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INTERNATIONAL SECONDARY CERTIFICATE EXAMINATION
MAY 2025

BIOLOGY: PAPER II

MARKING GUIDELINES

Time: 2 hours

100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1

1.1 The ability of an organism to bear offspring / to have babies / to reproduce. (1)

1.2 1.2.1 (a) Testes (1)

(b) Ovaries (1)

1.2.2 (a) Scrotum (1)

(b) Sperm production happens in the testicles, and the testicles (inside of the scrotum) are located outside of the body. where the temperature is cooler/lower than body temperature. (Cremaster) Muscles can contract or extend to raise or lower scrotal temperatures.
Any TWO (2)

1.2.3 (a) • A histogram gives the range of births per mother as continuous data.
• This presents a better 'picture' of a category and makes it more visible to compare age categories.
• A histogram plots grouped continuous independent variables (months are grouped into a year).
• A line graph cannot represent the times between the readings.
Any ONE (2)

(b) 1970 or 2024 (1)

(c) Oestrogen: repair and thickening of the endometrium will not take place/FSH will not be inhibited, thus more follicles will be stimulated to develop.

Progesterone: maintenance and final vascularisation of endometrium will not happen / FSH and LH will not be inhibited, thus more follicles will be stimulated to develop (FSH) / more ovulations may occur during one menstrual cycle (LH). (2)

1.2.4 (a) Increased temperatures around the testes can cause a condition called 'teratozoospermia' / a condition in which a man has a high percentage of abnormally shaped sperm.

Increases the immediate surface temperature of the body/leads to an increase in the temperature in and around the testes which prevents sperm production.

Increase in temperatures can influence hormone levels and lead to abnormal gamete development.
Any TWO (2)

(b) Do not wear tight pants / no (frequent) hot baths / do not work with laptops on laps.
Any ONE (1)

1.3 C

A

B

(3)

1.4 1.4.1 (a) A / B

(1)

- (b) A: No acrosome present. The sperm would not be able to penetrate (the outer membrane on) the egg cell.

OR

B: The contents / DNA of the sperm / nucleus would leak out of the head.

(2)

1.4.2 Actual size of sperm head = $\frac{\text{length of given line}}{\text{length of scale line}} \times \text{unit of scale line}$

Measurement mark: 18 – 19mm

$$= \frac{18-19\text{mm}}{7\text{mm}} \text{ (Method markx)}$$

$$= 2,5-2,7 \mu\text{m (Answer mark)}$$

(3)

1.5 1.5.1 Graafian follicle

(1)

1.5.2 Hormone A: LH

Hormone B: FSH

(2)

1.6 **Difference:**

- Ovulation in cows occurs at day 1, but in humans on day 14 of the cycle
- LH-levels stay increased longer in cows
- Cow menstruation is 21 days, but 28 days in humans
- FSH levels increase during the cycle in cows rather than around ovulation as in humans.

*Any one***Similarity:**

- Both ovulate around a spike in LH
- Both have oestrogen increases before ovulation
- Both have progesterone increases between ovulations
- Both have decreased LH/FSH levels between ovulations

Any one

(4)

[30]

QUESTION 2

2.1 2.1.1 Seeds (1)

2.1.2 Cuttings / Grafting (1)

2.2 Pollination: To ensure the male gamete / pollen reaches the stigma / female parts of a flower.

Fertilisation: To ensure the male and female gametes fuse to form a new plant / restores diploid state from two haploid gametes / ensures a new generation is produced (prevents extinction). (2)

2.3 2.3.1 (a) Filament (1)

(b) Style Stigma (2)

2.3.2 Y (1)

2.3.3 Yes. Grapes are a source of food / Vineyards can provide job opportunities, while proteas are not edible / do not have any fruit

OR

No. Wine is not a food source/is a luxury, and proteas populations are declining. Proteas are an important part of the food chain.
Any TWO (2)

2.4 2.4.1 The stigma is located above the filament/filaments located below stigma (1)

2.4.2 Seed: ovules.
Hard shell: ovary. (2)

2.4.3 (a) To preserve seeds / prevent extinction of species / preserve genetic diversity. (1)

(b) Yes.

First mark	Second mark
For conservation	it is important to store the seeds if in an event that the protea plant species are lost.
To conserve genetic diversity	that different types of proteas can be grown again in the future.
For scientific research	to study genetic traits/restore degraded ecosystems.
They are endemic to the Western Cape/small area in SA.	and could face extinction due to climate change/urbanisation.

No.

First mark	Second mark
There are some protea species that are not under threat	prioritising endangered species are better.
Many species are adapted to brush fires	and do not need protection.
The cost of putting seeds into a seed bank are high	funds could be used for protection of species under threat.
Some protea seeds might not store well	for long periods of time.

Markers: Students do not have to have answers in linear fashion. One mark for the reason, and another for a coherent explanation, even if it does not line up according to the MG.

(2)

- 2.5 Table heading: Table comparing the difference between asexual and sexual reproductive methods.

Asexual reproductive methods	Sexual reproductive methods
1. Offspring will be identical to parents/No genetic variation in offspring. 2. More expensive method. 3. Plants grow faster.	1. Genetic/Phenotypic variation in offspring. 2. Less expensive method. 3. Longer process of growth/development of seedling.

Heading

First two differences (must compare same feature)

Column headings

Construction of table with a ruler

(5)

- 2.6 2.6.1 When plants contain more than two (homologous) sets of chromosomes

(1)

- 2.6.2 Larger flowers / Thicker / more robust leaves / More (vivid/brighter) colours / altered leaves for better drought resistance / Delayed flowering / changes in blooming seasons / More flowers on a branch.
Any TWO

(2)

- 2.7 2.7.1 (a) Protea Beetle.

(1)

- (b) They lay many eggs / No parenting after hatching / Larvae have to look after themselves / Many larvae do not survive.

(1)

2.7.2 (a) Oviparity. (1)

- (b)
- The egg protects the embryo from desiccation/drying out.
 - The amniotic fluid provides a cushion for the developing embryo against mechanical shock.
 - The yolk sac provides nutrition for the growing embryo.
 - The allantois helps with waste removal/gaseous exchange.
 - The egg allows birds to be able to lay eggs in various types of terrain to help increase the rate of survival.

Any *THREE*

(3)
[30]

SECTION B**QUESTION 3**

Consider the following statement:

The cultivation of Genetically Modified (GM) crops will provide a solution to Africa's food shortages.	
<i>Yes – GM crops will provide a solution to Africa's food shortages.</i>	<i>No – GM crops will not be the solution to Africa's food shortages.</i>
Source A • More than a third of Africa's countries have a 10% or higher hunger problem in their respective populations. • Genetically modified crops can battle pest problems, like locusts.	Source A • Even though GM crops are good for Africa, only 11 out of 54 African nations have approved the cultivation of GM crops so far.
Source B • 'GM crops can grow in relatively infertile regions of the world' – shows sustainability through positive or neutral impact on the natural environment. • A strain of Golden Rice can satisfy 50% of a person's daily Vit. A needs per cup. • GMO crops are resistant to various problems, like insect pests and drought. • Soybean is an important source of protein (can help solve hunger problem in Africa). • Many examples from Zambia are of staple food sources that are GMO (corn/ maize, soy, papaya, rice, rapeseed/ canola, potatoes, tomatoes, peas).	Source B • Could be source of harm: – Require huge amounts of groundwater. – Excessive use of chemicals. – Sixfold rise in fertiliser per hectare. • Corporate control: Same company that sells seeds, sells herbicide. • African countries are already in poverty – they do not have the funds to pay for corporately controlled GM seeds and herbicides. • 'The new seeds required huge amounts of groundwater, an excessive use of chemicals, and a sixfold rise in fertiliser use per hectare as they were not indigenous to these countries' - shows unsustainability through negative impact on the natural environment. • Poverty-stricken countries do not have access to funds for GM seeds – shows inaccessibility, thus no sustainability. • Excessive herbicide use can harm indigenous plants.
Source C • Indigenous plant species cannot solve immediate food security problem.	Source C • Exotic plants might disturb the biodiversity of a local ecosystem. • Indigenous plants are also already adapted to local conditions (they are drought-resistant). • There are many staple foods that still grow naturally in their respective countries.

	- Some indigenous plants have higher concentrations of key nutrients (vitamins A and C). - Indigenous plants are already adapted to harsh environment of Africa and can face changing climate conditions. - Can offer cheap and elegant solution to food crisis in the future.
Source D - GM crops have been in Africa for a long time (28 years in 2024). - GM crops are designed to withstand harsh African environment. Repeat fact: Many examples of staple food: cowpea, soybean, rice and canola.	Source D Bt cotton example invalid – it is not a food crop.
Source E - Graph A: Current food supply does not match the population growth. - Map D: Large part of Africa is agricultural land. - Map D: Large amount of land can be used to utilise GM crops.	Source E Graphs B-D: The use of agricultural land for GM crop-growing could disturb biodiversity and put more species at risk.
Source F GM crops do not pose a threat in terms of cross breeding with indigenous plant species.	Source F - GM crops may cross breed with indigenous plant species. - Cross breeding can cause wild relatives to become more invasive. - GM crops can also displace indigenous plants. - GM crops can also outcompete indigenous plants and disrupt their reproductive strategies.
Source G - GM crops have been successful so far in Africa. - Claims against GM crops are speculative and not supported by evidence. - GM crops are the best solution to food security crisis.	Source G

OWN KNOWLEDGE • If hybridisation does occur, it may not be for the worse – better traits may arise. • GM plants may be too different from indigenous plants, thus no cross-pollination will occur. • Local farmers can sell GM seeds to help relieve poverty. • Technological breakthroughs could help Africa develop GM crops according to the country's own indigenous crop plants.	OWN KNOWLEDGE • GM crops can have long-term effects on health of animals or humans. • Possibility of cross-pollination – detrimental traits may arise. • Africa might learn to lean on foreign help more than developing their own GM crop solutions – puts Africa at risk of manipulation.
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SOURCE QUALITY

- Source A – World Vision: reliable source → humanitarian organisation
- Source A – Ukrainska Pravda: unreliable source → news website
- Source A – University of Michigan: reliable source → written by Master's candidate
- Source A – ScienceDirect: reliable source → peer-reviewed article
- Source A – National Library of Medicine: reliable source → publishes scientific articles
- Source B – FDA: reliable source → government institution
- Source B – EcoJesuit: not reliable → religious website
- Source B – Oxford Academic: reliable → contains scientific journals
- Source C – Oxfordshire Gardener: not reliable → magazine for gardeners – not scientific
- Source C – National Native Plant Month: not reliable → magazine website
- Source D – The Breakthrough Institute: not reliable → organisation with personal agenda
- Source E – Economic Research Service: reliable → governmental institute
- Source E – WWF: reliable → world-renowned wildlife protection organisation
- Source E – National Geographic: reliable → international nature magazine
- Source F – The Royal Society: reliable → scientific academy
- Source F – Introduction to Conservation Biology: reliable → College textbook
- Source G – The Borgen Project: not reliable → organisation with personal agenda

[40]**Total marks: 100**