

2007 Senior External Examination



Chief examiner report for candidates and teachers

Biology

In 2007, 44 candidates sat the Biology examination. The table below shows the exit levels of achievement awarded for each of the last five years.

Year	Number who sat	Level of achievement				
		VHA	HA	SA	LA	VLA
2007	44	3	13	19	8	1
2006	49	4	11	27	5	2
2005	47	0	5	31	10	1
2004	90	4	20	31	18	17
2003	91	4	11	35	27	14

Sample solutions for 2007 are included at the end of this report. They are not intended to provide definitive responses to the examination questions, but have been provided to help teachers and candidates prepare for future Biology examinations.

General comments

Although the number of candidates sitting the Biology examination was again lower than in previous years, the overall levels of achievement gained were pleasing. In 2007, the first year of implementation of the revised 2006 syllabus, 80 per cent of candidates received a Sound Achievement or higher. This is encouraging and indicates that teaching centres and candidates are adjusting appropriately to the expectations laid out in the new syllabus.

The new syllabus places more emphasis on the integration of laboratory investigations to explore biological content within various contexts, including the exploration and analysis of relevant biological issues in the environment around the candidates. The quality and depth of responses from most candidates demonstrated that this integration was indeed occurring during the learning experiences provided by teaching centres.

Once again, questions left unanswered sometimes left markers with too little evidence of candidates' knowledge and higher order thinking skills for them to award higher levels of achievement. A good response in one question only could not be taken as evidence of a solid knowledge of the topics involved. Often, candidates responded to the short-response questions appropriately but failed to follow through in Paper Two with in-depth extended responses that would show a real understanding of, and the ability to critically evaluate, the biology behind some topical issues. In many cases, candidates let themselves down by providing responses to *Evaluating biological issues* questions that were based on personal social beliefs rather than on their understanding of how the biology behind these issues influenced the situation. Extended-response questions are an opportunity to demonstrate a deep understanding in creative and logical formats. While some candidates' responses were impressively clear and well set out, others were very short and lacked evidence of comprehensive thinking. Candidates should be reminded that they are not penalised for incorrect responses and so they may be

doing a disservice to themselves by not responding to some questions completely. Even a partial attempt at a response has a high probability of providing some extra evidence for markers when overall levels of achievement are being determined.

This year, there appeared to be a larger number of papers in which poor mastery of the English language became a barrier to demonstrating Sound Achievement. Candidates with poor literacy skills should be encouraged to reduce their responses to simple dot points that remove the need for complex language skills, while still demonstrating their overall understanding and application of the syllabus. The best responses across both papers were provided by those candidates who “actively” read the questions using highlighters or circled key components of the questions before they constructed a response. This seemed to assist candidates to provide cohesive and concise responses that markers could use as evidence of candidates’ command of biology.

Comments on each section

Paper One — Part A: Multiple choice

As in 2006, candidates responded to all multiple-choice questions. This was encouraging and reflects the fact that candidates were able to make educated decisions about the options provided. Candidate performance in the *Understanding biology* criterion was poorer than that in the *Investigating biology* criterion. While this demonstrates the ability of candidates to read scientific data and tables, it also highlights their poorer retention of basic biological knowledge. Without this basic understanding of biology, candidates will struggle with the communication of their responses in questions which require an extended response.

Paper 1 Part B, and Paper 2 Part A: Short response

These questions required candidates to respond succinctly in their own words. This ability is dependent on their basic biological knowledge. Some candidates provided lengthy responses that contributed little to the judgment of their overall grades while other responses appeared to have little connection to the questions at all. Candidates need to read all the information provided before attempting to respond to the question.

Candidates responded well to questions that were structured to allow them to demonstrate personal involvement in the planning and execution of investigations; this was reassuring.

Detailed information about each question is in the sample solutions that follow.

Paper Two — Part B: Extended response

As previously mentioned, the best responses were from candidates who took the time to plan responses that answered the questions. Candidates who wrote single-sentence responses did not allow for an assessment of their knowledge and processing skills.

Question 1 — The use of fire in Australia

As candidates were asked for a discussion, they were expected to provide a balanced appraisal of both scenarios. Most candidates offered a one-sided evaluation which focused on fire bans, and did not include fire management practices such as prescribed burns. Candidates generally should have shown an awareness of the unique adaptations of the Australian ecosystem to firestick farming practices and the way they impact on our modern-day flora.

Question 2 – Kangaroo quota farming to reduce livestock impact on the environment

A considerable lack of understanding was shown in not recognising that kangaroos are less damaging to the environment than hard-hoofed animals such as cattle. Some candidates actually stated that kangaroos' feet are very damaging to the soil! Most candidates needed to improve the way they used their biological knowledge to support their viewpoint. Some even discussed the very big fences that would be needed to keep the kangaroos on a particular farmer's property.

Question 3 — The impact of fertility treatments on future generations

Not only did this question have the highest nil response rate, but those who did respond demonstrated the lowest level of understanding of the biology of the issue. Candidates needed to have a sound understanding to discuss the issue coherently. Without a basic understanding of how some well-known fertility treatments operate, candidates could not explain how interference with natural processes could affect future generations. They needed to take an open view on modern needs for fertility treatments, such as same-sex couples, and not concentrate on their personal opinions of these situations.

Question 4 — Impact of global warming on future generations

Some candidates did not read the question properly, and many failed to discuss fully the benefits of sexual reproduction as a strategy for survival. Too much emphasis was placed on a population's explosion and subsequent collapse.

Question 5 — The role of zoos in changing population dynamics

Candidates provided full responses for this question even though it was the final question of the examination. Unfortunately, while this showed an enthusiasm for the topic, some failed to focus on the biology involved and how the processes of evolution and natural selection are interfered with in zoo breeding programs. This was another question in which social opinions overshadowed the biology behind the issue. Candidates need to remain focused on the question and avoid expressing personal opinions.

Sample solutions

Paper One

Part A

Multiple choice

Suggested time allocation: 30 minutes.

This part has 10 questions of equal value. Attempt all questions.

Each question has four options, **one** of which is correct or is the best option. Respond to each question by selecting one of the four possible options and blackening the appropriate circle on the multiple-choice response sheet provided. Use a 2B pencil to blacken the circles.

No credit for your response will be given if more than one circle is blackened.

Question 1

Cells are considered to be the simplest unit of life. Which of the following contains only membrane bound organelles?

- A spindle, nucleolus, centromere, ribosome
- B nucleus, mitochondria, chloroplast, spindle
- C centromere, golgi apparatus, ribosome, chloroplast
- ☒ D nucleolus, golgi apparatus, mitochondria, chloroplast

(UB)

Question 2

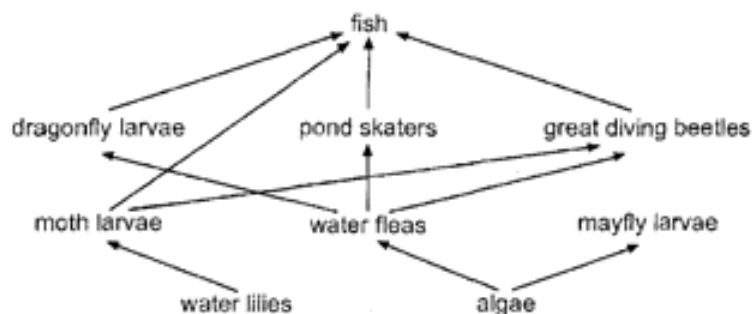
The name of the process where new plants and animals replace previous occupants as the habitat changes is called

- A mutualism.
- ☒ B succession.
- C procession.
- D natural selection.

(UB)

Question 3

Consider the information in the food web below.



Which of the following organisms may be considered as a second and third order consumer?

- ☒ A fish
- ☐ B algae
- ☐ C water fleas
- ☐ D mayfly larvae

(UB)

Question 4

Which of the following statements regarding light-dependent and light-independent stages of photosynthesis is correct?

- ☐ A The plant collects CO₂ during the light-dependent stage.
- ☐ B Carbon and oxygen are supplied during the light-dependent stage.
- ☐ C Light is absorbed by the chloroplasts during the light-independent stage.
- ☒ D Water is split during the light-dependent stage to release the hydrogen required.

(UB)

Question 5

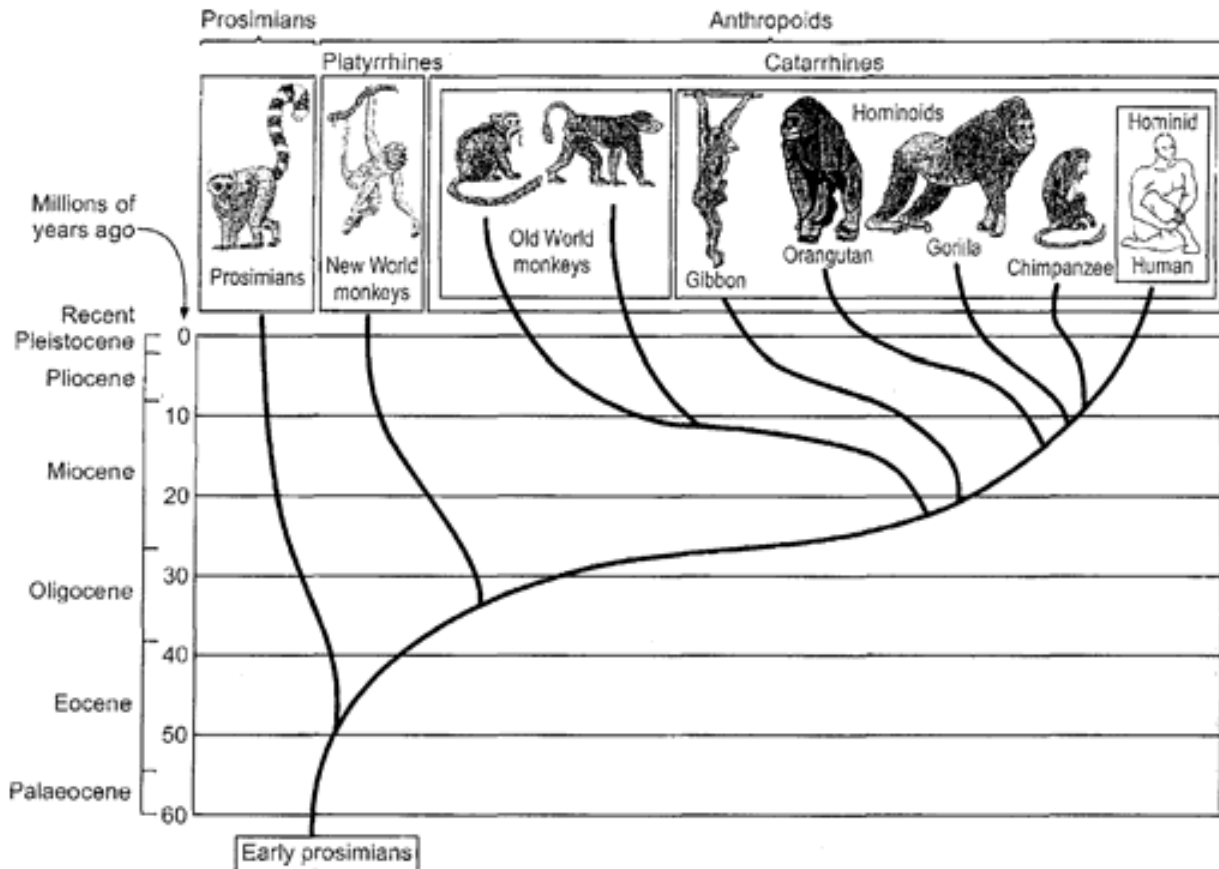
Which of the following is the correct order for the stages of mitosis following interphase?

- ☐ A metaphase, anaphase, prophase, telophase
- ☐ B anaphase, telophase, metaphase, prophase
- ☐ C telophase, metaphase, anaphase, prophase
- ☒ D prophase, metaphase, anaphase, telophase

(UB)

Question 6

The diagram below depicts a possible evolutionary tree for primates. If a new species of monkey were discovered, whose origins were thought to have been in the late Oligocene period, decide to which group it would be considered most closely related.



- ☒ A Platyrrhines
- ☐ B Prosimians
- ☐ C Hominoids
- ☐ D Hominids

(IB)

Question 7

A previously unidentified organism has been located in a remote terrestrial area of a tropical rainforest. The organism has:

- one pair of antennae
- a tracheal system
- simple eyes
- abdominal segments that appear to carry two pairs of legs each.

As a temporary measure, until laboratory research can be conducted, the table below was used to classify the organism.

Class Diplopoda	Class Chilopoda	Class Insecta	Class Arachnida
Mainly terrestrial	Mainly terrestrial	Mainly terrestrial	Terrestrial
Head, thorax and abdomen	Head, thorax and abdomen	Head, thorax and abdomen	Cephalothorax and abdomen
Simple eyes	Simple eyes	One pair compound eyes, not on stalks	Simple eyes
One pair antennae	One pair antennae	One pair antennae	No antennae
One pair walking legs per segment (but abdominal segments fused in pairs, so it appears there are two pairs of legs per segment)	One pair walking legs per segment; first pair modified as poison claws	Three pairs of thoracic legs; two pairs of wings typically present on thorax	Four pairs thoracic legs
Tracheal system	Tracheal system	Tracheal system	Tracheal system; lung books in some
Example: millipede	Example: centipede	Examples: cockroach, grasshopper	Examples: spiders, ticks

According to the descriptions in the table, the organism is best classified as

- A Insecta.
- B Arachnida.
- ☒ C Diplopoda.
- D Chilopoda.

(IB)

Question 8

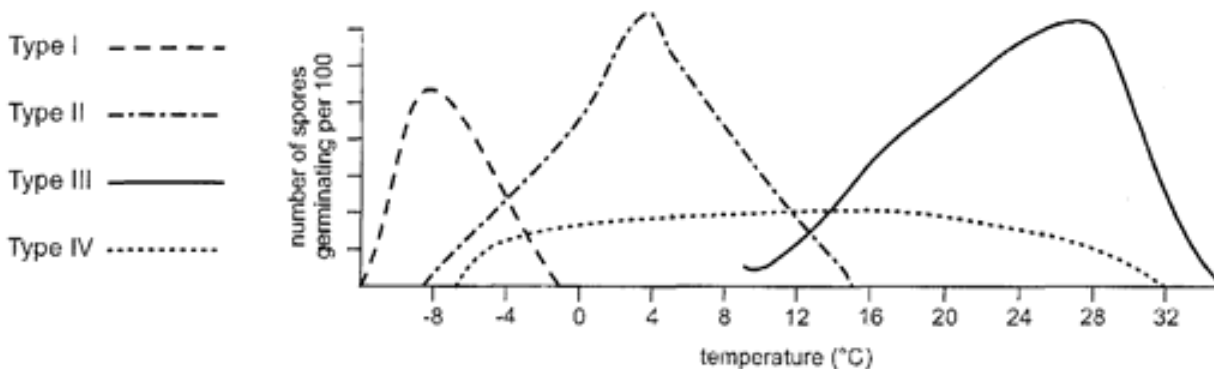
The continuous upwards movement of water in a vascular plant is called

- A homeostasis.
- ☒ B transpiration.
- C translocation.
- D photosynthesis.

(UB)

Question 9

A certain fungus produces four types of spores. Data obtained from studying spore production and germination is shown in the graph below.



The information on the production and germination of spores tends to indicate that the spores with the widest range of temperature tolerance are

- A Type I.
- B Type II.
- C Type III.
- ☒ D Type IV.

(IB)

Question 10

Dacus tyroni, the Queensland fruit fly, lays its eggs in soft-skinned fruit. When the larvae hatch, they use the ripening flesh for nourishment to complete their development. To which of the following organisms is *Dacus tyroni* most closely related?

- A *Pinuta dacus*
- B *Tyroni rosana*
- C *Rosana tyroni*
- ☒ D *Dacus cucumis*

(UB)

End of Part A

Part B

Short response

Suggested time allocation: 120 minutes

This part has 13 questions of equal value. Attempt all questions.

Respond to the questions in the spaces provided.

Question 1

Use the figures in the table below to explain why the deforestation of rainforests has more of a long-term impact than the deforestation of deciduous woodlands.

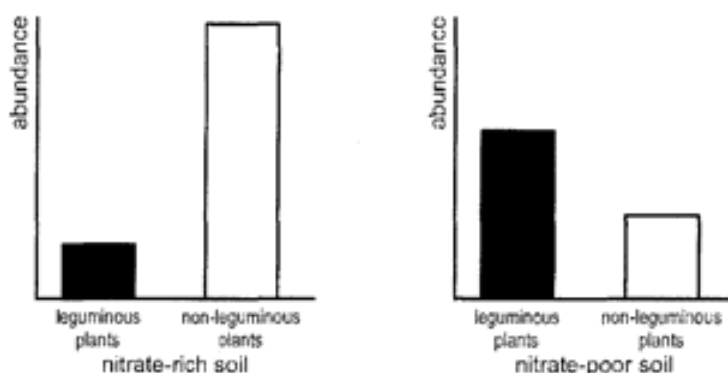
	Living plant biomass (kg m^{-2})	New plant material per year (kg m^{-2})	Organic matter in soil (kg m^{-2})
Deciduous woodland	40.7	0.9	1.5
Tropical rainforest	52.5	3.3	0.2

Rainforests produce more new plant material per year (3.3 kg m^{-2}) than woodlands (0.9 kg m^{-2})
Rainforests are a larger living plant biomass if it is removed/harvested and so also photosynthesize more than woodlands, so less O_2 is produced / CO_2 absorbed if deforested.

(1B)

Question 2

Legumes are plants that contain a special bacterium that can turn atmospheric nitrogen into nitrates which are a form useful to plants. State why leguminous plants are less abundant in nitrate-rich soil than in nitrate-poor soil.

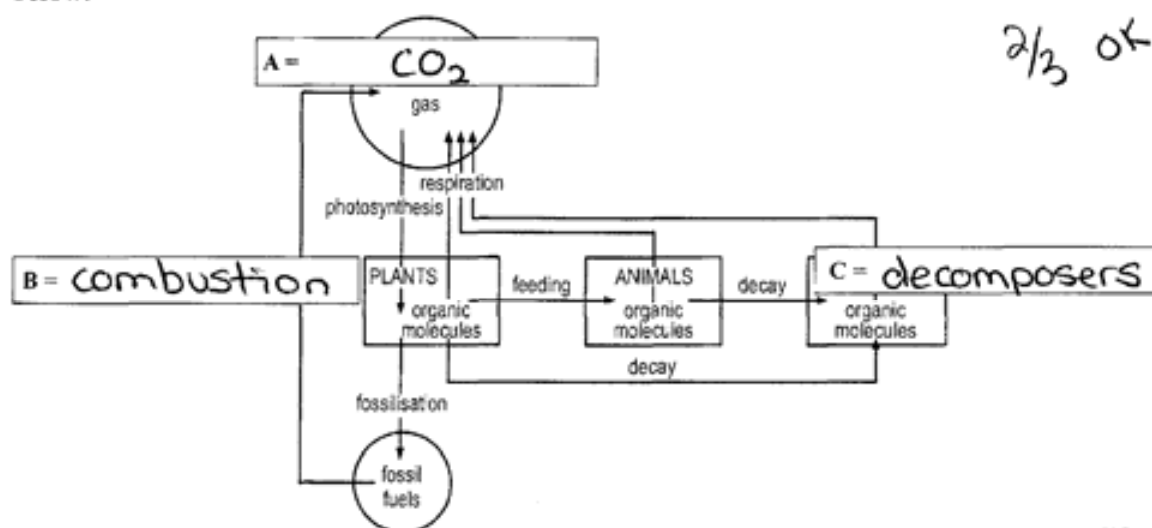


legumes are adapted to be able to fix atmospheric nitrogen (they then convert it to a useable form) - this is not needed in N-rich soil. Non legumes die in N-poor soil.

(UB)

Question 3

Fill in the missing labels (A, B and C), in the spaces provided, on the diagram of the carbon cycle below.



Question 4

Battery chickens are kept in small temperature-controlled spaces. Explain why they would convert a greater percentage of the energy in chicken feed into primary consumer productivity than free-range chickens, which are free to move around a larger area.

less energy is used to keep warm, or move around for food therefore more energy can be converted into producing muscle (meat) or eggs

(UB)

Question 5

The following information relates to questions (a) and (b) that follow.

The pitcher plant is an insect-eating plant with deep cup-shaped leaves that are filled with liquid. When an insect lands on the rim of a leaf it will often slip in and drown in the liquid. Digestive enzymes, secreted by the leaf, will then break the dead insect down so that the pitcher plant can absorb its nutrients. The leaves of a pitcher plant provide a food-rich environment for a number of different creatures. As well as microorganisms, which feed on the drowned insects, there are populations of mosquito larvae and fly larvae that feed on the microorganisms. There are also parasitic wasps that insert their eggs into the bodies of the fly larvae so that their young will have something to feed on when they hatch.

- (a) Within the leaf of a pitcher plant there is a community. What does this community consist of?

insects

microorganisms

mosquito larvae

fly larvae

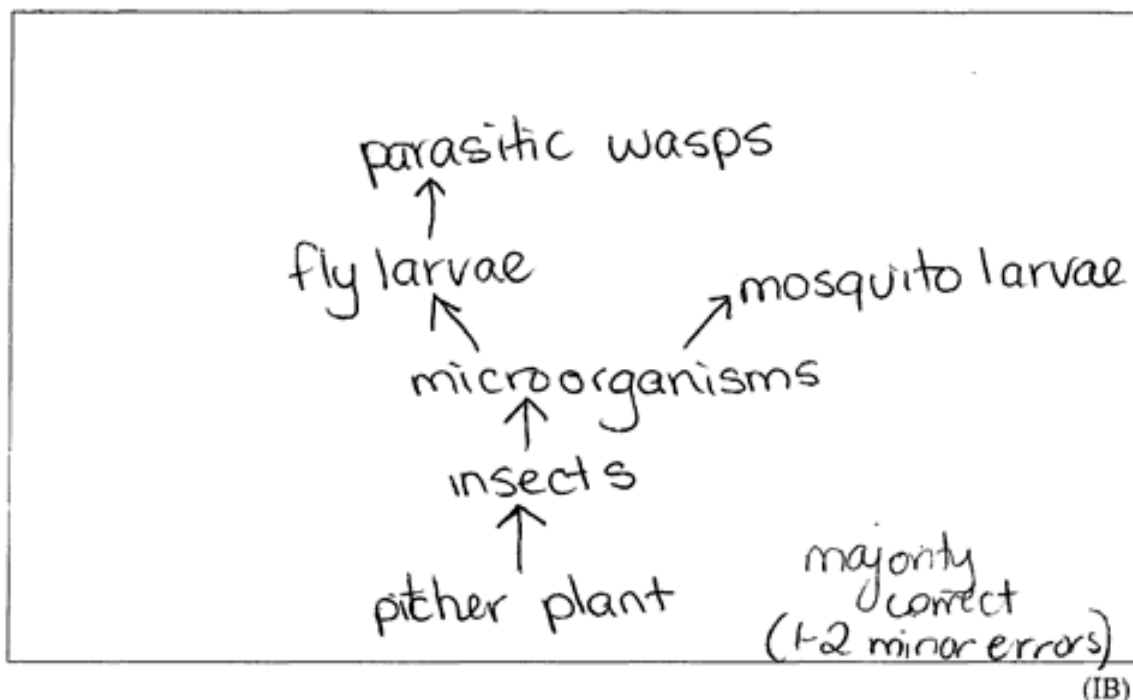
parasitic wasps

pitcher plant

most is OK

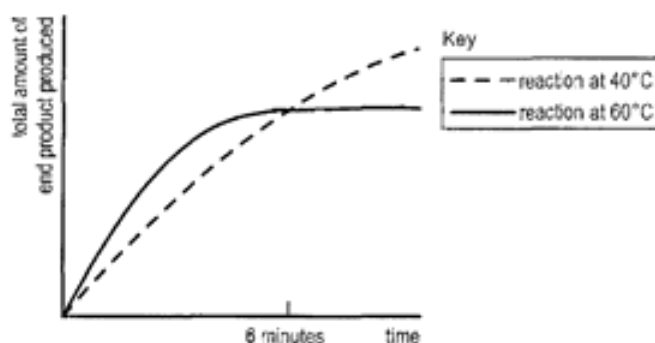
(UB)

- (b) Draw a food web to show the feeding relationships that occur within the leaf of a pitcher plant.



Question 6

Below is a graph showing the time it takes for a reaction to produce a product under different conditions. Explain the difference in the shape of the two curves both before and after the six-minute point.



at 60° the enzyme involved becomes denatured and hence no more product is produced but at 40° the reaction continues to occur after 6 minutes (faster at 60° at the start)

(IB)

Question 7

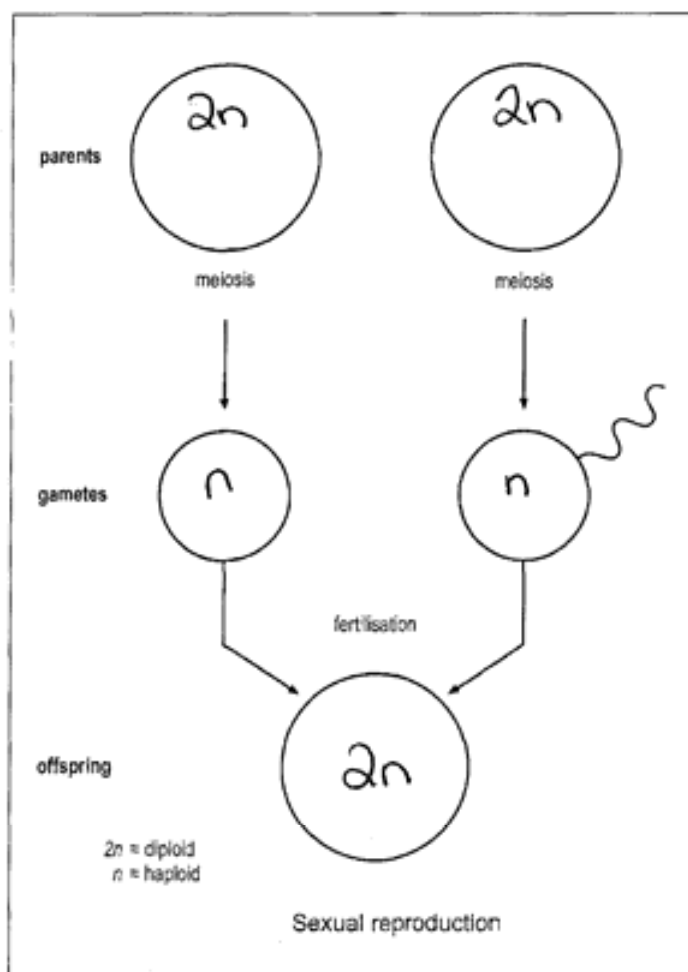
Explain the difference between diffusion and active transport.

diffusion is the passive movement of particles from areas of high concentration to low whereas active transport moves molecules either against this gradient or faster than would happen naturally.

(UB)

Question 8

Indicate at each stage on the diagram below whether the cell has a haploid or a diploid number of chromosomes.



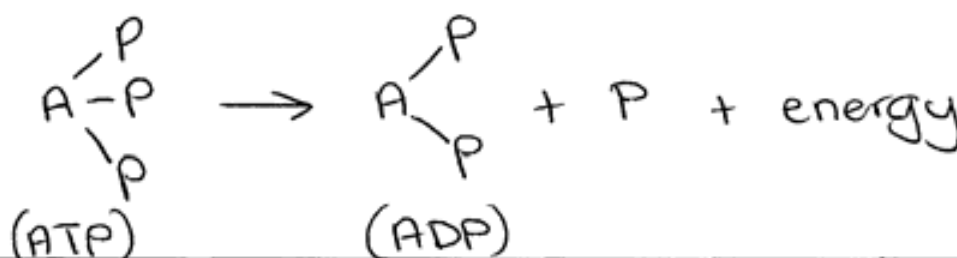
(UB)

Question 9

Establish the link between ATP (adenosine triphosphate) and ADP (adenosine diphosphate) in providing energy for cellular activities.

ATP creates energy for cell use when one of the 3 phosphate molecules is removed and the chemical bond is broken to make ADP. Photosynthesis traps energy back into the bond as ATP is "recreated"

Hint: A diagram may be useful. (not compulsory)



(UB)

Question 10

Using information from the table as evidence, explain why the proportions of A + G is approximately equal to the proportions of T + C in both pieces of DNA.

The proportions of the four organic bases in a piece of DNA from a squirrel, in a piece of DNA from a shark, and in a piece of human mRNA (messenger RNA) are given below.

	A	G	C	T/U
Squirrel DNA	29%	21%	22%	28%
Shark DNA	28%	21%	21%	30%
Human mRNA	40%	15%	30%	15%

human mRNA AG : CT/U bonding = 55% : 45%
 but squirrel DNA = 50 : 50
 shark DNA = 49 : 51

Because A + G pair up and C + T/U pair
 these ratios should be approx 50:50 (IB)

Question 11

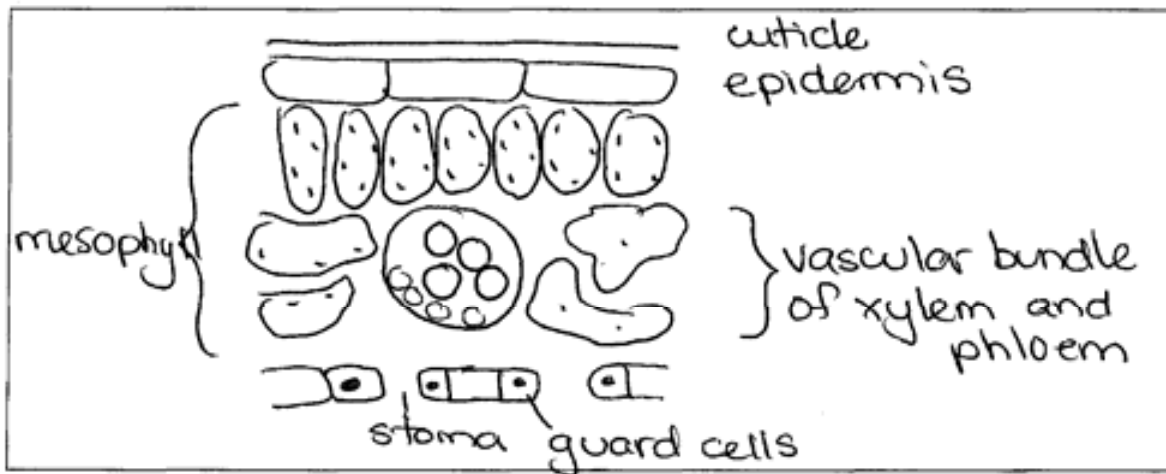
Compare and contrast meiosis I and meiosis II.

- phases are similar (prophase, metaphase, anaphase, telophase)
- Meiosis I produces pairs of homologous chromosome
- Meiosis II produces chromatids
(ie I = $2n \rightarrow 2n$, II = $2n \rightarrow n$)

(UB)

Question 12

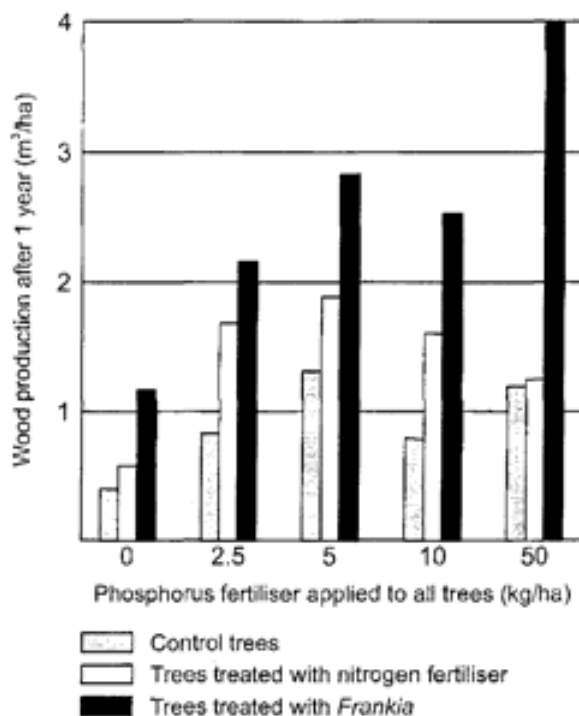
Draw a generalised cross section of a leaf including the following labels:
xylem, phloem, mesophyll, epidermis, stoma, guard cells, cuticle.



(UB)

Question 13

The graph below demonstrates the differences in wood production of trees, within a plantation, that were treated in three different ways. *Frankia* are bacteria that can provide nitrogen to a plant without the use of a commercial fertiliser.



Determine the preferred form of management that would maximise wood production and use supporting evidence from the graph to justify your response.

Frankia and 50 kg/ha - 4 m³/ha is produced this way, by far the highest

Frankia alone is important but fertiliser alone is not as good. - there is minimal change in production in trees without Frankia as fertiliser amounts increase

(1B)

End of Part B

End of Paper One

Paper Two

Part A

Short response

Suggested time allocation: 30 minutes.

This part has seven questions of equal value. Attempt all questions.

Respond to the questions in the spaces provided.

Question 1

Using an example from your own experimental experiences briefly describe the role of a control in experimental design.

.....
must include own example as evidence of
experience in experiments
.....

.....
A control is the basis for comparison with
a variable that has been changed.
.....

(UB)

Question 2

Design an experiment to determine a particular abiotic preference of a species of plant or animal. You should include an aim, hypothesis, procedure and some indication of the form the results may take.

- must show knowledge of correct use of the scientific method such as control of variables and fair test procedures, as well as appropriate experimental design
 - looking for evidence of lab/prac work during the course of study
-
.....
.....

(IB)

Question 3

When scientists want to observe an organism's chromosomes they add a chemical called colchicine to a sample of cells from the organism that are about to go through mitosis. Colchicine inhibits the formation of spindle fibres. Why is it useful to add colchicine to mitotically dividing cells if you want to observe chromosomes?

without spindles chromosomes cannot attach to anything and get pulled apart (type of suspended animation) so observations are easier to make

(UB)

Question 4

"Flavr Savr" tomatoes have been genetically modified so that they take longer than normal to ripen. Genetic engineers have achieved this delay in ripening by disabling a critical tomato gene so that it fails to produce a protein that is needed for ripening. In order to disable the gene, a start codon is inserted at the beginning of the non-coding strand so that both the coding strand and the non-coding strand get copied into mRNA. Explain why this will prevent a polypeptide from being produced.

If both strands are copied (transcribed) and used to produce peptides (translated) then a combination of useful and useless proteins are produced. This means the amounts may not be enough for ripening to occur as usual.

(UB)

Question 5

Explain why natural selection acts on individuals but evolution occurs only in populations.

Natural selection only allows an individual to survive or not. It is the collective ability of a population to reproduce and slowly change their characteristics (chosen by natural selection on an individual basis) which can be seen as evolution.

(UB)

Question 6

An overweight person suffers many effects from the excess weight that is being carried on the body. With specific reference to at least two interrelated body systems (e.g. respiratory system and cardiovascular system) describe how this extra fat being stored by the body can affect normal system functioning.

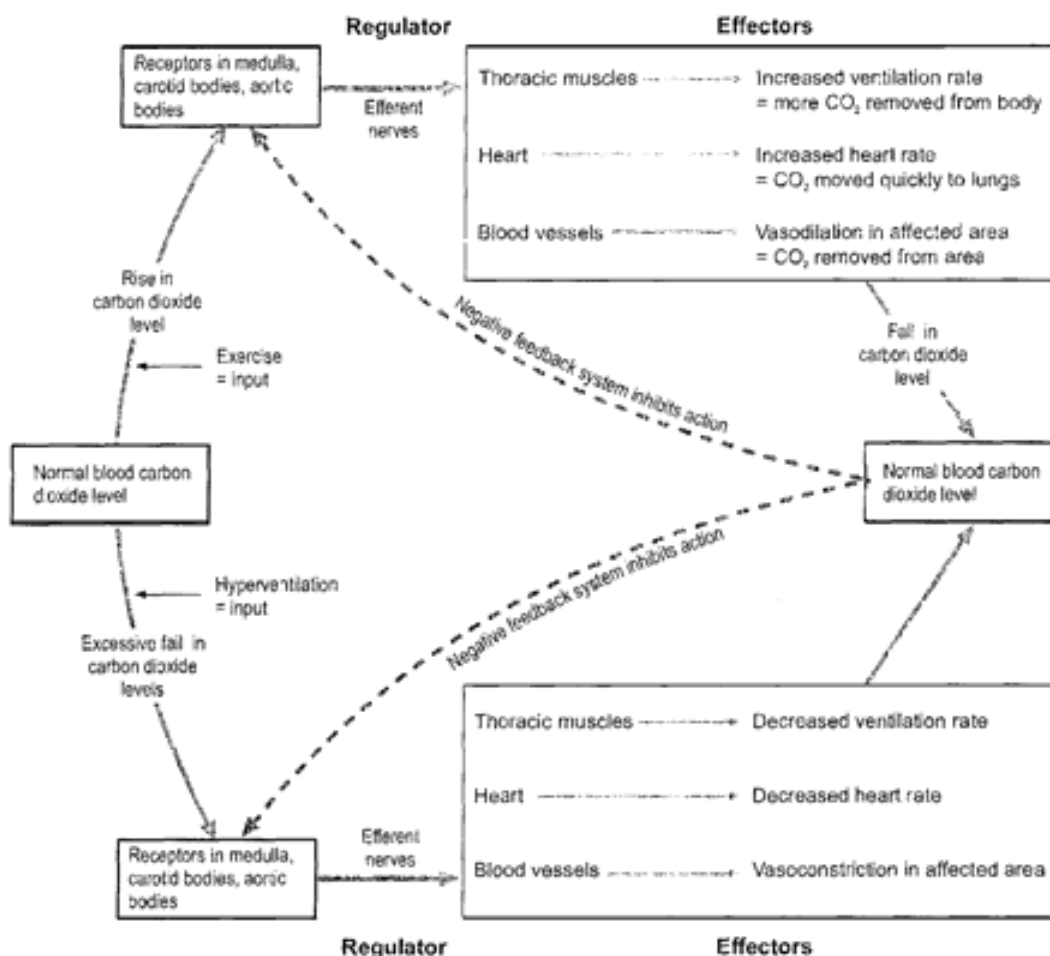
Clear links must be seen between systems.

eg extra fat, hard for heart to pump \therefore less O_2 being circulated.....

(UB)

Question 7

The following diagram refers to the control of carbon dioxide levels in the blood.



With reference to this diagram state how a person who has received severe brain damage to the section of the brain involved in detecting carbon dioxide, the medulla, may be adversely affected when exercising at a high intensity level.

without the medulla working effectively the excess CO_2 produced during exercise cannot be removed (by higher ventilation, increased heart rate etc) and CO_2 poisoning will occur.

(1B)

End of Part A

Part B

Extended response

Suggested time allocation: 90 minutes.

This part has five questions of equal value. Attempt all questions.

Write an extended response to each of the questions on the following pages.

If using the additional pages for any responses, clearly label the question you are responding to in the box provided on each page.

Plan your responses carefully. If you do a first draft and then a final draft, indicate which is the draft to be assessed.

Clearly cross out any draft work that is not to be assessed.

Question 1

Extensive bushfires in Australia often threaten human settlements, cash-producing crops and farming areas. Discuss the impact of permanent total fire bans and successful long-term fire prevention practices on both natural ecosystems and human activity.

(EBI)

intro Human lives and livelihood can be threatened by fire
So too, the animals & plants which coexist in
our communities, are effected by if and how
humans manage fire. If we get it right,
then natural ecosystems can continue to thrive
alongside profitable safe human activity.

1) ~~the~~ permanent total fire bans impact

- a) ~~the~~ natural ecosystems
- change communities eg beech
 - favour certain species esp adap?
 - compete / eliminate others - eg.
 - water flows / salinity levels -
 - build up of organic matter leaf litter
- b) ~~the~~ human activity
- restrict normal lives & quality of
 - affect how land can be used
 - affect clearing of land practices
 - affect recycling of nutrients / soil fer.

2) impact
successful long term fire prevention is some ^{smaller} cooler less drastic /
not devastating hot fires.

a) # natural communities

- fire a part of Australian landscape - eucalypts adapted germination, bark, sprouts
- some fire essential to prevent major fires (build up leaf litter etc)

b) # human activity

- protect lives - where houses built
 - practices of leaf litter clearance
 - evacuation strategies
- protect livelihood - choose crops & animals
 - suit environment, not add to risk.
i.e storage sites, animal fencing
 - sustainable pest control - control burns - wind/weather/location/water

Conclusion - It can be done

Nature has evolved ways to survive fire,
We must live with it, with control burns, with care
these affect interdependent species in
nature + in our farming communities - Humans
are part of the natural world after
all

Question 2

Organisations wishing to minimise the impact of hard-hoofed animals on the fragile Australian landscape have supported the farming of kangaroos using a system of allocated quotas, where farmers are allowed to harvest a certain number of kangaroos from their properties and then sell them for income. Briefly outline some biological arguments that would support this viewpoint.

(EBI)

Intro.

Last Two centuries of animal papns in Australia is vastly different from the preceding two millenia

Kangaroo farming - controlled - can help the fragile Australian landscape.

1/a Harm of hard hoofed animals

sheep → overgrazing grasses / insects / birds
part of food chains / webs / communities

cattle → soil degradation / erosion

goats → water resources / salinity

1/b Good of hard hoofed animals provide

□ our dietary choices.

200 years farming culture / practice.

economic role in our lives / livelihoods

2a) Kangaroo farming - the good.

- # competitors to sheep

- # reproductive cycle fast/economic

- # adapted Australian environment/cheap

- # useful in commercial ways/fur meat

2b) Kangaroo farming - the bad

- # uncontrollably compete with other
native species & effect

Balance of Nature. - is culling/quota
required.

- # some feel natural coat/arms/cute,
emotional response to farming Kangas

Conclusion: Are there other ways than the farming
practices of the past? Have millions of
years of adaptation & evolution provided
us with answers to problems of current
farming practice. Our National Emblem is
Leading the way. Kangaroo farms provide the
future direction, when controlled wisely.

Question 3

Fertility treatments can be used to either prevent or encourage pregnancies. Choose a modern treatment to explain the biological processes involved and the possible subsequent impact on future generations that the widespread use of this type of fertility treatment may bring about.

(EBI)

Intro. - To be or not to be, that is the question.
Some couples endure IVF in order to try to create new life, many couples use contraception to prevent unplanned pregnancy. Fertility treatment is personal; as well as social, having effects on the individual, the couple, the society in general and most of all on the ^{for us} newborn. Future generations will be altered by what we choose today. The common contraceptive of our time discussed here is "the pill".

- 1) biological processes involved:
- the pill - combination of ^{synthetic} hormones: gestagens (progesterone + oestrogen)
- progesterone - inhibits LH secretion & thus ovulation, i.e. no egg for fertilization.
- oestrogens - inhibit FSH secretion & thus follicle development in ovary.
- 2^o effects - mucus viscosity / sperm penetration.
- uterine wall unsuitable for implantation of zygote, so baby cannot develop.

- 2) impact on future generations of widespread use
- used widely now in western culture
 - effects social behaviour of couples
 - allows for family planning / economic security.
 - preventative with fewer moral dilemmas than abortion
 - may mean delayed parenthood (older parents)
 - may increase likelihood of difficult births from older parents - consider genetic aspects,
 - long term use & effects on fertility
 - lower population growth rate than unprotected sex.

Conclusion - effect of pill's use is

- 1° biological
- 2° social
- 3° cultural
- 4° economic

Touches all parts of our lives. Our choice today may choose our future tomorrow?

Question 4

Aphids are small insects that feed on sap from plants. They are capable of both sexual and asexual reproduction. In summer months, when food is readily available, an aphid population consists entirely of asexually reproducing females, which give birth to new females. Just before the onset of the harsh winter months, a few males are born and sexual reproduction occurs. Discuss the possible impact of global warming on the population dynamics of aphids and the long-term outlook for the survival of the species.

(UB)

Intro

Temperature affects the method of reproduction in aphids. Warmer temperatures from global warming, or summer ^{conditions}, stimulate asexual reproduction i.e. females.

1) Population dynamics:

change sexual balance ↑ females
↓ males

change in genetic variation asexual / clones
↓ genetic variation

change in population numbers
- asexual reproduction associated with summer food abundance, supports large populations - OK in summer.

2) long term outlook for species survival

change in ability of species to respond to change of environment. - less variation in species from asexual reproduction

any population, could in winter devastate whole population at ant limited food supplies, threatening whole population's survival.

Conclusion. Evolution has selected sexual behaviour of aphids in line with summer/winter seasons of the past. Food & temperature is abundant in summer, suits asexual female, while harsh winters suit sexual involvement of males in the reproductive cycle. External changes to this pattern could have dramatic deleterious effects on aphids in the long term. Global warming might trick aphids into anticipating a 'false summer' & an early demise.

Question 5

Many zoos attempt breeding programs with species that are endangered. One aim of these programs is to build up numbers to a level where controlled release into the natural populations can occur to boost their numbers. Discuss the implications of keeping a species "destined for extinction" alive and breeding in captivity. Comment on the likelihood of future success of such programs in situations with animals that are very endangered.

(EBI)

Intro

Endangered species have found a modern friend in an ancient foe. Zoos once seen as collectors, responsible for the removal of animals & depletion of populations, currently see their role as the opposite, a place of sanctuary, of skilled scientific breeding. A place where it is possible to keep alive animals whose existence in nature is threatened.

1 # implications

- a) - keeping alive "destined for extinction" animals
- zoo practice to become scientific / educational institution
 - animal knowledge / study required to meet requirements of animals
 - encourages biodiversity on planet
 - animals can exist in "artificial" conditions outside country of origin i.e. Polar bears at SeaWorld

- b) # - breeding in captivity
- # - animals bred are 'selected' artificially, not just by species, by individuals, some of which may contribute its genes disproportionately to gene pool for that animal; i.e. international
- # sperm donors this reduces natural variation of

species.

for the wild.

- # - Natural breeding not required / behaviour is unsuited

#2) likelihood of future success (very endangered animals)

a) In 2005 it is very likely, as zoos become scientific institutions with knowledge + facilities, that they will be able to 'keep alive' specimens, even very endangered ones, much as hospitals can prolong human life with intensive care units. Outside this environment, the outlook is not so certain.

- b) If. Controlled release in natural populations requires:
- habitats still exist
 - communities - food/disease/competitors will support such an animal.
 - animals behaviour can be reconditioned from its dependence in a zoo to become independent in the wild, e.g. hunting, mating.
 - Not likely that this can be achieved.
 - Even if it is possible, should we be interfering in natural events. Some extinctions man made. Are all

Conclusion: It will be possible to keep/produce endangered animals in zoos at least as museum pieces. By studying these animals we gain knowledge + experience of past ecosystems. Successful release into the wild again is not so certain, unless we can preserve their habitat + ecosystems as well!

End of Part B

End of Paper Two