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Organisms and Populations — CBSE Class 12 Biology Chapter Test

FREE CHAPTER TEST · CLASS XII · BIOLOGY (044) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	37	17 (A 8 · B 3 · C 3 · D 1 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 17 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. Section A (Q1–8) contains 6 multiple choice questions and 2 assertion-reason based questions of 1 mark each.
4. Section B (Q9–11) contains short answer questions of 2 marks each.
5. Section C (Q12–14) contains short answer questions of 3 marks each.
6. Section D (Q15) contains case-based questions of 4 marks each, with sub-parts of 1, 2 and 1 marks.
7. Section E (Q16–17) contains long answer questions of 5 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 1 question in Section D, 2 questions in Section E. Attempt only one of the alternatives in such questions.
9. Draw neat, labelled diagrams wherever necessary.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Biology (044) Sample Question Paper 2026-27, at about half the length of the 70-mark board paper: 37 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Organisms and Populations · **Topics:** Population attributes: birth rate, death rate, sex ratio · Age distribution and age pyramids · Population density and growth · Exponential and logistic growth · Mutualism, competition and predation · Parasitism, commensalism and amensalism

SECTION A

This section comprises 8 questions of 1 mark each: 6 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. A pond has 30 frogs. During a year 15 new frogs are added by reproduction. The birth rate of the frog population is 1

(A) 15

(B) 0.5 offspring per frog per year

(C) 2.0 offspring per frog per year

(D) 0.05 offspring per frog per year

2. Which of the following is an attribute of a population and not of an individual organism? 1

(A) birth

(B) death

(C) age

(D) birth rate

3. In a laboratory population of 60 fruit flies, 12 die during a week. The death rate of the population is 1

(A) 12 per week

(B) 0.5 per fly per week

(C) 0.2 per fly per week

(D) 5 per fly per week

4. An interaction in which one species benefits and the other is neither harmed nor benefited is 1

(A) commensalism

(B) amensalism

(C) parasitism

(D) mutualism

5. A population is best described as 1

(A) all the organisms living in a lake

(B) all the plants of a forest

(C) a group of different species living in one habitat

(D) a group of individuals of the same species living in a well-defined geographical area

6. A lichen is an intimate mutualistic association between 1

(A) a fungus and a bacterium

(B) a fungus and photosynthesising algae or cyanobacteria

(C) a moss and an alga

(D) a fungus and the roots of a higher plant

7. **Assertion (A):** Exponential growth of a population cannot continue indefinitely in nature. 1
Reason (R): Resources in nature are finite, so the population can grow only up to the carrying capacity of its habitat.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

8. **Assertion (A):** Cuscuta is a parasite that grows on hedge plants. 1
Reason (R): Cuscuta has chlorophyll and makes its own food by photosynthesis.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

SECTION B

This section comprises 3 short answer questions of 2 marks each.

9. (a) Name the four basic processes that change the density of a population, and write the equation relating the population at time t + 1 to that at time t. 2

OR

(b) What are age pyramids? Describe the shapes of the age pyramids of expanding, stable and declining populations.

10. (a) What is brood parasitism? Explain with an example how the parasite's eggs escape detection. 2

OR

(b) Give two reasons why predators are important in nature.

11. A population of 500 deer gains 80 by births and 20 by immigration in a year, while 30 die and 10 emigrate. Find the population at the end of the year, and the birth and death rates. 2

SECTION C

This section comprises 3 short answer questions of 3 marks each.

12. What is Gause's competitive exclusion principle? Give two examples showing competition in nature, and explain how species avoid competition by resource partitioning. 3

13. Describe three ways in which prey animals and plants defend themselves against predators. 3

14. Explain mutualism with the examples of (i) mycorrhiza, (ii) the fig and its wasp and (iii) the orchid Ophrys and its bee pollinator. 3

SECTION D

This section comprises 1 case-based question of 4 marks, with sub-parts of 1, 2 and 1 marks.

15. The prickly pear cactus was introduced into Australia in the early 1920s. It spread rapidly over millions of hectares of rangeland and caused havoc. It was finally brought under control only after a moth, whose caterpillars feed on the cactus, was brought in from the cactus's natural habitat.

(I) Why did the prickly pear spread so rapidly in Australia? [1]

(II) What type of population interaction controlled the cactus? Explain how such an interaction is used in agricultural pest control. [2]

(III) Give one reason why predators in nature do not usually wipe out their prey. [1]

OR

(III) What happened when the predatory starfish Pisaster was removed from an intertidal community? [1]

SECTION E

This section comprises 2 long answer questions of 5 marks each.

16. (a) Describe the important attributes of a population: birth rate, death rate, sex ratio and age distribution. How is population density measured? 5

OR

(b) Compare the exponential and logistic models of population growth, giving their equations and describing their curves. What is the intrinsic rate of natural increase? At what population size is logistic growth fastest?

17. (a) Describe the six types of interactions between populations of two species, using the signs +, − and 0, with one example of each. 5

OR

(b) Describe the special adaptations of parasites. Distinguish between ectoparasites and endoparasites, with examples, and explain why endoparasites often have complex life cycles.

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
(B)	(D)	(C)	(A)	(D)	(B)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). 15/30 = 0.5 offspring per frog per year.

Q2. Answer (D). An individual is born and dies, but only a population has a birth rate (births per member per unit time).

Q3. Answer (C). 12/60 = 0.2 deaths per fly per week.

Q4. Answer (A). Commensalism (+, 0), e.g. an orchid growing as an epiphyte on a mango branch.

Q5. Answer (D). Members of a population share or compete for resources, can interbreed, and together show attributes such as birth rate, death rate and sex ratio.

Q6. Answer (B). The fungus–root association is mycorrhiza; a lichen is a fungus with algae or cyanobacteria.

Q7. Answer (A). Limited resources make growth level off at K. R explains A. Answer A.

Q8. Answer (C). A is true. R is false: Cuscuta has lost its chlorophyll and leaves and takes its nutrition from the host. Answer C.

Q9. (2 marks) Answer: (a) B, I, D, E; $N_{t+1} = N_t + [(B + I) - (D + E)]$; (b) expanding, stable, declining.
(a) Natality (B) and immigration (I) increase the density; mortality (D) and emigration (E) decrease it. [1] $N_{t+1} = N_t + [(B + I) - (D + E)]$. [1]
OR (b) Age pyramids are plots of the age distribution (the percentage of individuals of a given age or age group) in a population; for humans they show the numbers of pre-reproductive, reproductive and post-reproductive individuals. [1] A broad-based (triangular) pyramid shows an expanding population, a bell-shaped one a stable population, and an urn-shaped one (narrow base) a declining population. [1]

Q10. (2 marks) Answer: (a) eggs laid in host's nest; egg mimicry by the koel; (b) energy transfer, population control, diversity.
(a) A kind of parasitism in which the parasitic bird lays its eggs in the nest of its host and lets the host incubate them. [1] The eggs of the cuckoo (koel) resemble those of its host, the crow, in size and colour, which reduces the chances of the host detecting the foreign eggs and ejecting them from the nest. [1]
OR (b) Predators act as conduits for energy transfer across trophic levels, and keep prey populations under control. [1] They help maintain species diversity by reducing the intensity of competition among competing prey species. [1]

Q11. (2 marks) Answer: 560; 0.16 and 0.06 per year.
$N_{t+1} = 500 + (80 + 20) - (30 + 10) = 560$. [1]
Birth rate = 80/500 = 0.16 per deer per year; death rate = 30/500 = 0.06 per deer per year. [1]

Q12. (3 marks) Answer: competitive exclusion; Abingdon tortoise, Balanus; MacArthur's warblers.
Two closely related species competing for the same resources cannot coexist indefinitely, and the competitively inferior one will be eliminated eventually. [1]
Examples (any two): the Abingdon tortoise of the Galapagos became extinct within a decade after goats were introduced, because the goats were better at browsing; the larger barnacle Balanus dominates the intertidal area and excludes the smaller Chthamalus from that zone; flamingoes and resident fishes compete for zooplankton in South American lakes. [1]
Resource partitioning: if two species compete for the same resource, they can avoid competition by choosing different times for feeding or different foraging patterns; MacArthur showed that five closely related species of warblers living on the same tree avoided competition by foraging on different parts of the tree. [1]

Q13. (3 marks) Answer: camouflage; distasteful chemicals (monarch butterfly); thorns and toxins (Calotropis).
Camouflage: some insects and frogs are cryptically coloured, so that the predator cannot easily see them. [1]
Poison: the monarch butterfly is distasteful to its predator (a bird) because of a special chemical in its body, which it acquires by feeding on a poisonous weed as a caterpillar. [1]
Plants: thorns (Acacia, cactus) are the most common morphological defence; many plants produce chemicals that make the herbivore sick when eaten, inhibit feeding or digestion, disrupt reproduction or even kill it — e.g. Calotropis produces highly poisonous cardiac glycosides, so cattle and goats do not browse on it; nicotine, caffeine, quinine, strychnine and opium are produced as defences against grazers and browsers. [1]

Q14. (3 marks) Answer: nutrients ↔ carbohydrates; fig–wasp; Ophrys sexual deceit.
(i) Mycorrhizae are associations between fungi and the roots of higher plants: the fungi help the plant absorb essential nutrients from the soil, while the plant provides the fungi with energy-yielding carbohydrates. [1]
(ii) Each fig species is pollinated by only its 'partner' wasp species; the female wasp pollinates the fig inflorescence while searching for suitable egg-laying sites, and the fig offers the wasp some of its developing seeds as food for the larvae. [1]
(iii) The Mediterranean orchid Ophrys uses 'sexual deceit': one petal of its flower bears an uncanny resemblance to the female bee in size, colour and markings; the male bee 'pseudocopulates' with the flower and is dusted with pollen, which it carries to another flower. [1]

Q15. (4 marks) Answer: (I) no natural predators; (II) predation, biological control; (III) prudent predators, or >10 species lost.
(I) In its new habitat there were no natural predators (or other enemies) of the cactus, so it grew unchecked (an invasive species). [1]
(II) Predation (here, a herbivore feeding on a plant). [1] Biological control methods in agriculture are based on the ability of predators to regulate prey populations: natural enemies of a pest are introduced to keep the pest population in check. [1]
(III) Predators are 'prudent': if a predator over-exploits its prey, the prey might become extinct and, following it, the predator too, for lack of food. [1]
OR (III) More than 10 species of invertebrates became extinct within a year, because of increased competition among the prey species. [1]

Q16. (5 marks) Answer: (a) per capita rates, sex ratio, age pyramids, density estimates; (b) J and S curves; r; growth fastest at K/2.

(a) Birth rate: the number of births per capita (per member) in a given period, e.g. 8 new lotus plants in a pond of 20 is 0.4 offspring per lotus per year. [1] Death rate: the number of deaths per capita in a period, e.g. 4 of 40 fruit flies dying in a week is 0.1 per fly per week. [1] Sex ratio: the proportion of females and males, e.g. 60 % females and 40 % males. [½] Age distribution: plotted as an age pyramid of pre-reproductive, reproductive and post-reproductive individuals; its shape (broad base, bell or urn) shows whether the population is growing, stable or declining. [1] Density: total numbers are counted where possible; otherwise relative measures are used — percent cover or biomass (e.g. for plants), the number of fish caught per trap, or indirect estimates from pugmarks and faecal pellets (e.g. for tigers). [1½]

OR (b) Exponential growth: when resources are unlimited, $dN/dt = rN$, so $N_t = N_0 e^{rt}$; the curve is J-shaped. [1½] r is the intrinsic rate of natural increase, e.g. 0.015 for the Norway rat and 0.12 for the flour beetle; for India it was 0.0205 in 1981. [1] Logistic growth: resources are limited, so growth is described by $dN/dt = rN\,(K - N)/K$, where K is the carrying capacity; the curve is S-shaped (sigmoid), with a lag phase, a phase of acceleration, a phase of deceleration and an asymptote at K. [1½] The growth rate is greatest when $N = K/2$ and falls to zero as N approaches K; logistic growth is considered the more realistic model. [1]

Q17. (5 marks) Answer: (a) (+,+), (−,−), (+,−) ×2, (+,0), (−,0) with examples; (b) adaptations, ecto- and endoparasites, intermediate hosts.

(a) Mutualism (+, +): both benefit — lichens, mycorrhizae, the fig and its wasp. [1] Competition (−, −): both lose — flamingoes and fishes competing for zooplankton; Balanus and Chthamalus. [1] Predation (+, −): the predator benefits, the prey is harmed — tiger and deer; also herbivores and plants. [1] Parasitism (+, −): the parasite benefits at the cost of the host — Cuscuta on hedge plants; lice on humans. [1] Commensalism (+, 0): an orchid growing as an epiphyte on a mango branch; barnacles on the back of a whale; cattle egret and grazing cattle. Amensalism (−, 0): one species is harmed and the other unaffected. [1]

OR (b) Adaptations (any three): loss of unnecessary sense organs; adhesive organs or suckers to cling to the host; loss of the digestive system; high reproductive capacity. [1½] Ectoparasites feed on the external surface of the host (lice on humans, ticks on dogs, copepods on marine fish); endoparasites live inside the host body (liver fluke, tapeworm, Plasmodium). [1½] Life cycles of endoparasites are more complex, with one or two intermediate hosts to facilitate parasitisation of the primary host, e.g. the human liver fluke depends on a snail and a fish; the malarial parasite needs a mosquito. [1] Parasites may reduce the survival, growth and reproduction of the host and reduce its population density; they may make the host physically weak and more open to predation. [1]

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