



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**NOVEMBER 2014**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 14 pages.**

## **INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. ALL drawings must be done in pencil and labelled in blue or black ink.
7. Draw diagrams, flow charts or tables only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

## SECTION A

### QUESTION 1

- 1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.
- 1.1.1 The part of the brain that interprets impulses from the retina of the eye is the ...
- A cerebrum.
  - B cerebellum.
  - C medulla oblongata.
  - D corpus callosum.
- 1.1.2 Which ONE of the following hormones is responsible for the development of secondary male characteristics?
- A FSH
  - B Testosterone
  - C Oestrogen
  - D Progesterone
- 1.1.3 The number of chromosomes found in a human sperm cell is ...
- A 23.
  - B 22.
  - C 46.
  - D 47.
- 1.1.4 A patient suffers from an undersecretion of ADH. This will lead to ...
- A a high concentration of sodium in the urine.
  - B the presence of glucose in the urine.
  - C decreased thirst.
  - D the formation of large volumes of urine.
- 1.1.5 Damage to the dendrites of a motor neuron in a reflex arc would probably prevent ...
- A a receptor from receiving a stimulus.
  - B synaptic contact with a sensory neuron.
  - C an impulse from being transmitted to an effector organ.
  - D an impulse from being transmitted to the spinal cord.

- 1.1.6 The part of the brain that regulates breathing is the ...
- A medulla oblongata.
  - B cerebrum.
  - C corpus callosum.
  - D cerebellum.
- 1.1.7 Grommets may be used in the treatment of ...
- A astigmatism.
  - B cataracts.
  - C middle ear infections.
  - D long-sightedness.
- 1.1.8 Which ONE of the following is a response of the human body when adrenalin is released?
- A Decreased oxygen intake
  - B Increased blood flow to the intestines
  - C Decreased blood flow to the muscles and heart
  - D Increased conversion of glycogen to glucose
- 1.1.9 In gamete formation in human females, each diploid cell forms ...
- A four diploid gametes.
  - B one diploid gamete.
  - C one haploid gamete.
  - D two haploid gametes.
- 1.1.10 Crossing-over and random arrangement of chromosomes occur respectively in ...
- A prophase II and metaphase II.
  - B prophase I and metaphase I.
  - C prophase II and anaphase II.
  - D prophase I and anaphase I.
- (10 x 2)      **(20)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.10) in the ANSWER BOOK.

- 1.2.1 The membranes which protect the central nervous system
- 1.2.2 A plant growth hormone that stimulates seed germination
- 1.2.3 The nervous system which consists of cranial and spinal nerves
- 1.2.4 A branch of the autonomic nervous system that decreases the heartbeat back to normal
- 1.2.5 The outermost extra-embryonic membrane surrounding the embryo
- 1.2.6 The hormone that regulates the salt concentration in the human body
- 1.2.7 The blood vessel in the umbilical cord that carries blood rich in oxygen and nutrients
- 1.2.8 The hormone inhibited by an increased level of thyroxine
- 1.2.9 The period of development of an embryo in the uterus, between fertilisation and birth
- 1.2.10 The structure in the head of a sperm cell that contains enzymes which break down the membrane surrounding the ovum (10 x 1) **(10)**

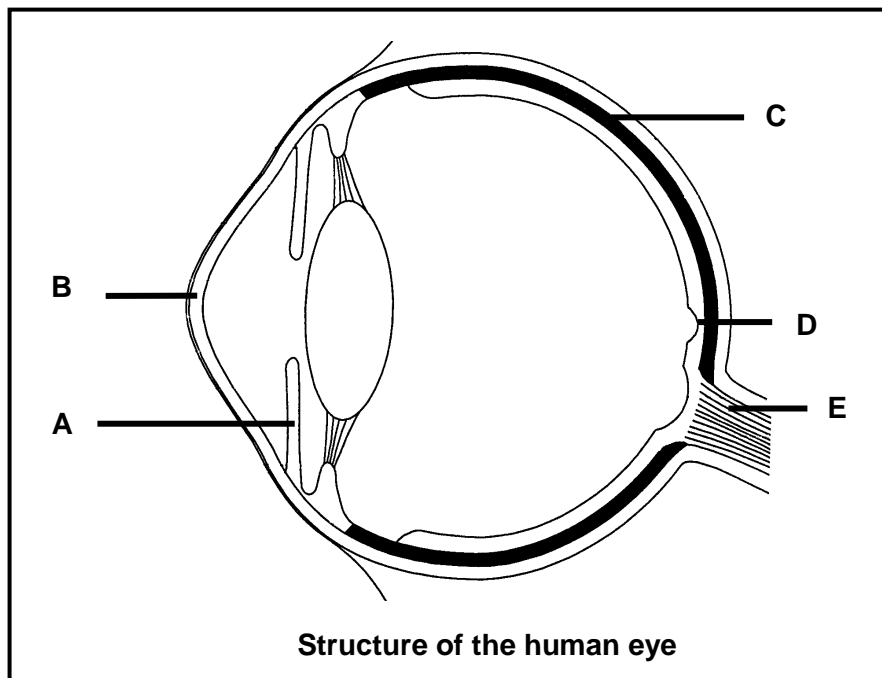
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.5) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Embryo is nourished with yolk found in the egg	A: Ovipary B: Vivipary
1.3.2 Gas produced when organic matter decomposes	A: Chlorofluorocarbons (CFCs) B: Methane
1.3.3 Foetus is attached to the mother's uterus	A: Ovipary B: Ovovivipary
1.3.4 Young bird cannot feed or move independently after hatching	A: Precocial development B: Altricial development
1.3.5 Decreases biodiversity	A: Alien plant invasion B: Urbanisation

(5 x 2)

**(10)**

1.4 The diagram below represents the structure of the human eye.



Give the LETTER and the NAME of the part which:

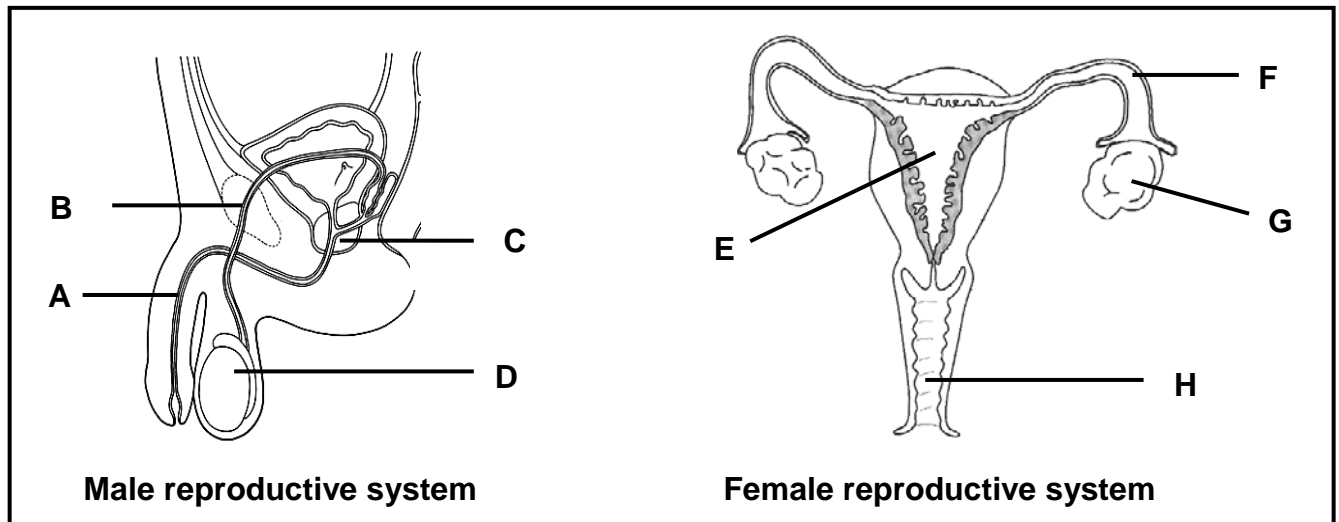
- |       |   |             |
|-------|---|-------------|
| 1.4.1 | Regulates the amount of light entering the eye    | (2)         |
| 1.4.2 | Supplies food and oxygen to the eye               | (2)         |
| 1.4.3 | Transmits impulses to the brain                   | (2)         |
| 1.4.4 | Contains cones and is the area of clearest vision | (2)         |
| 1.4.5 | Assists in the refraction of light rays           | (2)         |
|       |   | <b>(10)</b> |

**TOTAL SECTION A: 50**

## SECTION B

### QUESTION 2

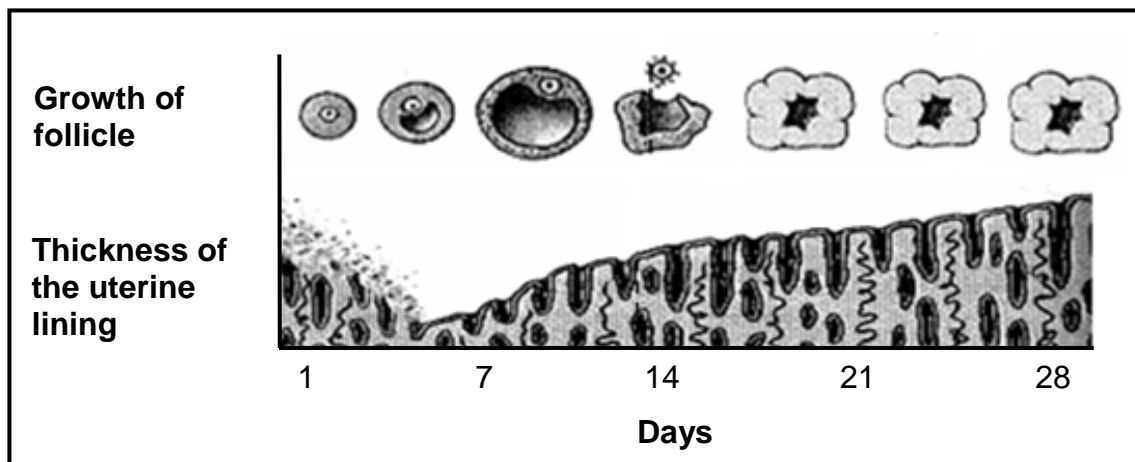
2.1 Study the diagrams below showing the male and female reproductive systems.



- 2.1.1 Identify parts **A**, **B** and **F** respectively. (3)
- 2.1.2 State ONE function of each of the following:
- (a) The fluid produced by part **C** (1)
  - (b) Part **E** (1)
- 2.1.3 Give the LETTER ONLY of the organ where meiosis takes place in the:
- (a) Male reproductive system (1)
  - (b) Female reproductive system (1)
- 2.1.4 Name the type of gametogenesis that takes place in the:
- (a) Male reproductive system (1)
  - (b) Female reproductive system (1)
- 2.1.5 State TWO functions of part **H**. (2)
- 2.1.6 Explain why it is necessary for part **D** to be 'outside' the body in males. (2)

**(13)**

- 2.2 The diagram below shows some of the changes that take place during the menstrual cycle.



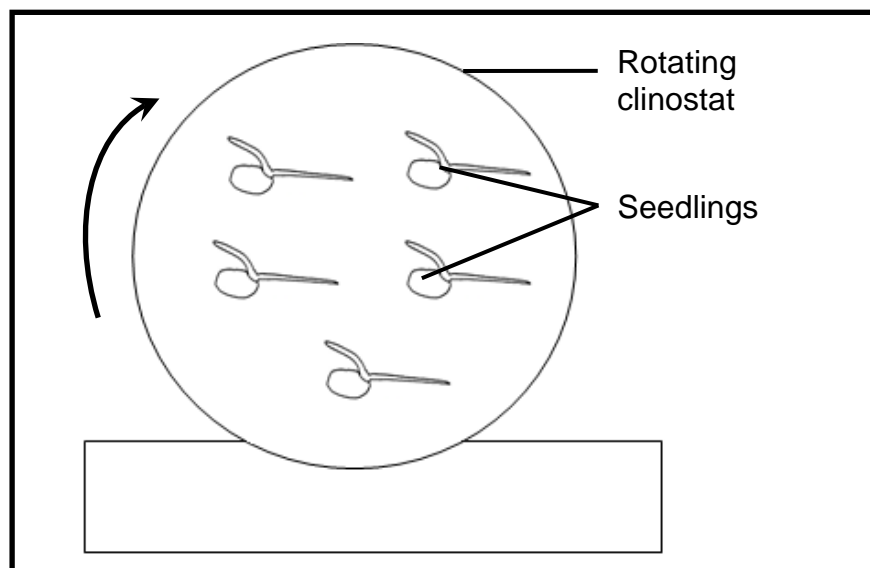
- 2.2.1 The menstrual cycle is controlled by hormones. Name ONE hormone which will increase in level between day 2 and day 10. (1)
- 2.2.2 Give ONE observable reason for your answer to QUESTION 2.2.1. (2)
- 2.2.3 Explain evidence from the diagram which indicates that fertilisation took place. (3)
- 2.2.4 Describe the developmental changes in the fertilised ovum until implantation occurs in the uterus. (5)
- 2.2.5 Some females use an ovulation monitor so that they can be aware of the days when they are fertile. These monitors measure the level of hormones in the blood.
- (a) Why would females want to know when they are fertile? (1)
- (b) Explain which hormone is likely to be monitored by the ovulation monitor. (3)
- (15)**



2.3 A learner conducted an investigation to determine the effect of auxins and the effect of gravity on root growth in pea seedlings. He used the following procedure:

- He germinated pea seeds for seven days.
- He then took a sample of 15 seedlings and divided them into 3 groups (A to C) of 5 seedlings each.
- In each group the 5 seedlings were placed **horizontally** on 3 different clinostats.

A clinostat is a device which has a disc that rotates at a constant speed. A diagram of a clinostat is shown below.



- He removed the root tips of all 5 seedlings at the same length in group B.
- In groups A and B the clinostats were left stationary (no rotation).
- In group C the clinostat was allowed to rotate.
- All 3 clinostats were placed in a dark cupboard.

A summary of the learner's procedure is shown in the table below.

GROUP A	GROUP B	GROUP C
Root tips present	No root tips	Root tips present
Stationary clinostat	Stationary clinostat	Rotating clinostat

After two days the direction of root growth was observed.

- 2.3.1 Which TWO groups were used to obtain information about:
- (a) The effect of auxins on root growth (1)
  - (b) The effect of gravity on root growth (1)
- 2.3.2 Explain why the apparatus was placed in a dark cupboard. (2)
- 2.3.3 Describe the expected results for each of groups **B** and **C** in this investigation. (2)
- 2.3.4 Explain the expected results for group **A**. (3)
- 2.3.5 State THREE ways in which the learner ensured a high level of validity for this investigation. (3)
- (12)**  
**[40]**

### QUESTION 3

3.1 A farmer conducted an investigation to determine which type of fertiliser would increase the yield of her wheat crop.

- She divided her farm into three 1 hectare plots and treated them as follows:

Treatment	Hectare A	Hectare B	Hectare C
Type of fertiliser	None	Contains nitrogen	Contains phosphorus
Amount of fertiliser (kg)	None	10	10

- She planted the same type of crop, namely wheat, during November each year for five years.
- She used water from a river which flows through the farm to irrigate her crop.
- She recorded the yield per plot for each year. The yield was measured by calculating the number of kilograms of wheat produced per hectare.

- 3.1.1 Identify the dependent variable in this investigation. (1)
- 3.1.2 Explain the purpose of including hectare **A** in this investigation. (2)
- 3.1.3 State ONE way in which the farmer could have increased the reliability of her results. (1)
- 3.1.4 If this investigation was carried out for more than five years, list THREE negative effects of planting the same type of crop over many years on the same plot of land. (3)
- 3.1.5 Explain how the excessive use of fertilisers can affect biodiversity if it is washed into the river. (4)
- (11)**

3.2 Read the passage below about food wastage around the world.

**FOOD WASTAGE AROUND THE WORLD**

Every year a third of all food for human consumption, about 1,3 billion tons, is wasted in the world. The UN Food and Agriculture Organisation (FAO) estimated that the carbon footprint of wasted food was equivalent to 3,3 billion tons of carbon dioxide a year. The FAO suggests that more efficient use of food could contribute to global efforts to cut greenhouse gases to limit global warming.

In the industrialised world, much of the waste comes from consumers buying too much and throwing away what they do not eat. In developing countries it is mainly the result of inefficient farming and a lack of proper storage facilities.

[Adapted from: *Reuters Daily News*, September 2013]

3.2.1 What is meant by the following terms:

(a) Carbon footprint (2)

(b) Food security (2)

3.2.2 Explain how wastage of food contributes to loss of energy and global warming. (4)

3.2.3 Use the information in the passage to suggest TWO ways in which food wastage could be reduced. (2)  
(10)

3.3 The table below shows how body temperature is regulated by the hypothalamus by influencing heat production and heat loss.

BODY TEMPERATURE (°C)	HEAT PRODUCTION (JOULES PER SECOND)	HEAT LOSS (JOULES PER SECOND)
36,4	320	5
36,6	260	5
36,8	150	35
36,9	90	90
37,0	90	100
37,2	90	180
37,4	90	310

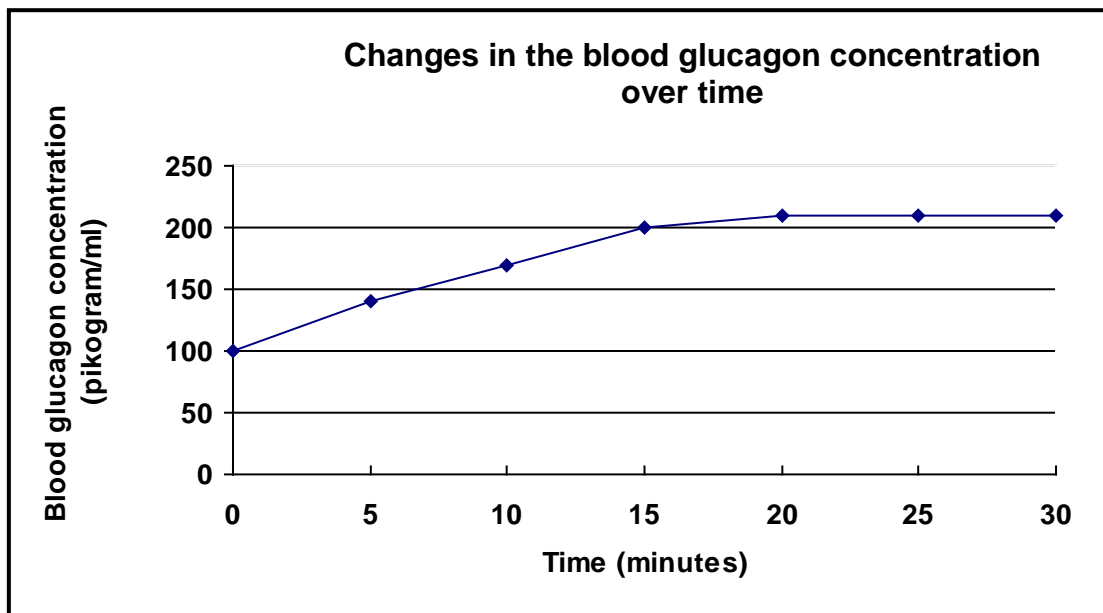
[Adapted from *Cambridge Biology*, 2002]

3.3.1 Are the blood vessels that supply blood to the skin constricted or dilated when the body temperature is 36,4 °C? (1)

3.3.2 Explain the advantage of the diameter of the blood vessels (constricted/dilated) mentioned in your answer to QUESTION 3.3.1. (4)

3.3.3 Heat loss is the greatest at 37,4 °C. Explain how the body is able to increase heat loss. (4)  
(9)

- 3.4 Study the graph below showing the changes in the glucagon concentration during exercise.



- 3.4.1 Describe the trend for the changes in the glucagon level over time. (3)
- 3.4.2 Explain the changes in the level of glucagon from 0 to 10 minutes. (3)
- 3.4.3 Taking into account the pattern for glucagon concentration from 0 to 10 minutes in the graph above, what will you expect to happen to the insulin concentration for the same period? (1)
- 3.4.4 Explain why people with diabetes mellitus have very little glycogen in their liver and muscle cells. (3)
- (10)**  
**[40]**

**TOTAL SECTION B: 80**

## SECTION C

### QUESTION 4

A goalkeeper in a soccer match prevented a goal from being scored when he dived to his right after the ball was kicked towards him. Just before he dived, he heard his team-mate shout, 'your ball'.

Describe how his eyes adjusted to see the ball as it travelled towards him and describe how he heard his team-mate and maintained his balance as he dived to save the ball.

Content: **(17)**  
Synthesis: **(3)**

**NOTE:** NO marks will be awarded for answers in the form of flow charts, diagrams or tables.

**TOTAL SECTION C: 20**  
**GRAND TOTAL: 150**