

**Model Answers: Medium**

1a

a) This plant has become an endangered species because...

Any **three** of the following:

- It is large/colourful **SO** it is easy to detect; [1 mark]
- It may be taken by collectors; [1 mark]
- It may be sold / (illegally) traded / used in traditional medicine; [1 mark]
- It may be destroyed due to the (bad) smell; [1 mark]
- It's habitat is being destroyed / named reason for habitat destruction *e.g. effect of grazing / building / agriculture / deforestation*; [1 mark]
- Other possible reasons *e.g not easily pollinated / flowers infrequently / flowers for a (very) short time*; [1 mark]

**[Total: 3 marks]**

1b

b) It is sometimes necessary to conserve a plant species outside its natural habitat (*ex-situ*) because...

Any **three** of the following:

- Their natural habitat may be decreased/degraded/damaged/lost due to climate change/human activity; [1 mark]
- The population is very low; [1 mark]
- In the wild / *in-situ*, sexual reproduction is difficult if numbers are low; [1 mark]
- Assisted reproduction can be easier to carry out *ex-situ*; [1 mark]
- Breeding *ex-situ* can maintain the gene pool; [1 mark]
- *Ex-situ* conservation allows protection from grazers/competing species/humans/collectors/(illegal) traders; [1 mark]
- *Ex-situ* conservation allows protection from disease; [1 mark]

**[Total: 3 marks]**

1c

c) Advantages of using seed banks, rather than adult plants, for conserving an endangered plant species include...

Any **four** of the following:

- Seeds can be collected with minimal damage to wild population(s); [1 mark]
- Most plants produce an excess of seeds so availability is high; [1 mark]
- Seeds take up less space **SO** larger numbers / more species can be stored; [1 mark]
- Therefore can also store greater genetic diversity; [1 mark]
- Seeds are easier/cheaper/lower maintenance to store/transport (than adult plants); [1 mark]
- Seeds remain viable for long periods of time; [1 mark]
- Seeds are less vulnerable/susceptible to disease/environmental change; [1 mark]
- Storing seeds (instead of adult plants) prevents fertilisation by undesired pollen; [1 mark]

**[Total: 4 marks]**

Whole adult plants may need different conditions when they are stored depending on the species, whereas storing seeds simply requires them all to be stored in dry and cold

conditions. Cold temperatures reduce enzyme activity and the lack of water prevents hydrolysis of the food reserves.

2a

a) The meerkat is less likely than the elephant to become endangered because...

Any **three** of the following:

- Meerkats reproduce faster / have larger number of offspring / shorter life cycle / shorter gestation period (than elephants); [1 mark]
- Meerkats are of no use to humans / are not hunted/poached **WHEREAS** elephants are hunted/poached/exploited (for ivory); [1 mark]
- Meerkats are protected in burrows **WHEREAS** elephants are exposed / out in the open; [1 mark]
- Meerkats are small/camouflaged **WHEREAS** elephants are large/obvious / easy to locate/hunt/poach; [1 mark]
- Meerkats have a (wide) variety of food (sources) **WHEREAS** elephants have limited food sources / one main food source; [1 mark]
- Meerkats require less food/water **WHEREAS** elephants require large amount of food/water; [1 mark]

**[Total: 3 marks]**

2b

b) The Red List has many more vertebrates than invertebrates because...

Any **two** of the following:

- People/scientists/biologists are more interested in vertebrates (than invertebrates); [1 mark]
- Vertebrates are more widely researched/surveyed (than invertebrates); [1 mark]
- Vertebrates are larger / more visible so are easier to survey / it is easier to estimate their numbers (than invertebrates); [1 mark]
- Vertebrates may be under more pressure / more endangered / at greater extinction risk (than invertebrates); [1 mark]
- We may not be aware of many invertebrates that are endangered as they harder to survey / are more cryptic / hidden; [1 mark]

**[Total: 2 marks]**

2c

c) The three main components of biodiversity are...

- Habitat/ecosystem diversity **AND** species diversity **AND** genetic diversity; [1 mark]

**[Total: 1 mark]**

2d

d) Ecological, ethical and economic arguments for maintaining biodiversity include...

**One** mark for ecological argument:

- Vital for nutrient recycling; [1 mark]
- Makes populations more stable / robust (to changes in the environment); [1 mark]
- To prevent soil erosion; [1 mark]
- More biodiverse communities are more productive; [1 mark]

**One** mark for ethical argument:

- To prevent extinction; [1 mark]

- To prevent the loss/reduction of populations/habitats; [1 mark]
- To save organisms for future generations; [1 mark]

**One** mark for economical argument:

- Tourism; [1 mark]
- Agriculture; [1 mark]
- Commercial products (suitable example accepted); [1 mark]
- Pharmaceutical/medical needs; [1 mark]

**[Total: 3 marks]**

Ensure that you have included at least one of each type of argument as this is what the question has asked for.

3a

a) An invasive species is...

- A species that has moved into an ecosystem where it was previously unknown **OR** a species that has moved into a new ecosystem in which it did not previously exist; [1 mark]

**[Total: 1 mark]**

3b

b) The negative effects that alien species can have on an ecosystem include...

Any **three** of the following:

- Alien species may be carnivorous/predators so will prey on (many) native/existing species **OR** native/existing species may not have adaptations/defences/ability to avoid new predators; [1 mark]
- Alien species will compete with native/existing predators (in the ecosystem) for food **OR** herbivorous alien species will compete with native/existing herbivores (in the ecosystem) for food; [1 mark]
- Alien species will compete with native species for other named resource(s) e.g. space/territory, breeding/nesting sites, etc.; [1 mark]
- Alien plant species will compete with existing species for named resource(s) e.g. light, minerals, water, space, etc.; [1 mark]
- Alien species may introduce disease that native/existing species have no immunity against; [1 mark]
- Alien species may change the environment so that native/existing species cannot survive **OR** destroy habitats that native/existing depend on (for survival); [1 mark]

**[Total: 3 marks]**

3c

c) The main forms/stages of assisted reproduction are...

Any **two** of the following sets of names/descriptions:

- Artificial insemination / AI; [1 mark]
- Semen/sperm is collected from the male and injected/inserted into the (vagina/uterus of the) female (near the time of ovulation); [1 mark]

**OR**

- In vitro fertilisation / IVF; [1 mark]
- Semen/sperm collected from the male / eggs are collected from the ovary **AND** semen/sperm and eggs are mixed together in a (petri) dish or (test) tube

to fertilise; [1 mark]

**OR**

- Embryo transfer; [1 mark]
- Embryo(s) (formed during IVF) are inserted into uterus (of female/mother) for implantation to take place **OR** embryo(s) are taken from uterus of female/mother and transferred to a surrogate female/mother (of non-vulnerable species); [1 mark]

**OR**

- Surrogacy **OR** surrogate female/mother; [1 mark]
- A female that becomes pregnant with the embryo(s) from another female and carries the embryo to full term / gives birth **OR** embryo(s) are placed into the uterus of a female who did not provide the female gamete; [1 mark]

**[Total: 4 marks]**

4a

a) i) A reason for the very low numbers of Bali starlings in the wild could be...

Any **three** of the following:

- Habitat destruction; [1 mark]
- Competition for food / food shortage; [1 mark]
- Predation; [1 mark]
- Disease; [1 mark]
- Pollution / pesticide use **OR** removed from wild (to zoos) to conserve species **OR** problems finding a mate; [1 mark]

a) ii) The roles zoos can take in the protection of the Bali starling are...

Any **two** of the following:

- (Captive) breeding; [1 mark]
- Release into wild; [1 mark]
- Education / increase awareness (of illegal bird trade); [1 mark]
- Research diet / habitat / breeding/behaviour / genetic diversity; [1 mark]
- Raise money / work with (Bali) government to set up reserves; [1 mark]
- Veterinary/health care; [1 mark]

**[Total: 5 marks]**

It is important in part ii) to make sure you don't list methods of captive breeding that are only applicable to mammals and not to birds, such as *in vitro* fertilisation and embryo transfer to surrogate mothers.

4b

b) The consequences on genetic biodiversity of having a wild population of just six birds would be

Any **four** of the following:

- Low/decreased (genetic) diversity/variation; [1 mark]
- Low/decreased heterozygosity; [1 mark]
- Harmful recessive alleles may come together; [1 mark]
- Inbreeding depression; [1 mark]
- No/decreased hybrid vigour; [1 mark]
- Not/less able to adapt to changed selection pressure/environment; [1 mark]

**[Total: 4 marks]**

Small populations have low **genetic diversity** due to the low total number of alleles of each gene present in the population. This increases the risk of any offspring inheriting **two identical alleles** from their parents (this reduces **heterozygosity**), which can then further reduce the genetic diversity in the next generation. Inheriting two identical copies of a gene also increases the risk of inheriting **two harmful recessive alleles**, leading to the problem of **inbreeding depression**.

Populations with low genetic diversity are less likely to be able to adapt (by natural selection) to a changing environment, and are therefore more likely to be wiped out by such change.

5a

a) i) Two reasons why the Visayan warty pig is critically endangered are...

Any **two** of the following:

- Deforestation **OR** habitat destruction/fragmentation; [1 mark]
- Killed/hunted; [1 mark]
- Disease; [1 mark]
- Reduction in food supply; [1 mark]

a) ii) The role of zoos in the protection of the Visayan warty pig is...

Any **three** of the following:

- Captive breeding / AI / IVF / surrogacy; [1 mark]
- Release into the wild / insurance populations; [1 mark]
- Education / awareness; [1 mark]
- (Work with Philippine government to) set up reserves; [1 mark]
- Research diet / habitat / breeding / behaviour / genetic diversity; [1 mark]
- Veterinary care / monitor health; [1 mark]

**[Total: 5 marks]**

5b

b) The consequences of this interspecific breeding are...

Any **three** of the following:

- Hybrids formed / fewer warty pigs produced; [1 mark]
- (Offspring) may be sterile; [1 mark]
- Genetically different (from warty pigs); [1 mark]
- (Hybrids are) less adapted for natural environment; [1 mark]
- (Hybrids are) susceptible to diseases/parasites; [1 mark]

**[Total: 3 marks]**

5c

c) The completed table is as follows...

taxonomic group	name
domain	Eukarya; [1 mark]
kingdom	animalia
phylum	chordata
Class; [1 mark]	mammalia
order	artiodactyla
family	suidae

**[Total: 2 marks]**

You need to spell Eukarya correctly, and it can't be substituted for words like Eukaryote. Use a mnemonic to help you remember the order of taxonomic ranks, such as Keep Ponds Clean Or Frogs Get Sick.

6

a) The role of botanic gardens in the protection of endangered species is...

Any **seven** of the following:

- To collect plants/seeds from the wild; [1 mark]
- (From) many countries / internationally; [1 mark]
- (Especially from) areas at risk from climate change; [1 mark]
- Plant the seeds/plants (in botanic gardens); [1 mark]
- (Planting the seeds/plants allows scientists to) increase plant/seed number; [1 mark]
- Tissue culture / cloning; [1 mark]
- (Store seeds in) seed bank; [1 mark]
- Maintain / measure genetic diversity **OR** enter information into a gene bank; [1 mark]
- Cooperate with governments / charities / universities...; [1 mark]
- ...For research; [1 mark]
- To conserve habitats; [1 mark]
- To restore habitats; [1 mark]
- To reintroduce species (to wild); [1 mark]
- To educate (public) / raise awareness; [1 mark]
- To raise funds; [1 mark]
- Prepare suitable habitats / growing conditions; [1 mark]

**[Total: 7 marks]**

This question asks about **botanic gardens**, so any references to zoos specifically cannot gain marks.

Note that genetic diversity within an endangered species (marking point 8) cannot be maintained by selective breeding and cross breeding. Selective breeding will reduce genetic diversity while cross breeding will create hybrids rather than conserving the gene pool of an existing species.