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Grade 12 Marking guidelines Preliminary Examination

Question 1

- 1.1.1 E. Social organization✓
 - 1.1.2 I. Simple sampling✓
 - 1.1.3 G. Intra-specific✓
 - 1.1.4 H. Resource partitioning✓
 - 1.1.5 A. Commensalism✓
 - 1.1.6 C. Mortality✓
 - 1.1.7 J. Developing✓
 - 1.1.8 D. Population✓
 - 1.1.9 N. Natality✓
 - 1.1.10 F. Territoriality✓
- (10)

- 1.2.1 D✓
 - 1.2.2 C✓
 - 1.2.3 B✓
 - 1.2.4 C✓
 - 1.2.5 D ✓✓
 - 1.2.6 B ✓✓
 - 1.2.7 C ✓✓
 - 1.2.8 A ✓✓
- (12)

1.3.1 Both A and B ✓

1.3.2 Accept Both A and B **and** A only ✓ (due to phrasing of question)

1.3.3 A only ✓

1.3.4 A only✓

(4)

[Do not leave any short questions unanswered. Guess if you do not know]

[Make sure to follow the instruction *exactly*. Example: "A only" not "A".]

[Cladogram - Characteristics vs Phylogenetic tree – Evolutionary relationships]

1.4.1 Prey-predator/ predation✓ (1)

1.4.2 Carrying capacity✓ (1)

1.4.3 - The number of wild dogs will increase✓

- due to there being more food/kudu available✓

- Thereafter the number of wild dogs will decrease✓

- as the number of kudu would have decreased ✓ due to limited resources /
environmental degradation ✓

(Any 3) (3)

1.4.4 1980: Accept 45 to 55 2001: Accept 280 to 290

290 – 50 ✓ (identify both values and subtract)

240/ 50 x 100 ✓ (divide by original and multiply by 100)

= 480% (answer with unit) ✓ (3)

[Read axis – x100!]

1.4.5 - The population decreased from 1987-1994✓

- then increased from 1994-2008✓

- and finally decreased after 2008✓

(if specific dates not given – minus 1 mark from final answer for question) (3)

1.5.1 (a) GGT✓ (1)

(b) AAA✓ (1)

(c) UCA✓ (1)

1.5.2 (a) 1✓ (1)

(b) 198✓ (1)

(c) 66✓ (1)

- 1.5.3 - One of the base triplets on the DNA / a nucleotide has changed (substituted)✓
- from ACG to ACC (codon changed) ✓
 - Both codons code for the amino acid threonine✓
 - resulting in no change in the sequence✓ of amino acids
 - Therefore no change in protein ✓
 - An example of silent/neutral mutation ✓ (Any 4) (4)

[Question asking for change in this *specific* protein, NOT what changes in aa sequence do in general]

- 1.6.1 Diagrams 1 and 3 (bat wing & butterfly wing)✓
- They have a similar function, but not from a common ancestor/ are because of a similar environment ✓ (2)
- 1.6.2 Diagram 4 (human appendix) ✓ (1)
- 1.6.3 the structures that are reduced and have no known function in an organism✓ (1)
- 1.6.4 Vestigial structures were once used in ancestors ✓ which shows that organisms have changed over time✓ or
- Other organisms similar structures ✓ indicating a common ancestry ✓ (2)
- 1.7.1 Census / Aerial photographs to count individuals✓ (1)
- 1.7.2 (a) $(15 \times 40) \checkmark \div 5 \checkmark = 120 \checkmark$ (3)
- (b) Below the carrying capacity✓ (1)

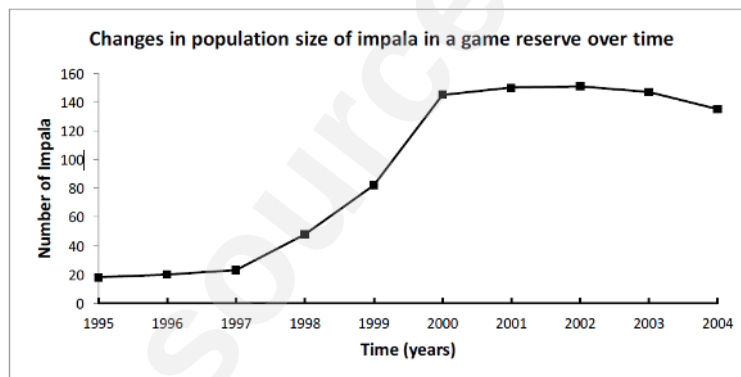
- 1.7.3 - The mark must not harm/affect the organism in any way✓
- The mark must last for the duration of the investigation✓
 - Investigation must be carried out on a closed population✓
 - Enough time must be given for the marked organisms to mix with the rest of the population ✓
 - Time not too long for individuals to die or be born✓

["Appropriate time" – too vague. Must be descriptive re not too long or too short]

- Several samples can be taken and then an average taken✓
- The animals must be randomly captured ✓ (ANY 2)

(2)

1.7.4



Criterion	Mark
Correct type of graph	1
Caption-includes both variables	1
Correct label and unit for X-axis and Y-axis	1
Correct scale for X-axis and Y-axis	1
Plotting of points	1:1-9 points plotted correctly 2: All 10 points plotted correctly

[Accept "year" for x-axis. According to data table]

[Cannot assume graph starts at 0]

Graph is only out of 5 on Question paper. Plotting of points – Correct general shape –

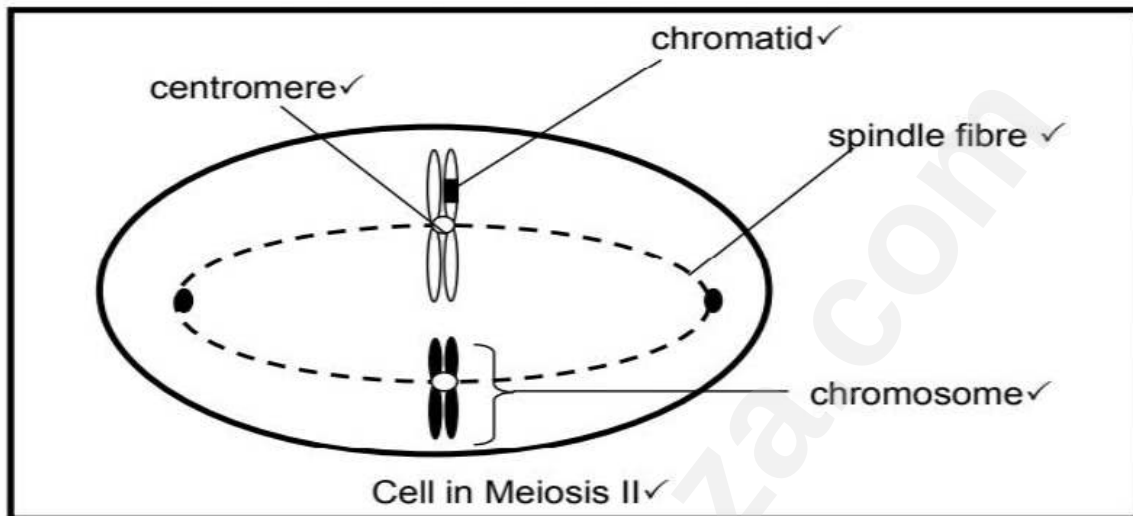
1 mark max

(5)

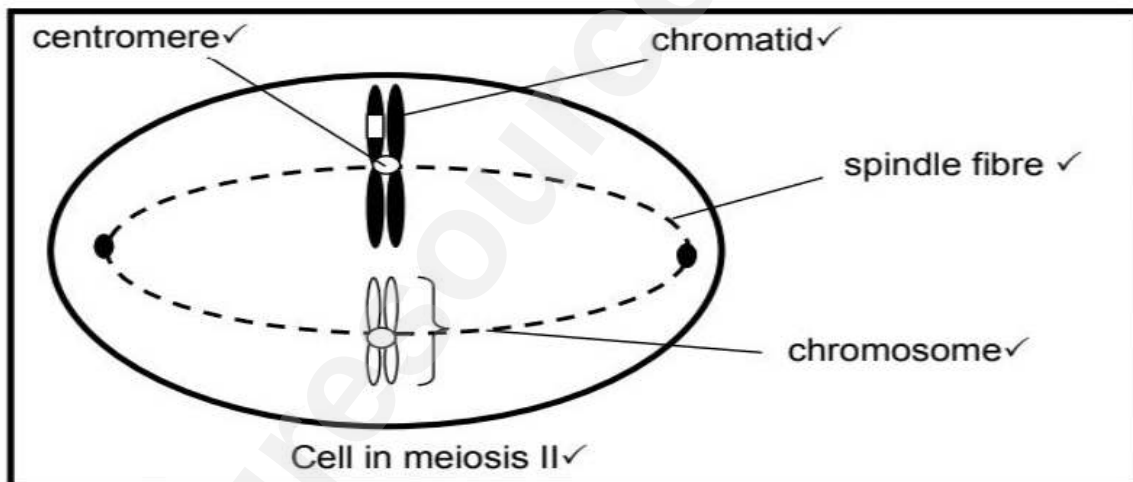
1.8.1 Metaphase I ✓

(1)

1.8.2



OR



Caption	1
2 chromosomes shown	1
Alignment of chromosomes at the equator shown	1
Correct appearance of chromosomes	1

(5)

- 1.9.1. (a) 46 ✓ (Accept 23 pairs) (1)
 (b) 44 ✓ (Accept 22 pairs) (1)
 (c) 2 ✓ (Accept 1 pair) (1)

1.9.2. 23 ✓ (1)

1.9.3. Male ✓

There is XY in pair number 23 ✓ / There is small chromosome and large/
 big chromosome pair number 23/ there is different size in chromosomes
 pair 23. (2)

1.10

Marks are allocated as follows:

Formula: $Actual\ size = \frac{Measured\ length \times number\ on\ scale\ bar}{Length\ of\ the\ scale\ bar}$

Substitution 32.4 nm ✓

Two lengths measured correctly ✓

Substitution of "number on scale bar (nm)" ✓

Final answer WITH UNITS (nm) ✓

$$32.4nm \checkmark = \frac{63mm\ (accept\ 62 - 64) \times x\ nm \checkmark}{23mm\ (accept\ 22 - 24) \checkmark}$$

$$Actual\ size\ of\ scale\ line = 11.83nm \checkmark$$

(4)
[80]

Question 2

- 2.1.1 This will ensure the survival of the fittest ✓ in their species ✓, even if it is not necessarily their own offspring.

(Accept answers re division of tasks, if well-explained)

[Important part of the question “not their own”. Cannot say that it’s because the pups are vulnerable to predation.] (2)

- 2.1.2 This ensures the pups receive parental care ✓ while they are still developing / growing ✓

Or

This ensures the protection of the pups ✓ while they are too small to defend themselves ✓ (2)

- 2.1.3 predation by lions ✓
stealing of food by hyenas ✓
persecution by stock farmers ✓
disease such as rabies
traditional use of wild dogs by humans (any 3) (3)

- 2.1.4 **For:**

Only alpha male and female breed - best genes passed on to offspring ✓

Pack members help raise the puppies - higher survival rate ✓

Most pack members are related - reduces aggressive behavior in pack ✓

Vulnerable young are fed first

Regurgitate food for pups/old/injured pack members

Share reproductive effort of parental care

Accept answers re division of tasks

Against:

Because all members of pack are related inbreeding may occur over time ✓

Inbreeding may lead to increased homozygosity / harmful mutations spreading in population ✓

Decrease chance of evolution ✓

Adults that stay behind to watch the young reduces the size of hunting pack ✓

Less individuals reproducing = less pups in each reprod season

[Instructions!!! "Numbered bullets"] (5)

2.1.5 Availability of food ✓ - successful hunters that eat their kill quickly (1)

2.1.6. They are extensively hunted for their hearts and fat ✓

(Food for hunting dogs & traditional medicine may be 2 separate marks)

Killed by farmers ✓

they have a low immunity ✓

Urbanization and destruction of habitat/resources ✓

They are heavily predated (accept high density of lions and/or hyenas) ✓

(Any 2) (2)

2.1.7 Look for a reasonable ✓ answer that is practical ✓ that addresses one of the problems the learner mentioned ✓ in 2.1.6. (3)

2.2.1 lack of food ✓ oxygen ✓ space ✓ or accumulation of toxins/wastes ✓

(Accept temperature)

[Cannot just say "resources". Must be more specific] (3)

2.2.2 slower growth rate ✓

colder temperatures cause enzymes to function more slowly/reactions slower ✓

less energy for growth and reproduction would have been released ✓

(Accept - pattern would be the same) ✓ (3)

2.2.3 The food source for the bacteria was depleted ✓

Which caused many bacterial cells to die ✓

OR

Oxygen was depleted ✓

Cells cannot respire and/or die ✓ (2)

2.2.4 Temperature ✓ + explanation ✓

Type of bacteria ✓ + explanation ✓

Ensure their environment is sterile ✓ + explanation ✓ (Any 2) (4)

2.3.1 Geometric/exponential growth ✓

“The human population increases faster than the exponential growth” ✓

as a result of the “high natality rates” ✓ and “low mortality rates” ✓.

“Females fecund” (4)

2.3.2 Less food per individual available ✓✓

Diseases ✓✓

(Accept answers re arranged marriages and inbreeding, as well as health care and loss of newborns) (4)

2.3.3 SA's mortality rate ✓ is lower ✓.

(Accept: Mexico's mortality rate is higher than SA).

If student wrote data out and did not interpret it – max 1 (2)

[40]

Question 3

- 3.1.1 DNA from the blood on the duvet cover can say who murdered the young girl ✓
and if DNA from the other two suspects are found on the duvet cover or any
significant item it could mean they were there when the crime was committed ✓. (2)
- 3.1.2 Identify relatives or paternity testing ✓
Diagnose inherited disorders or to advise parents during genetic counseling ✓
Identifying unrecognizable casualties ✓
Fight illegal trade (e.g. plants, poaching, etc.) ✓ (Any two) (2)
- 3.1.3 Suspect 2 was involved in the crime ✓ as their bands correspond / are exactly
the same / match up exactly to the DNA sample found at the crime scene ✓
**[DNA Fingerprints match – not sufficient. Students *must* talk about the
bands being identical. Same thickness, same distance apart, etc.]** (2)
- 3.1.4 They could argue that there may have been some tampering with /
contamination of the evidence ✓ or human error at collection or analysis of
DNA ✓
They could argue that suspect 2 has an identical twin ✓ (2)
- 3.1.5 Yes ✓. Hair will contain DNA if the follicle is intact ✓. (2)
- 3.1.6 - DNA may be planted or tampered with.
- Privacy concerns regarding the collection and storage of genetic information.
- Potential misuse of genetic data by authorities or third parties.
- Discrimination based on genetic information.
- Informed consent for DNA collection. (Any ONE ✓, explained ✓) (2)

3.2.1 Ribosome ✓ (1)

3.2.2 If an organism cannot produce proteins, it will not survive. ✓

Proteins control most of the functions, as they are enzymes, hormones, etc. ✓ (2)

3.2.3 The new antibiotics could work by targeting the messenger RNA (mRNA) ✓, unfolding process which is essential for protein production ✓.

By interfering with this step, these antibiotics would prevent bacteria from making necessary proteins, leading to their inability to grow or survive ✓. (3)

3.2.4 The tRNA picks up specific amino acids from the cytoplasm ✓ and brings them into position on the surface of a ribosome ✓ where they can be joined together in specific order to make a specific protein. (2)

3.2.5 Misuse of antibiotics:

The overuse / over-prescription of antibiotics ✓ have caused overexposure of the bacteria to the antibiotic ✓.

Bacteria reproduce quickly ✓, so when a person does not finish their course of antibiotics ✓, mutations ✓ will make them resistant to the antibiotic. (Any 4) (4)

3.3.1 3 ✓ (1)

3.3.2 ff ✓ (1)

3.3.3 No. ✓

Each of them have a parent who is not polydactylous ✓ thus they will receive one allele normal phenotype ✓ OR

One parent must be heterozygous/Ff. ✓ because half the offspring are polydactylous ✓ SO all polydactylous offspring must be heterozygous OR

It is a dominant gene ✓ and all the offspring have gone on to have unaffected children ✓ (3)

3.3.4 Ff x Ff (or in Punnett square) ✓

(Lose this mark if student used own symbol (not F and f))

	F	f
F	FF	Ff✓ (row)
f	Ff	ff✓ (row)

25% FF; 50% Ff; 25% ff ✓ OR 1:2:1 FF:Ff:ff

Thus 75% chance of having a polydactylous child ✓ OR 3:1 chance (5)

3.3.5 No ✓ They are both homozygous recessive / ff / don't have a F ✓

And thus cannot pass it on ✓

(Accept: Not possible to be a carrier as it is a dominant trait) ✓ (3)

3.3.6 No ✓ it affects both men and women equally/it is present in heterozygous form in both men and women ✓

(Accept: Females would need an affected mother and father to be affected.

The affected female's parents are not both affected) ✓

(2)

3.3.7 Dominance in genetics is a relationship between alleles of one gene, in which the effect on phenotype of one allele masks the contribution of a second allele at the same locus. ✓ A dominant allele will be expressed in a heterozygote, as well as a homozygous dominant individual. ✓ (2)

[40]

Question 4

- 4.1 - During continental drift two different islands formed/Geological barrier ✓
- The population will split up into two groups, as each island has a different environment/vegetation ✓
- Each group of tortoises undergoes natural selection independently ✓
- The tortoises with longer necks (Group B) survived on drier island because they could feed on the cactus plants ✓
- The tortoises with shorter necks (Group A) survived on moister island because they could feed on grass ✓
- Each group may become genotypically and phenotypically different, which might prevent them from interbreeding ✓
- They become reproductively isolated leading to the formation of a new species through allopatric speciation ✓ (Any 6) (6)

[The question asked for 3 ways explained. Accept any reasonable responses. Drifting to 2 islands, sympatric speciation, earthquake, etc.]

4.2.1 4.8 ✓ mya (allow range from 4.7 – 4.8) (1)

4.2.2 *A. afarensis* ✓ (1)

4.2.3 Karabo / Mrs Ples / Little Foot / Taung Child ✓✓ (any 2)

[Lucy – Found in Ethiopia, not SA] (2)

4.3.1 One that shows a combination of features (intermediate form) ✓ of more highly evolved and less evolved/earlier species /difficult to classify /cannot be put into one group / between two known forms/species ✓ (Any 2) (2)

- 4.3.2 (a) Study of ancient life, particularly through fossils ✓
(b) Study of human society and culture ✓ (2)

- 4.3.3 Upright posture freed hands for tool making✓/fire making✓/allowed manipulation of environment for own use. ✓
See ahead – Avoid predators ✓, see and hunt & for food ✓
Greater surface area – Cool body ✓ in changing climate
(Accept any other valid point.) (3)

- 4.3.4 *A. sediba* was able to walk upright✓, but could also climb trees to escape predators✓.
A. sediba is the transitional species between quadrupedal knuckle-walkers who Climbed ✓ and bipedal species that walked on land. ✓ (2)

- 4.3.5 Find a lot more evidence, e.g. that it lived at the right time✓, in the right place✓, more fossils, when most scientists accept that at this time it fits into the human evolutionary tree and no other possible contenders. (Any 2)
(Accept other reasonable responses) (2)

4.3.6

<i>Homo sapiens</i>	<i>A sediba</i>
Large cranium house big brain✓	Small cranium smaller brain✓
Flatter face – finer features✓	More protruding face ✓
Smaller jaw	Larger upper jaw
Smaller brow ridges	Larger brow ridges
No gap between teeth (diastema)	Diastema present

(any 2 + 2) = 4 marks

Table layout ✓

Heading ✓

[If student writes “pronounced chin” for human – award mark

But cannot get mark for “no chin” for *A.sediba* – Cannot see on image] (6)

- 4.3.7 a. Humans come from Apes ✓✓ / evolution proves there is no God
(any logical) answer (2)
- b. offence to religions who claim that we are made in the Image of God/
Can be offensive to certain races if they are classified as more primitive
Must be a valid reason ✓ well explained ✓✓ (3)
- 4.3.8 Yes ✓ variety of races, physical appearance etc.
Debate whether we all came from the same lineage
No ✓ We are one species because we are able to interbreed
Would cause too many ethical debates
Not enough differences
Opinion ✓ Reasoning ✓✓ (3)
- 4.4.1 The oldest fossils of human ancestors✓ were only found in Africa✓ (2)
- 4.4.2 -Mitochondrial DNA is passed down from mother to child✓
-mutations ✓ on the mitochondrial DNA
-were traced to an ancestral female that existed in Africa✓
(Accept answers relating to the San people – oldest population – African) (3)

[40]

GRAND TOTAL [200]