| Question | | | Answer | Mark | Guid |
|---|---|---|---|---|---|
| 1 | (a) | (i) | larger territory / greater distance between neighbours = lower predation **;** | 1 | **ACCEPT** ora - smaller territory / smaller distance = higher predation<br>**DO NOT CREDIT** descriptions wrong way round |
| | | (ii) | **1** great tit numbers, oscillate / rise and fall **;**<br>**2** (weasel predation) helps keep great tit numbers stable **;**<br>**3** predation (by weasels) is density–dependent **;** | 2 max | **IGNORE** weasel population size<br>**ACCEPT** keeps great tit numbers moderate |
| | (b) | (i) | *two areas*<br>as a control / for comparison / to see the effect of removal of starfish **;**<br>*same size*<br>to make test, valid / fair / unbiased **;** | 2 | **IGNORE** reliable, precise, accurate<br>**CREDIT** *'as a valid control'* = 2 marks |
| | | (ii) | interspecific competition **;**<br>(competition from) **,** barnacles / mussels **;**<br>for**,** algae / space **;**<br>barnacles / mussels **,** no longer eaten by starfish **;** | 2 max | **IGNORE** intraspecific competition<br>**ACCEPT** description e.g. barnacles / mussels, eat food of, limpets / chitons<br>**IGNORE** food |
| | | (iii) | sponges outcompeted (by **,** barnacles / mussels) **;**<br>less, prey / food / sponges, for nudibranchs to eat **;**<br>*idea of* specialist feeder **;** | 2 max | **IGNORE** *'sponge population decreases'* alone (as given in question)<br>**CREDIT** nudibranchs **only** feed on sponges |
| | | | **Total** | **9** | |

| Question | | | Answer | Mark | Guidance |
|---|---|---|---|---|---|
| **2** | (a) | (i) | polar **and** brown bear **;** | 1 | |
| | | (ii) | *no because*<br><br>one, more closely related to / in same group as **,** raccoons **and** one **,** to / with**,** bears / AW **;** | 1 max | **DO NOT CREDIT** answer if in context of yes |
| | (b) | (i) | knowledge **,** tentative / uncertain / subject to change **;**<br><br>to re-test / check, hypotheses / results **;** | 2 | **IGNORE** incomplete, new technology<br><br>**IGNORE** to validate |
| | | (ii) | **1** *idea that* haemoglobin could be **,** an adaptation (to the environment) / an adaptive feature **;**<br><br>**2** *idea that* low oxygen partial pressure is selective agent **or** both subject to the same selection pressure **;**<br><br>**3** (haemoglobin of both) has high oxygen affinity / dissociation curve shifted to left **;**<br><br>**4** convergence / similarity not due to shared ancestry **;** | 3 max | **3** **ACCEPT** haemoglobin can uptake $O_2$ at low partial pressure<br><br>**4** **ACCEPT** description e.g. "changes happen to both independently"<br>**IGNORE** "red and giant panda may not be closely related" (as given in question) |

| Question | | | Answer | Mark | Guid |
|---|---|---|---|---|---|
| | (c) | | **step 2** PCR / polymerase chain reaction **;**<br>**step 3** genetic modification / genetic engineering **;**<br>**step 4** electrophoresis **;** | 3 | **FA on each line**<br>**ACCEPT** gene cloning / transformation<br>**ACCEPT** (gel) chromatography |
| | (d) | | triplet code **or** 3 bases = 1 amino acid **;**<br>525 **;**<br>3 bases are **,** stop / (chain) termination **,** codon **;** | 3 | **DO NOT CREDIT** triplet makes amino acid |
| | **(e)** | ( | ox **;** | 1 | **FA** |
| | | (ii) | **1** genetic code is degenerate **;**<br>**2** more than 1**,** triplet / codon**,** for same amino acid **;**<br>**3** silent / neutral, mutations **;**<br>**4** *idea that* DNA, changes more than / is more different to, protein **;** | 3 max | **1** **ACCEPT** redundant<br>**2** **DO NOT CREDIT** 'make' the same amino acid<br>**4** **ACCEPT** polypeptide / amino acid sequence<br>**ACCEPT** nucleotide sequence for DNA |
| | | | **Total** | **17** | |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| 3 | (a) | (i) | ecology ; | 1 | **First Answer** |
| | | (ii) | abiotic ; | 1 | **First Answer** |
| | | (iii) | ecosystem ; | 1 | **First Answer** |
| | (b) | | (interspecific) competition ;<br>species 1 and species 2 named ;<br>description of interaction ;<br><br>trophic / predator-prey / predation / parasitism / grazing / herbivory ;<br>species 1 and species 2 named ;<br>description of interaction ;<br><br>mutualistic / mutualism ;<br>species 1 and species 2 named ;<br><br>description of interaction ; | 6 | **Mark the first suggestion on each numbered line only, max 3 for each, therefore max 6 overall.**<br>**ACCEPT** English or scientific names for species (genus name alone acceptable and does not need capital letter) and accept phonetic spelling.<br>**DO NOT ACCEPT** intraspecific<br><br>eg eat, same / named, food OR occupy same niche<br>*'Red and grey squirrels compete for the same food'* = 3 marks<br><br>**IGNORE** grass, worms,<br><br>**ACCEPT** symbiosis / symbiotic / commensalism<br>**IGNORE** legumes and nitrogen-fixing bacteria if no species identified<br>eg could include pollination, seed dispersal |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| | (c) | (i) | auxin / IAA ;<br><br>(positive) <u>phototrop</u>ism ;<br><br>plants / shoots, bend towards light ;<br><br>etiolation / plants grow taller ;<br><br>climbing plants climb, up / over, other plants ;<br>(positive) thigmotropism / sense of touch ;<br><br>grow roots towards, water / minerals ;<br><br>allelopathy / description ; | 4 max | **IGNORE** other named hormones<br>**IGNORE** apical dominance<br>**DO NOT ACCEPT** phototrophic / thigmotrophic (but penalise once)<br>**IGNORE** move, grow<br><br><br><br><br><br><br>**IGNORE** nutrients |
| | | (ii) | less auxin / auxin production stopped ;<br><u>apical dominance</u>, stopped / removed ;<br>side shoots grow / lateral buds develop / ora ;<br><br>plant becomes bushy ; | 3 max | <br><br>**CREDIT** axillary buds<br>**IGNORE** side leaves |

| Question | | | Answer | Marks | Guidance |
|---|---|---|---|---|---|
| | (d) | | **1** tape measure / rope, laid **;**<br><br>**2** line / belt, <u>transect</u> **;**<br>**3** continuous / interrupted / AW **;**<br><br><br><br>**4** (use quadrat to) record percentage cover of plants **;**<br><br>**5** (use quadrat with) ACFOR scale **;**<br>**6** point quadrat use described **;**<br><br>**7** use of key to identify species **;**<br>**8** data recording sheets prepared in advance **;**<br><br>QWC – sequencing of steps in procedure **;** | 5 max<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>1 | <br><br><br>**3** record all species touching line = continuous line<br>quadrats end to end = continuous belt<br>OR at selected intervals only = interrupted<br><br>**4 ACCEPT** description = number of squares with species (>half covered)<br>**5 DO NOT ACCEPT** record abundance<br><br><br><br><br>One point from **1 - 3**<br>before a point from **4** to **8** |
| | | | **Total** | **22** | |