SENIOR SECONDARY IMPROVEMENT PROGRAMME 2013

education

Department: Education

GAUTENG PROVINCE

GRADE 12

LIFE SCIENCES

TEACHER NOTES

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TEACHER NOTES

SESSION 12

TOPIC: LIFE PROCESSES IN PLANTS AND ANIMALS – GENERAL REPRODUCTION AND PLANT REPRODUCTION

Teacher Note: Please make sure that the learners know and understand:

- Definition and difference between sexual and asexual reproduction.
- Types of asexual reproduction for vegetative structures from stems, leaves and roots.
- Alterations of generations
- Plant life cycles for the moss and angiosperm
- Difference between complete and incomplete metamorphosis
- Diagram of the amniotic egg and the difference between Precocial and Altricial development.

Please ensure that the learners adhere to the time limits for each question. This is so that they learn to work quickly and efficiently.

LESSON OVERVIEW

1. Typical exam questions: 57 minutes
2. Review/solutions/memo: 33 minutes

SECTION A: TYPICAL EXAM QUESTIONS

**QUESTION 1:** **25 minutes** *(Taken from various sources)*

1.1. Discuss the importance of seeds as a food source. (4)
1.2. Name four types of stems that are organs of asexual reproduction and include an example of each. (8)
1.3. Tabulate the advantages and disadvantages between sexual and asexual reproduction. (10)
1.4. Briefly describe the difference between self-pollination and cross pollination. (3)

> **HINT:** Remember that marks are allocated for drawing the table and placing the headings into the appropriate blocks. Always make sure that you compare the same type of characteristic in each point, and take careful note of the mark allocation.

[25]

QUESTION 2:   **10 minutes**   *(Viva Life Sciences Grade 12)*

The diagram below represents the life cycle of a butterfly.
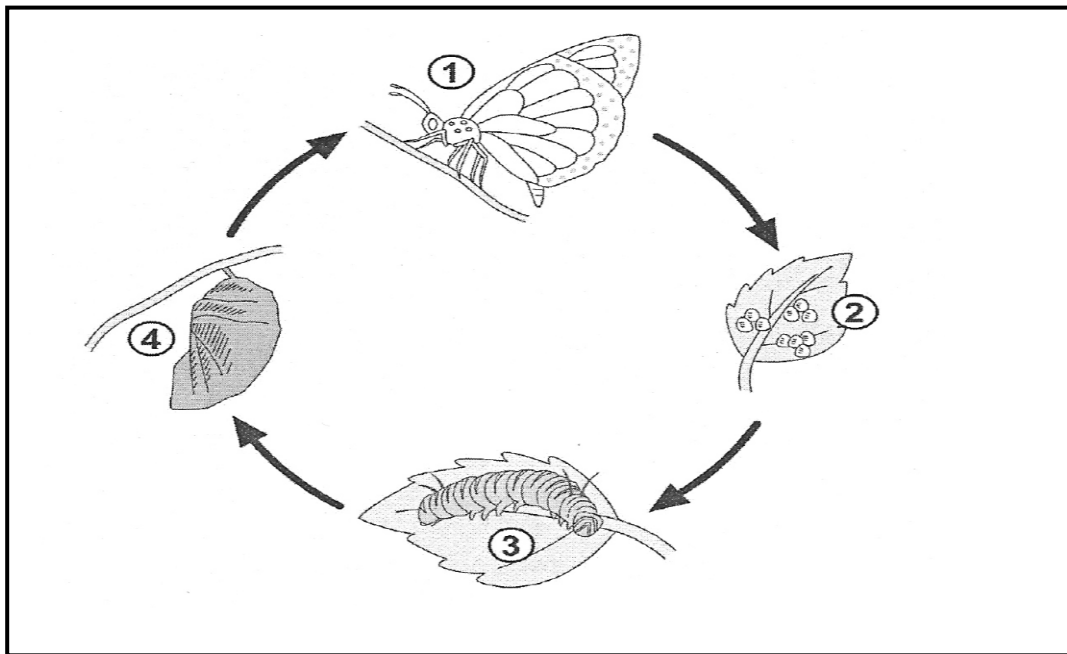
2.1.   Name the type of metamorphosis shown in this diagram. Explain your answer.   (4)
2.2.   Label the stages numbered 1 to 4.   (4)
2.3.   Explain the major difference between complete and incomplete metamorphosis.   (4)
                                                                                                                                    [12]

QUESTION 3:   **22 minutes**   *(Modified from Study and Master old Grade 11 syllabus)*

The following diagram represents a section through an amniotic egg:
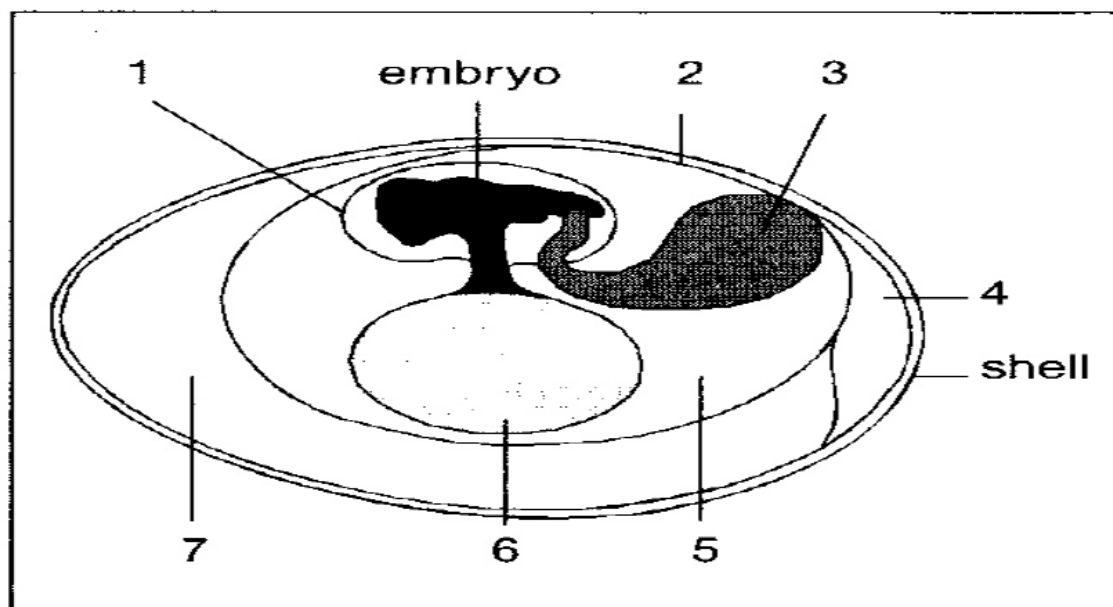
> **HINT:** Learners must make sure that they learn the diagrams, and write the function next to each label on the diagrams. In a test or an exam, they must first write the labels on the diagram before they proceed with the questions.

3.1.	Identify the membrane numbered 1.	(1)
3.2.	What fills the space between the developing embryo and the membrane mentioned in QUESTION 3.1, and what is its function?	(2)
3.3.	Which number represents the allantois? State one function of this structure.	(2)
3.4.	Identify the membrane numbered 2, and state its function.	(2)
3.5.	Did internal or external fertilisation occur to produce the structure in the diagram?	(1)
3.6.	Explain the difference between viviparous and oviparous embryo development.	(8)
3.7.	Briefly explain the meaning of the terms:	
	a) precocial young	(3)
	b) altrical young	(3)
		[22]

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1.
- Seeds are an important source of food for humans, animals and birds. ✓
- Peas, soya beans, lentils, oats, nuts and green beans are a rich source of proteins. ✓
- Cereals, like wheat, maize and rice, are the staple diet food for many people and are often grown as a monoculture. ✓
- Sorghum is used in the production of traditional and commercial beer. ✓
- Sunflower and peanut seeds are used to produce cooking and salad oils. ✓

(any 4) (4)

1.2.
- Rhizomes ✓ e.g., grasses or any relevant example ✓
- Tubers ✓ e.g., the potato / sweet potato ✓
- Bulbs ✓ e.g., the onion or any other relevant example ✓
- Stolons /runner ✓ e.g., strawberry plants / Hen and Chicken plant or any other relevant example ✓

(4 x 2) (8)

1.3.

	Sexual reproduction	**Asexual reproduction**
Advantage	• The recombination of the chromosomes during **meiosis** ✓ and the random fusion of gametes during fertilisation ✓ results in offspring that show **genetic variation** ✓	• Asexual reproduction is ideal for producing large numbers ✓ of identical offspring ✓ with **desirable genetic characteristics**, from one selected parent ✓
Disadvantage	• Male and female gametes may be prevented from fusing – so no offspring will be produced ✓ • Genetic mutations may result in undesired characteristics in the offspring ✓	• Offspring are identical to the parent and show **no genetic variation** ✓

Plus 1 mark for correct headings/table   (10)

1.4.
- **Self-pollination** is the transfer of pollen from the anther to a receptive stigma of the **same flower** ✓ or the receptive stigma of a **flower on the same parent plant** ✓
- **Cross-pollination** is the transfer of pollen from the anther of one plant to the receptive stigma of a flower on **another plant** ✓ of the same species.   (3)

[25]

QUESTION 2

2.1.   Complete ✓ All stages of development are present ✓/ egg (½), larva (½), (✓) pupa (½)and adult (½) (✓) stages are present   (4)

2.2.   1 – Adult butterfly ✓
        2 – Eggs ✓
        3 – Larva ✓
        4 – Pupa ✓   (4)

2.3.

Complete	**Incomplete**
The organism **changes completely** physically, ✓ during the four life stages: **egg, larva, pupa and adult (imago)** ✓	The organism **changes gradually** physically ✓ during the three life stages: **egg, nymph and adult (imago)** ✓

(4)

[12]

QUESTION 3

3.1.   Amnion ✓   (1)

3.2.   Watery fluid ✓that protects the embryo during development ✓   (2)

3.3.   No.3 ✓ respiration / for waste disposal from embryo ✓   (2)

3.4.   Chorion ✓transfers nutrients from the albumen to the embryo ✓   (2)

3.5.   Internal fertilisation ✓   (1)

3.6.   **Viviparous:** the embryo develops **inside the uterus** ✓.A placenta nourishes the embryo ✓. The female **gives birth** to **live** young ✓when the **gestation period** is complete ✓

   Oviparous: eggs with shells are **laid** ✓outside the female's body ✓into a nest and continue to develop in the egg ✓, **hatching** when development is complete ✓ (8)

3.7.   **Precocial:** young are mature ✓and able to move directly after birth or hatching ✓ They are able to fend for themselves ✓and feed without parental care ✓
                                                                          (any 3)   (3)
   Altricial: young are born helpless ✓cannot protect ✓, feed themselves ✓or fend for themselves ✓   **(any 3)**   (3)
                                                                                              [22]

SECTION C: HOMEWORK

QUESTION 1:   **12 minutes**   *(Various sources)*

Select the correct answer from options A, B, C or D in the questions below:

1.1.   The testa of the seeds of Angiosperm develops from the…
   A placenta
   B integument
   C ovary wall
   D endosperm

1.2.   Fertilisation in Angiosperms is known as 'double fertilisation' because:
   A pollination of the stigma as well as fertilisation of the ovum occurs
   B two male gametes are found in the pollen tube
   C the ovum and one of the antipodal cells are fertilised
   D the ovum and the primary endosperm cells are fertilised

1.3.   The endosperm of the Angiosperms is the…
   A haploid tissue of the embryo sac
   B diploid product of fertilisation
   C diploid tissue of the ovary
   D nutritional tissue for the embryo

1.4.   The two essential reproductive parts of a flower are…
   A pistil and stamens
   B corolla and ovary
   C calyx and corolla
   D corolla and stamens

Questions 1.5 to 1.8 refer to the schematic representation in the life cycle of an angiosperm.
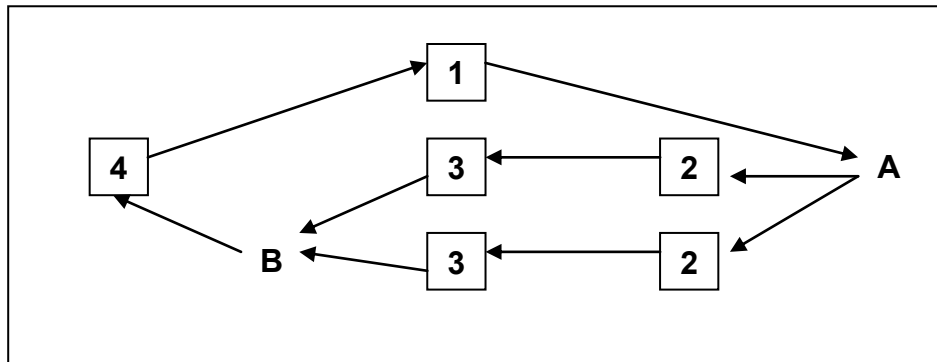
1.5.   If number 1 represents the adult angiosperm and 2 represents the microscopic
        gametophyte, then A must be the…
        A spores
        B gametes
        C seed
        D zygote

1.6.   If the two number 2's are microscopic gametyphytes in the flower then the two 3's
        are…
        A seeds and zygote
        B ova and male gametes
        C spores and pollen
        D two embryos in the seed

1.7.   **B** (in the diagram) restores the diploid number of chromosomes in the …
        A zygote
        B gametes
        C seed
        D spores

1.8.   The structure numbered 4, which develops into the adult angiosperm at 1, is the …
        A zygote
        B spore
        C seed
        D endosperm

1.9.   Plants are said to be more pure in their reproduction than animals. This is because
        plants…
        A reproduce by means of seeds
        B reproduce vegetatively
        C are cross-pollinated
        D have more stable genes

1.10.   The process of pollination is:
        A the transfer of ripe pollen from the anther to a receptive stigma
        B the transfer of ripe pollen from the receptive stigma to an anther
        C is the transfer of ripe pollen to a feeding insect
        D self pollination ensures genetic variation and a larger gene pool

1.11. The following terms have reference to the following vertebrates:
    1. viviparous
    2. oviparous
    3. ovoviviparous

    A Insects, fish and mammals are all oviparous
    B Some reptile, birds and mammals are ovoviviparous
    C All mammals are viviparous
    D All reptiles are oviparous

1.12. How does the gametophyte generation of a plant species differ from the sporophyte generation?
    A It produces the spores
    B It is diploid in all its cells
    C It is always dependent on the sporophyte
    D It is haploid in all its cells   [12]

QUESTION 2:   7 minutes   *(Taken from NSC Life Science November 2009 Paper 1)*

An investigation was done to determine the role of petals in insect pollination in apple flowers. When flowers are self-pollinated, the pollen tubes grow a little into the stigma and style, and fertilisation does not take place.
- 10 flowers with petals and 10 flowers without petals were used.
- After two days the flowers were prevented from further pollination.
- After seven days the extent of pollination and fertilisation was recorded.

The diagrams below show the appearance of the flowers with and without petals.

Flower with petals   Flower without petals
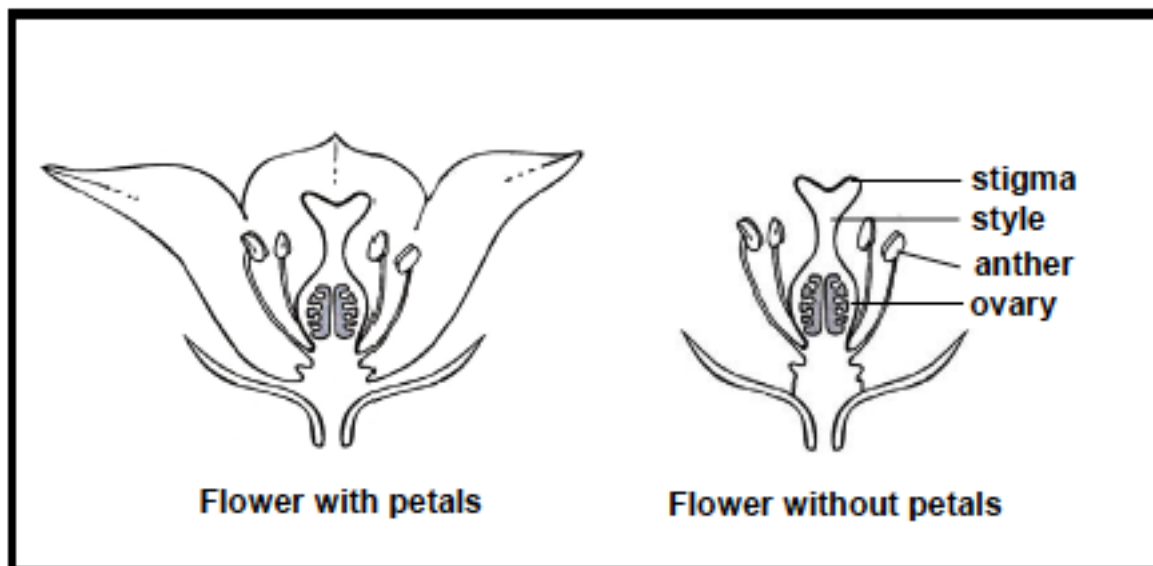
The results are shown in the table below.

	NUMBER	
	Flower with petals	Flower without petals
Pollen on stigma	158	25
Pollen tubes in the style	86	8
Ovules fertilised	38	4

2.1. Give an explanation for the presence of more pollen on the stigmas of the flowers with petals than on the flowers without petals. (2)
2.2. Explain why there are more pollen tubes present in the styles of both types of flowers than the number of ovules fertilised. (2)
2.3. State THREE ways in which this investigation could be improved. (3)
[7]

SECTION D: SOLUTIONS AND HINTS TO HOMEWORK

QUESTION 1

1. B
2. D
3. D
4. A
5. A
6. B
7. A
8. C
9. B
10. A
11. C
12. D

[12]

QUESTION 2

2.1 The flowers with petals attracted more insects✓ for pollination✓ than the flowers without petals/ attracts pollinating✓ agents✓/ pollinators✓✓

OR

The flowers without petals may not have attracted insects✓ for pollination✓/pollinating✓
agents✓/pollinators✓✓

OR

The presence of petals prevents✓ wind from blowing most of the pollen away✓

OR

The absence of petals will allow✓ wind to blow most of the pollen away✓ **(Any 2)**   (2)

2.2   Some of the pollen tubes that developed were from the same flower✓/self-pollination occurred
and only make little growth into the style✓/not all pollen tubes reach the ovary/does not fertilise the ovum/ovule

OR

The contents of some pollen tubes✓ may be non-functional✓

OR

More pollen tubes to increase✓ chances of fertilisation✓   (2)

2.3   Repeat the investigation and use the average✓
Increasing the size of the sample✓
Use the same size flowers✓
Use the same colour flowers✓
Use the flowers of the same apple tree✓
Ensure that all the flowers are pollen-free at the beginning of the investigation✓
The number of flowers with or without petals must be the same✓
Allow the same number of days for pollination✓/prevention of pollination/fertilisation to take place
Keep all environmental factors constant✓
 Increase the period of the investigation✓

Any   (Mark first THREE only)   (7)
[11]

SESSSION 13

TOPIC: HUMAN REPRODUCTION

LESSON OVERVIEW

Teacher Note: Please make sure that the learners know and understand:
- The male and female reproductive systems and all relevant diagrams.
- Definitions of gametogenesis, oogenesis and spermatogenesis.
- The menstruation cycle, events in the ovarian cycle and the uterine cycle.
- Hormonal control of the menstruation cycle as well as the negative feedback mechanisms involved
- Fertilisation process and the implantation process
- Identification and function of the parts of the developing embryo and amnion
- Contraceptive devices as well as STDs (Syphilis and Gonorrhoea specifically).

Please ensure that the learners adhere to the time limits for each question. This is so that they learn to work quickly and efficiently.

1.   Typical exam questions: 56 minutes
2.   Review/solutions/memo: 34 minutes

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1:   12 minutes   *(Taken from NSC Life Science Nov 2009 Paper 1)*

Study the graph below, which shows the menstrual cycle and the influence of the different hormones on it.

Hormonal regulation of the female reproductive cycle
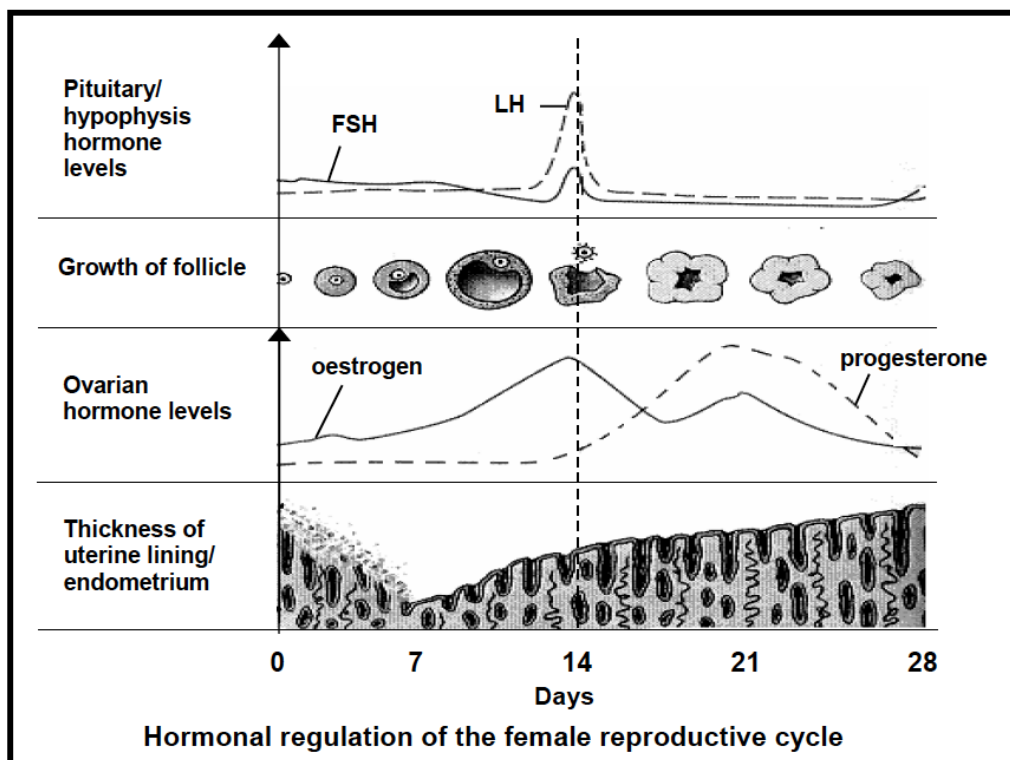
1.1   On which day does ovulation take place?   (1)
1.2.   Between which days does menstruation take place?   (1)
1.3.   State any ONE function of luteinizing hormone (LH).   (1)
1.4.   Describe the changes in the level of LH shown in the graph.   (3)
1.5   Describe the relationship between the level of oestrogen and the
        endometrium from day 7 to day 14.   (2)
1.6.   Explain why it is necessary for the level of progesterone in the blood to
        increase after ovulation.   (2)
1.7.   Did fertilisation take place in the 28-day cycle illustrated in the graph? (1)
1.8.   Explain your answer to QUESTION 1.7.   (2)
                                                                                   [13]

QUESTION 2:   **8 minutes**   *(Taken from the NSC Exemplar 2008 Paper 1)*

The diagram below represents a part of the human female reproductive system after copulation. Study the diagram and answer the questions that follow.

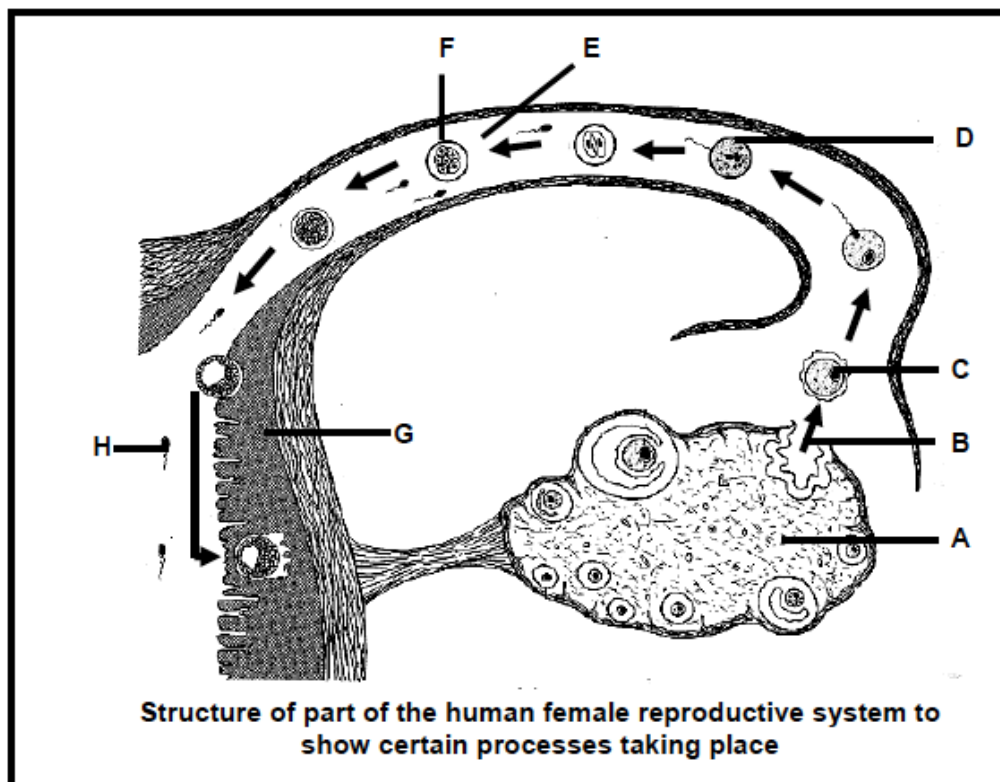Structure of part of the human female reproductive system to show certain processes taking place

2.1.   Give labels for parts A, E and G respectively.   (3)
2.2.   Name the process that takes place at B.   (1)
2.3.   When, during the menstrual cycle, does the process mentioned in
        QUESTION 2.2. take place?   (1)
2.4.   Describe the process represented by D.   (3)
2.5.   Write down the number of chromosomes that would be present in the
        nucleus of the following:
        a)   Cell C   (1)
        b)   One cell of F   (1)
        c)   Cell H   (1)
                                                                                   [11]

QUESTION 3:   **6 minutes**   *(Taken from NSC LS Prep Exam 2008 Paper 1)*

Study the diagram of the developing foetus below.

Diagram of a developing foetus
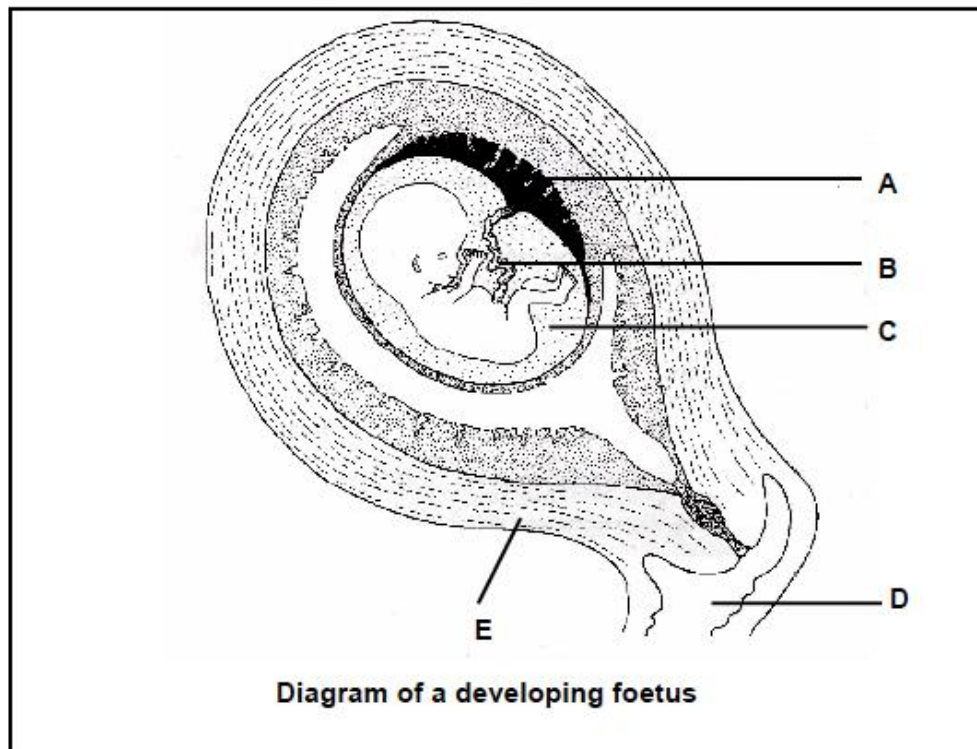
3.1.	Label structures A, B and D.	(3)
3.2.	Give TWO functions of the fluid found in C.	(2)
3.3.	Name the process by which some of the fluid from C is withdrawn by doctors to test for abnormalities in the foetus.	(1)
3.4.	Describe the function of E during the birth process.	(2)
		[8]

QUESTION 4:   **23 minutes**   *(Taken from Viva Life Sciences Grade 12)*

The table shows the results of a survey of the different types of contraceptives used in a particular community:

Method	Number	Percentage
Pill	4321	86,4
IUD	157	3,1
Condom	320	6,4
Injections	112	2,2
Other	90	1,8

4.1	State a hypothesis for this survey.	(2)
4.2	How would you get the information recorded in the table shown here?	(1)
4.3	Which of the method/s represented in the table can be classified as a chemical method?	(2)
4.4	Which method/s represented in the table will prevent the transfer of STDs?	(2)
4.5	Draw a pie graph showing the percentage distribution of the different contraceptive methods. Show all your calculations.	(14)
		[21]

QUESTION 5:   10 minutes

Match column A with the statements in column B:

Column A	Column B
1. uterus	A. the external opening of the vagina
2. Fallopian tube	B. releases the egg cell during ovulation
3. testis	C. produces the hormone testosterone
4. cervix	D. development of the foetus takes place here
5. ovary	E. develops into the Graafian follicle
6. corpus luteum	F. organ enclosed by a scrotum
7. primary follicle	G. secretes progesterone
8. cells of Sertoli	H. provides nutrition of the sperm cells
9. epididymus	I. deposits sperm cells into the female
10. penis	J. transports egg cells from the ovary to the uterus
	K. region in the female that separates the vagina and the uterus
	L. produced by the Cowper's gland
	M. region where the sperm cells mature before release

[10]

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1 Accept day 14 or day 15✓   (1)
1.2 Days   0 - 7✓or 1 - 7 or 0 - 6 or 1 - 6   (1)
1.3 - Stimulates development of Graafian follicle✓
       - Causes the follicle to burst open✓/stimulates ovulation
       - Stimulates the formation of the corpus luteum✓   (1)
       (Mark first ONE only)
1.4 - LH levels remain low✓/more or less constant up to day 12/13
       - Then it increases✓ sharply up to day 14
       - After which it decreases and remains low✓/more or less constant   (3)
1.5 As the oestrogen level increases✓
       the thickness of the endometrium also increases✓   (2)
1.6 Maintains the increase in the thickness✓/blood supply/glandular
       nature of the endometrium
       for greater chances of implantation✓/maintaining pregnancy
                              OR
       Inhibits the production of FSH✓
       preventing further ovulation✓in this cycle   (2)
1.7 No✓   (1)
1.8 The progesterone level✓has dropped✓/ is not maintained
                              OR
       Corpus luteum✓ has started to degenerate✓
                              OR
       FSH✓ level starts to increase✓ towards the end of the cycle   (2)
                                                                                                                 [13]

QUESTION 2

2.1   A- Ovary ✓,   E- Fallopian tube ✓, G- endometrium ✓,   (3)
2.2   Ovulation ✓   (1)
2.3   Day 14/middle of the menstruation cycle ✓   (1)
2.4   Fertilisation ✓, takes place. The sperm ✓(haploid/n) fuses with the
       (haploid/n) egg cell/ovum ✓to form a diploid zygote (2n) ✓ **(any 3 points)**   (3)
2.5   a) 23 chromosomes ✓   (1)
       b) 46 chromosomes ✓   (1)
       c) 23 chromosomes ✓   (1)
       [11]

QUESTION 3

3.1.   A Placenta✓
        B Umbilical cord✓
        D Vagina✓   (3)
3.2   - Acts as a shock absorber✓
        - Regulates embryo's body temp / keeps temp constant ✓   (2)
3.3.   Amniocentesis✓   (1)
3.4.   Oxytocin released by posterior lobe of Pituitary gland✓. Causes uterine
        contractions, push baby out through the birth canal. ✓   (2)
        [8]

QUESTION 4

4.1.   The pill ✓is the most commonly used contraceptive in the community ✓   (2)
4.2.   Design a questionnaire. ✓   (1)
4.3.   The pill and injections✓✓   (2)
4.4.   Condom✓✓   (2)
4.5.   Survey of different types of contraception
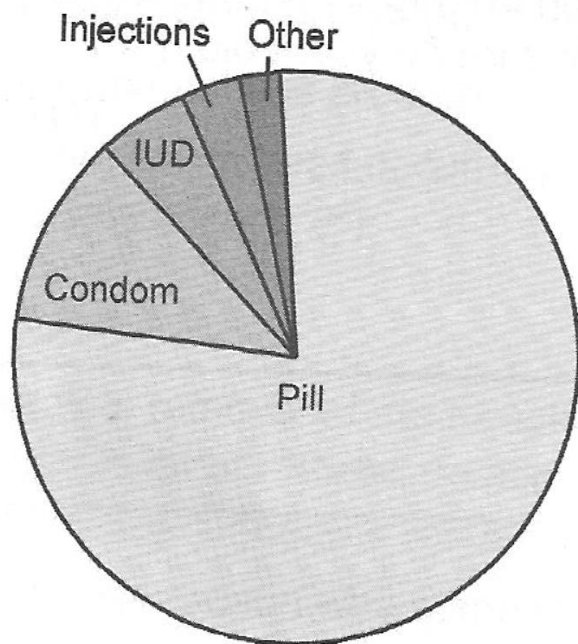
Pill: 86.4%:
$86.4 \times 360 = 31104/100 = 311^0$

IUD: 3.1%:
$3.1 \times 360 = 1116/100 = 11^0$

Condoms: 6.4%:
$6.4 \times 360 = 2304/100 = 23^0$

Injections: 2.2%:
$2.2 \times 360 = 792/100 = 8^0$

Other: 1.8%:
$1.8 \times 360 = 648/100 = 7^0$

Calculations	1 mark for each calculation (5)
Correct type of graph	1
Title / heading is correct	1
Correct proportions for each slice	1 mark for each slice (5)
Each sector is labelled or a key is given	1
Each amount/percentage is indicated on the graph	1

(14)
[21]

QUESTION 5

5.1.	D		5.6.	G
5.2.	J		5.7.	E
5.3.	F		5.8.	H
5.4.	K		5.9.	M
5.5.	B		5.10.	I

[10]

SECTION C: HOMEWORK

QUESTION 1:   20 minutes   *(Taken from various sources)*

1. In mammals, fertilisation takes place in the
   A   Fallopian tubes
   B   vagina
   C   uterus
   D   ovary

2. During the development of the embryo, the function of the amnion is to
   A   give rise to the placenta
   B   protect the embryo against harmful chemical substances
   C   enclose the fluid which protects the embryo against injury
   D   prevent the developing embryo from moving about

3. The following is NOT a function of the placenta of mammals:
   A   transports nutrients to the embryo
   B   removes waste products from the embryo
   C   protects the embryo against mechanical injury
   D   protects the embryo against harmful chemical substances

4. The fusion of an egg cell and a sperm cell is known as
   A   copulation
   B   cleavage
   C   fertilisation
   D   ovulation

5. The human embryo obtains:
   A   nutrients and oxygen from the mother's blood
   B   nutrients and CO_2 by diffusion across the placenta
   C   yolk and albumen from the allantois
   D   nutrients and oxygen by diffusion across the placenta

6. The human foetus is immediately surrounded by the…
   A   allantois
   B   amnion
   C   chorion
   D   placenta

7. The human foetus is surrounded by
   A   amniotic fluid
   B   air
   C   wastes
   D   mother's blood

8.   Fertilisation occurs when the….
    A   sperm penetrates the ovum
    B   sperm makes contact with the ovum
    C   nucleus of the sperm fuses with the nucleus of the ovum
    D   fertilisation membrane has formed around the ovum

9.   Which of the following pairs indicates a reproductive structure and its function accurately?
    A   Fallopian tube – production of sperm
    B   Vagina – fertilisation
    C   Uterus – development of the embryo
    D   Testes – production of the ovum

10.   The main function of the amnion and amnionic fluid is:
    A   shock absorber
    B   medium that removes excretory waste
    C   medium from which oxygen is obtained for the growing embryo
    D   medium in which secretions take place

11.   Which of the following is not an example of a sexually transmitted disease?
    A   Tuberculosis
    B   Syphilis
    C   AIDS
    D   Gonorrhoea

12.   The 'window period' is when the body does not show any signs of infection of the HIV\AIDS virus for up to _____ after initial infection even with blood tests:
    A   7 weeks
    B   6 months
    C   12 weeks
    D   8 months

13.   Gonorrhoea is transmitted through direct sexual contact as well as through contact with toilet seats and towels.
    A   True
    B   False

14.   An AIDS infected person will contract illnesses such as:
    A   flu
    B   pneumonia
    C   TB
    D   all of the above

15.   Contraception pills work effectively because the hormone progesterone in them…
    A   stops the development of the egg cell
    B   prevents the thickening of the endometrium wall
    C   impedes the movement of sperm in the fallopian tube
    D   increases the movement of sperm in the fallopian tube

16.   Mother to child transfer of HIV is an area of great concern. Which of the following statements is true?
    A   HIV is sometimes transferred through the birthing process or breastfeeding
    B   AZT is a drug that prevents the HIV from being passed from the mother to the developing foetus
    C   AZT is administered to the foetus during the first trimester of pregnancy
    D   A Caesarean section is not the preferred method of birth for an HIV positive mother because there is too much blood

17.   Which of the following is the hormone responsible for the birth process?
    A   prolactin
    B   oestrogen
    C   progesterone
    D   oxytocin

18.   Dizygotic twins….
      A   result when one egg cell is fertilisation and separates into two structures
      B   will be identical in genetic inheritance and appearance
      C   result when two or more eggs are fertilisation
      D   will always be the same sex

19.   The following are various forms of contraception:
      (i)   condoms
      (ii)   the pill
      (iii) IUD
      (iv)   abstinance
      (v)   vasectomy

      Which of the following contraception methods will reduce the risk of transferring STDs?
      A   (i), (ii) and (iii)
      B   (i) and (v)
      C   (i) and (iv)
      D   (i), (iii) and (iv)

20   Which of the following statements about abortion is incorrect?
      A   It is the premature and deliberate termination of a pregnancy
      B   Counselling is not necessary once the mother has made her choice
      C   Abortions may only be performed up to 12 weeks of pregnancy under normal circumstances
      D   Abortions are only legally performed by qualified medical staff

                                                                    (20 x 1) [20]

QUESTION 2:   6 minutes   *(Taken from NSC LS Exam November 2009 Paper 1)*

Choose an item from COLUMN II that matches a description in COLUMN I.

COLUMN I	COLUMN II
1. The type of reproduction involving a male gamete that fuses with a female gamete	A gestation
	B identical
2. The type of fertilisation that occurs outside the body in a glass petri dish in a laboratory	C placenta
	D cancer
3. The type of twins formed as a result of the fertilisation of two ova	E sexual
4. The muscular, hollow organ in mammals in which the embryo develops	F fraternal/ dizygotic/ non-identical
5. The period of development of an embryo between fertilisation and birth	G in-vitro
	H asexual
6. Forms as a result of uncontrolled division of cells	I uterus

                                                                              [6]

QUESTION 3:   16 minutes   *(Taken from Viva Life Science G12)*

Some sexually transmitted diseases (STDs) are increasing world-wide. The table below indicates the number of people infected with two common bacterial STDs.

Year	Number (per 100 000 people) infected with syphilis	Number (per 100 000 people) infected with gonorrhoea
1986	50	150
1990	150	280
1994	200	150
1998	220	100

3.1.   On the same system of axes, draw TWO line graphs to compare the number of people infected with syphilis and gonorrhoea from 1986 to 1998. (13)
3.2.   Describe the trends shown in both graphs for EACH of the two diseases.   (3)
                                                                              [16]

SECTION D: HOMEWORK SOLUTIONS

QUESTION 1

1.	A	8.	C	15.	B		
2.	C	9.	C	16.	B		
2.	C	10.	A	17.	D		
4.	C	11.	A	18.	C		
5.	D	12.	A	19.	C		
6.	B	13.	B				
7.	A	14.	D				
20.	B				(20 x 1) **[20]**		

QUESTION 2

1	E✓	4	I✓	
2	G✓	5	A✓	
3	F✓	6	D✓	

[6]

QUESTION 3

3.1.
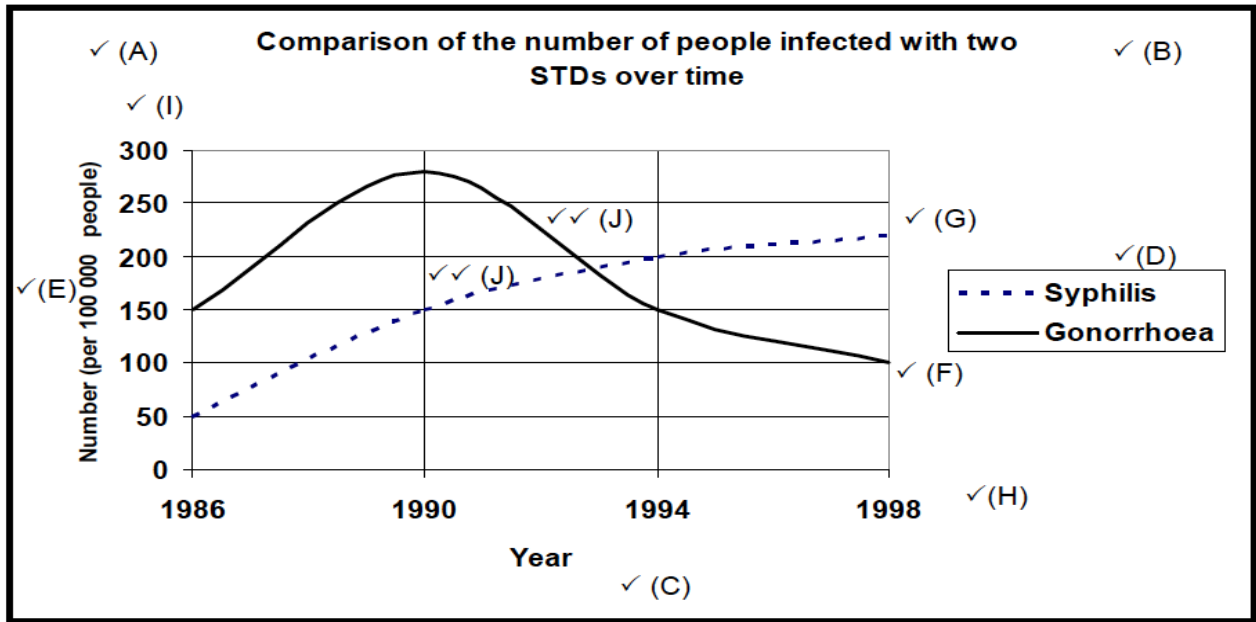
Marking Rubric:

A	Correct type of graph	1
B	Title of graph	1
C	Correct label for X-axis	1
D	Graphs labelled/key provided for 2 graphs	1
E	Correct label for Y-axis including **unit**	1
F	All points joined for graph A	1
G	All points joined for graph B	1
H	Appropriate scale for X-axis	1
I	Appropriate scale for Y-axis	1
J	Drawing of the graphs	1 – 1 to 2 points plotted correctly 2 – 3 to 5 points plotted correctly 3 – 6 to 7 points plotted correctly 4 – all 8 points plotted accurately

(13)

3.2   Syphilis – the number of infections has increased✓from 1986 to 1998
Gonorrhoea – the number of infections has increased ✓from 1986 to 1990 and then decreased ✓

(3)

[16]

SESSION 14

TOPIC: POPULATION ECOLOGY: SPECIES, POPULATION AND COMMUNITY, POPULATION SIZE, HUMAN POPULATION AND SOCIALISATION

LESSON OVERVIEW

Teacher Note: Please make sure that the learners know and understand:
- Definitions of terms.
- Natality, mortality and dispersal – impact on population size.
- Carrying capacity, environmental resistance and fluctuations of populations.
- Characteristics of growth patterns especially geometric and logistic growth patterns.
- Direct and indirect techniques used to determine population size.
- Learners MUST be able to do the various types of calculations.

Please ensure that the learners adhere to the time limits for each question. This is so that they learn to think and work quickly and efficiently.

1. Typical exam questions: 55 minutes
2. Review/solutions/memo: 35 minutes

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1:   20 minutes   *(Taken from Viva Life Science Grade 12)*

The table below shows the population of rats in a mealie field over a period of ten years.

Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Population	30	40	80	130	140	130	95	115	110	110

1.1. Use the table above to draw a graph.   (12)
1.2. What type of growth form is shown by this graph?   (1)
1.3. Indicate the carrying capacity of the mealie field on the graph.   (2)
1.4. List FOUR abiotic factors that affect the carrying capacity of an area.   (4)

[19]

QUESTION 2:   6 minutes   *(Taken from Viva Life Science Grade 12)*

A farmer has a game farm and wants to establish the number of impala that he has.
- On a set date, they build an enclosure.
- They then set out on horseback and round up 50 impala.
- Once the impala are safely in the enclosure, the animals are marked and set free.
- After two weeks, the animals are rounded up for the second catch of 42 impala.
- 10 marked animals are found in the second catch.

2.1. Calculate the estimated population of impala that the farmer has on his game farm. Show all your calculations.   (4)
2.2. How will the farmer be able to improve the accuracy of the estimated population size of the impala that live on his farm?   (2)

[6]

QUESTION 3:   **15 minutes**   *(Taken from Viva Life Science Grade 12)*

Study the pyramid of population size in Angola and answer the questions that follow:

Angola: 2005
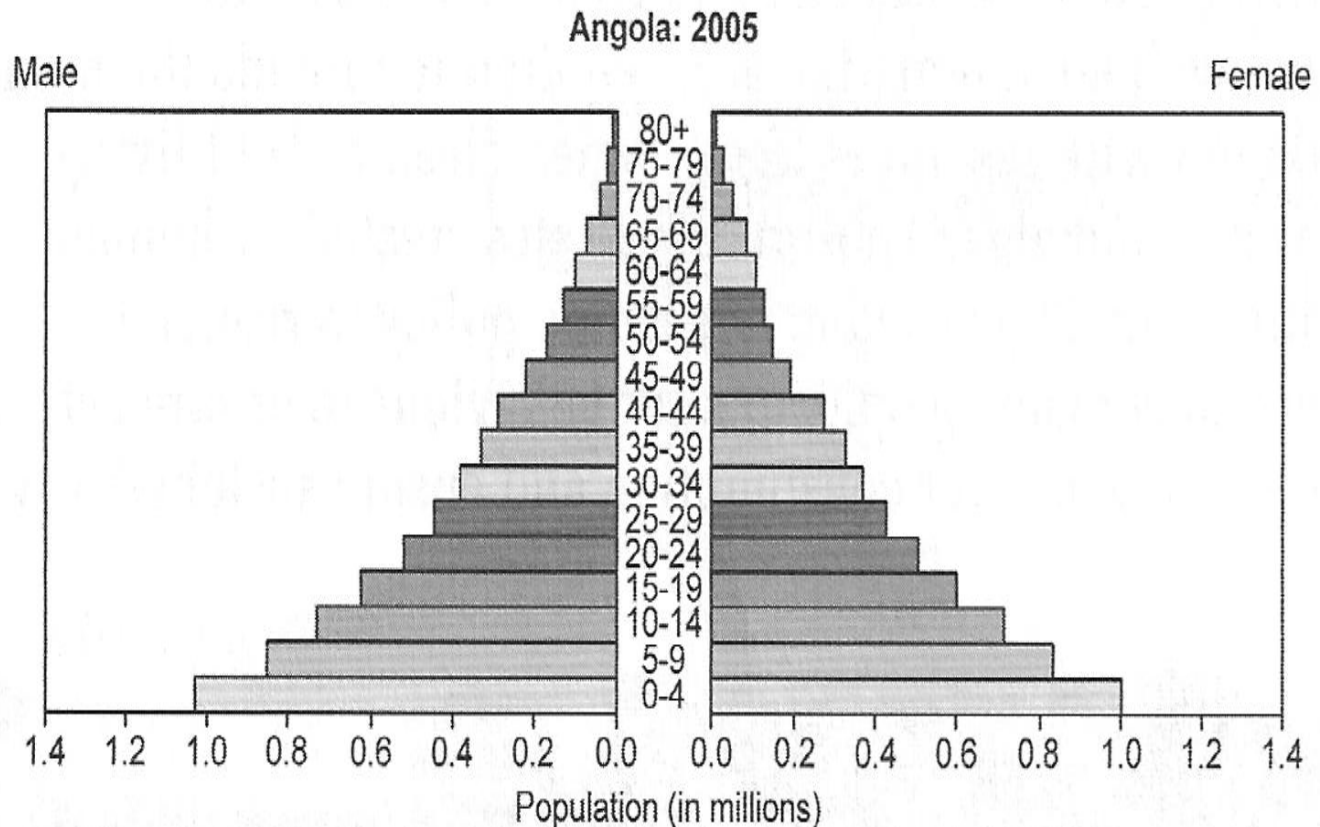
Source: U.S. Census Bureau, International Data Base.

3.1.   What percentage of the female population is aged between 15 and 19 years?
Show calculations.   (2)
3.2.   Which age group makes up approximately 20% of the male population? Show
calculations.   (2)
3.3.   What number of the female population is aged between 65 – 69?
Show calculations.   (2)
3.4.   What is the difference in population size between females in the age group 0-4
and 45-49?   (2)
3.5.   Provide two reasons why the mortality rate is so high for the age group 0-4.   (2)
3.6.   Which group, male or female has the greater percentage reaching old age?   (1)
3.7.   Provide two reasons for your answer to Question 3.6 above.   (4)
                                                                                                                          [15]
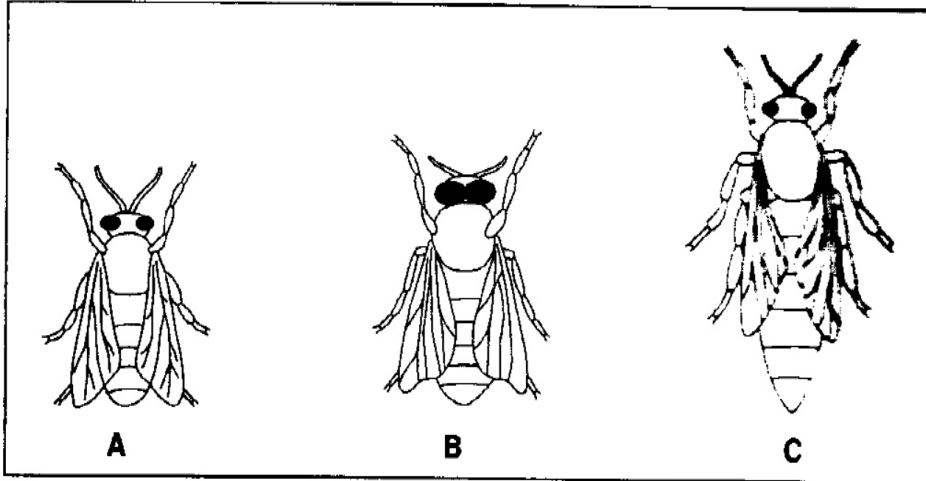
QUESTION 4:   **14 minutes**   *(Modified from unknown source)*

Study the diagrams of the three castes of individual bees that live in a bee colony and answer the questions that follow.

4.1.	Identify the castes marked A, B and C and state one function of each.	(6)
4.2.	Which one of the three castes has no sting?	(1)
4.3.	How does the queen bee ensure that only one queen develops to the stage of laying eggs?	(1)
4.4.	Name the special substance that is fed only to the queen bee.	(1)
4.5.	Discuss social organisation in animal packs especially with regard to pack leadership.	(5)
		[14]

SECTION B: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1.

Rat Population of Rats in a Mielie Field over 10 years

Marking Rubric:

A	Correct type of graph	1
B	Title of the graph	1
C	Correct label for X-axis	1
D	Correct label for Y-axis	1
E	Correct units for X-axis	1
F	All points are joined	1
G	Appropriate scale for the X-axis	1
H	Appropriate scale for the Y-axis	1
I	Drawing of the graph	1 – 1 to 2 points are plotted correctly 2 – 3 to 5 points are plotted correctly 3 – 6 to 8 points are plotted correctly 4 – all 10 points are plotted correctly
	Total:	**12 marks**

1.2.   Logistic   (1)

1.3.   Carrying capacity should be indicated on the graph at 130 ✓ rats ✓   (2)

1.4.   Soil, water, humidity, temperature, light –   **(any 4)**   (4)

[19]

QUESTION 2

2.1. $N = \dfrac{C \times M}{R}$

Est. population   =   total of second catch × total of first catch   (1)
                              marked in the second catch

                     = $\dfrac{42 \times 50}{10}$ (1)
                                                                                              (1)
                     =   210 impala   (1)

2.2.   The reliability of this method improves with each recapture of the individuals   (1).
        The more times that the steps are repeated, the more accurate the estimation
        of the population size will be   (1).
                                                                                            [6]

QUESTION 3

3.1.   0,6 million of 1,0 million
            $\dfrac{0,6 \times 100}{1,0}$ (1)   = 60%   (1)

3.2.   45 to 49 years = 0,20 of 1,10 (1)   = 18% (1)   (2)
3.3.   100 000 females   (2)

3.4.   0 to 4 years = 1,0
            45 to 49 years = 0,2
            1,0 – 0,2 = 0,8   (1)
            800,000 females (1)   (2)

3.5.   Disease / malnutrition / civil war / lack of health care / lack of education of parents
                                                                        (any 2)   (2)
3.6.   Males   (1)
3.7.   Females: more stress / look after young so exposed to children diseases/ work
        very hard physically / poor health care in rural areas / poor living conditions /
        malnutrition   **(any 2)**   (2 x 2) (4)
                                                                                            [15]

QUESTION 4

4.1.   A – Worker ✓– gathering of food/feed drones and larvae/clean
                        hive/guardians of hive entrance ✓
        B – Drone ✓ – mate with the queen / reproduction ✓
        C – Queen ✓ – lay eggs / reproduction ✓   (6)
4.2.   Drones   (1)
4.3.   The first mature queen to emerge from her cell kills all the other possible queen
        larvae with her sting ✓   (1)
4.4.   Royal jelly ✓   (1)

4.5   Animal packs (wild dogs, wolves, lions, etc.)
- There is a **ranking order** and intense loyalty within the pack ✓
- Pack is led by the **alpha-male** ✓
- The dominant breeding pair forms a family unit that includes their offspring ✓
- When young pack members are of a certain age, they move into a new territory to start their own family unit ✓
- There is no sexual tension in the pack and, therefore, leadership by the alpha-male is accepted ✓
- The **dominant breeding pair** leads the pack, with their signals and behaviour imitated by the younger members ✓
- Hunting strategies are learned from other pack members ✓
- One disadvantage of working as a pack means that when a prey is hunted and caught, all the members must share the food ✓
- This results in an eating order, where the strongest males will eat first, then the females and the young and weak will be left with what remains on the carcass ✓

(Any 5)   (5)

[14]

SECTION C: HOMEWORK

QUESTION 1:   16 minutes   *(Taken from various sources)*

1.   The size of a population can decrease due to ….
A natality
B immigration
C emigration
D increased reproduction

2.   Which of the following collections of organisms can be regarded as a population?
A beetles, flies, butterflies
B Grass, buck, lions
C Termites in a termite nest
D Locusts, frogs, snakes

3.   A group of individuals of the same species, which interbreed is defined as:
A a population
B an environment
C a community
D an ecosystem

4.   Which of the following is a density-dependent factor?
A fire
B drought
C predation
D temperature

5.   The mark-recapture-mark method of population size estimation can be considered reliable only if….
A   animals become trap-shy and cannot be caught
B   animals are left for a year before recapture
C   no immigration occurs
D   markings are temporary

6.   Which of the following do NOT apply to the mark-recapture-mark method to establish the size of a population? It…..
A   is a direct technique to estimate population size.
B   comprises the counting of part of the population.
C   comprises more than one counting session of the population.
D   provides an estimation of the total size of the population

7.   A rabbit population will NOT increase in numbers when the….
A   number eaten by predators is less than the number being born
B   immigration rate exceeds the mortality rate
C   natality rate is higher than the mortality rate
D   emigration rate exceeds the natality rate

8.   Emigration is the ….
A   increase in population size
B   migration of animals
C   permanent movement of individuals of a population out of a habitat
D   movement of people from country to country

9.   Which of the following is a density-independent factor?
A   Predation
B   Lack of space
C   Competition for food
D   Flood

10.   The maximum number of individuals of a species that can be supported by a habitat, is referred to as the….
A   community
B   environmental resistance
C   carrying capacity
D   ecological niche

11.   Social insects …
A   form highly organised groups
B   are of the same type of individuals, lacking social instincts
C   live on their own
D   form partially organised groups

12.   Which of the following are not social insects?
A   Ants
B   Locusts
C   Termites
D   Honey-bees

13. The most productive ecosystems are those having…
    A a relatively large autotrophic component
    B efficient predator prey relationships
    C less autotrophs than heterotrophs
    D few decomposers

14. The diagram illustrates types of age pyramids. Which age pyramid illustrates a declining population with a larger number of older individuals?
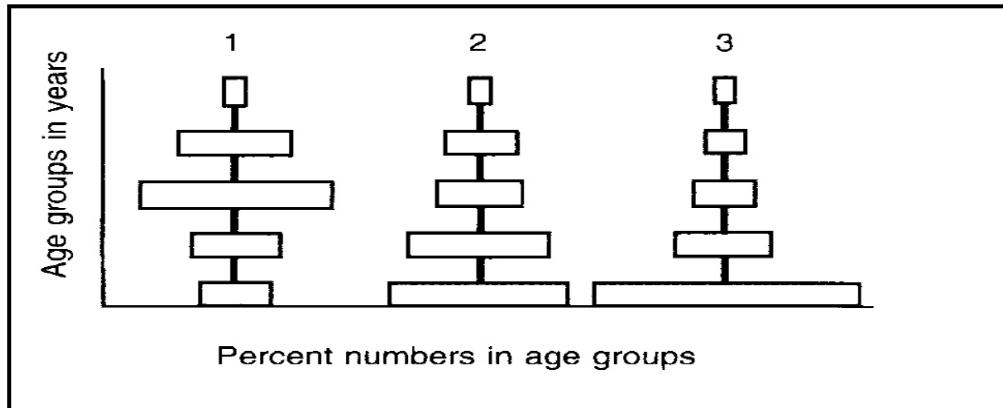

    A 1
    B 2
    C 3
    D 1 and 3

15. The rapid growth of the human population over the past two centuries has occurred largely due to:
    A increased world-wide birth rates
    B increased world-wide death rates
    C increased immigration
    D increased emigration rates

16. Environmental resistance …..
    A prevents a new population from immigrating into a new habitat
    B is the sum of the factors inhibiting population growth
    C causes the development of resistant properties under favourable environmental conditions
    D ensures the survival of the fittest.   (16x1) [16]

QUESTION 2:   17 minutes   (*Taken from Study and Master Grade 12 old syllabus*)

The following diagram shows a plot of lawn 10 metres x 10 metres. Each dot represents a dandelion plant (a weed) growing between the grass plants of the lawn. Five quadrants (each of an area 1 square metre) were selected at random and were used to estimate the total number of dandelion plants growing on the lawn.

Study the diagram and answer the questions that follow:

Quadrats in randomly chosen sites (each quadrat encloses one square metre

dandelion plant

grass
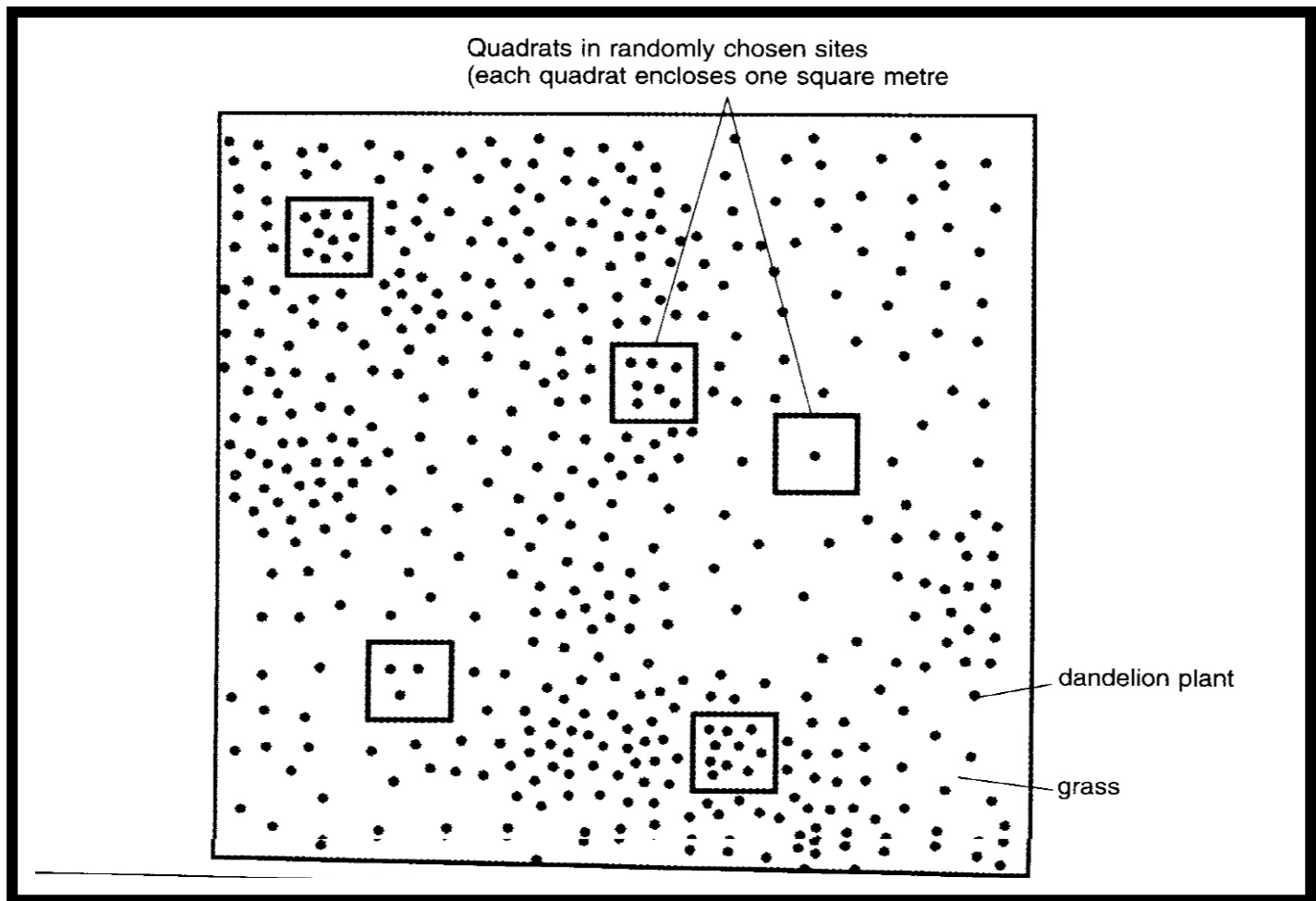
2.1.   Calculate the area of the lawn. Show all your calculations.   (3)
2.2.   Estimate the total number of dandelion plants growing on the lawn using
        only the information provided by the randomly chosen quadrants. Show
        all your calculations.   (8)
        2.3.1. What method has been used to estimate the size of the dandelion
                population?   (1)
        2.3.2. Is the method used an indirect or direct technique?   (1)
2.4.   State FOUR requirements that are necessary to ensure that this method used,
        would be accurate and valid.   (4)
                                                                                       [17]

SECTION D: SOUTIONS TO HOMEWORK

QUESTION 1

1.	C		10.	C
2.	C		11.	A
3.	A		12.	B
4.	C		13.	A
5.	C		14.	A
6.	A		15.	A
7.	D		16.	B
8.	C				(16 x 1) **[16]**
9.	D			

QUESTION 2

2.1.   Area of the lawn   = L x B   (1)
                                  = 10 m^2 x 10 m^2 (1)
                                  = 100 m^2 (1)

2.2.   Average number of dandelion plants in 1 quadrant
    = $\dfrac{9 + 7 + 1 + 3 + 10}{5}$ (1)

    = 6   (1)
    Estimated number of dandelion plants on the whole lawn surface:

    = number of plants in sample areas x $\dfrac{\text{habitat area}}{\text{sample area}}$ (1)
                      $\dfrac{100}{}$
    = 6 x 1   (1)
    = 600 dandelions   (1)

2.3.1. sampling   (1)
2.3.2. Indirect technique   (1)
2.4.

- ○ Quadrants must be selected at **random**. ✓
- ○ Each individual inside each quadrant must be **accurately counted**. ✓
- ○ Quadrants must cover at least **10% of the total area.** ✓
- ○ The **total area** must be known. ✓   (4)

[14]

SESSION 15

TOPIC: INTERACTION IN A COMMUNITY – PREDATION, COMPETITION, SYMBIOSIS AND ECOLOGICAL SUCCESSION

LESSON OVERVIEW

Teacher Note: Please make sure that the learners know and understand:
- Definitions of terms.
- Predation and predator relationship in naturally stabilising population numbers.
- Difference between intraspecific and interspecific competition.
- Resource partitioning and the relevance to survival.
- Symbiosis: difference between parasitism, mutualism and commensalism, and examples of each.
- Ecological succession: know the difference between autogenic and allogenic succession.
- Explain and apply primary and secondary succession processes.
- Learners MUST be able to draw graphs from given information.

Teacher Note: Please ensure that the learners adhere to the time limits for each question. This is so that they learn to think and work quickly and efficiently. They MUST do the homework questions please.

1.   Typical exam questions: 55 minutes
2.   Review/solutions/memo: 35 minutes

---

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1:   **15 minutes**   *(Taken from various DoE Exam papers)*

1.1.   Intraspecific competition is ….
    A. an example of a predator-prey relationship
    B. competition between members of the same species
    C. the survival of the fittest
    D. competition between members of different species

1.2.   Competition for the same resources between individuals of the same species, is known as….
    A. intraspecific competition
    B. interspecific competition
    C. environmental resistance
    D. ecological footprint

1.3.   When certain individuals of a population survive, irrespective of the pressure of the environment, it is called….
    A. natural selection
    B. succession
    C. intraspecific competition
    D. density-dependent factors

1.4.   When kudu (browsers) and springbuck (grazers) live in a camp of 400 ha in Vaalbos Park…
A. the springbuck will die out through interspecific competition
B. the numbers of both species will increase logistically if the population ratio between the two species remains constant
C. both species will show the geometric growth form
D. their population density will be controlled by intraspecific competition within the two species

1.5.   The replacement of one community by another, until a climax stage is reached, is called
A. predation
B. competition
C. stratification
D. succession

1.6.   Which of the following is the first seral stage of primary succession?
A. Volcanic bare rock
B. A flooded river-bed
C. A forest after a veldfire
D. An abandoned meadow land

1.7.   Commensalism refers to a symbiotic association in which…
A. both organisms benefit
B. one organism benefits while the other is harmed
C. both organisms are harmed
D. one organism benefits while the other neither benefits or is harmed

1.8.   Which of the following is the best example of mutualism:
A. insects on a flower
B. fleas on a dog
C. a cheetah catching an impala
D. a monkey in a tree

1.9.   An ectoparasite…
A. lives within a host
B. lives externally on its host
C. visits the host at intervals
D. does not cause harm to its host

1.10. When Remora-sucker fish are transported by a shark and so gain advantage, it is an example of:
A. predation
B. commensalism
C. mutualism
D. parasitism

1.11. Which one of the following is possibly the best example of predation?
A. A bird's nest in a tree
B. Ticks on a dog
C. A lion catching a zebra
D. Bees visiting a flower

1.12. A predator….
    A. feeds on dead animal matter
    B. captures and kills prey because they are in its territory
    C. competes with prey for food and shelter
    D. captures and kills prey for food

1.13. The most productive ecosystems are those having…
    A. a relatively large autotrophic component
    B. efficient predator prey relationships
    C. less autotrophs than heterotrophs
    D. few decomposers

1.14. This graph shows the number of antelope in an ecosystem.
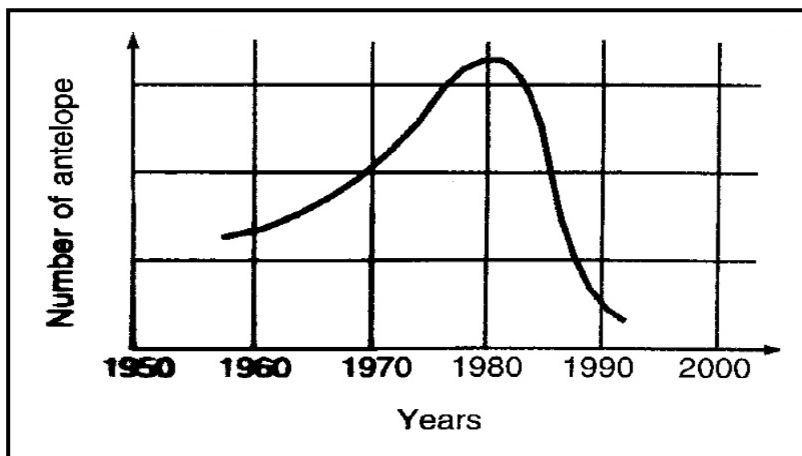
Which of the following events, in the correct sequence, could have caused the particular graph curve?
    1. Overgrazing resulting from overpopulation
    2. Eradication of predators by people
    3. Reduced numbers caused by shortage of food
    4. Increase in the number of predators

    A. 4, 3, 2, 1
    B. 2, 3, 4, 1
    C. 2, 1, 3, 4
    D. 1, 4, 2, 3

1.15. Which of the following is not true of predation:
    A. Predator numbers fluctuate slightly out of phase with prey numbers
    B. It is an example of interspecific competition
    C. Predation level is a density-dependent regulator of the prey population
    D. Predators maintain the stability of the prey population

[15]

QUESTION 2:   14 minutes   *(Modified from Viva Grade 12 Life Science)*

Study the graph below and answer the questions that follow:
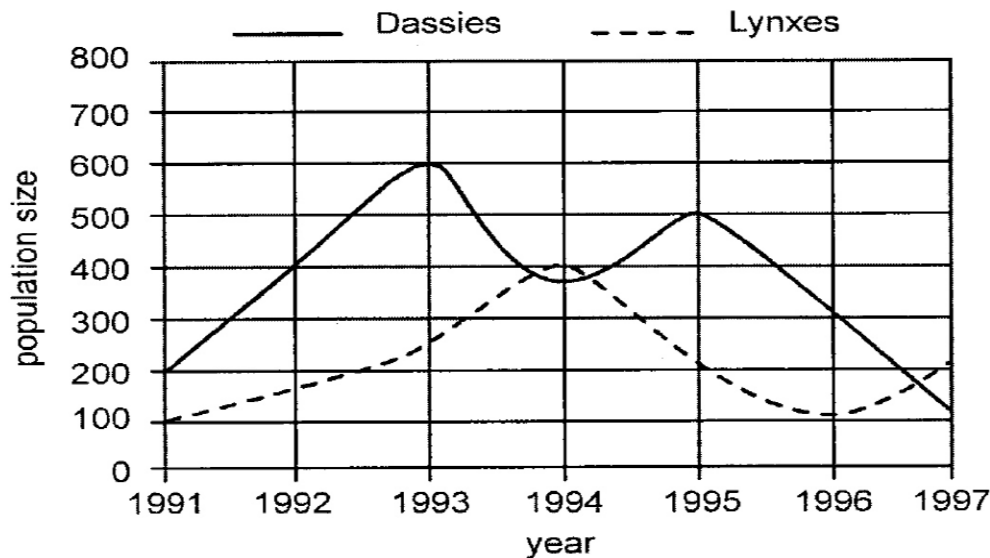
2.1.   How many dassies and lynxes were there in 1995?   (2)
2.2.   In what year was the population of dassies the highest?   (1)
2.3.   In what year was the population of lynxes the highest?   (1)
2.4.   In which year did the population of dassies start decreasing? Give a reason for
       your answer.   (2)
2.5.   In which year did the population of lynxes start decreasing? Give a reason for
       your answer.   (3)
2.6.   Study the graph and explain the relationship between the population of the
       dassies and the linxes as a survival strategy.   (5)
                                                                                         [14]

QUESTION 3:   26 minutes   *(Modified from Study and Master Grade 10 old syllabus)*

The diagram on the following page illustrates succession in a plant community. Study the diagram and answer the questions that follow.
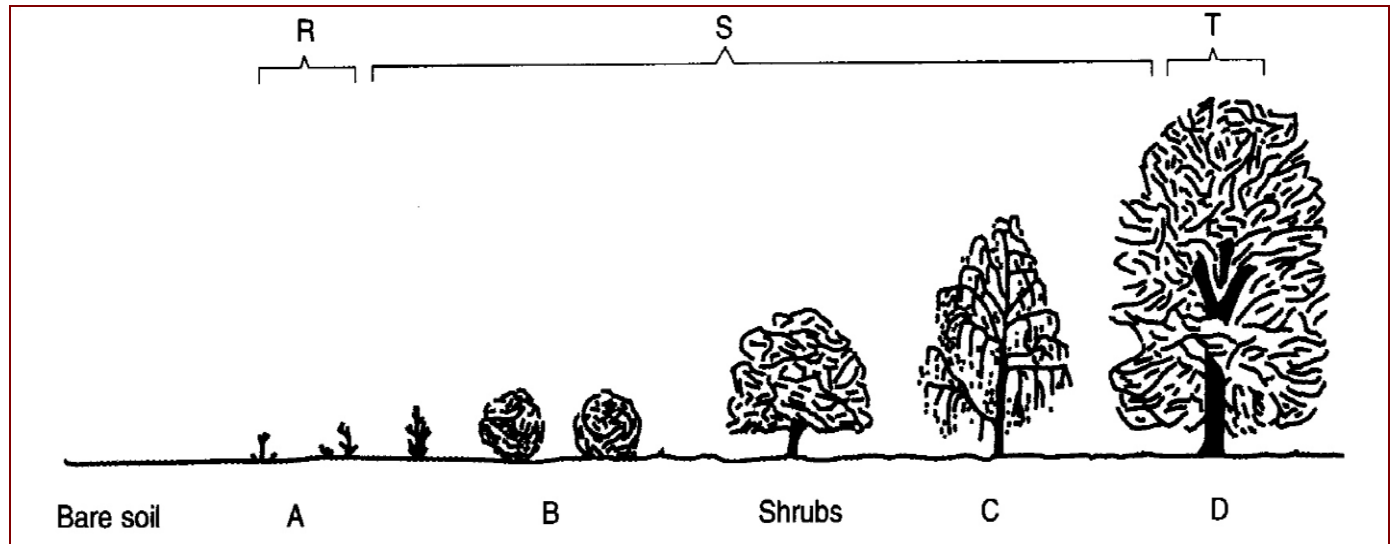
3.1.   What is meant by the term succession? (4)
3.2.   Which marked part R, S or T represents:
    a) Succession (1)
    b) A climax community (1)
    c) Colonisation? (1)
3.3.   What are the various stages of succession called? (1)
3.4.   Which part marked A, B, C or D represents small bushes? (1)
3.5.   Distinguish between autogenic and allogenic succession. (3)
3.6.   Tabulate the difference between primary and secondary succession. (7)
3.7.   Explain the difference between R-strategy and K-strategy organisms. (6)
3.8.   a) What is the plant community in the first stage of succession called? (1)
    b) Which part marked A, B, C or D represents the community mentioned
        in QUESTION 3.8 (a)? (1)
    c) Name three different types of animals that may be found in the part
        mentioned in QUESTION 3.8 (b)? (3)

[30]

SECTION B: SOLUTIONS TO SECTION A

QUESTION 1

1.1.	A	1.5.	D	1.9.	B	1.13.	A
1.2.	B	1.6.	A	1.10.	B	1.14.	C
1.3.	B	1.7.	D	1.11.	C	1.15.	B
1.4.	D	1.8.	A	1.12.	D		(15 x 1) **[15]**

QUESTION 2

2.1. Dassies – 500 ✓, Lynxes – 200 ✓
2.2. 1993 ✓
2.3. 1994 ✓
2.4. 1993 ✓ – The number of predators in the area had increased. ✓
2.5. 1994 ✓– The number of dassies in the area had decreased (1), therefore, the amount of food for the predators had decreased. ✓
2.6. As the population of the dassies increases ,✓ the lynx population increases. ✓
   Lynxes prey on the dassies ✓reducing / regulating the dassie population. ✓
   When the population of the dassies decreases, the lynx population decreases. ✓

[14]

QUESTION 3

3.1. It is the orderly ✓and gradual change ✓where one plant or animal community is replaced by another ✓ in a given area over a period of time. ✓   (4)
3.2. a) S ✓   b) T ✓   c) R ✓   (3)
3.3. Seral stages ✓   (1)
3.4. B ✓   (1)
3.5. **Autogenic:** When the stimulus for change is **internal** ✓ and caused by organisms in the biotic communities. ✓
      Allogenic: when the stimulus for change is **external** to the biotic communities. ✓ (3)

3.6

Primary Succession	Secondary Succession
Develops in a **new, uncolonised habitat** ✓	Develops **after** an established biotic community has been destroyed ✓
Occurs when land or lakes emerge after a glacier retreat /or volcanic eruption ✓	Communities are destroyed by a natural catastrophe / like hurricanes,/ tornados, /deforestation or /after crop harvesting ✓
Lack of soil so pedogenesis must first take place ✓	Fertile soil is already present ✓

   Plus 1 mark for drawing a table and headings are correct. ✓)   Total = (7)

3.7. **R-strategy:** pioneer populations ✓ = very **high production** of offspring ✓, but a **low survival rate** ✓   (3)
      K-strategy: climax populations ✓= produce **few offspring** ✓, but have a **high survival rate** ✓ with good parental care ✓   **(Any 3)**   (3)

3.8. a) Pioneer plants/pioneers ✓   (1)
      b) A ✓   (1)
      c) ants/ termites/ grasshoppers/ locusts/ mice ✓   **(Any 3)**   (3)

[30]

SECTION C: HOMEWORK

QUESTION 1:   **20 minutes**   *(Modified from Viva Grade 12 Life Science)*

Species A is a consumer found in the grasslands habitat. The data below shows the number of individuals in a population of species A over a 14-week period.

Time (weeks)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Number of individuals	0	6	8	16	26	40	70	96	110	118	120	120	120	110	70

1.1.   Draw a line graph to illustrate the growth curve of the population of species A. Label the axes and provide a heading for the graph.   (9)

1.2.   Interpret and explain each phase as indicated by the results shown in the graph.   (10)

1.3.   What kind of competition occurs among the individuals of the population? State a reason for your answer.   (2)

1.4.   What is the carrying capacity of the habitat? Provide a reason for your answer.   (2)

1.5.   What impact will the introduction of a predator have on the population of species A?   2)

                                                   [25]

QUESTION 2:   **17 minutes**   *(Taken from Bios Best 2007)*

Read the passage and answer the questions that follow.

> Prior to 1907, there were about 4 000 springbuck and their predators in the Kalahari. It was estimated that this area could have supported 30 000 buck at this time. In 1907 this region was declared a nature reserve and all predators such as lions and cheetahs were eradicated. By 1925 the buck population had increased to 100 000… and everything in reach, grass, tree seedlings and shrubs were eaten. The area had become overgrazed and over-browsed. In the following two winters 40% of the buck starved to death. The buck population continued to decrease to about 10 000 individuals. The area continued to be depleted and the damage to the plant productivity would be evident for a long time.

2.1.   List TWO density-dependent factors, which could have caused a decrease in the population.   (2)

2.2.   List ONE density-independent factor, which could have caused a decrease in the population.   (1)

2.3.   Name the type of competition that occurred in the buck population. Provide a reason for your answer.   (3)

2.4. Are springbuck K-strategy or r-strategy species? Provide a reason for your answer. (2)

2.5. What was the original carrying capacity of the area? (1)

2.6. What is likely to have been the cause of most of the damage to the plant vegetation? (1)

2.7. Suggest TWO ways in which the habitat could be restored to its former state? (2)

2.8. What would the function of the predators have been ecologically, if they had been left in the nature reserve. (2)

2.9. What type of process of succession will occur in the area mentioned in the passage, should the buck be removed for a period of time? (2)

[16]

SECTION D: SOLUTION TO HOMEWORK

QUESTION 1

Growth curve of species A
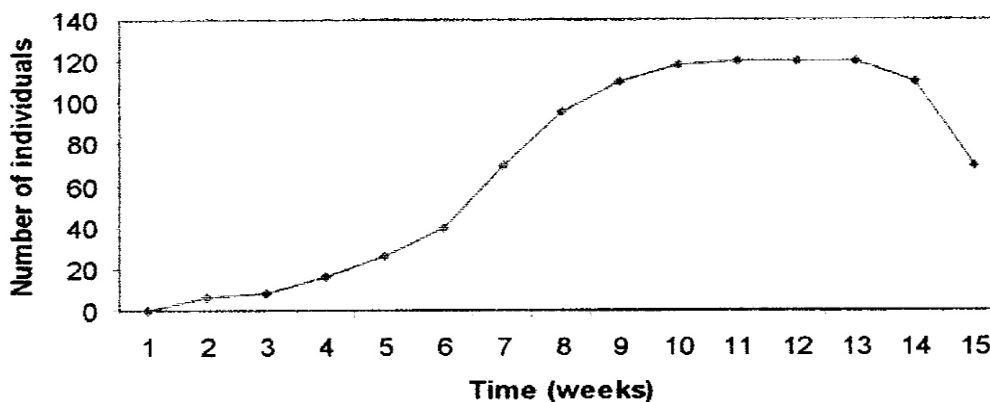
1.1.
Marking of graph:

A	Correct type of graph	1
B	Title / heading for graph	1
C	Correct label for X-axis	1
D	Correct label for Y-axis	1
E	All points are joined	1
F	Appropriate scale for X-axis	1
G	Appropriate scale for Y-axis	1
H	Drawing of the graph	2 – all points plotted correctly 0 – points not plotted correctly

(9)

1.2. **Week 1 to 3**: Growth is slow because the animals are adjusting / acclimatising ✓ – lag phase. ✓

Week 4 to 8: Increase in population – accelerated growth phase. ✓ There is enough food, shelter and space/ there are no limiting factors. ✓

Week 8 to 10: Deceleration phase ✓- population growth is slower ✓

Week 11 to 13: Equilibrium phase ✓- carrying capacity is reached ✓

Week 14 to 15: Death phase ✓- environmental resistance causes population size to decrease ✓   (10)

1.3. Intra-specific ✓Organisms of the **same** species are competing. ✓   (2)

1.4. 120. ✓ The natality rate = the mortality rate ✓   (2)

1.5. A predator will cause the population to decrease ✓and give the environment a chance to improve the carrying capacity. ✓   (2)   **[25]**

QUESTION 2

2.1. Competition for food and water ✓/ competition for space ✓/ spread of disease ✓   **(Any two)**   (2)

2.2. Drought / cold / veldfires ✓   **(Any one)**   (1)

2.3. Intraspecific competition ✓
Competition for resources between individuals ✓ belonging to the same species ✓   (3)

2.4. K-strategy ✓
They produce few offspring ✓/ supply good parental care ✓   **(Any one)**   (1)

2.5. 30 000 springbuck ✓   (1)

2.6. Overgrazing ✓/ trampling which causes soil erosion ✓   **(Any one)**   (1)

2.7. Reintroduce predators ✓/ cull the springbuck ✓ / hunting ✓/ relocate springbuck to other areas for a period ✓   **(Any two)**   (2)

2.8. Regulating the springbuck population naturally ✓ to ensure a stable population ✓
OR
Predators would have been a stabilising factor ✓
          (Only 1 mark for the second option)   (2)

2.9. Secondary succession ✓✓   (2)

          [16]