



LIFE SCIENCES: PAPER I

EXAMINATION NUMBER

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There are (vi) pages in this booklet.

QUESTION 1

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

1.1 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.

Description	Term
[] A unit of heredity composed of DNA.	A chromatin
[] Half a chromosome, just prior to cell division.	B recessive
[] This molecular complex, consisting largely of DNA and proteins can form thread-like structures.	C genotype
[] This indicates that a cell has only one of each homologous pair of chromosomes.	D dominant
[] This refers to the genetic makeup of an organism.	E polyploid
[] This describes the chromosome number in a zygote after fertilisation.	F phenotype
[] Alternate forms of a gene.	G allele
[] This type of gene is often expressed in an organism.	H chromatid
[] This type of gene is not expressed in a heterozygote.	I haploid
[] Observable physical characteristics of an organism.	J gamete
	K diploid
	L gene

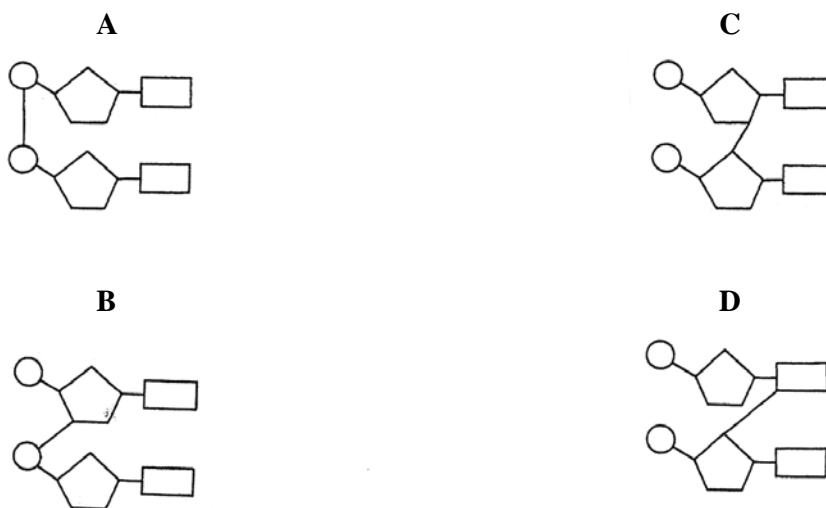
(10)

1.2 Six multiple choice questions are given below. Choose the most correct alternative in each question and write its letter in the space provided in the table.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer						

(6)

1.2.1 Which of the following diagrams shows nucleotides correctly joined together?



1.2.2 Which of the following is a base pair normally present in DNA?

- A adenine and cytosine
- B guanine and adenine
- C thymine and guanine
- D thymine and adenine

1.2.3 Refer to the table below to answer this question.

Cell type	Average mass of DNA per cell ($\times 10^{-12}$)
sperm	3.35
kidney	6.70
lung	6.70

The average mass of DNA present in an ovum of the species referred to in the table above would be ...

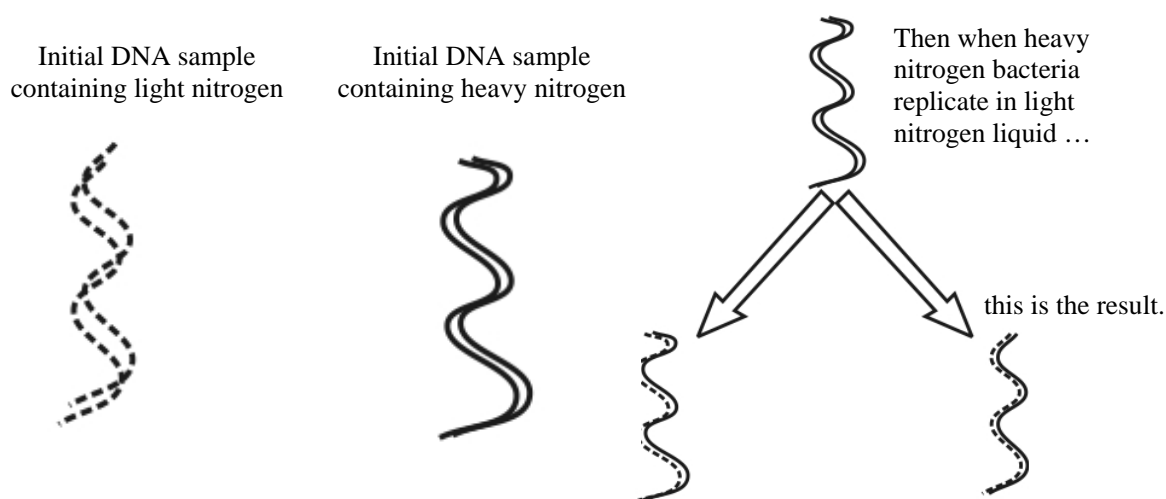
- A 3.35×10^{-6}
- B 6.70×10^{-6}
- C 3.35×10^{-12}
- D 6.70×10^{-12}

1.2.4 If 30% of the bases in a DNA molecule are adenine, what percentage of the bases are guanine?

- A 15%
- B 20%
- C 30%
- D 40%

Observe the following diagrams of an experiment and use this to answer questions 1.2.5 and 1.2.6.

DNA replication can be shown by using two isotopes (radioactive markers) of nitrogen; 'light' nitrogen (^{14}N) and 'heavy' nitrogen (^{15}N). Bacteria are grown in a liquid in separate test tubes containing 'light' or 'heavy' nitrogen. As the bacteria reproduce they absorb nitrogen from the liquid in the test tubes.



[Adapted from *AS level Biology Exam Board – OCR The Revision Guide*]

1.2.5 Nitrogen can be used as a marker in this experiment as it is ...

- A an element found in all organic molecules.
- B an element found in DNA bases.
- C found in the membranes of bacteria.
- D found in deoxyribose sugars.

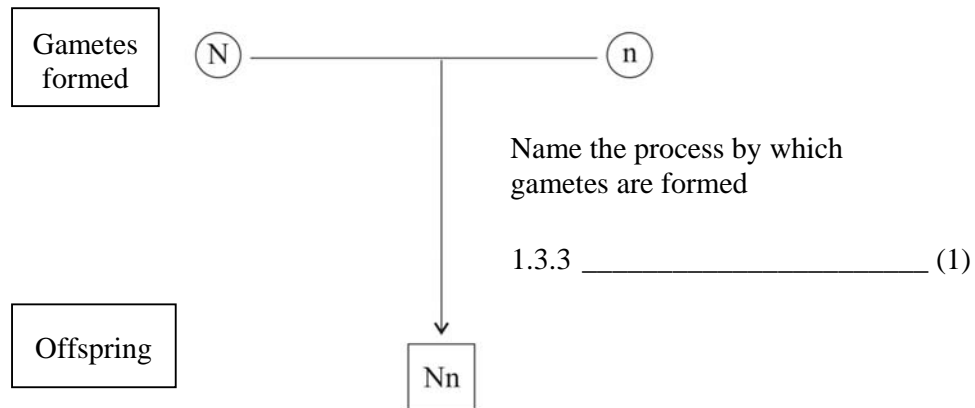
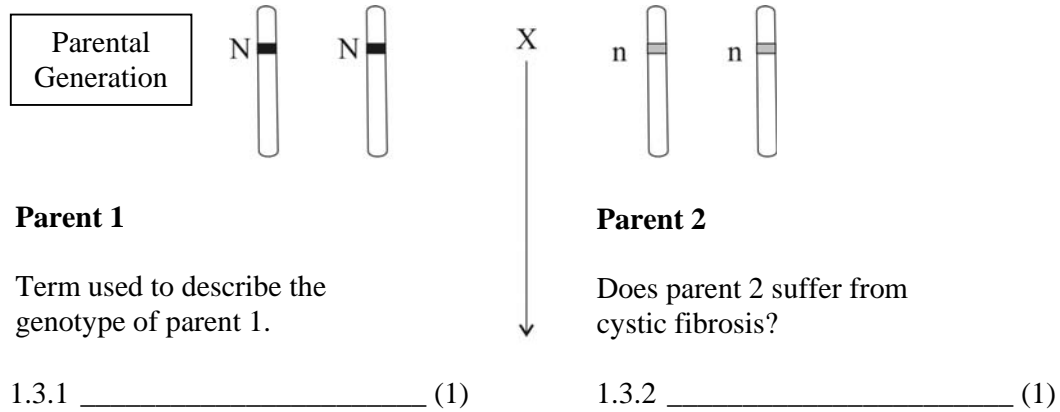
1.2.6 This experiment shows that when DNA replicates ...

- A two entirely new DNA strands are formed.
- B the DNA strands formed have half of the original DNA components and half new components.
- C the original DNA strands reorganise themselves to form new strands.
- D the 'heavy' and 'light' nitrogen enables protein synthesis to take place.

1.3 Cystic fibrosis is a human disease caused by a faulty (mutant) gene on chromosome 7.

Fill in the answers as required on this diagram.

The gene for the normal condition (no disease) is represented as N
 The gene for cystic fibrosis disease is represented as n



Describe the genotype and phenotype of the offspring

Name the generation represented by the offspring

1.3.4 genotype _____ (1) 1.3.6 _____ (1)

1.3.5 phenotype _____ (1)

1.3.7 Mark with an F the point on the diagram which represents fertilisation. (1)

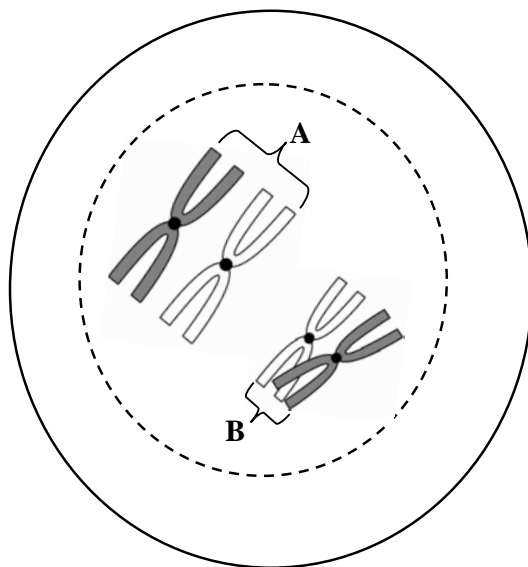
1.3.8 One of the offspring reproduces with a person with the same genotype. Give a ratio of the possibility of whether their children will suffer or not suffer from cystic fibrosis.

_____ (2)

1.3.9 Use information from the processes shown on the previous page (in the genetics diagram) to explain why the ratio you have given in the question 1.3.8 is a probability and not an accurate prediction.

 _____ (4)

1.4 **Diagram to show an animal cell during meiosis.**



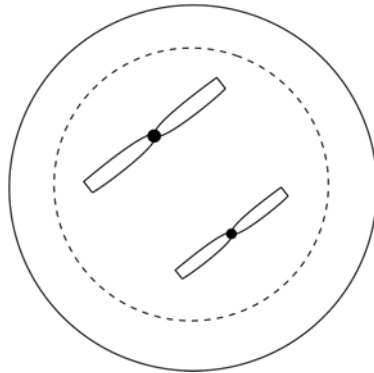
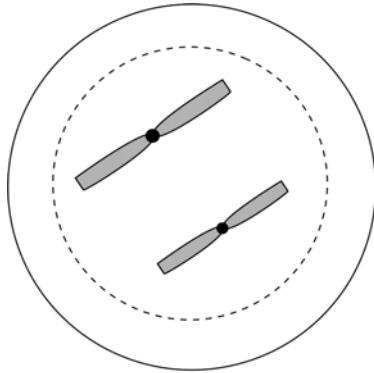
1.4.1 Would you see the structures A and B as shown in the diagram above, with the naked eye, or with a microscope?

_____ (1)

1.4.2 Name the pair of structures at A _____

and the process taking place at B _____ (2)

- 1.4.3 Here are two of the cells that could result from the animal cell shown in 1.4 at the end of meiosis. Draw the remaining cells at the same level of detail.
Do not include labels.



(8)

40 marks