NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2024

LIFE SCIENCES: 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 matter of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at the standardisation meeting, there may be different interpretations of the application of the marking guidelines.

SECTION A

QUESTION 1

1.1 1.1.1 Germination

1.1.2 Self-pollination

1.1.3 Diploid

1.2 1.2.1 Pollination – transfer of pollen from the anther (of one plant/flower) to the stigma (of the same/another plant)

Fertilisation – Joining/fusion of the sperm/male gamete (from the pollen grain) with the egg/female gamete (in the ovule)

1.2.2 Drawing of table
Column headings

One comparable difference
Possible compared differences

Sexual Reproduction	Asexual Reproduction
1 Fusion of haploid male gamete/sperm cell with a haploid female gamete/egg cell	1 Diploid female gamete/ egg cell produced OR
2 Involves meiosis	2 No meiosis occurs OR
3 Fertilisation occurs	3 No fertilisation occurs OR
4 Genetically different from parent plant	4 Genetically identical to parent plant OR
5 Requires/uses more energy	5 Requires/uses less energy OR
6 Production of flowers/seeds	6 Production of rhizomes OR
7 Haploid egg produced	7 Diploid egg produced

1.2.3 Less energy is required / no energy expenditure on floral structures / production of pollen
Faster and easier
Offspring genetically identical to parent – reduces variation in the product
Bypasses vulnerable juvenile stages
Larger yields – more food (produced)
Traits can be selected (for) – uniformity of product
Any 2×1 OR 1 well-explained reason

1.3 1.3.1 Longitudinal (section)

1.3.2 (a) G anther
(b) A stigma

1.3.3 Magnification = Image size / actual size

= 80 mm (check print copy) (/ 12) mm (method)
= 6.67 x

Note: Accept 76 – 82 mm for scale bar measurement
Range in Magnification is therefore: 6.33 – 6.83 x
Accept rounded-off whole numbers 6.0-7.0 x

1.3.4 Anthers positioned far beneath the stigma making accidental touching of anthers/pollen to the stigma unlikely

1.4 1.4.1 More than 2 chromosomes per homologous set
OR
More than the diploid (2n) number of chromosomes

1.4.2 (a) Larger seeds
More seeds
Larger outside florets
Larger flowers
Any 1 × 1

(b) **Larger seeds** – seedling survival is increased greater likelihood of outcompeting parent species/ greater likelihood of coping with environmental change/more nutrients stored in seed for germination
OR
More seeds – greater chance of some of the offspring germinating / landing on fertile ground. More seedlings = greater likelihood of out-competing other plants / for resources in a changing environment
OR
Larger outside florets – greater chance of attracting pollinators / greater chance of pollination / fertilisation / seed development. Greater chance of surviving/coping with changing environment through the next generation
OR
Larger flowers - can use one of the above explanation groupings.

1.5 1.5.1 (a) r (strategy)

(b) 'A single daisy flower can contain as many as 2 000 florets, each with the potential to develop a seed'

1.5.2 Ovule

1.5.3 Seeds are protected until conditions are right/rain occurs/ the wet period occurs (to ensure greater chance of germination)

1.5.4 - Advantage of storing seed in a seed bank
- Benefit of the advantage to tourism

For example:

- Ensures protection of the variety of different species that attract tourists to the area
- Areas negatively affected by climate change can be replanted to ensure flowering in the tourist (correct) season
- Provide a bank for reseeding / should (frost) damage result in significant loss in numbers/species
- Prevent elimination of rare species / preserves endangered species that attract tourists to the area

QUESTION 2

2.1 Population numbers have increased / overpopulation of elephants / too many elephants to the point that elephant damage to big trees/vegetation is negatively impacting other animal diversity/the amount of available forage
Any 2 × 1

2.2 2.2.1 A 'r' reproductive strategy; 'k' reproductive strategy

B ovipary; ovovivipary; vivipary

C external fertilisation; internal fertilisation

2.2.2 Name/describe courtship behaviour
describe outcome/reason for courtship behaviour

For Example:
Females make low-frequency rumblings / vocalizations to attract males / communicate their reproductive state
OR
Males release chemical signals in their urine / produce strong-smelling secretions from glands in head to show they are ready to mate
OR
Females hold their tails to one side / stand still / move towards males in a relaxed manner to show they are ready to mate
OR
Males show increased aggression / push over trees / mock battles / dominance displays / demonstrations of physical strength / actively pursue females during periods of increased testosterone levels/ during periods when they are ready to mate
OR
Males raise their trunks to smell/receive female's pheromones signalling her readiness to mate
OR
Male catch (receptive) female's trunk with his own/ gently strokes female's back with his trunk to determine if she will allow mounting/mating

2.2.3 Evidence from text (any 1 × 1):
- Teach their calves everything/how to stand/how to swim / how to find food / how to protect themselves
- Fiercely nurturing and protective
- Nurse their young for 4–6 years

2.3 2.3.1 Possible compared differences (any 1 × 1):

Elephants	Humans
1 2 LH surges	1 1 LH surge OR
2 LH levels higher than FSH before and after ovulation	2 LH levels similar to FSH levels before and after ovulation OR
3 LH surge around Day 9/10	3 LH surge around Day 12/13

2.3.2 (a) Progesterone

(b) Maintains the endometrium layer / increases vascularisation of the uterus (lining) (in the uterus for implantation / embryo / foetal development).

2.4 2.4.1 An increase in the level of one hormone will result in a decrease / inhibition of the level / secretion of another hormone.

2.4.2

	Column A	Column B
C	FSH	A Stimulates the development of secondary sexual characteristics
A	Oestrogen	B Stimulates ovulation
		C Stimulates the development of a follicle in the ovary

2.4.3 Prevents fertilisation (of the ovum/egg) as sperm cells are blocked from penetrating the egg (membrane) by antibodies* (produced by the vaccine)
Any 2 + 1 compulsory*

2.5 2.5.1 Calving % = number of calves born / number of cows vaccinated × 100
= (7/50) (× 100) (method)
= 14 (%)

2.5.2 4 (years)

2.5.3 Have long-term anti-fertility effects
Little impact on secondary sexual characteristics
No health risk for the elephant
Economically feasible
Does not affect social group behaviour
Easy administration

2.6 2.6.1 The cutting/blocking/sealing of the sperm ducts (vas deferens) (of both testes).

2.6.2 (A vasectomy) prevents sperm from travelling with the semen from the testes (into the female).

2.7 2.7.1 The vasectomy does not impact:

- the production of LH from the pituitary gland which stimulates the interstitial cells (Leydig cells) in the testes to produce testosterone
- the production of testosterone which influences male courtship behaviour as the cut/incision does not sever blood vessels to the testes
- does not affect the instinctive behaviour to mate
- does not affect the ability of the male to enter musth

2.7.2 ONE consequence of inbreeding
ONE linked explanation of how the consequence limits adaptation ability

Possible consequences:
Reduced genetic diversity / Inbreeding depression / increased expression of negative mutations / decreased fertility / higher mortality / reduced reproductive success

Possible Explanations:
Limits population's resistance to climate change / less ability to adapt to changing climatic conditions / less able to cope with the stressors of a changing climate / can limit a population's ability to adapt quickly

2.8 Yes

- Population growth is controlled/preventing further habitat/vegetation destruction
- Non-lethal method
- Less psychological damage
- Protects biodiversity of elephant habitats
- Overpopulation of elephants leads to increased competition for space / food / resources

No

- Disrupts normal social and courtship behaviours
- Elephants should be allowed to live natural lives without human-imposed restrictions
- Long-term negative genetic impacts (inbreeding, reduced adaptability)
- Contraceptive methods can cause stress/physical discomfort to elephants
- Elephants are not able to give consent to contraceptive application /procedures

Any TWO facts or ONE well explained.

SECTION B

QUESTION 3

	FOR	AGAINST
Source	**Pregnancy at advanced maternal age DOES cause more health risks for mother and child.**	**Pregnancy at advanced maternal age DOES NOT cause more health risks for mother and child.**
A Maternal age pregnancy trends	**After age 35 increased risk of:** Miscarriage* / genetic abnormalities / Pregnancy complications / (gestational diabetes*) / Diabetes / high blood pressure* **After the age of 40 higher chance of:** C-section delivery* / premature birth* / low birth weight / birth defects / still birth **Figure 3.1:** Fertility declining from age 32 Proportion of poor quality oocytes ±87% at age 32 Older mothers face increased risks due to aging reproductive organs ***DON'T DOUBLE MARK IF USED FROM SOURCE C**	Many women in their 40s can still have healthy pregnancies / babies **Figure 3.1:** End of fertility only after 42 years Birth rates 35–39 increased by 272% Birth rates 40–44 increased by 318% Dr – age less relevant than underlying health condition
B Pregnancy complications	Chromosomal abnormalities increase (6,4%) **Figure 3.2:** 35–39 and 40+ – highest % of genetic defects (proportionally) 34–44 – pregnancy complication rates higher 40 – 4 % NICU admissions 45–46+ – 6% NICU admissions **Figure 3.3:** 34-41 – 0/1 % end at term / most/all are pre- & post-term. 42-49 - all are pre-term Risk of health complications for mother/baby in pre-term births is high (page xv) **Figure 3.4:** 35+ - Steep increase in risk of foetal loss	**Figure 3.2: Under 20 -** Highest % of congenital heart defects Highest % of nervous system defects 18–24 & 34–44 childbirth complication rates similar **Figure 3.3:** 18–25 & 26–33–many pre-/ post-term births. Risk of health complications for mother/baby in pre-term births remains high (page xv) **Figure 3.4:** <15 years = increase in risk of foetal loss

C **Health risks**	**Reproductive System:** Decline in number and quality of oocytes* Surface tissues at risk of cancer Uterus less sensitive to oxytocin **Endocrine Disturbance:** Altered sensitivity to negative feedback Progesterone and oestrogen levels decline Insulin resistance / more glucose tolerance Heightened risk of obesity **Placental Problems:** Placental detachment Placental previa Uterine bleeding **Pregnancy Outcomes:** Miscarriage* Pre-term birth* Gestational diabetes* Slow foetal growth High blood pressure* Caesarean section required* **DO NOT DOUBLE MARK IF USED FROM SOURCE A**	
D **Parenting styles**	**Older Mothers:** **OR** Less physical energy Larger generational gap More social judgement Fewer years to spend with children **Younger mothers:** **OR** More Energy Smaller generational gap No/Less social judgement More years to spend with children **Parent Experiences:** 27 – confident, full of energy / ready 32 – time to establish a career & be emotionally solid 35–37 – disconnected from other mom's	**Older Mothers:** Stronger emotionally / better mental health More mature/patient / better parenting skills More financial resources More stable relationships / support system Stable careers Higher levels of education **Younger mothers:** Less maturity/life experience Less support systems Financial challenges Less / unfinished education **Parent Experiences:** 18 – hard to parent when you still have to grow up yourself 32–37 – more mature and financially stable
E **Effect on lifespan**	**Children born to older parents:** More likely to carry DNA mutations / impaired mitochondrial functions More frail / ageing process faster **Figure 3.5:** Offspring mortality rate higher / steeper / greater in offspring of old parents (with increasing offspring age)	**Young mothers:** Higher mortality rates Negative implications for health later in life.

F **Effect on mental health**	**Children of older parents:** Parental frailty / loss leads to stress/health problems increased symptoms of depression/anxiety/stress Increased risk of schizophrenia	**Children of older parents:** Perform better academically Report better health Fewer behavioural issues **Younger parents:** Higher risk of having children with schizophrenia 16–44 % experience depression **Figure 3.6:** Poor mental health knock-on effects: **Pregnancy (mom)** – inadequate nutrient intake / preterm birth / preeclampsia **Post birth (mom)** – difficulty breastfeeding / less bonding with baby / poor nurturing care **Baby (child)** – risk of infant mortality / low birth weight / less maternal attachment **Children (child)** – stunted growth / underweight / poor cognitive development / lower immunisation rates **Adolescents (child)** – higher rates of suicide/increased risks of mental illness
Own Knowledge	How chromosomal abnormalities occur during meiosis Description of placental function in pregnancy Correct description of feedback disruptions of blood glucose levels that result in diabetes (type 2) Effect of fertility treatments on mother/child Ethics surrounding fertility treatments – must link to mother/(future) child health Downs' syndrome Amniocentesis	Role of oxytocin in labour/ breastfeeding / bonding HIV effects on mother and/or child

TOTAL: 100 marks

Note: The essay should be 2½ to 3 pages long.

Suggested allocation of time: Reading sources 10 min; Planning 10 min; Writing essay 40 min.

	1 mark	2 marks	3 marks	4 marks	Possible mark
Planning **× 2**	• Decision given • Key points present for and against the argument	• Decision given • Key points developed for and against the argument	• Decision given • Key points developed for and against the argument • Source references identified		**6**
Decision	• Vague • Changed position within essay	Clear decision made			**2**
Use of knowledge from sources [x 2]	Up to ¼ of potential detail in sources used to support argument	Up to ½ of potential detail in sources used to support argument	Up to ¾ of potential detail in sources used to support argument	Source detail – very close to full potential used to support argument	**8**
Use of own knowledge	Some facts beyond the source given to support the argument	Many facts beyond the source given to support argument	• Some facts beyond the source given to support argument • Facts integrated into the argument	• Many facts beyond the source given to support argument • Facts integrated into the argument	**4**
Content relevance	• Repetition is mostly avoided • Some minor digression • Supporting argument relevant	• Repetition is mostly avoided • Some minor digression • Supporting argument relevant • Quality of source extracts acknowledged			**2**
Quality of argument supporting decision [x 2]	• Writing consists of facts with little linkage or reasoning • Reasoning incorrect	• **Maximum if no clear decision in support** • Reasoning correct, but hard to follow • Ordinary; some linkage evident	• Supports the position • Reasoning is clear • Minor errors in flow • Linkage sometimes missed	• Strongly supports a clear position • Reasoning is very clear and succinct • Flow is logical • Compelling with regular linkage • Well-integrated argument	**8**
Fairness – counter opinions to decision	**One to two** counter opinions from the sources given	**Three to four** counter opinions from the sources given	Integration of one to two counter opinions from the sources into argument	Integration of three to four counter opinions from the sources into argument	**4**
Presentation	• Writing is almost unintelligible • Tone, language, terminology unscientific and very weak • Introduction **and/or** conclusion **not** present	• Tone, language, terminology weak • Introduction **and** conclusion present	• Tone is consistent and suited to scientific language • Good and appropriate language and terminology • Mostly appropriate paragraphing • Introduction and conclusion have merit	• Tone is mature and suited to scientific language • Excellent and appropriate language and terminology • Correct paragraphing with good transitions • Interesting introduction, satisfying conclusion	**4**
Scientific merit	The essay shows academic rigour, accurate reasoning, insight and cohesiveness.				**2**
Total Possible Mark					**40**