NATIONAL SENIOR CERTIFICATE EXAMINATION
EXEMPLAR 2008

LIFE SCIENCES: PAPER I

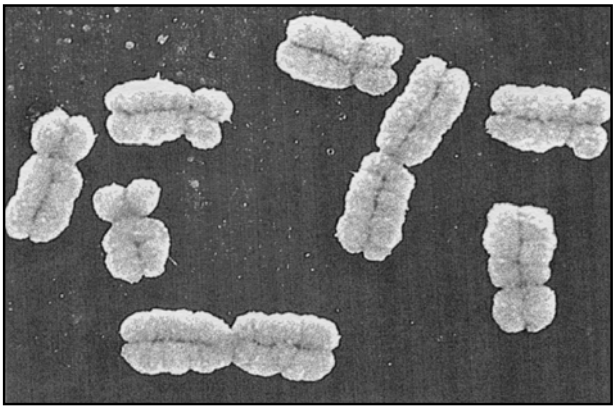
EXAMINATION NUMBER

THERE ARE 7 PAGES IN THIS BOOKLET

QUESTION 1

Answer the questions in the spaces provided. Place this booklet inside the Answer Book in which you answer the rest of the examination paper.

1.1 Observe this photograph of chromosomes and use this to select the term in the right column which best matches the description in the left column. Write the letter of the term in the corresponding space provided between the brackets. Use each letter only once.



[Adapted from *Kent*]

	Description		**Term**
[ ]	Chromosomes can be seen in the detail shown here with the … microscope.	A	RNA
[ ]	Chromosomes in this state have undergone the process of …	B	chromatids
[ ]	The most important chemical component of chromosomes is …	C	electron
[ ]	These chromosomes consists of two …	D	DNA
[ ]	The two parts of the chromosomes are joined by …	E	light
		F	centromeres
		G	translation
		H	replication

(5)

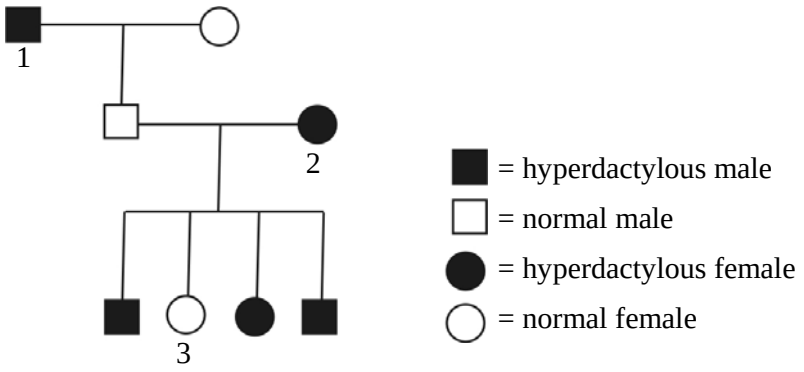
1.2 Five multiple choice questions are given below. Choose the most correct option for each question and write the corresponding letter of that option in the space provided in the table below.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5
Answer					

(5)

For questions 1.2.1 and 1.2.2 refer to the following information about hyperdactyly, a genetically inherited condition.

In humans the condition of hyperdactyly (the possession of twelve fingers) is determined by the dominant allele (H) and the normal condition by the recessive allele (h). The following diagram shows a family tree in which some members of the family are hyperdactylous.



[Adapted from *Torrance*]

1.2.1 Parent 1's genotype is …

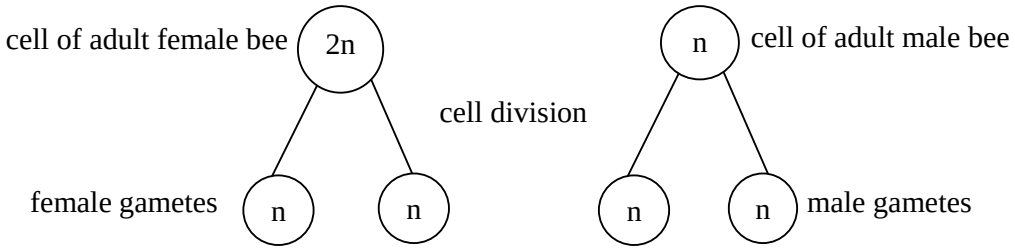
A heterozygous
B homozygous recessive
C homozygous dominant
D lacking the mutant gene

1.2.2 The genotypes of persons 1, 2 and 3 in this family tree are …

	1	2	3
A	HH	Hh	hh
B	HH	HH	hh
C	Hh	HH	Hh
D	Hh	Hh	hh

1.2.3 and 1.2.4 refer to the following information.

A queen honey bee can lay both fertilised and unfertilised eggs. Fertilised eggs develop directly into diploid females and unfertilised eggs develop directly into haploid males. The diagram shows the formation of gametes in male and female bees.



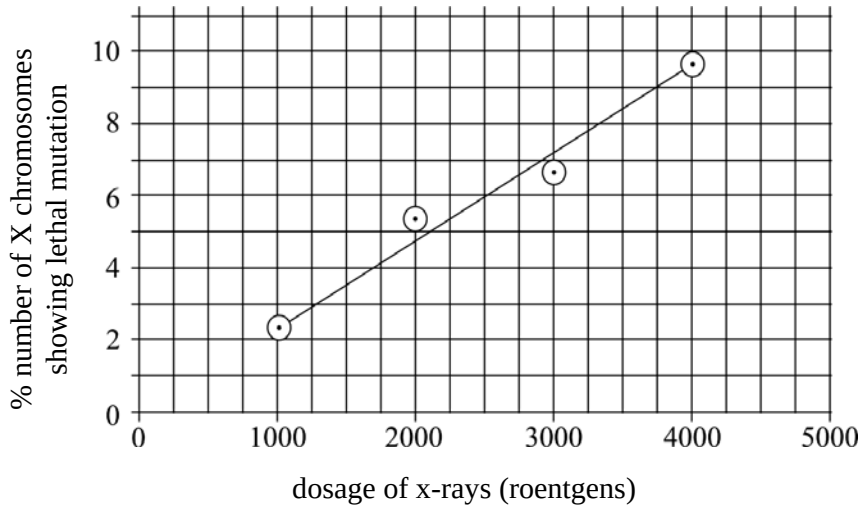
1.2.3 The type of cell division that forms male gametes in the honey bee is …

A meiosis.
B mitosis.
C a reduction division.
D the same as occurs in human males.

1.2.4 In the formation of female honey bee gametes, variation is caused by …

A crossing over.
B DNA replication.
C transcription.
D fertilisation.

1.2.5 The X Chromosomes of fruit flies (*Drosophila melanogaster*) sometimes show a lethal (deadly) mutation. The graph below shows the results of an investigation to find out the effect of increasing X-ray radiation on the percentage number of X chromosomes displaying the mutation.



[Adapted from *Torrance*]

The dosage of x-rays has the following relationship to the % of lethal mutations:

A Inversely proportional
B An exponential increase
C Directly proportional
D No pattern of relationship

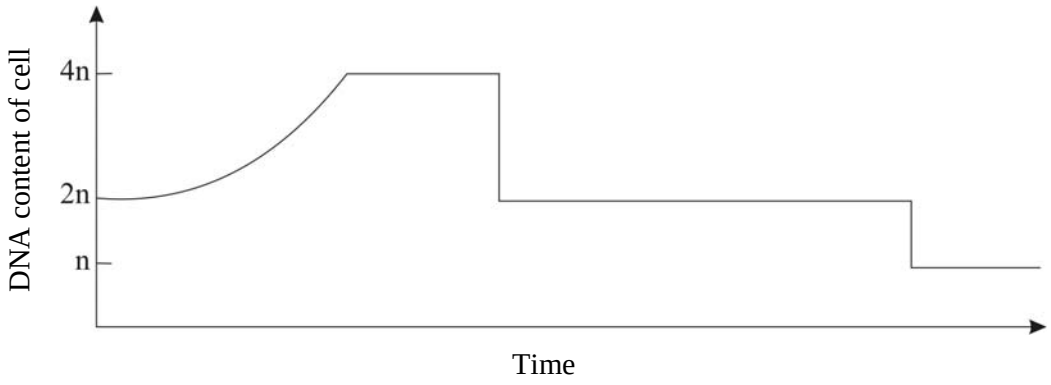
1.3 Fill in a tick on this table to show where the structural component listed in the first column is present, in DNA, mRNA and/ or tRNA.

Nucleic acids

Structural component	**DNA**	**mRNA**	**tRNA**
Deoxyribose sugar			
Guanine, cytosine, adenine			
Thymine			
Uracil			
Phosphate			
Ribose sugar			

(6)

1.4 The following graph illustrates the chromosome complement (number) of a cell during meiosis.



[Adapted from *Pickering*]

1.4.1 Use the letters R, P, M, G and label on the graph:

R – where DNA replication takes place.
P – where homologous pairing occurs.
M – where double stranded chromosomes align themselves in a double row at the equator.
G – where the cells are haploid.

(4)

1.4.2 Draw a diagram of a single pair of homologous chromosomes showing the process of crossing over. Label any 2 structures. Do not draw any other cell structures.

(5)

1.5 The data below resulted from a study conducted in the USA. Use the data and your knowledge of Life Sciences to answer the questions that follow.

Method of contraception	**Effectiveness of method (pregnancies/ 1000 users/ year)**
Male sterilisation	3.5
Female sterilisation	6.0
Hormone implant	3.0
Injectable hormones	10.0
Intra-uterine device	3.0
The pill	5.0
The mini-pill	7.0
Condoms	9.0
A diaphragm	15.0
Vaginal spermicides	17.0
Periodic abstinence	20.0
Vaginal sponge	22.0

[Source: *The Economist*]

1.5.1 Give a heading for the table.

_____ (2)

1.5.2 What was the independent variable in this study?

_____ (1)

1.5.3 What type of graph would you draw to make the results easier to read? Give a reason for your answer.

_____

_____ (3)

1.5.4 Suggest two other variables (factors) that should have been taken into consideration in this study to improve its accuracy. Provide a reason for each of your suggestions.

_____

_____

_____

_____

_____

_____

_____ (4)

1.5.5 Which was the least effective method of contraception?

_____ (1)

1.5.6 Choose one of the most successful methods of contraception and explain why you think it was effective.

_____

_____

_____ (2)

1.5.7 Condoms are not rated as very effective in this study, yet their use is being promoted by the Department of Health in South Africa. Why?

_____

_____

_____

_____ (2)

40 marks