NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

LIFE SCIENCES: PAPER I

MARKING GUIDELINES

Time: 3 hours 200 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

	COLUMN A		COLUMN B
[G]	A new population is established by a very small number of individuals from a larger population.	A	Outbreeding
[A]	Promotes heterozygosity.	B	Jean-Baptiste Lamarck
[K]	One of the first scientific thinkers who proposed an idea of evolution.	C	Alfred Wallace
[B]	Theory of inheritance of acquired characteristics.	D	Gene flow
[J]	A form of macroevolution with a constant rate of variations over long periods of time.	E	Punctuated equilibrium
[D]	Movement of genes from one population to another.	F	Homologous
[H]	Formulated the theory of evolution by natural selection.	G	Founder effect
[L]	Structure which once performed a function in an ancestor of an organism.	H	Charles Darwin
[F]	Similar structures in organisms acquired from a common ancestor.	I	Extinction
[C]	Proposed a similar mechanism of evolution to that of Charles Darwin.	J	Gradualism
		K	Erasmus Darwin
		L	Vestigial organ

(10)

1.2

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer	C ✓	C ✓	B ✓	B ✓	A ✓✓	B ✓✓

(8)

1.3 1.3.1 1 mm = 22-24 mm ✓ A to B = 10-15 mm ✓ 10 mm × 1 mm /✓ 23 mm = 0,42 – 0,68 mm ✓ (Accept range)
(*Check final question paper for measurements*) (4)

1.3.2 (a) Time/mya ✓ different time periods (1)

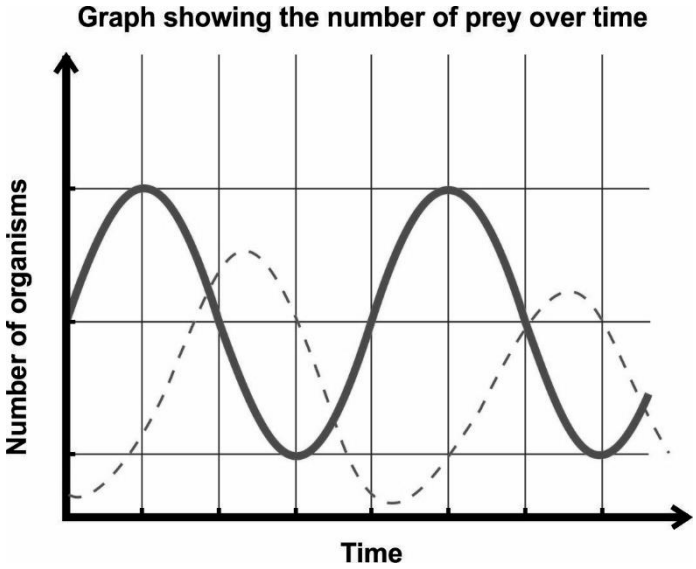
(b) 0,4 mm ✓
(*Check final question paper for measurements*) (1)

(c) Drill hole gets bigger ✓ over time / the younger the fossil ✓
Increase till 250 mya; ✓ slight decrease till 200 mya; ✓ increase till 50 mya ✓
(*Accept other reasonable answers*.) (2)

(d) Thicker shells/ better camouflaged/ harder shell ✓
(*Accept other reasonable answers*) (1)

(e) Used 7000 / large sample shells ✓ can calculate average /more data removes influence of outliers ✓ published in journal ✓ therefore peer reviewed ✓/ results repeatable ✓ (2)

(f) Graph line lower ✓ lags behind prey ✓



(2)

1.4

	Statement	A, B or C
1.4.1	South Africa has more cases of FAS than the rest of the world.	A / C✓
1.4.2	Abnormalities caused by foetal alcohol syndrome are reversible.	B ✓
1.4.3	FAS can be prevented by avoiding alcohol during pregnancy.	A ✓
1.4.4	Children with FAS have physical abnormalities and intellectual disabilities.	A ✓
1.4.5	FAS largely affects poverty stricken areas.	C ✓

(5)

1.5

Item	Term	Answer
1. Permanent contraception for female 2. Inserted into the uterus	IUD	B ✓
1. Prevents STIs 2. Chemical barrier	Male condom	A ✓
1. Tracking fertile days in the menstrual cycle 2. Prevents embryo implantation	Rhythm method	A ✓
1. Foreskin is removed 2. The fallopian tubes are tied off	Vasectomy	D ✓
1. Prevents ovulation 2. Contains reproductive hormones	Contraceptive pill	C ✓

(5)

1.6 1.6.1 Label on diagram ✓ (1)

1.6.2

Term/Description		Correct letter
(a)	Mature Graafian follicle	C ✓
(b)	Ovulation	D ✓
(c)	Corpus luteum	E ✓
(d)	Releases oestrogen at the start of the menstrual cycle.	B ✓
(e)	Starts developing as a result of FSH release.	A ✓
(f)	Produces a hormone to inhibit FSH production after ovulation.	E ✓
(g)	Remains in place if fertilisation does occur.	E ✓
(h)	Occurs due to a surge in LH.	D ✓

(8)

1.7 1.7.1

Description	Label number(s)	
	Diagram A	Diagram B
Place where fertilisation takes place.	3 ✓	11 ✓
Place where the male reproductive cells are deposited.	6 ✓	9 ✓
Organ which protects a developing foetus.	4 ✓	
Structure where meiosis takes place.	2 ✓	8 ✓ / 11
Structure which develops into the fruit.		12 ✓

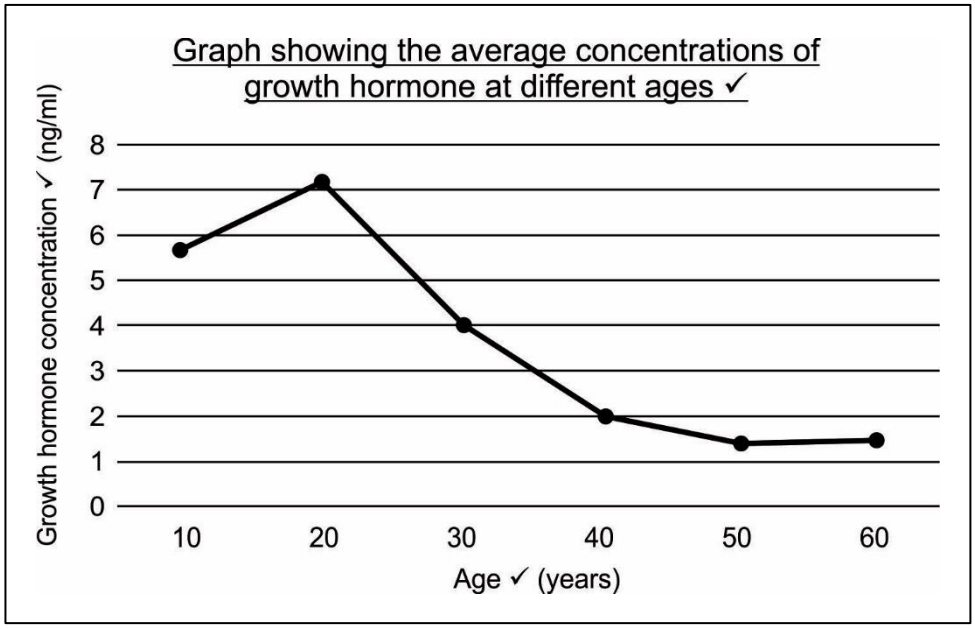
(8)

1.7.2 Heading: Differences between sexual and asexual reproduction ✓

Sexual	**Asexual** (column headings) ✓
Production of gametes	No production of gametes ✓
Results in variation	Clones of parent ✓
Slower process	Faster process ✓
Requires larger input of energy	More energy efficient
Pollination/Pollinators required	No pollination
Requires sexual reproductive structures e.g. flower	Any vegetative part
Usually 2 parents	One parent

Construction of table format ✓
(*Accept other relevant differences*) (6)

1.8 1.8.1 Heading ✓
Y – axis: growth hormone concentration ✓
X – axis: age ✓
Units included in axis headings ✓ (ng/ml)
Scale ✓ (check y-axis carefully)
Plotted correctly ✓✓ (✓✓ all 6 correct, ✓ 3–5 points correct)
Line graph ✓



(8)

1.8.2 Pituitary / hypophysis✓ (1)

1.8.3 Hormones transported in blood ✓ to target organs (1)

1.8.4 Puberty/adolescence occurring ✓ growth spurt ✓ (2)

1.8.5 (a) 50–60 years ✓ (1)

(b) Old age all processes slow down / growth plates closed / growth in height ceased / renewal of tissues slows ✓ (1)

1.8.6 (a) Acromegaly ✓ (1)

(b) Enlarged (flat) bones of hands/feet/face; ✓coarsening of skin ✓ enlarged or protruding tongue/ thickening of soft tissues/ enlarged heart (1)

[80]

QUESTION 2

2.1 2.1.1 *Australopithecus africanus* ✓ (1)

2.1.2 Foramen magnum (or described)✓ towards centre of skull (descriptions meaning the same)✓ (2)

2.1.3 Freed hands able to carry tools / weapons whilst moving ✓/ carry offspring to safety; ✓ cover large distances / with little energy expenditure); ✓ see predators / source of food easily; ✓ live in a greater variety of biomes, e.g. forest and savannah ✓ increased cooling ✓ (max 3)

2.1.4 Ape's teeth would be larger; ✓ pronounced canines; ✓ U shape of dental arch ✓gap in upper jaw for canines (diastema) ✓ (2)

2.1.5 Measuring the volume ✓ of the brain-cast; ✓ which was a model of actual brain size ✓ / using cranium of skull; ✓ determining volume ✓ (*Accept any suitable measurement of volume*) description of how volume measured ✓ use a endocranial cast ✓ (2)

2.1.6 Belief that early humans originated in Europe/ England ✓ had a larger brain; ✓ and more apelike jaw/teeth ✓ (2)

2.1.7 Open minded about new evidence; ✓ rather than sticking to preconceived ideas; ✓ allowing many scientists to examine evidence ✓ to reduce chance of hoax / mistakes made by scientists; ✓ prevent societal views ✓ to slant their ideas on science; ✓ collaboration more important than competition ✓ as human evolution largely an unknown field. ✓ (max 4)

2.2 2.2.1
- mtDNA / genetic evidence✓ modern Africans have largest number of variations ✓
- Fossil evidence ✓ oldest *Homo sapiens* fossils found in Africa ✓
- archaeological evidence ✓ oldest evidence of symbolic thought found in Africa✓/ e.g. Art (Blombos Cave); ✓
- burial of dead✓ (Klasies Cave, Border Cave); ✓
- tools/artefacts✓ (Pinnacle Cave, Blombos) ✓

(line of evidence ✓ explained ✓) × 2 (4)

2.2.2 200 000 – 45 000 ✓ = 155 000 years ✓ (2)

2.2.3 Larger brain ✓ enabled to plan ahead / communication; ✓ use of fire ✓ source of warmth in inhospitable areas / defence against prey / social organisation ✓ bipedalism ✓ cover large distances ✓ pronounced chin ✓to allow for more space for tongue for communication✓
(*List two characteristics and explain how each enabled them to survive. Accept any reasonable answers*) (4)

2.2.4 Multiregional ✓ *Homo sapiens* evolved independently in separate regions ✓ from *Homo erectus* / *Homo neanderthalensis* ✓ (max 2)

2.3 2.3.1 Cradle of Humankind/ Malapa ✓ (1)

2.3.2 Allows time for scientists to study fossils; ✓ to identify species ✓ time needed to remove fossil from rock; ✓ to collect many specimens; ✓ peer review requires time; ✓ dating to confirm ages ✓ (*Any 2*) (2)

2.3.3 Transitional fossil ✓ explanation of specific feature, e.g. long arms, / arched feet ✓ / showing characteristics of both Homo and Australopithecus ✓ / new species ✓ fills gap in evolutionary record /explanation of human evolution ✓ (2)

2.3.4 Increased tourism ✓/ South Africa on map to find good fossils / enhances scientific understanding of human evolution in the public (*Any reasonable explanation*) (1)

2.4 A – divergent ✓ common ancestor ✓ shows species evolve differences ✓ homologous structure explained ✓
B – convergent ✓ parent species not closely related ✓ show similarities in form ✓ / analogous structure explained (6)
[40]

QUESTION 3

3.1 3.1.1 Not enough food available ✓ (1)

3.1.2 Interspecific ✓ (1)

3.1.3 Variation in head size ✓ lizards with larger heads able to access more food ✓ greater chance of surviving ✓ and reproducing ✓ genes/traits for larger heads passed to offspring ✓ over time ✓ population had a greater number of larger head individuals ✓ (max 5)

3.1.4 YES: as geographically isolated / allopatric speciation ✓ therefore reproductively isolated ✓ / cannot interbreed / produce viable offspring ✓
OR NO: not enough time ✓ to accumulate changes /only head size has changed ✓ can still interbreed when reintroduced ✓ (max 2) (2)

3.1.5 Microevolution ✓ small changes / only change in head size ✓ in short period of time ✓ / small scale ✓ in small population ✓ (3)

3.2 3.2.1 96–99(%) ✓ (1)

3.2.2 11/12/13 ✓✓ months ~~✓~~ (2)

3.2.3 4 ✓ ˚C ✓ (2)

3.2.4 Storage facility for seeds / place to preserve seeds / ~~prevent extinction of plants~~✓ (1)

3.2.5 Verge of extinction; ✓ used by locals for medicinal purposes; ✓ overuse ✓ (2)

3.2.6 The longer the seeds are stored ✓ less likely they are to germinate ✓ (2)

3.2.7 Cuttings / vegetative propagation ✓ remove a piece of plant ✓, place in water ✓add growth hormones / and allow growth of roots, ✓ plant it out ✓ / tissue culture/ cloning/micropropogation ✓ remove small number of cells from plant ✓ place in growth medium ✓ add growth hormones allow callus to develop ✓ and growth of plantlet ✓ plant it out ✓ (*name one ✓ explanation ✓✓✓*) (4)

3.3 3.3.1 Patient has more glycogen granules ✓✓ / healthy subject has less glycogen granules ✓✓ has more dark patches – only ✓ or healthy has less dark patches✓ (2)

3.3.2 Used as a comparison /control ✓ to show state of healthy liver ✓ (2)

3.3.3 (a) Insulin ✓ (1)

(b) Heading ✓ arrows ✓ high blood glucose levels ✓ → insulin released from beta cells (pancreas/ islets of Langerhans) ✓ → insulin travels in blood ✓ to liver ✓ → membrane of liver cells

more permeable ✓ to glucose ✓ → glucose absorbed ✓ → converted to glycogen ✓ (any 5 sequential steps) (7)

3.3.4 Enlarged liver – excess glycogen stored ✓ and no glucagon secreted to convert glycogen to glucose ✓ low blood glucose – no / low secretion of glucagon ✓ to convert glycogen to glucose ✓ enzyme needed to release glucose from glycogen missing. ✓
Accept any reasonable answer for each symptom. (max 2)
[40]

QUESTION 4

4.1 A – prostate gland ✓ B – vas deferens / sperm duct ✓
C – urethra ✓ D – scrotum ✓ (4)

4.2 4.2.1 Tip of penis ✓ (1)

4.2.2 (a) True ✓
(b) True ✓
(c) False ✓ (3)

4.3 4.3.1 Testes ✓ (1)

4.3.2 Rapid physical growth in puberty; ✓ development of secondary sexual characteristics; ✓ regulate secretion of LH and FSH; ✓ sex drive; ✓ sperm production ✓ (2)

4.3.3 High levels of testosterone in blood ✓ inhibits ✓ secretion of LH and FSH ✓ from pituitary gland ✓ acts on testes ✓ stop secreting testosterone ✓resulting in less sperm production ✓
(*5 good facts sequentially*) (max 5)

4.3.4 Unfair advantage ✓ reduce pressure from coaches and parents to take steroids ✓ reduce peer pressure to take steroids ✓ steroids have serious side-effects e.g. lowers fertility, disrupts secretion of reproductive hormones ✓ steroid side-effects more pronounced in adolescents ✓ high levels of aggression✓ testing acts as a deterrent ✓ highlight the dangers of taking steroids ✓ (any 3) (3)

4.4 Larger footprint / image on right in developed countries ✓use more natural resources / ecological debtor ✓ to sustain lifestyle ✓ represented by larger figure in cartoon ✓ indicates greed ✓ using more land✓ more negative impact ✓Smaller footprint / image on left in developing countries ✓ no shoes/ thinner figure ✓ suggests lack of use of resources / ecological creditor ✓ (*Accept any reasonable suggestions*.) (6)

4.5 4.5.1 (a) Secondary ✓ (1)

(b) Started with soil / not bare rock / soil present / plants grew here before / no lichens and moss / annual plants first colonisers ✓ (1)

4.5.2 Hardwood trees ✓ (1)

4.5.3 Living space; ✓ sunlight; ✓ water; ✓ soil nutrients; ✓ increase in competition; ✓ increase in diseases; ✓ pests ✓ (*any 2*) (2)

4.5.4 YES – long term ✓ with changing plant communities ✓ increase in nutrients in soil ✓would come animals ✓ increase in food ✓ increase in shelter ✓
OR NO – long period of time ✓ before climax community ✓/ stable community pioneer community has low biodiversity ✓seeds from crops present lead to different communities ✓ (*3 points*) (3)

4.5.5 (a) Pioneer ✓ coloniser (1)

(b) Community – group of populations/species in an area ✓
Ecosystem includes interaction with environment ✓ / groups of communities interacting with each other (2)

(c) (i) Early – short ✓ one growing season / 2 – 12 months
(ii) Late – longer ✓ more than a year (2)

(d) Reduces competition with parent plants ✓ lifespan of early stage plants short ✓ if dispersed widely better coverage of new areas ✓ (any 2) (2)

[40]

Total: 200 marks