



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2011

LIFE SCIENCES: PAPER I

MARKING GUIDELINES

Time: 2½ hours

150 marks

These marking guidelines were used as the basis for the official IEB marking session. They were prepared for use by examiners and sub-examiners, all of whom were required to attend a rigorous standardisation meeting to ensure that the guidelines were consistently and fairly interpreted and applied in the marking of candidates' scripts.

At standardisation meetings, decisions are taken regarding the allocation of marks in the interests of fairness to all candidates in the context of an entirely summative assessment.

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, and different interpretations of the application thereof. Hence, the specific mark allocations have been omitted.

QUESTION 1

1.1 G F K J A C D E B (9)

- 1.2 1.2.1 B (1)
- 1.2.2 C (1)
- 1.2.3 D (1)
- 1.2.4 B (2)

1.3 1.3.1 A single species evolved into many species. Their mouths changed shape as they ate different food sources /to suit the type of food they were now eating/exposed to different food sources /competition between cichlids. (3)

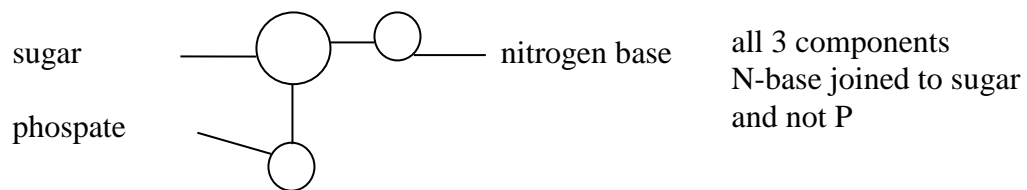
- 1.3.2 (a) Prevents breeding/mating between new and parent population. (1)
OR Prevents gene flow between populations. (1)
- (b) Sympatric (1)
 Cichlids were not separated by any geographical barrier. (1)
OR Cichlids were separated by different food niches in the same area/ lake. (1)

1.4 1.4.1

STATEMENT	TRUE	FALSE	CORRECTION
DNA replication happens just before <u>protein synthesis</u> .			cell division or mitosis/ meiosis or mitosis and meiosis
During DNA replication, weak <u>hydrogen</u> bonds between bases break.			
The base pairing to form two new strands of DNA occurs in the following way: cytosine with guanine, <u>thymine</u> with adenine.			
As a result of DNA replication, the DNA content of a cell is <u>halved</u> .			doubled

(7)

1.4.2

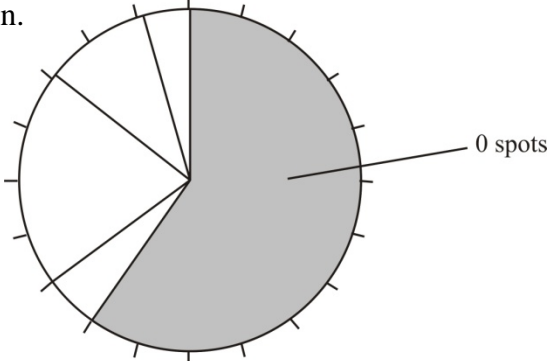


(2)

1.4.3 C = 16% Therefore G = 16%

$$\frac{16}{100} \times \frac{6000}{1} = 960$$

(2)

- 1.5 1.5.1 More spots could add to better camouflage /warning colouration to predator
OR Better potential for survival outcompete other less spotted.
 Any one reasonable explained reason. (2)
- 1.5.2 = 2 correct wedges
 = 4 correct wedges
- 
- 1.5.3 All the Meadow Brown butterflies belong to same species **OR** do not belong to same species.
 = statement (3)
- 1.5.4 Genotype similar
 Mating with each other.
 Viable/fertile eggs. (any 2 = +) (2)
- [40]**

QUESTION 2

- 2.1 2.1.1 (a) In the anthers/ovaries/ovule. (1)
 (b) Petal/sepal/filament/stigma/style (any one) (1)
- 2.1.2 (a) Haploid (1)
 (b) To transfer a copy of the lily's chromosomes to the ovum /new plant/seed /gametes for sexual reproduction/fertilisation (2)
- 2.1.3 Ensures that gametes only contribute one of each homologous chromosome to new offspring, so that correct number of chromosomes retained for the particular species avoid polyploidy.
 (any 3 points) (3)
- 2.2 2.2.1 Triploid orange no seeds/usually sterile/larger fruit /triploid > 2n (2)
 (any 2)
- 2.2.2 Improved size of fruit / better nutritional value /create seedless varieties (1)
- 2.3 2.3.1 (a) 2; 4; 1; 3 (2 correct = ; 4 correct =) (2)
 (b) Change in order of nucleotides/nitrogen bases on DNA/RNA/nucleic acid (1)
- 2.3.2 Buddy system get a friend/health professional to remind patient.
 (any other practical suggestion) (2)
- 2.3.3 (a) Patient 2 (1)
 (b) Patient 1 (1)
- 2.3.4 Yes – viral load in all 3 patients was already at 100% by the end of the 12 weeks. Viruses replicate very quickly.
OR
 No – needed longer to see if it would start working. /Patient 2 did show some ARV response. (any 2 appropriate good points) (2)
- 2.3.5 3TC was not effective as an ARV as the viral load in the patients was not reduced. (2)

- 2.3.6 (a) Same stage in disease – need to compare how well respond to medication and how well recovery is.
 Similar health – a measure of the actual effect of the medication and not due to stage of disease.
 Similar fitness – fit people healthier overall./Unfit might respond differently.
 Same age – age must not affect results.
 Same sex – respond same. (any 2 × 2 +) (4)
- (b) Free will, not only to make money.
 Carefully monitor progress.
 Explain side effects, etc.
 Will not endanger life.
 Background checks to screen for other disorders.
 Mental health.
 Signed consent forms
 Provision for counselling after conclusion of experiment.
 (any 4) Ensure transparency so that patients are fully aware of all aspects. (4)

[30]

QUESTION 3

- 3.1 3.1.1 Gene for disorder appears on one of the gonosomes/sex chromosomes / Mainly X chromosome (2)
 3.1.2 Y chromosome shorter and so if a gene exists on their X chromosome where there is no allele to mask it and the gene is expressed. (2)
- 3.2 **Healthy Fibres** **Affected fibres**
 Straight fibres Crooked/disorganised fibres
 Smooth/whole appearance Holes/disintegrated fibres
 Membranes/edges of fibres whole Membranes broken (any 2 =) (2)
- 3.3 3.3.1 Unlikely to be a carrier as no symptoms yet. /These normally appear in childhood/most die in 20s (2)
 3.3.2 (a) 1. X Y
 2. recessive
 3. $X^D X^D$
 4. 50% (4)
- (b) **Agree:** Visual aid clearly shows inheritance of genes. Can work out probabilities of genotypes. Provides scientific evidence to patients
Disagree: Use pictures/diagrams to show visible inheritance. Explain in terms of percentages/inherited features only as too difficult for non-scientist to understand (any 2 =) (2)

3.3.3 **Amniocentesis:** Sample amniotic fluid. Culture foetal cells for DNA analysis. Can prescreen to determine if baby has the disorder. Informed decision = abort or continue with pregnancy.

OR

Abortion: Amniocentesis for karyotyping/ detect an abnormality. Terminate pregnancy. Do not wish to have disabled children.

OR

Adoption: Choose not to have own children. Will not pass on muscular dystrophy. Ensure that children healthy. (elaboration of a reason) (3)

- | | | | | | | |
|-----|-------|---|-----|-------|---|-----|
| 3.4 | 3.4.1 | T | (1) | 3.4.2 | F | (1) |
| | 3.4.3 | T | (1) | 3.4.4 | F | (1) |
| | 3.4.5 | F | (1) | 3.4.6 | F | (1) |
| | 3.4.7 | T | (1) | | | |

- 3.5 3.5.1 Remained low and constant between 1900 and 1980. Increased in last 20 years. (2)
- 3.5.2 1980 – 2000 (1)
- 3.5.3 6.6 t/ha – 2.2 t/ha = 4.4 tons/ha (1)
- 3.5.4 Selective breeding. To crossbreed with desirable traits and improve quality.

OR

GMOs – Using vectors to insert genes into wheat to improve nutrition/pest resistance/drought resistance. (2)

[30]

QUESTION 4

- 4.1 4.1.1 One that shows a combination of features 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)
- 4.1.2 Paleontologist = Study of ancient life particularly through fossils. (2)
- Anthropologist = Study of human society and culture. (2)
- 4.1.3 Bipedalism – Walk on two legs. Upright posture, freed hands for toolmaking/firemaking/allowed manipulation of environment for own use. (3)
- 4.1.4 *A. sediba* was able to walk upright, but could also climb trees to escape predators. (3)
- 4.1.5 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 =) (2)
- | | | |
|-------|---------------------------------|--|
| 4.1.6 | <i>H. sapiens</i> | <i>A. sediba</i> |
| | Small brow ridges | Big brow ridges – attachment of strong jaw muscles |
| | Large cranium – house big brain | Small cranium |
| | Flatter face – finer features | More protruding face |
| | Smaller jaw | Larger upper jaw |
| | (any 2 + 2 =) | (4) |

- 4.2 4.2.1 Extinct with no descendents, end of evolutionary line. (any 2 =) (2)
- 4.2.2 Between Homo habilis and Homo erectus /between Australopithecus afarensis and Homo habilis. (2)
- 4.2.3 Fence off area, so no unskilled people damage fossils. Remove to lab with whole section of rock or soil intact around fossils. Use soft paintbrushes to remove soil. Skilled people to chisel rock away from fossils. (and any other reasonable methods) (any 2 =) (2)
- 4.3 4.3.1 Survival of the fittest. Seeds with elaiosomes able to survive underground, passed on genes to new plants selected by nature to survive /bigger elaiosomes = more nutrition, more often selected. Ants had more food for larvae. Ant colony able to survive better, passed on these genes to offspring/selected for these favourable genes, for advantageous co-existence. Ant behaviour and seed structure work together for survival of both. Dispersal of seeds to favourable area important in survival of species. Reduces competition with parent plant. (any 7) (7)
- 4.3.2 Convergent (1)
- [30]**

QUESTION 5

Facts from source material that can be used in essay.

GENERAL FACTS TO INCLUDE IN EITHER ARGUMENT	
<p>Stem cells can grow into any type of tissue or organ – 2 types:</p> <p>1. Embryonic stem cells – grow into any body system or organ Technology – remove inner mass of cells from blastocyst/embryo; grow in culture; they self-replicate and can be induced to form any specialised cell type</p> <p>2. Adult stem cells – repair organs, renew skin and blood Technology – create a blastocyst; insert a nucleus from a specialised cell of a person into an egg without a nucleus; grow in culture; remove cells from blastocyst/embryo; all genetically identical to patient’s cells; can grow into patient’s required organ/tissue</p>	
Yes – stem cell research is important	No – stem cell research is unethical
<p>1. Embryos</p> <ul style="list-style-type: none"> • Embryos cannot survive outside the womb therefore not regarded as living • Blastocysts are similar cells with no differentiation/ no organs or tissues • Embryos are not humans; heartbeat 5th week of pregnancy, brain 7 – 8 weeks • Are excess embryos available from in vitro fertilisation which normally would be discarded • More than 1/3 of naturally formed embryos don’t implant; much more than would be used in research <p>2. Research</p> <ul style="list-style-type: none"> • Stem cell research valuable in learning how cell differentiation takes place • Has potential to minimise suffering of people • Can be applied to many different disorders and diseases • Already well used in bone marrow transplants • Spinal cord injury important area of research • Many people live with paralysis • Secondary complications can be life threatening • Foundations set up to support research • Paralysed people die a decade earlier due to complications 	<p>1. Concerns about using embryos:</p> <ul style="list-style-type: none"> • Embryos represent a living person • They have a soul from time of creation • They should be treated with dignity • Harvesting stem cells from embryos kills them • This is murder • Adult cloned stem cells from purposely created blastocysts is also murder <p>2. Concerns with safety of stem cell research:</p> <ul style="list-style-type: none"> • Pass on viruses and other disease causing microorganisms • Animal products used could pass on unknown animal diseases – dangerous • Stem cells grow quickly and could cause tumours – life threatening • Transplanted stem cells could grow into the wrong type of tissue in an organ receiving the treatment • Unknown consequences

A good essay could take either point of view as there is sufficient information to support both arguments. A few additional facts (2) from own knowledge + up to 12 facts taken from general info and either the **for** or **against** columns to support a viewpoint. **Three** counter arguments to round off a good essay. A good intro and conclusion is required and a definite viewpoint.

QUESTION 5 RUBRIC

	1	2	3	4
Content: Thoroughness	<ul style="list-style-type: none"> Up to 1/3 of potential detail cited. 	<ul style="list-style-type: none"> About half of potential detail cited. 	<ul style="list-style-type: none"> All main topics covered. About ¾ of potential detail cited. One instance of significant information beyond the sources. 	<ul style="list-style-type: none"> All main topics covered. Source detail very close to full potential. At least (x) significant instances of information beyond the sources.
Content: Relevance	<ul style="list-style-type: none"> Mostly digression and/or repetition. 	<ul style="list-style-type: none"> Around half is digression and/ or repetition. 	<ul style="list-style-type: none"> Repetition mostly avoided. Some minor digression. 	<ul style="list-style-type: none"> Isolated incidences of minor repetition. No digression.
Supporting Argument, i.e. for	<ul style="list-style-type: none"> Writing consists of facts with little linkage or reasoning. Reasoning incorrect. 	<ul style="list-style-type: none"> Max if no decision to support. Reasoning correct hard to follow and lengthy. One paragraph placed illogically. Ordinary; some linkage is evident. 	<ul style="list-style-type: none"> Supports the position. Reasoning is clear but bit lengthy. Minor errors in flow. Solid but not compelling; linkage sometimes missed. No new information in conclusion. 	<ul style="list-style-type: none"> Strongly supports a clear position. Reasoning is very clear and succinct. Flow is logical, showing evidence of clear planning (no after-thoughts). Compelling with regular use of linking language. No new information in conclusion. Refer to at least one incidence of bias, anecdote, false argument, emotive language, etc. where relevant.
Fairness, i.e. Argument against	<ul style="list-style-type: none"> Few counter opinions given. Merit to counter opinion not given. 	<ul style="list-style-type: none"> Counter opinions often given (x). One instance of merit to counter opinion in order to get a 4. 	<ul style="list-style-type: none"> Counter opinions regularly given (x). A few instances (x) of merit to counter opinions. 	
Position	<ul style="list-style-type: none"> Clear decision made. 			
Presentation	<ul style="list-style-type: none"> Writing is almost unintelligible. Language exceptionally weak. Inappropriate language. 	<ul style="list-style-type: none"> Tone is inconsistent and/or in places inappropriate. Language is weak but appropriate. No terminology. Introduce and conclude present, no matter how weak. 	<ul style="list-style-type: none"> Tone is consistent and suited to scientific argument. Good and appropriate language. Some good use of terminology. Introduce and conclude have merit. Some generalisation but not exaggerated. 	<ul style="list-style-type: none"> Tone highly mature and suited to scientific argument. Excellent and appropriate language. Good use of terminology. Correct paragraphing with good transitions. Interesting introduce, satisfying conclude. No sweeping generalisation.

[20]

Total: 150 marks