**Marking Guide**

**Biology Unit 1**

**2021**

**Section One: Multiple-choice 30% (30 Marks)**

|  |  |
| --- | --- |
| **Question** | **Answer** |
| **1** | b |
| **2** | c |
| **3** | a |
| **4** | d |
| **5** | a |
| **6** | d |
| **7** | c |
| **8** | d |
| **9** | b |
| **10** | c |
| **11** | b |
| **12** | a |
| **13** | c |
| **14** | a |
| **15** | b |
| **16** | d |
| **17** | c |
| **18** | b |
| **19** | c |
| **20** | a |
| **21** | b |
| **22** | c |
| **23** | d |
| **24** | a |
| **25** | b |
| **26** | d |
| **27** | b |
| **28** | a |
| **29** | c |
| **30** | b |

**Section Two: Short answer 50% (100 Marks)**

**Question 31 (20 marks)**

Fire is a dynamic factor in Australian ecosystems and has different effects on biodiversity.

(a) Define biodiversity. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Biodiversity is the range and number of species in a given area and the range of ecosystems in that area. | 1 |
| Wording may vary depending on teaching **- TOTAL** | **1** |

(b) The intensity of a fire is the result of many different factors. Name **three** (**3**) factors that can influence the intensity of a fire and describe how this factor affects the intensity of the fire. (6 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The season that it occurs in, if hot and dry fire will be more intense. | 1 - 2 |
| The frequency of fire, more frequent fires will result in lower intensity. | 1 - 2 |
| Fuel load in the area on fire, more fuel higher the intensity. | 1 - 2 |
| The geography where the fire is occurring, fire will move up hill faster than on flat ground, resulting in a higher intensity. | 1 - 2 |
| Wind speed, higher wind speed can fuel a fire with more oxygen resulting in higher intensity. | 1 - 2 |
| **TOTAL** | **6** |

(c) After a fire has burnt an area of land, describe the immediate effect this would have on biodiversity and abiotic components of that area. (5 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The total amount of biomass would have decreased in the burnt area as organic compounds would have been combusted. | 1 - 2 |
| Number of individual animals would decrease as there would be deaths from the fire. Also many animals would have emigrated from the area due to loss of food and shelter. | 1 - 2 |
| The number of individual plants would be decreased as many would have been burnt up during the fire. | 1 |
| The nutrient level in the soil would have increased as compounds would be released from biotic components for other biotic components to use. | 1 - 2 |
| Day and night time temperature extremes could increase, as lack of shade during the day could increase sun exposure to the ground heating it faster. Lack of canopy means more heat / infrared energy can escape into the atmosphere cooling the area more than it would normally. | 1 - 2 |
| Accept other reasonable answers - **TOTAL** | **5** |

Over the last 40-60 000 years, Aboriginal people of Australia have become very skilful at burning the landscape for many different purposes. This constant use of fire by Aboriginal people as they went about their daily lives resulting in a mosaic of different vegetation across the landscape.

(d) Using your understanding of succession, explain how this mosaic burning results in the increase of biodiversity across the area where it takes place. (4 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Fire starts the ecological succession process. | 1 |
| The number and type of species / organisms present throughout the ecological process changes over time. | 1 |
| By having different areas of the bush at different stages of ecological succession the total area will have greater range and number of plant and animal species existing in it. | 1 |
| Increasing the number and range of species (plants and animals) increases the biodiversity of the area. | 1 |
| **TOTAL** | **4** |

Some Australian plants require fire to complete their life cycles. If fires occur too frequently, this can be detrimental to these species and they will reduce in number in that area.

(e) Explain how very frequent fires can result in the reduction in number of fire tolerant and resistant species of plant. (4 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Fire tolerant species need fire in order for their seeds to germinate / complete their life cycle. | 1 |
| An initial fire could cause the seeds to a fire tolerant species to germinate. | 1 |
| A secondary fire that occurs too soon after could destroy the germinating seeds before they have an opportunity to develop their own seeds. | 1 |
| With no seeds to be germinated by the secondary fire the number of fire tolerant plants in that area could decline. | 1 |
| **TOTAL** | **4** |

**Question 32 (20 marks)**

Australia is home to many unique ecosystems, which is tern are home to many unique species found nowhere else in the world.

1. Define the term ecosystem. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Ecosystem is a self-sustaining unit consisting of the interactions between the community and the environment. | 1 |
| Wording will vary depending on teaching - **TOTAL** | **1** |

1. Below is a table that names and describes the diet of some native Australian plants and animals. In the space provided, construct a food web depicting these feeding relationships. (4 marks)

|  |  |
| --- | --- |
| Organism | Diet |
| Cicada | Eucalyptus Sap |
| Eucalyptus | Producer |
| Northern Quoll | Amphibians and Birds |
| Green Tree Frog | Insects |
| Kookaburra | Amphibians and insects |
| Tussock Grass | Producer |
| Meat Ants | Plant material, other insects and dead animals. |

Northern Quoll

Kookaburra

Green Tree Frog

Meat Ants

Cane Toads

Cicada

Eucalyptus

Tussock Grass

|  |  |
| --- | --- |
| **Description** | **Marks** |
| All organisms included in diagram. | 1 |
| All arrows present. | 1 |
| All arrows in correct direction. | 1 |
| Is neat and readable. | 1 |
| **TOTAL** | **4** |

1. The food web above is incomplete as it is missing decomposers. If this food web really did not have any decomposers what would be a likely result of this? (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Matter that enters the food web cannot be broken down to be re-released. | 1 |
| Dead matter will accumulate until produces run out of inorganic nutrients / resources and the food web collapses. | 1 |
| Answers can vary - **TOTAL** | **2** |

1. Name and describe the relationship(s) that exists between the Green Tree Frog and the Meat Ants in the above food web. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The two species predate on each other. | 1 |
| They area also interspecific (1) competitors (1) for cicadas. | 1 - 2 |
| **TOTAL** | **3** |

1. Write out a food chain that places the Northern Quoll in the highest trophic level possible. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Eucalyptus 🡪 Cicada 🡪 Green Tree Frog 🡪 Kookaburra 🡪 Meat Ant 🡪 Northern Quoll.  OR  Eucalyptus 🡪 Cicada 🡪 Meat Ant 🡪 Green Tree Frog 🡪 Kookaburra 🡪 Northern Quoll. | 1 |
| **TOTAL** | **1** |

1. In a different colour (if possible), add Cane toads to the food web. Cane toads will consume other amphibians and all types of insect. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Cane toad added and arrows are present and drawn correctly. | 1 |
| **TOTAL** | **1** |

1. Once Cane toads were introduced into this ecosystem, consider what could occur to the Kookaburra population. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Kookaburra population would decrease in number. | 1 |
| Cane toads compete with Kookaburras for food. | 1 |
| With less food, the ecosystem cannot support as many Kookaburra. | 1 |
| Answers can vary - **TOTAL** | **3** |

1. i. Biologists working in the field, surveyed a 120m2 area in which the food web exists. They found that over a 2 month period, the Tussock grass produced 120kg of biomass. Calculate the biomass productivity for 1m2 of this ecosystem for one month. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 120kg in two months divided by 2 to get 60kg in a month. | 1 |
| 60kg in one month divided by 120m2 = 0.5kg / month. | 1 |
| **TOTAL** | **2** |

ii. If all 120kg of Tussock grass was consumed by the Meat Ants and assuming none died, by how much biomass would you expect the Meat Ant population to have increased by over a 1 month period. Justify your answer. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| In one month 60kg of Tussock grass would be consumed. | 1 |
| Roughly only 10% of biomass moves onto the next trophic layer. | 1 |
| Therefore the Meat Ant population could have grown by 6kg of biomass. | 1 |
| Answers can vary - **TOTAL** | **3** |

**Question 33 (20 marks)**

Antibiotics are a class of drug that can kill or slow the growth of bacteria. Since their discovery in 1928, the therapeutic use of antibiotics has saved the lives of millions of people. However, in the 1930’s it was discovered that the treatment of cattle, and other livestock, with low level doses of antibiotics increased their growth rate. This meant that in the same period of time larger cattle could be produced increasing profits for farms.

|  |  |
| --- | --- |
| Table showing the mass of cows after 2 years of growth when receiving different concentrations of Oxytetracycline | |
| Concentration of Oxytetracycline (mg/kg) | Mass of Cow after 2 years of growth (kg) |
| 50 | 425 |
| 100 | 550 |
| 200 | 660 |
| 300 | 680 |
| 350 | 685 |

1. Write a hypothesis that the scientist conducting this experiment may have used.

(1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Hypothesis must relate the independent variable to the dependent variable.  Example: The higher the monthly dose of Oxytetracycline given to the cattle the greater the adult mass of the cattle. | 1 |
| **TOTAL** | **1** |

1. i. Name the independent variable for the above experiment. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Concentration of Oxytetracycline (mg/kg) | 1 |
| Must include units for full mark - **TOTAL** | **1** |

ii. Name the dependent variable for the above experiment. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Mass of cow(s) (kg) | 1 |
| Must include units for full mark - **TOTAL** | **1** |

iii. Name **two** (**2**) variables the scientists should have controlled as part of their experiment. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| * Breed of cattle * Exercise cattle undertook * Feed quality * Amount of feed available to cattle | 1-2 |
| Accept other reasonable variables - **TOTAL** | **2** |

1. Construct an appropriate graph on the grid provided to represent the data in the table on the previous page. (6 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Title – which links the dependent variable and independent variables correctly. | 1 |
| correctly allocates Dose of Oxytetracycline on x-axis, Mass of Cows on y-axis. | 1 |
| **Appropriate** and **even** scale on axes and graph size is appropriate for grid size. | 1 |
| Appropriate graph / line graph | 1 |
| Correctly plotted points and neat. | 1 |
| Correct labelling of both axis including units | 1 |
| **TOTAL** | **6** |

1. Did the data support your hypothesis? (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Student to state according to their hypothesis, mark for justification, no mark for single word yes or no.  Example- Yes, as the amount of Oxytetracycline increased so too did the mass of the cattle. | 1 |
| **TOTAL** | **1** |

1. One of the scientists in the team conducting the experiment stated, “This data shows that antibiotics must also increase the growth rate in humans too”. Is this statement **valid**? Justify your answer. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| No – statement is not valid. | 1 |
| Experiment was conducted on cattle not humans. | 1 |
| Any conclusions drawn from this data can only be applied to cattle. | 1 |
| **TOTAL** | **3** |

1. i. By drawing a line on your graph estimate the mass of a cow after two years if given 150mg/kg monthly dose of Oxytetracycline. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 600kg +/- 20kg – use graph constructed by students to check their answer. Must use units for full mark. | 1 |
| Student must use lines on their graph to get second mark. Shown above in red. | 1 |
| **TOTAL** | **2** |

ii. Estimate the mass of a cow after two years if given 400mg/kg monthly dose of Oxytetracycline. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 690kg +/- 10kg – use student graph to judge if estimate is reasonable. | 1 |
| **TOTAL** | **1** |

iii. Which estimate do you have more confidence in and why? (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| First estimate should be more confident. | 1 |
| Estimate is made by interpolation, can have greater confidence, second estimate is made by extrapolation, not as accurate. | 1 |
| **TOTAL** | **2** |

**Question 34 (20 marks)**

Nitrogen is a key element in the formation of proteins, which are essential for growth and health of all organisms.

1. Name the **two** (**2**) general processes that make atmospheric nitrogen available to plants. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Action of lightning. | 1 |
| Action of bacteria in soil and root nodules. | 1 |
| **TOTAL** | **2** |

1. Legumes and other species of pea plant are able to obtain their nitrogen due to a particular relationship they have with another organism. Name and describe the type of relationship they have with this other organism. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Legumes have a mutualistic symbiotic relationship with bacteria in their root nodules. | 1 |
| Bacteria get a safe place to live / exist. | 1 |
| Plant has access to source of nitrogen compounds produced by the bacteria. | 1 |
| **TOTAL** | **3** |

1. Animals need nitrogen for the synthesis of their proteins as well. Unfortunately, many animals do not have access to the same source of nitrogen that is available to plants. How do many animals obtain the nitrogen they need for growth and survival? (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| By consuming plants that contain nitrogen or organisms that consume the plants. | 1 |
| **TOTAL** | **1** |

1. Farmers, in an attempt to increase crop yields, will add fertilisers, rich in nitrogen compounds, to their fields. Describe how this can lead to eutrophication and the death of fish in nearby lakes. (4 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Excess fertiliser runs off into lakes which increases nutrient content of water. | 1 |
| Algae grow and bloom using up oxygen in lake. | 1 |
| Algae then begin to die and decompose further using up oxygen in lake. | 1 |
| Aerobic organisms like fish die from lack of oxygen. | 1 |
| **TOTAL** | **4** |

Carbon is also a key element in many organic molecules and is essential for life. Carbon on Earth flows between the atmosphere, geosphere, hydrosphere and biosphere.

1. Name the process that moves carbon from the biosphere to the geosphere. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Fossilisation | 1 |
| **TOTAL** | **1** |

1. There are three other processes that move carbon from sphere to sphere. Name these other processes and describe how human activity is negatively affecting them to result in more carbon in the atmosphere. (6 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| **Respiration** – Human activity is increasing respiration by increasing the number of animals on the planet through large scale farming, and by the increase in the number of humans. | 1 - 2 |
| **Photosynthesis** – humans are removing forests and polluting the ocean, killing off phytoplankton, which decrease the total amount of photosynthesis taking place keeping more carbon dioxide in the atmosphere. | 1 - 2 |
| **Combustion** – humans burn wood and fossil fuels which places more carbon dioxide into the atmosphere. | 1 - 2 |
| **TOTAL** | **6** |

1. Much effort is used to try to limit the amount of carbon dioxide in the atmosphere. But having no carbon dioxide in the atmosphere would be catastrophic to the planet. Explain why a small amount of carbon dioxide in the atmosphere is a good thing for the planet and the organisms that exist on it. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Carbon dioxide traps heat in the atmosphere. | 1 |
| A small amount of carbon dioxide keeps the planet from freezing over / becoming too cold / entering an ice age. | 1 |
| Removal of too much carbon dioxide will make the planet too cold for many organisms to survive. | 1 |
| Plants need carbon dioxide for photosynthesis. | 1 |
| Any three points **- TOTAL** | **3** |

**Question 35 (20 marks)**

Below is a graph showing the relative population of a species of bird over time.

Z

Population

C

B

A

Time

1. Name the term used to describe the population of the bird species at population “Z”. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Carrying Capacity | 1 |
| **TOTAL** | **1** |

1. Explain why the population of bird does not increase much beyond population level “Z”.

(3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| At carrying capacity population will experience **environmental resistance to growth**. | 1 |
| Due to large population resources needed to survive become limited. | 1 |
| Environment can no longer support any more individuals. | 1 |
| **TOTAL** | **3** |

1. If a new species of predator was introduced into this environment at time “B”, extend the line to show the effect this would have on the bird population. Use the space below to explain your answer. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| One mark for line on graph, as per above. Must show population decrease and then reach new lower carrying capacity. | 1 |
| New predator will increase environmental resistance to growth. | 1 |
| It will increase the death rate on the population due to increase in predation. | 1 |
| New lower carrying capacity will be created. | 1 |
| Any three point **- TOTAL** | **3** |

1. i. There are four factors that can be used to calculate the rate of growth of a population. Name these **four** (**4**) factors. (4 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Births | 1 |
| Deaths | 1 |
| Immigration | 1 |
| Emigration | 1 |
| **TOTAL** | **4** |

ii. During the time frame “C” what can be assumed about these four (4) factors?

|  |  |
| --- | --- |
| **Description** | **Marks** |
| During this time (births + immigration) = (deaths + emigration). | 1 |
| **TOTAL** | **1** |

1. This particular species of bird was found to be previously unknown to science. Name the sources of information that scientists could have used to classify it. (3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Molecular sequences. | 1 |
| Structural or morphological features. | 1 |
| Mode and method of reproduction. | 1 |
| **TOTAL** | **3** |

1. Explain the major steps that would need to be carried out in order to calculate an estimate of this bird population using the capture-mark-recapture method. (5 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Trap a sample of the population and tag / mark them. | 1 |
| Release them back into the environment. | 1 |
| Allow enough time for them to fully and randomly redisperse into population. | 1 |
| Trap a second time – count number that are tagged. | 1 |
| Use the Lincoln index to calculate estimate for population. | 1 |
| **TOTAL** | **5** |

**End of Section Two**

**Section Three: Extended answer 20% (40 marks)**

**Part A**

**Question 36 (20 marks)**

(a) Assess and consider the relative impact that zoos and their breeding programs have globally on the three levels of biodiversity. As part of your answer name and define the three levels of biodiversity.

(10 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Levels / Types of Biodiversity | |
| Ecosystem diversity: is the range and number of different ecosystems types that exist in a biome. | 1 |
| Species biodiversity: is the number of different species that exist in a particular ecosystem / community. | 1 |
| Genetic biodiversity: is the number of different genes and the range in alleles of those genes that exist in a population’s gene pool. | 1 |
| **TOTAL** | 3 |
| Zoo’s impact of global biodiversity | |
| **Ecosystem Diversity**   * Zoos would have the smallest impact on ecosystem diversity when compared to the impacts they have on the other 2 levels. * Ecosystem biodiversity is about the range and number of ecosystems in a biome, the existence of zoos and their breeding programs do little to address this issue. | 1 - 2 |
| **Species Biodiversity**   * Zoos have a large impact on species biodiversity. * Zoos act as safe havens for many species, some of which are only found in zoos. * Therefore, zoos help maintain global species diversity by preventing the extinction of species. | 1 - 3 |
| **Genetic Biodiversity**   * Zoos impact on genetic biodiversity is moderate. * A zoo’s breeding program is carefully planned to maintain the existing genetic diversity in the population of the breeding program. * Zoo breeding programs also try to prevent the build-up of deleterious alleles in breeding populations. * Most species still exist in the wild and have sperate gene pools from the zoos, the zoo only assists. | 1 - 3 |
| Any seven point **- TOTAL** | 7 |
| **Student judgement on relative impact will be arbitrary but depended on justification used to defend point - TOTAL** | **10** |

Accurate monitoring of at-risk populations is important to assess the effectiveness of conservation strategies. One of many monitoring techniques is capture-mark-recapture.

(b) (i) Outline the major assumptions that are made when conducting a capture-mark-recapture. (7 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The population is **closed.** No animals enter or leave (immigrate or emigrate) from the monitored area. | 1 |
| Animals do not **lose** their tags. | 1 |
| Tagged animals are just **as likely** to be captured as untagged animals. | 1 |
| No animals **die** or are **born** during the monitoring activity. | 1 |
| All animals are **equally** **catchable**. Often there are different patterns of movement between males and females or old and young individuals. | 1 |
| Tagged animals have time to **redisperse randomly** back into the population. | 1 |
| There are no **trap happy or trap shy** behaviours. | 1 |
| Tags do not effect organisms survival. | 1 |
| **First seven marks only - TOTAL** | **7** |

(ii) The capture-mark-recapture involves working with animals. When handling animals ethics must be considered. Name and describe the three R’s of animal ethics.

(3 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| **Refine** – Modify procedure to make experiment more humane (less trauma to organism). | 1 |
| **Replace** – Substitute with a non-animal models (cell culture) or lower sentient organism. | 1 |
| **Reduce** – Use less organisms as part of the experiment. | 1 |
| **Must have the ‘R’ and explanation for 1 mark - TOTAL** | **3** |

**Question 37 (20 marks)**

Ecosystems change. Often this change take place in the form of ecological succession, during this process the species present in that ecosystem also change.

(a) With the use of examples, name and describe the differences in the characteristics that you would expect to see in the species found at the start of the ecological succession process, compared to the species found at the end of this process.

(10 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Up to **8** marks for contrast points. **Points must be contrasting**, do NOT have to relate to examples given, as these are general trends, not all species will possess all characteristics. | |
| **Life Span**   * Pioneer species will generally have short life spans. * Climax community species generally have longer life spans. | 1 - 2 |
| **Number of Offspring**   * Pioneer species will generally have large numbers of offspring. * Climax community species generally have fewer offspring. | 1 - 2 |
| **Infant Mortality**   * Pioneer species will generally have high infant mortality. * Climax community species generally have low infant mortality. | 1 - 2 |
| **Growth Rate**   * Pioneer species will generally reach full / adult size fast. * Climax community species generally take longer to be fully grown. | 1 - 2 |
| **Age of Sexual Maturity**   * Pioneer species will generally reach sexual maturity early / at a young age. * Climax community species generally reach sexual maturity later in life. | 1 - 2 |
| **Parental Care**   * Pioneer species will generally give very little to no parental care. * Climax community species generally give a large amount of parental care to offspring. | 1 - 2 |
| **Other comparisons allowed at marker discretion - TOTAL** | **8** |
| Up to **2** marks for examples, one per example. Examples don’t need to possess all characteristics mentioned above. But should be recognised **pioneer and climax** species (or R-select / K-select species). | |
| **Relevant examples**   * Pioneer species example * Climax species example | 1 - 2 |
| **TOTAL** | **2** |

Protecting, maintaining and rebuilding biodiversity is an almost endless task for many biologists. To aid them in this task, many conservation strategies are employed including **genetic** strategies, **environmental** strategies and **management** strategies.

(b) Name and give examples of **five** (**5**) different conservation strategies. Be sure to include at least one example from each of the three different conservation strategies.

(10 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| **1 mark** for naming strategy and **1 mark** for correct and relevant example. Examples may vary according to teaching.  A **maximum total of 8 marks** if answer missing one of the strategy types below.  A **maximum total of 6 marks** if answer missing two of the strategy types below. | |
| **Genetic Strategies** | |
| **Seed Banks** – Kings Park has a collection of seeds taken from many W.A. habitats. OR Svalbard Global Seed Vault has a global collection of agricultural and cultural significant species stored. | 1 - 2 |
| **Captive Breeding Programs** – Perth Zoo has a Numbat breeding program, many of which have been successfully reintroduced into the wild. | 1 - 2 |
| **Environmental Strategies** | |
| **Biological Control** – *Calici* virus has been used to reduce the number of introduced rabbits in Australia. *Cactoblastis* moth has reduced the amount of prickly pear in Australia. | 1 - 2 |
| **Reafforestation** – Mining sites on the Darling scarp have had areas cleared for mining have had those area native vegetation replanted on them once mining was completed. OR Replanting native bush land to connect isolated areas of bush land as part of the Gondwana project. | 1 - 2 |
| **Pest Controls** – Culling of animals like wild / introduced goats, pigs and camels to reduce their negative impact on the environment and to reduce competition for native animals. | 1 - 2 |
| **Management Strategies** | |
| **National Parks** – National parks are areas of rich biodiversity which are protected, examples include but not limited to; Karijini, Nambung, Purnululu, Kalbarri, Cape Range, Cape Le Grand, Fitzgerald River, Leeuwin-Naturaliste, D’Entracasteaux, Walpole-Nornalup and Yalgorup. | 1 - 2 |
| **Protected Zones** – Ningaloo and Rottnest both have ‘Sanctuary Zones’ which no damaging activity can take place i.e. fishing. | 1 - 2 |
| **Licences** – Abalone, Marron and Rock Lobster and many fish species require licences to catch. This allows authorities to monitor and manage populations of these species. | 1 - 2 |
| **Open Seasons** – Many species are only allowed to be caught at particular times of the year, like Abalone. This allows authorities to stop over-fishing or taking individuals during vulnerable times of their life cycles. | 1 - 2 |
| **Other relevant answers acceptable - TOTAL** | **10** |

**Part B**

**Question 38 (20 marks)**

Human activity often has negative impacts on the environment and the greater biosphere. This global level of change is often described as climate change. Climate change is not one ‘thing’ but a large number of issues affecting almost every part of the Earth.

(a) Name and describe some of these components of climate change and where appropriate, include the specific cause of the issue.

(10 marks)

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| **Description** | **Marks** |
| * Climate change overall is the result of greenhouse gas emissions from human activity. * These gases include; carbon dioxide, methane and nitrous dioxide. | 1 - 2 |
| **Global warming**   * Is the gradual increase in average global temperature. * Due to increase in GHG from human emissions. * These gases prevent heat from escaping the atmosphere into space, resulting in the atmosphere increasing in temperature. | 1 - 3 |
| **Ocean acidification**   * The average pH of the ocean in decreasing / becoming more acidic. * This is due to the increased level of dissolved carbon dioxide forming carbonic acid. * This acid damages shell formation and negatively affects the health of corals. | 1 - 3 |
| **Decreased oxygen levels in the ocean**   * Warmer oceans, due to global warming, are able to hold less dissolved gases, like oxygen. * Pollution in the ocean also lead to decreased phytoplankton. * Both of these reduce level of oxygen in the ocean. | 1 - 3 |
| **Reduction in biodiversity**   * Rate of climate change is greater than the capacity of life to evolve. * This increases the rate of extinction, decreasing biodiversity. | 1 - 2 |
| **Sea level rise**   * As global temperature increase, ice melting increases, resulting in higher sea levels and coastal erosion. * Higher temperature also causes water to expand adding to sea level rise. | 1 - 2 |
| **Changed weather patterns**   * Due to temperature changes weather patterns have changed. * This results in alterations of rain fall patterns and the length of seasons. | 1 - 2 |
| **TOTAL** | **10** |

Individual species have specific needs and no two species will have the exact same needs in the same ecosystem, due to the competitive exclusion principle.

(b) (i) Define the term ‘niche’ and describe what the competitive exclusion principle postulates and why biologists only ever find one species per niche. (5 marks)

(ii) Describe, with the use of examples, how species avoid competitive exclusion.

(5 marks)

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| **Description** | **Marks** |
| Niche and competitive exclusion principle – up to **5 marks** | |
| * **Niche** is the specific biotic and abiotic factors that an organism requires to exist in its habitat. * As well as the function or role that the organism has in its community. | 1 - 2 |
| * Competitive exclusion principle is when two species occupy the same niche and one will eventually outcompete the other. | 1 |
| * If two species have overlapping niches, then they will compete for resources. * If the niches completely overlap, they will compete for all resources. | 1 - 2 |
| * One organism will eventually prevail. * This could be due to producing more offspring at a time, find food more effectively, reach maturity faster or could be larger. | 1 - 2 |
| **TOTAL** | **5** |
| Avoid competitive exclusion principle – up to **5 marks** | |
| * Competitive exclusion is avoided by resource partitioning. * Species will occupy realised niche / actual niche. * Similar species will change to have slightly different niches. | 1 - 3 |
| * Some species of birds will hunt / search for food at different levels in the canopy. | 1 |
| * Some species will become nocturnal in order to avoid competition. | 1 |
| * These actions stop complete overlap of niches decreasing competition allowing for the survival of more than one species. | 1 |
| **TOTAL** | **5** |

**Question 39 (20 marks)**

Human activities can affect biodiversity and change ecosystems.

(a) Excluding climate change, name and describe some of the environmental problems that have been created by humans. Where appropriate use examples to clarify your point or describe the ramifications of the environmental problem.

(10 marks)

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| **Description** | **Marks** |
| No mark just for naming, must be able to describe / outline process. | |
| **Habitat destruction**   * When an ecosystem is altered to a point where the native organisms that exist there are no longer able to exist there or are destroyed in the process. * Resulting in a decrease in all level of biodiversity. * This can include the removal or ecosystems due to clearing of land for agriculture or urban sprawl. | 1 - 3 |
| **Habitat fragmentation**   * The subdivision of an ecosystem into smaller sections. * This leads to smaller populations which can result in inbreeding and subsequent decrease in genetic diversity. * Due to logging, mining or the creation of roads / freeways. | 1 - 3 |
| **Habitat degradation**   * The decrease in biodiversity of an ecosystem without decreasing the size of the ecosystem. * Due to pollution, algae blooms, changing weather patterns resulting in drought. | 1 - 2 |
| **Introduction of invasive species**   * Non-native plants or animals that have escaped or been released into the wild. * Often these introduced species will out-compete native species due to lack of predators and disease. * Native animals may become extinct or decrease in number dramatically reducing over biodiversity. | 1 - 3 |
| **Unsustainable use of natural resources / overharvesting**   * Overexploitation or over harvesting of vegetation, over grazing, burning of plant materials, overhunting or fishing of particular species at a rate that cannot be replaced by the natural processes of the planet. * Example; tuna is fished at a rate greater than the species can reproduce at. | 1 - 2 |
| **Impact of pollutants / bioaccumulation**   * Some pollutants / pesticides are not biodegradable and can bioaccumulate. * These materials can increase in concentration further up food chains / webs, leading to negative health consequences to those species at the top of those food chains / webs. * DDT and mercury are both able to bioaccumulate. | 1 - 3 |
| **TOTAL** | **10** |

Different environments have different abiotic and biotic factors that are used to describe them. The biotic and abiotic factors of a single ecosystem can also change throughout the course of a day.

(b) The abiotic and biotic factors of a rock shoreline change dramatically over the course of a day due to changing tide. Name and account for **five** (**5**) changes in the abiotic and biotic factors of a rocky shoreline between high and low tide. Your answer must address at least **one** (**1**) abiotic and biotic factor. (10 marks)

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| **Description** | **Marks** |
| **Abiotic factors** – answer must include **naming** of factor and a REASONABLE **justification** for how / why it changes in order to get **both marks**. Examples are below. | |
| **Salinity**   * At low tide the water that remains on the rocky shore could evaporate, leaving the water behind to become **increasing saline.**   OR   * At low tide it might be raining, the freshwater rain could dilute the water that remains **decreasing the salinity** of the water on the shore. | 2 |
| **Temperature**   * As the tide goes out during the day the shore is exposed to direct sunlight, this will **increase the temperature** of the shore.   OR   * At night, as the tide goes out the ocean would be warmer due to being heated by the Sun all day. As the tide moves out the shore is exposed to the cold night **decreasing the shore temperature.** | 2 |
| **Oxygen levels**   * Air contains a higher percentage of oxygen than water. As the tide moves out the **oxygen levels will increase**. | 2 |
| **Oxygen availability**   * As the tide moves out there is less water. Many intertidal organisms obtain their oxygen from the water. As the tide recedes there is **less oxygen available** to these organisms. | 2 |
| **Light intensity**   * During the day as the tide goes out there will be less water to shelter the organisms from the sunlight. As tide moves out **light intensity will therefore increase**. | 2 |
| Other possible factors that could be affected by changes in tide: pH humidity, wind strength / presence. | 2 |
| **TOTAL** | **8** |
| **Biotic factors -** answer must include **naming** of factor and a REASONABLE **justification** for how / why it changes in order to get **both marks**. Examples are below | |
| **Competition**   * Organisms may group due to limited space (like rock pools) increasing the competition for limited resources available there. | 2 |
| **Predation**   * Many fish species will move further away from coast due to tide moving out. This will decrease predation.   OR   * As organisms collect into rock pools opportunistic predators may enter these rock pools, and the organisms in these pools have limited space to evade predators. | 2 |
| **TOTAL** | **4** |

**End of questions**