

Question 36

- (a) Discuss the processes that would be undertaken to gather relevant material and generate DNA profiles that would enable you to understand the genetic diversity within an endangered plant's population. (10 marks)

- (a) Recombinant DNA technology is becoming increasingly vital to agricultural production. Explain the process used to create recombinant organisms and discuss one application of the process to agricultural industries. (10 marks)

Question 38

- (a) Discuss the advantages and disadvantages of the development and use of transgenic organisms in an agricultural setting. (10 marks)

Extended Answers

Question 36

- (a) Discuss the processes that would be undertaken to gather relevant material and generate DNA profiles that would enable you to understand the genetic diversity within an endangered plant's population. (10 marks)

Description	Marks
Collection of plant species <ul style="list-style-type: none"> Requires field work, collection and storage of material Refrigeration and alcohol required to preserve the DNA 	1-2
Extraction of DNA from plant <ul style="list-style-type: none"> Need to break down cell walls (done by pulverising/blending) and destroy cell membranes (achieved by detergent) Separation of DNA from other plant material (filtration and separation with ice cold alcohol) 	1-2
Amplification of DNA <ul style="list-style-type: none"> Achieved in a thermal cycler. Appropriate sections of DNA that need to be isolated and amplified to allow comparisons will be identified by use of relevant primers Most likely to use sections of DNA with Tandem repeats (STR/VNTR) 	1-2
DNA Profiles <p>Any two of</p> <ul style="list-style-type: none"> Prior to running profile, DNA is prepared using one or more restriction enzymes. This cuts DNA into various lengths DNA profiles are achieved by gel electrophoresis Each separate plant's DNA will be run in separate lane Imagery in each lane is compared (by looking at number of fragments and fragment lengths). The more differences the more variability there is in the endangered plant population. 	1-4
Total	10

Question 37

- (a) Recombinant DNA technology is becoming increasingly vital to agricultural production. Explain the process used to create recombinant organisms and discuss one application of the process to agricultural industries. (10 marks)

Description	Marks
Process of recombinant DNA <p>In the gene donor organism</p> <ul style="list-style-type: none"> Identify and isolate the gene of interest (that would add value to a different species) Extract the gene using restriction enzyme 	1-2
In the plasmid vector <ul style="list-style-type: none"> Open the plasmid vector using the same restriction enzyme 	1
Incorporating the donated gene into the plasmid vector <ul style="list-style-type: none"> This is achieved as a result of annealing (weak hydrogen bonds hold the complimentary bases together) And ligation (requires use of ligation enzyme to form the phosphodiester bonds) 	1-2
Incorporate plasmid into the organism that is being genetically modified. <ul style="list-style-type: none"> Plasmids are inserted into host organism - This is done by use of technology such as gene gun or being mixed with the embryos. Once uptake has occurred the organism is said to be transformed. Transformed individuals will express the incorporated gene in their phenotype 	1-3
Application to agricultural industries <ul style="list-style-type: none"> Refers to only (maximum one mark) (e.g. GM Corn, canola etc) Describes the process for the named example (maximum of two marks) 	1-2
Total	10

Question 38

- (a) Discuss the advantages and disadvantages of the development and use of transgenic organisms in an agricultural setting. (10 marks)

Description	Marks
Agricultural setting <ul style="list-style-type: none"> Uses at least one agricultural example Discussion is always focussed upon agriculture examples 	1
Advantages <ul style="list-style-type: none"> transgenic organisms have been engineered for disease/herbicide/pesticide resistance, faster growth rate greater product quality greater product yield tolerance to adverse environmental conditions 	1-5
Disadvantages <ul style="list-style-type: none"> Transgenic organisms may have adverse effects on the effects on non-target organisms Transgenic organisms may lead to more rapid evolution of pesticide-resistant species Gene flow from crop species to weed species may result in emergence of super weeds 	1-3
Total	10