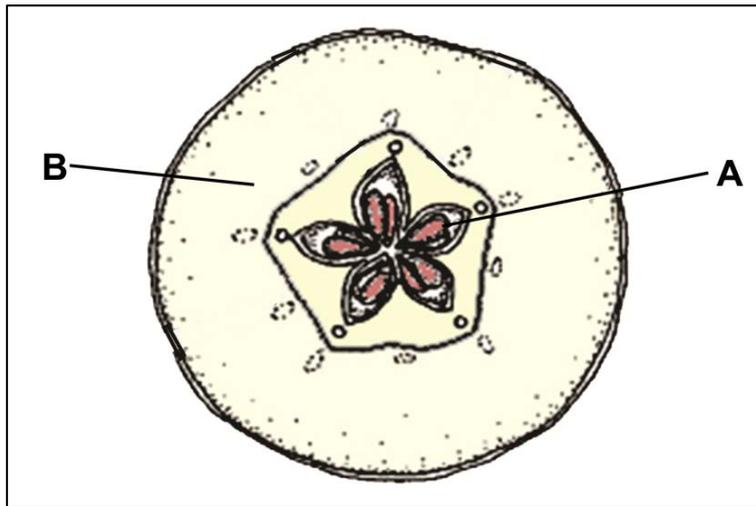
1.7.4 Were the results obtained valid? Justify your answer by considering whether the fixed variables were properly controlled. Discuss **THREE** fixed variables.

(6)

1.7.5 If you were an apple farmer, would you use the data from the third column (average number of fruits per tree) or the fourth column (per cent reproductive success) of the table if you were making a decision about which cultivar to grow? Explain your answer.

(2)

1.7.6 The following diagram shows a transverse section cut through a Golden Delicious apple:



[Adapted from: <<http://biology.clc.uc.edu>>]

Complete the table below:

Labelled part	Name	Function	Which part of the flower did it originate from?
A			
B			

(6)
[80]