

| Question number | Answer | Marks | Guidance | | | | | | | | | | | | |
|------------------------|--|------------------|---|--|-----------------|------------------|--------------------|--------|-------|------------------------|------|------|-----------------------|------|------|
| 1 (a) (i) | Secondary succession, does not begin with bare ground. | 1 | | | | | | | | | | | | | |
| 1 (a) (ii) | To change the habitat; allowing different species to colonise; | 2 | | | | | | | | | | | | | |
| 1 (b) (i) | Pioneer species; formation of soil; | 2 | | | | | | | | | | | | | |
| 1 (b) (ii) | Outcompeted; by grasses and shrubs and trees; | 2 | | | | | | | | | | | | | |
| 1 (b) (iii) | Climax community | 1 | | | | | | | | | | | | | |
| 1 (c) (i) | Live increases and then plateaus; detritus decreases and then plateaus; total decreases, increases and then plateaus; soil increases and then plateaus; figures quote; | 4 max | | | | | | | | | | | | | |
| 1 (c) (ii) | Soil would increase from zero; live would start above zero; the total would not drop; detritus would not decrease as much; | 4 | | | | | | | | | | | | | |
| 1 (d) (i) | Increase in net primary productivity; to a peak / then decrease; figures quote; | 3 | | | | | | | | | | | | | |
| 1 (d) (ii) | Increase in biomass; as succession progresses; climax community is stable so energy is no longer accumulated; | 3 | | | | | | | | | | | | | |
| 2 (a) (i) | Position in food, chain / web at which an organism feeds | 1 | | | | | | | | | | | | | |
| 2 (a) (ii) | A 2; B 1; | 2 | | | | | | | | | | | | | |
| 2 (a) (iii) | Biomass; e.g. more aphids than trees; | 2 | | | | | | | | | | | | | |
| 2 (a) (iv) | Along the side; from top to bottom; | 2 | | | | | | | | | | | | | |
| 3 (a) | Light intensity; carbon dioxide concentration; nutrient availability; competition; reference to pests; | 5 | | | | | | | | | | | | | |
| 3 (b) (i) | Representative; capture as many organisms as possible; mark captured organisms; harmless method; release individuals; recapture; | 3 max | | | | | | | | | | | | | |
| 3 (b) (ii) | Marking may harm organism; capturing organism may cause harm; marks may be lost; marks may change interactions of organisms; some organisms may be easier to capture / organisms may learn to avoid capture; ORA | 5 | | | | | | | | | | | | | |
| 3 (c) | $208 / 10\,357 = 24\,064 / n$; $24\,064 / (208 / 10\,357) = 1\,197\,214\,91$; | 2 | | | | | | | | | | | | | |
| 3 (d) | More accurate; decreases random error; | 2 | | | | | | | | | | | | | |
| 3 (e) | Increase time before recapture; | 1 | | | | | | | | | | | | | |
| 4 (a) | <i>climate - tropical versus temperate tropical has ...</i> higher temperature / hotter; more (sun)light / days longer; photosynthesis faster; <i>idea that</i> | 4 max | CREDIT reverse arguments for temperate <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th><i>tropical</i></th> <th><i>temperate</i></th> </tr> </thead> <tbody> <tr> <td><i>temperature</i></td> <td>higher</td> <td>lower</td> </tr> <tr> <td><i>light intensity</i></td> <td>more</td> <td>less</td> </tr> <tr> <td><i>photosynthesis</i></td> <td>more</td> <td>less</td> </tr> </tbody> </table> | | <i>tropical</i> | <i>temperate</i> | <i>temperature</i> | higher | lower | <i>light intensity</i> | more | less | <i>photosynthesis</i> | more | less |
| | <i>tropical</i> | <i>temperate</i> | | | | | | | | | | | | | |
| <i>temperature</i> | higher | lower | | | | | | | | | | | | | |
| <i>light intensity</i> | more | less | | | | | | | | | | | | | |
| <i>photosynthesis</i> | more | less | | | | | | | | | | | | | |

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|---------------------|---|------------------|--|---------------------|------|------|--|-------------|------------------|-------------------|------|------|--------------------|------|------|
| | <p>more storage of , organic molecules / biomass / energy or more formation of , organic molecules / biomass; AVP; <i>vegetation - woodland or rainforest versus grassland(s)</i> <i>woodland or forest has ...</i> <i>idea of greater complexity / greater biodiversity /</i> more niches; competition for space less limiting; AVP;</p> | | <table border="1"> <tr> <td><i>biomass made</i></td> <td>more</td> <td>less</td> </tr> </table> <p>eg less seasonal change faster , mineral cycling / decomposition CREDIT reverse arguments for grassland</p> <table border="1"> <tr> <td></td> <td><i>wood</i></td> <td><i>grassland</i></td> </tr> <tr> <td><i>complexity</i></td> <td>more</td> <td>less</td> </tr> <tr> <td><i>competition</i></td> <td>less</td> <td>more</td> </tr> </table> <p>eg greater , humidity / shelter</p> | <i>biomass made</i> | more | less | | <i>wood</i> | <i>grassland</i> | <i>complexity</i> | more | less | <i>competition</i> | less | more |
| <i>biomass made</i> | more | less | | | | | | | | | | | | | |
| | <i>wood</i> | <i>grassland</i> | | | | | | | | | | | | | |
| <i>complexity</i> | more | less | | | | | | | | | | | | | |
| <i>competition</i> | less | more | | | | | | | | | | | | | |
| 4 (b) | <p>(bomb) calorimeter; detail of technique; detail of , measurement / analysis;</p> | 2 max | <p>eg known / dry , mass of (organic material) (material) burnt in oxygen</p> <p>eg temperature rise of water measured known volume of water calculation described / converted to kJ</p> | | | | | | | | | | | | |
| 4 (c) (i) | (perch) 22; (cow) 1; | 2 | | | | | | | | | | | | | |
| 4 (c) (ii) | <p>higher in bobcat / lower in cow; <i>for bobcat</i> more (energy) absorbed; ora less (energy / waste) egested; ora correct comparative figs. quoted from table; meat more digestible; ora mainly protein and fat; contains no cellulose; ora</p> | | <p>DO NOT CREDIT figs alone IGNORE refs to grasshopper and perch ALLOW ecf if cow calculated as > 6 in (i) bobcat 83(%) and cow 40(%) (absorbed) or bobcat 17(%) and cow 60(%) (egested)</p> | | | | | | | | | | | | |
| 4 (c) (iii) | <p>grasshopper; idea of high conversion to biomass figure; idea of herbivore / primary consumer / low(er) trophic level than perch; idea of more food available; idea of one stage of energy loss in food chain not two / more energy passes through food chain (to humans);</p> | 3 max | | | | | | | | | | | | | |