

# Important Questions on Population Growth and Dynamics



- Complete the following sentence with the most appropriate option:  
In a human-dominated world, K-selected species are...
  - Favoured over r- selected species
  - At the risk of extinction
  - In equilibrium with r-selected species
  - None of the above
- Which of the following hypotheses proposes a stepwise decline in community function with decreasing species richness?
  - Linear
  - Idiosyncratic
  - Keystone
  - Rivet
- A young scientist reported that a sample of pond water had around 1000 species of diatoms per cubic meter. What was the researcher measuring?
  - Dispersion
  - Carrying capacity
  - Density
  - Dispersion
- In a random mating population in equilibrium, which one brings a change in gene frequency in a non-directional manner?
  - Random drift
  - Migration
  - Resource partitioning
  - Mutation

5. Match the following-

COLUMN A	COLUMN B
a. r- selected	i. iteroparity
b. k- selected	ii. small body size
	iii. semelparity
	iv. large body size

- a-ii, iii, b- i, iv
  - a-i, ii b-iii, iv
  - a-iii, b-ii
  - a-ii, iv b-i, iii
- Which one of the given is the correct logistic equation models a rate of population increase that is limited by intraspecific competition?
    - $dN/dT = rN(K-N)/N$
    - $dN/dT = rN(K-N)/K$
    - $dN/dT = rK(K-N)/N$
    - $dN/dT = rK(K-N)/K$
  - A bell shaped age structure was found in a population of birds. What kind of population is of this bird?
    - Expanding
    - Stable
    - Diminishing
    - Narrowed

8. Bulgaria's population is anticipated to fall by 22.5 percent between 2020 and 2050, from 6.9 million to 5.4 million. Bulgaria's population reduction is mostly caused by mass outbound migration. Which type of age pyramid is expected in Bulgaria?
- A. Expanding  
B. Stable  
C. Diminishing  
D. Narrowed
9. What is the change in population size if the intrinsic rate is 56 and population size is 300.
- A. 16800  
B. 1680  
C. 168  
D. 168000
10. In an experiment to find the number of tigers in Sunderban, 200 tigers were captured and tagged. After one month, 230 tigers were captured, and of those 40 were tagged. The total number of tigers population in Sunderban will be
- A. 990  
B. 1050  
C. 1150  
D. 1200

## Answers

- |      |      |      |       |      |      |
|------|------|------|-------|------|------|
| 1. B | 2. D | 3. C | 4. A  | 5. A | 6. B |
| 7. B | 8. C | 9. A | 10. C |      |      |

## Solutions

### Solution 1.

K-selected species have more or less stable populations adapted to exist at or near the carrying capacity,  $K$ , of the environment. They need a large area to establish their territories also they produce only fewer offspring and breed at a later age. The gestation period is also longer for the K-selected species. In a human-dominated world, many K-selected species are selectively logged or hunted or their habitat is altered, and the resulting small population sizes make extinction a real possibility.

### Solution 2.

Paul and Ann Ehrlich (1981) proposed an alternative called the Rivet hypothesis. In this model, species are like the rivets on an airplane. Some species play a small but critical role in keeping the plane, the community, airborne, while other species do not. Thus, community services decline with decreased species richness in a stepwise fashion.

### Solution 3.

Carrying capacity refers to the maximum no. of individuals that the particular environment can sustain. Range and dispersion are incorrect as they need multiple numerical values and the problem statement has only a single value. So, the correct answer is that the scientist is measuring population density.

### Solution 4.

As we know, gene frequencies are conserved from one generation to another under certain conditions. We also know that under these conditions, genotypic frequencies reach an equilibrium after a single generation of random mating. The conditions include mutations, selection, migration and random drift. But, these are never fulfilled. In a large panmictic (random mating) population, changes in gene frequencies occur over time. This can either be directional as in the case of mutations, selection or migration or non-directional like random drift.

**Solution 5.**

COLUMN A	COLUMN B
a. r- selected	ii. small body size iii. semelparity
b. k- selected	i. iteroparity iv. large body size

**Solution 6.**

The logistic equation below models a rate of population increase that is limited by intraspecific competition (i.e., members of the same species competing with one another).

$$dN/dT = rN(K-N)/K$$

- The first term on the right side of the equation ( $rN$ , the intrinsic rate of increase [ $r$ ] times the population size [ $N$ ]) describes a population's growth in the absence of competition.
- The second term ( $[K-N] / K$ ) incorporates intraspecific competition, or density-dependence, into the model, and takes a value between 0 and 1.
- The addition of this term describes a rate of population growth that slows down as population size increases until the population reaches its carrying capacity.

**Solution 7.**

As the rate of growth slows and stabilizes, the pre-reproductive and reproductive age groups become more or less equal in size; the post reproductive groups, remains as the smallest. The graphical population of stabilized population is that of a bell shaped.

**Solution 8.**

A human population decrease (also known as underpopulation, depopulation, or population collapse) is a fall in the size of a human population due to a variety of circumstances. Recent occurrences, however, indicate that this long-term pattern may be coming to an end. Global population growth was fairly modest until the advent of the industrial revolution.

**Solution 9.**

$$dN/dt = rN$$

$$dN/dt = 56 \times 300$$

$$dN/dt = 16800$$

**Solution 10.**

Given,

- 200 tigers were captured and tagged on the first visit
- 230 tigers were captured on the second visit
- 40 tigers were recaptured that were already tagged.

$N = nK/k = (200 \times 230)/40 = 1150$  tigers are there in total.

Let

$N$  = Number of animals in the population

$n$  = Number of animals tagged on the first visit

$K$  = Number of animals captured on the second visit

$k$  = Number of recaptured animals that were tagged



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