education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MARKS: 150

This memorandum consists of 12 pages.

SECTION A

Question 1

1.1
1.1.1 B✓✓
1.1.2 A✓✓
1.1.3 C✓✓
1.1.4 D✓✓
1.1.5 B✓✓

5 x 2 = **(10)**

1.2
1.2.1 corpus luteum✓
1.2.2 alleles✓
1.2.3 pollination✓
1.2.4 amniocentesis✓
1.2.5 testis✓
1.2.6 oogenesis✓
1.2.7 mitosis✓
1.2.8 homologous✓

(8)

1.3
1.3.1 C✓
1.3.2 A✓
1.3.3 H✓
1.3.4 B✓
1.3.5 D✓

(5)

1.4
1.4.1 A - Umbilical cord✓
   B - Placenta✓   (2)

1.4.2 - Has folds✓/villi to enlarge the surface area✓
      - Enriched with blood vessels✓for transport of gases✓/nutrients/
        waste products
      - Selective permeable membranes✓ to promote diffusion of gases✓/
        substances
      - Contains blood sinuses✓ to bring blood of mother in close
        association with that of foetus✓
      - interdigitated✓ to anchor foetus✓
      (***Mark first ONE only***)   any 1 x 2   (2)

1.4.3 - acts as a shock absorber✓/prevents mechanical damage
      - prevent great variation in temperature ✓
      - allows for movement of the foetus✓
      - passes out before birth to lubricate the birth canal✓
      (***Mark first TWO only***)   any   (2)

1.4.4 Foetal alcohol syndrome✓   (1)

1.4.5 Causes
- mental retardation✓
- slow growth✓
- abnormalities of skull and face✓
- organ malfunction✓ any (1)
(8)

1.5
1.5.1 The percentage of X chromosomes with lethal mutations increases/
decreases✓ when the dosage of X-rays increases/decreases✓
OR
A change in the amount of X-rays✓ has no effect on the percentage X
chromosomes with lethal mutations✓ (2)

1.5.2   Radiation✓/Amount of X-rays (1)
(*Mark first ONE only)*

(1)

1.5.3 4✓

1.5.4 Use chromosomes from the same species✓
Use X chromosomes only✓
Time exposed to radiation✓
Environmental conditions✓e.g. temperature, CO_2, O_2 and humidity
Ensure that no lethal mutations present before the investigation✓
(Mark first TWO only)
any (2)

1.5.5 An increase in the amount of radiation of X-rays✓ leads to an increase
in the percentage of X chromosomes showing lethal mutations✓
OR
A decrease in the amount of X-rays✓ leads to a decrease
in the percentage of X chromosomes with lethal mutations✓ (2)

1.5.6 Take many readings✓ at each X-ray amount and find the average✓
reading
(2)
(10)

1.6

1.6.1　AB✓　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(1)

1.6.2　Represent separate/discrete/different✓ entities✓ /blood groups/units

OR

　　　Discontinuous ✓ variable ✓

OR

　　　No ✓ intermediate groups ✓　　　　　　　　　　　　　　　　　(2)

1.6.3　Frequency of blood groups in a small human population

Blood group	Percentage
AB	5
A	40
B	10
O	45

　　　Caption✓
　　　Column headings✓
　　　Row headings✓
　　　3 or 4 correct percentages✓✓
　　　1 or 2 correct percentages✓
　　　Draw table✓　　　　　　　　　　　　　　　　　　　　　　　(6)
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(9)
　　　　　　　　　　　　　　　　　　　TOTAL QUESTION 1:　50
　　　　　　　　　　　　　　　　　　　　TOTAL SECTION A:　50

　　　　　　　　　　　　　　　　　　Please turn over

SECTION B

QUESTION 2

2.1
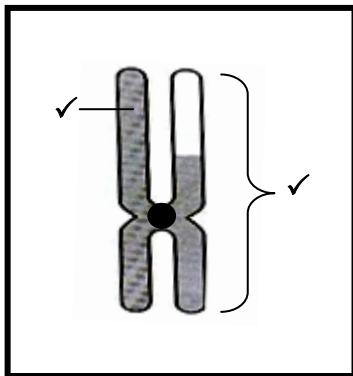2.1.1   A - Chromosome ✓
        B - Centromere✓
        C - Chromatid ✓
        D - Chiasma✓   (4)

2.1.2   Crossing over✓   (1)

2.1.3   Mixing of genetic material✓/variation and gametes are different from
        each other✓   (2)
        (**Mark first ONE only)**

2.1.4   Prophase 1✓   (1)

2.1.5

        Mark allocation:
        Chromosome drawn✓
        Chromosome has shaded and unshaded part in the correct proportion✓
                                                                          (2)
                                                                         (10)
2.2
2.2.1   Translation✓   (1)

2.2.2   Ribosome✓   (1)

2.2.3   (a)   Isoleucine✓   (1)
        (b)   CAG✓/cytosine,adenine,guanine   (1)
        (c)   Codon✓   (1)
        (d)   Have arginine✓ instead of alanine✓/have different✓amino
               acids✓   (2)

2.2.4   GTA✓✓   (2)
                                                                         (9)

2.3

2.3.1 Mouse 2 - XY✓
       Mouse 3 - XX✓   (2)

2.3.2   50%✓   (1)

2.3.3 Mouse 2✓   (1)

2.3.4 A cross between mouse 3 and mouse 4✓produced offspring with
       white✓/recessive coat colour and white colour will only show up if
       both parents have at least one recessive gene✓   any   (2)

                                                                                     (6)

2.4

2.4.1 Sickle cell anaemia✓   (1)

2.4.2 100% – (78+7+10)% = 5✓%

       $\dfrac{5}{100}$ X $\dfrac{1200✓}{1}$

       60✓ people   (3)

2.4.3 - Parents can decide whether to abort foetus or not✓
       - Help prepare parents to manage with such a child✓   any   (1)
       (Mark first ONE only)

                                                                                     (5)

                                                       TOTAL QUESTION 2: 30

QUESTION 3

3.1
3.1.1 - Combating heart diseases✓
  - Improving intelligence✓ (2)
  (Mark first TWO only)

3.1.2 $\left(\dfrac{10}{1\,800}\right)$ ✓ x 100✓

  = 0,55✓% (3)

3.1.3 The gene responsible for producing omega-3 fatty acids is located✓
  in the DNA of salmon✓/fresh mackerel/tuna
  This gene is cut✓ from the donor organism,
  inserted into a plasmid of a bacterium✓
  Bacteria replicates to form many copies of the gene✓
  These genes are then inserted into the cells of the zygote✓/embryo   any (4)

3.1.4 (a) **Support**
    - Healthier for humans to eat✓/combating heart disease
    - Mass production of healthy fat✓
    - Improves intelligence✓ any (2)
    (Mark first TWO only)
  (b) **Against**
    - Cultural objection to eat meat from pigs✓
    - The sucess rate is very low✓
    - Expensive procedure✓
    - No value for vegetarians✓
    - Objection to eating any genetically modified food✓ any (2)
    (Mark first TWO only)

  (13)

3.2
3.2.1
  - Determine a sample size that would be large enough and
    managable ✓
  - Keep the number of boys and girls the same✓ for every age group
  - Design a table to record the results✓
  - Set up accurate measuring equipment✓
  - Time span to be controlled✓/investigation to be completed in a
    short time
  - Same nutritional status✓/same socio-economic conditions   any (3)
  (Mark first THREE only)

3.2.2 (a) 13,4 – 13,6 years✓ (1)

  (b) Average height of boys and girls✓ of different age groups✓
    between ten and eighteen years   ` (2)

  (c) No/not accept/reject ✓ (1)

(d) The girls are taller✓ than the boys at a younger age✓/
between 10 to 13 years

OR

The boys are shorter✓ than the girls at a younger age✓/
between 10 to 13 years

OR

The boys are not taller than the girls✓ at all age groups✓ (2)

(9)

3.3

P_1/parent   phenotype   Brown x blue eyes✓
          genotype   Bb x bb✓

Meiosis

G/gametes   B,   b x b✓

Fertilisation   **OR**

gametes	B	b
b	Bb	bb
b	Bb	bb

1 mark for correct gametes
1 mark for correct genotypes

F_1/offspring genotype Bb and bb✓
          phenotype Brown and Blue✓

Ratio: 1:1 ✓
Parents and offspring✓
Meiosis and fertilization✓

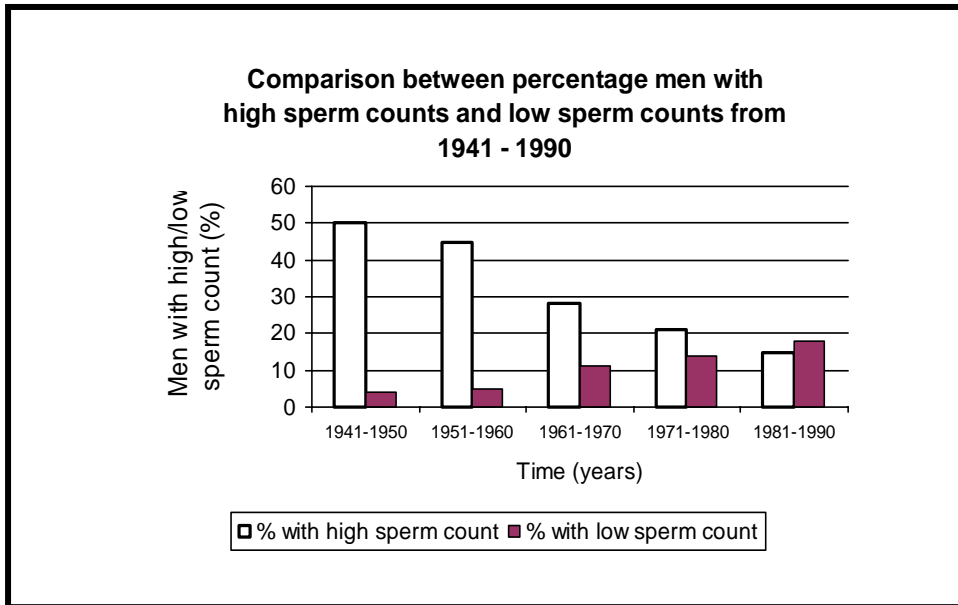**(8)**

TOTAL QUESTION 3:   30

TOTAL SECTION B: 60

SECTION C

Question 4

4.1

4.1.1   17✓%   (1)

4.1.2

**Comparison between percentage men with
high sperm counts and low sperm counts from
1941 - 1990**

Y-axis: Men with high/low sperm count (%)
X-axis: Time (years)

Legend: □ % with high sperm count ■ % with low sperm count

Rubric for the mark allocation of the graph

Correct type of graph	1
Title of graph	1
Correct label and units for X-axis	1
Graphs labelled/key provided for 2 graphs	1
Correct label and units for Y-axis	1
Appropriate width and interval of bars	1
Appropriate scale for Y-axis	1
Drawing of the graphs	1: 1 to 3 bars plotted correctly 2: 4 to 6 bars plotted correctly 3: 7 to 9 bars plotted correctly 4: all 10 bars plotted accurately

(11)

NOTE:

If the wrong type of graph is drawn: marks will be lost for 'correct type of graph'
If graphs are not drawn on the same system of axes, mark the first graph only
using the given criteria

4.1.3   The percentage of men with low sperm counts has increased✓ from
1941 - 1990
The percentage of men with high sperm counts has decreased✓ from
1941 to 1990   (2)

4.1.4 To increase chance of fertilisation✓ since there is a reduced
number of egg cells✓

OR

Many millions of sperms increase the chances of fertilization✓
since many sperms are destroyed✓/ get lost (2)

4.2
4.2.1 Fertilisation✓ (1)

4.2.2
Couple could not conceive normally due to any of the following:
Man has low sperm count/ infertile✓
Blocked Fallopian tubes✓
Irregular menstrual cycles✓
Imbalance of the hormones concerned with ovulation✓
Sexually transmitted diseases✓ any (2)
(Mark first TWO only)

4.2.3 (a) Ethical since it allows couples to have children✓ if one of
them might be infertile✓

OR

Unethical since only those that are rich✓ would be able to
take advantage of the opportunity✓ any 1 x 2 (2)

(b) Ethical since it can be used to develop treatment✓ for
defects in foetuses✓

OR

Unethical since this is experimentation✓ with human life✓ any 1 x 2 (2)

4.2.4 IVF involves fusion of 2 haploid nuclei✓/gametes
whereas in cloning no fusion takes place✓/diploid nucleus
from a somatic cell is used.

OR

IVF can lead to variation✓ in the offspring
whereas cloning produces identical✓ offspring

OR

IVF 'mimics'natural sexual reproduction✓
whereas cloning no sexual reproduction✓ (2)
(Mark first ONE only)

Possible answers for the mini essay

Contraceptive methods and the effect on human reproduction

Method	Affect on human reproduction
Condom✓	Acts as a barrier✓/stops sperm getting into the vagina✓
Loop/IUD✓	It prevents fertilised eggs✓/embryos from becoming attached to the uterine wall✓ and is highly effective
Femidom✓	Acts as a barrier✓ /stops sperm getting into the uterus✓/Fallopian tubes
Diaphragm✓	It covers the cervical opening✓ and prevents sperm from entering the uterus✓ and is fairly effective.
Contraceptive pill✓	Contains artificially produced hormones which prevents the production of eggs✓/ovulation/signalling the body that it is already pregnant. It changes the lining of the cervix✓/ womb. It is a very reliable method
Spermicides✓	It contains a chemical substance that kills sperm✓ and acts as a barrier✓/prevents sperm from entering the Fallopian tubes. They are not very reliable on their own.
Contraceptive injections✓	It contains progesterone✓/combination of oestrogen and progesterone which stops ovulation✓/ changes the lining of the womb and the cervix. It works for 2 to 3 months and are very effective.
Male sterilisation✓ - vasectomy	The sperm ducts are cut✓ and tied. Semen without sperm is produced✓ and is a very effective method of contraception.
Female Sterilisation✓ - tubal ligation	The fallopian tubes are cut✓ and tied during a small surgical operation preventing the fusion of sperm and egg. ✓
Withdrawal✓	The penis is removed✓ out of the vagina before ejaculation✓ but is not a safe method because many sperms are released during sexual intercourse
Rhythm✓	Sexual intercourse is avoided✓ during ovulation✓ but is not a safe method of contraception because it is impossible to be 100% sure when ovulation will occur

(Mark first THREE only)   any   3 x 3   (9)

The influence on the quality of human life

Limits family size✓/unwanted pregnancies
- which allows better care for the children✓ higher standard of living✓/
  less dependant on debt/ more psychologically stable children

Prevents the transfer of STD's✓
- the use of e.g. condoms can increase life span✓ and decrease✓ the spread
  of diseases to other people

Might cause conflict
- e.g. the use of IUD could be seen by some people as a form of abortion✓ which may not be acceptable to some religions ✓
    (Mark first ONE only)   any   1 x 3   (3)

Synthesis

Description	Marks
Not attempted	0
Significant gaps in the logic and flow of the answer	1
Minor gaps in the logic and flow of the answer	2
Well structured – demonstrates insight and understanding	3

(3)
(15)
TOTAL QUESTION 4:   40

GRAND TOTAL: 150