NATIONAL SENIOR CERTIFICATE EXAMINATION
EXEMPLAR 2008

LIFE SCIENCES: PAPER II

EXAMINATION NUMBER

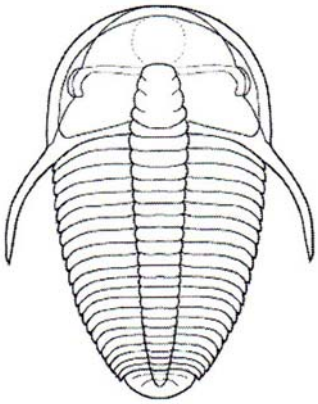
THERE ARE 8 PAGES IN THIS BOOKLET

QUESTION 1

Answer these 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

The diagram below shows a trilobite. Trilobites are an extinct group of marine arthropods. Trilobites have been well studied due to the abundance of fossils. Trilobites have a tough exoskeleton (skeleton on the outside of their bodies) and their bodies and legs are divided into segments. They were distributed worldwide and occupied a variety of habitats. They existed for almost 300 million years before becoming extinct around 250 million years ago.



Nepea

[<www. trilobites.info/drawing.htm>]

1.1.1 How long ago did the first trilobites appear?

_____ (1)

1.1.2 Suggest one reason why trilobite fossils are abundant.

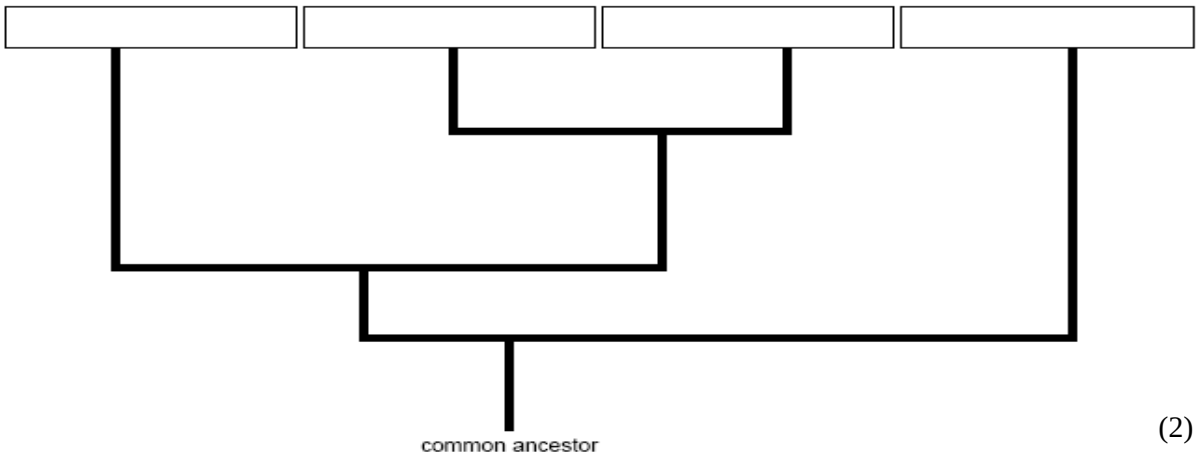
_____ (1)

1.1.3 Suggest one reason why all species of trilobites became extinct.

_____ (1)

Trilobites are thought to be closely related to three other groups of fossil arthropods: helmetids, tegopeltids and naraoids. The tegopeltids and helmetids are the two most closely related groups. These two groups are more closely related to the trilobites than they are to the naraoids. The diagram below shows the evolutionary relationships amongst these four groups

1.1.4 Using the information provided above, write the names of the trilobites, tegopeltids, helmetids and naraoids in the blocks at the top of the diagram, to show their evolutionary relationships.



(2)

1.2 The diagrams on page 3 show two possible family trees and the evidence used to construct them.

1.2.1 Identify two differences between the family trees shown on page 3.

_____

_____

_____

_____ (4)

1.2.2 Name two other types of evidence that scientists could use to construct family trees of this type.

_____

_____ (2)

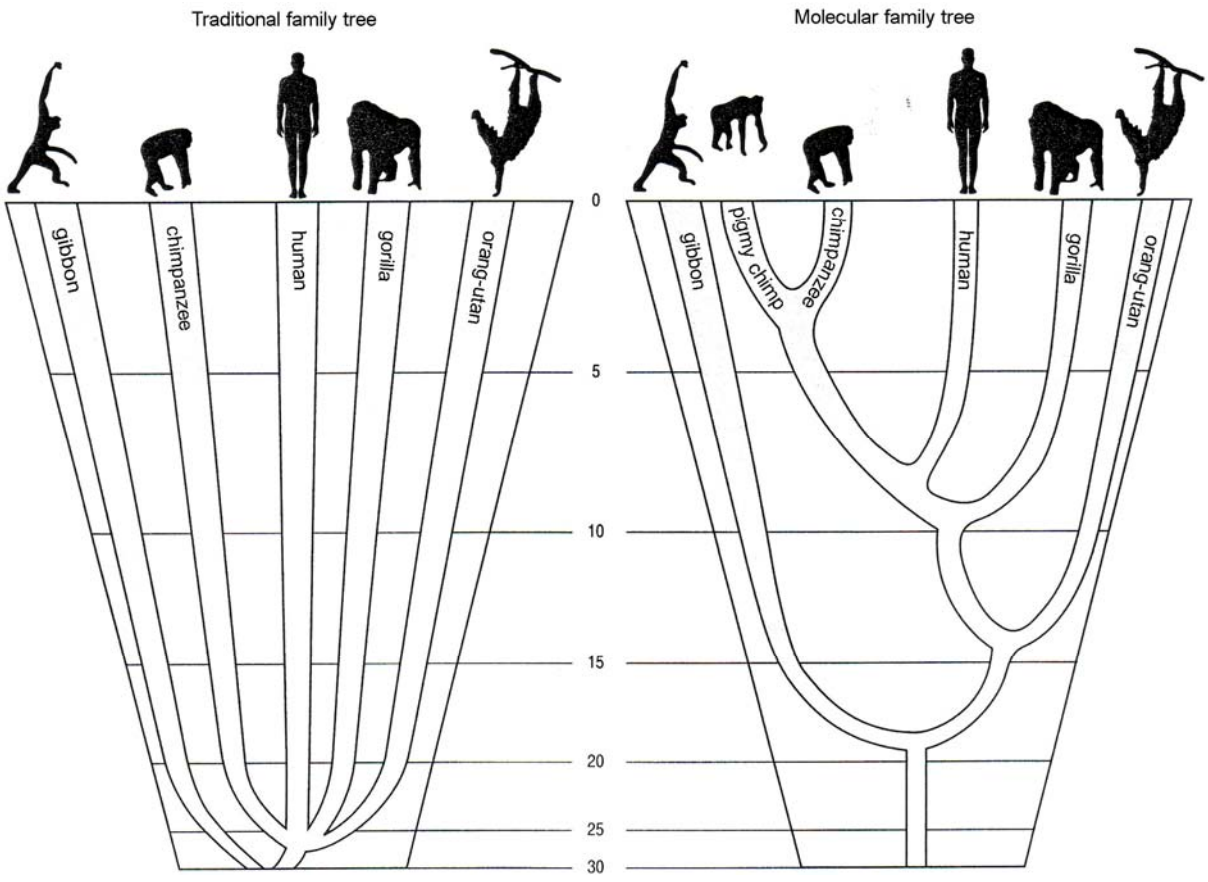
1.2.3 Which evidence, do you think, is the most reliable for constructing family trees? Give your reasons.

_____

_____

_____

_____ (5)



The traditional family tree shows very early branching

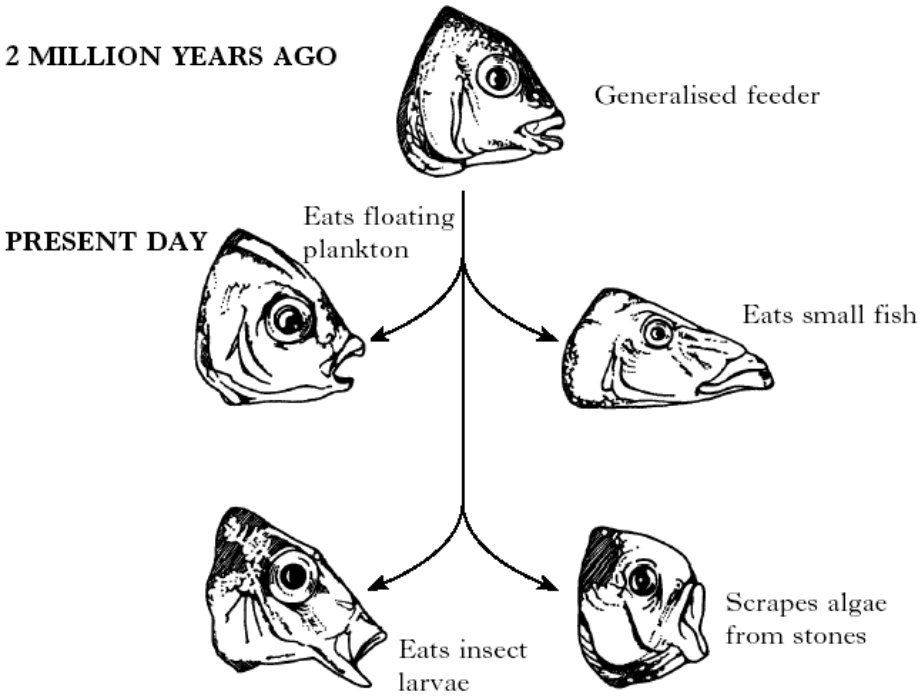
The molecular tree shows more recent divergence (branching) and that humans are close relatives of the African apes

Family tree 1 (Traditional)	Family tree 2 (Molecular)
This is based on anatomical differences. All five have bodies covered with hair but hairy covering is longer in gorillas and chimpanzees. Gorillas and chimpanzees walk on all four limbs, humans walk on two legs. Gorillas and chimpanzees have short legs and long arms, swing through trees and walk on their knuckles. Humans have long legs and shorter arms with hands that have very flexible digits (fingers).	This is based on analysis of the organism's DNA, using DNA sequencing, mitochondrial DNA sequencing and DNA hybridisation. • DNA Sequencing = DNA fingerprint of nuclear DNA • Mitochondrial DNA sequencing = DNA fingerprint of DNA in mitochondria • DNA hybridisation = replication of tiny amounts of DNA to collect enough to do DNA sequencing

[Adapted from *Clegg*]

1.3

Today, the lakes in a certain part of East Africa contain a variety of *Cichlid* fish species. The drawings show the evolution of a group of these *Cichlid* species together with information on their food sources.



[Adapted from *SQA*]

1.3.1 What type of radiation is shown in the diagram above? Give a reason for your answer.

_____

_____

_____ (2)

1.3.2 What advantages do the *Cichlid* species gain from being specialised feeders?

_____

_____ (3)

1.3.3 Name two events which would have to occur to allow the speciation of the *Cichlid* fish to take place.

_____ (2)

1.4

Cereal crops produce grains which can be ground into flour (used to make bread). Rye, *Secale cereale*, is a cereal crop which is widely grown, particularly in northern hemisphere countries such as Europe. Rye is believed to have originated over 2 500 years ago in Asia from a wild species (*Secale ancestralis*).

As the cultivation of wheat, (*Triticum* sp.), spread in Europe, wild rye accompanied it. Wild rye grains were often mixed with wheat grains and farmers planted both together. The ability of wild rye to grow well in infertile, stony soils and to resist frosts and drought better than wheat resulted in rye plants surviving in areas where wheat could not grow. Rye became the only cereal crop in cold stony soils. Today, artificial selection of rye plants has produced varieties with increased yields.

[Adapted from *Kent*]

1.4.1 Name the selection pressures that benefit (encourage) wheat cultivation.

(4)

1.4.2 A Land Bank programme proposes that people in rural villages plant communal (shared) cereal fields in an attempt to meet their own bread demands.
If you were a person living in a rural village in South Africa, which cereal (Wheat or Rye) would you plant? Explain your reasons.

(6)

1.5 Seven 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	1.5.1	1.5.2	1.5.3	1.5.4	1.5.5	1.5.6	1.5.7
Answer							

1.5.1 The human embryo and all other vertebrate embryos have gill slits. This best supports the idea that

A fish are our closest relatives.
B the human embryo, like fish, can breathe underwater.
C all vertebrates are related.
D humans are evolved directly from fish. (1)

1.5.2 Why are all living hominids classified as the species *Homo sapiens*?

A There is a similarity of appearances in individuals.
B There are only slight differences in the shape of the skull.
C There are only slight differences in texture and distribution of body hair.
D They can all interbreed and produce fertile offspring. (1)

1.5.3 Which of the following is NOT an example of natural selection in action?

A Development of pedigree strains of Scottish terrier dogs.
B Increasing number of rats in a population that thrive on warfarin (blood thinning) poison.
C Resistance of certain types of bacteria to penicillin.
D Survival of mutant head lice treated with insecticide. (1)

1.5.4 There is little fossil evidence of the earliest forms of life because the organisms

A decayed quickly in the oxygen-rich atmosphere.
B did not have hard parts which would fossilise easily.
C evolved so quickly that they left few remains.
D lived in water and were not preserved. (1)

1.5.5 Rabbits were introduced into Australia by early European settlers, after which they rapidly increased in numbers. The viral disease, myxomatosis, was deliberately introduced into Australia in the early 1950s in an attempt to control rabbit populations. The following table shows the results from an investigation using rabbits selected each year from wild populations and injected with the original disease-causing strain of the virus.

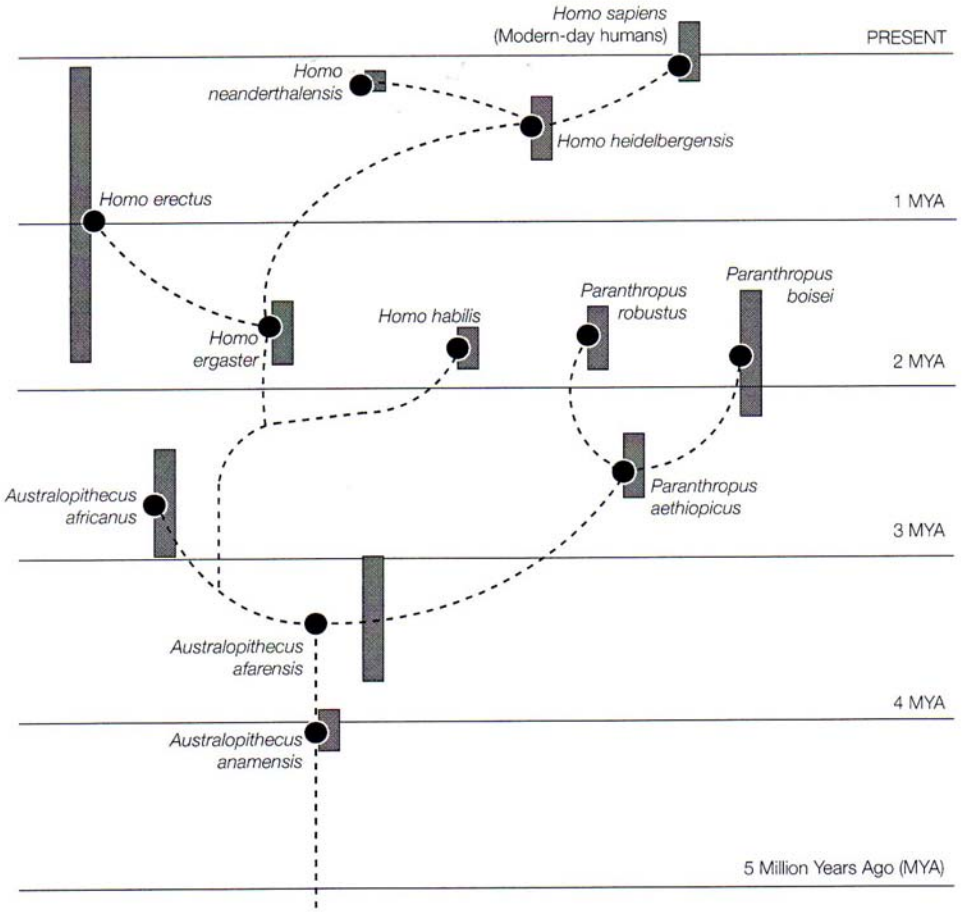
Year	**% population suffering from fatal symptoms**
1952	93
1953	95
1954	93
1955	61
1956	75
1957	54

These results in the table above support the theory that

A over the years, an increasing number of genetically resistant rabbits survived.
B natural selection occurred between 1955 and 1957 with a peak in 1956.
C the virus which causes myxomatosis underwent a mutation each year.
D rabbits acquired an immunity to the disease in 1956 only. (1)

Refer to the diagram below for questions 1.5.6 and 1.5.7.

The diagram shows one interpretation of the origin of humans. The dotted lines indicate possible evolutionary relationships and the solid black vertical lines show the period from which fossils are known for each species.



[Adapted from *VSE*]

1.5.6 The diagram suggests that

A *Homo habilis* is an ancestor of modern humans.
B *Homo sapiens* is descended from *Parathropus aethiopicus.*
C *Homo erectus* became extinct before modern human appeared.
D *Australopithecus species* may have given rise to modern humans. (1)

1.5.7 The diagram suggests that *Homo sapiens* existed at the same time as

A *Homo ergaster*.
B *Homo heidelbergensis.*
C *Homo neanderthalensis.*
D *Australopithecus africanus.* (1)

40 marks