

Year 14 Populations and Pests test – mark scheme:

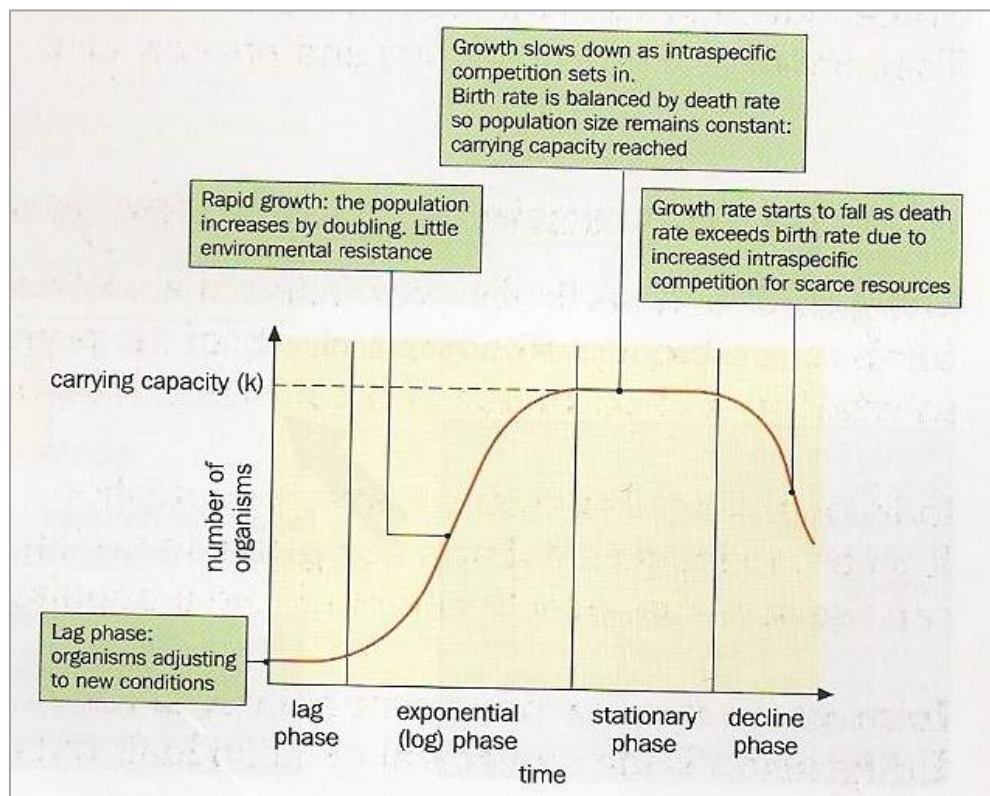
1. a)

- A resource is any substance that an organism consumes or allows it to survive and reproduce e.g. nutrients, space, mates, sunlight.
- Competition occurs when two individuals require a common resource that is in limited supply. Interspecific = between different species, intraspecific is within the same species

b)

- Biotic potential: The reproductive capacity of a population under optimum environmental conditions i.e. the maximum rate at which the population can reproduce.
- Environmental Resistance : All the factors which may limit the growth of the population/prevent the biotic potential being reached e.g. accumulation of waste, scarcity of resources (food, space), adverse climate

2. a), b), c)



d)

- Carrying capacity (k): *The maximum number that the population can support, which is affected by the environment*

3. a)

r-selective species

Many small offspring
prey
adapted to unstable environments
pioneers and colonisers
low trophic level
rapid growth
short life

k-selective species

slower growth
high trophic level
fewer large offspring
predators
long life
later stages of succession
adapted to more stable environments

b) - **r-selective example:** insects e.g. aphids, weeds e.g. dandelion, small rodents e.g. mice, phytoplankton

- **k-selective example:** large mammal e.g. elephants, humans, whales, trees

4.

(a) Monocultures offer an enormous food source (concentrated food source) for any pest species/allow rapid colonisation and spread of the pest species/
no break in pest life cycle; [1]

(b) (i) The moth population begins to rise again (towards the end of July)/
mite populations grow (during July); [1]

(ii) No bioaccumulation/no transfer to other ecosystems (e.g. soil, aquatic);
Not phrasing like 'no accumulation' or 'damages other organisms' [1]

(c) *Stethorus punctum* is the predatory mite;
its population graph peaks after that of its prey/as predator numbers increase
prey numbers decrease;
Not phrasing such as 'predator follows prey' [2]

(d) (i) Biological control;

(ii) Is species specific/pest is controlled all year round/potentially harmful chemicals not sprayed on food crops/no problems with bioaccumulation in the food chain/when used as the sole method of pest control crops may be sold as organic and achieve a higher price/increases biodiversity within the ecosystem/after initial set up costs it may be cheaper;

(iii) Pest is not totally eliminated (so grower has to put up with some damage to crops)/initial research may be long and expensive/biological control agent may itself become a pest/may not cope with surges in pest numbers/biological control agent may have an adverse effect on non-pest species/may die out and need to be re-introduced; [3]

(e) (i) **Any three from**

- moths are captured, marked and released
- some marked moths may be kept back (not released) to ensure the nontoxicity of the marker
- enough time for assimilation into the orchard population/time shorter than life expectancy/breeding cycle
- a second sample of the moth population is taken and the numbers of marked (and unmarked) individuals are recorded
- the population size is estimated as 'first sample size (S_1) \times second sample size (S_2) \div number of recaptured (marked in second sample)'; [3]

(ii) Period between first and second capture is not longer than the life expectancy/ensure marking does not affect moth's survivability behaviour/mark stays on for length of experiment/no migration occurring /no births or deaths occurring/marked moths mix with the population (if not awarded above)/proportion of marked individuals in second sample equals proportion of total marked individuals (in first sample) in the population; [1]

