AP ENVIRONMENTAL SCIENCE • EXERCISE SHEET

3.4 Carrying Capacity

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS carrying capacity 环境容纳量 • die-off 骤减 • overshoot 超载 • limiting factors 限制因素

Objective

Build the skills to answer exam questions on **carrying capacity**.

You must be able to:

- define **carrying capacity** 环境容纳量 K
- explain **overshoot** 超载 and **die-off** 骤减
- describe **limiting factors** 限制因素

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Carrying capacity

Carrying capacity (K) is the maximum population an environment can support long-term, set by **limiting factors** (food, water, space, disease).

■ Overshoot and die-off

If a population grows **past** K (an **overshoot**), resources are used up faster than they renew, causing a **die-off** (crash) back below K.

■ Limiting factors

Density-dependent factors (competition, disease) intensify as the population grows and pull it toward K. **Density-independent** factors (weather) can also cap it.

■ A worked scenario

Deer multiply past the food supply (overshoot); winter food runs out and many starve (die-off), dropping the population below carrying capacity.

2 Practice

Now apply the methods above.

2.1 Define carrying capacity. [1]

2.2 What is an overshoot? [1]

2.3 Name one limiting factor. [1]

3 Exam-style questions

3.1 When a population exceeds carrying capacity, the likely result is a [1]

- **A** continued rise
- **B** die-off (crash)
- **C** stable population
- **D** new carrying capacity

3.2 A deer population grows rapidly and exceeds the food supply.

(a) Name what happens to the population next, and why. [2]

(b) State one density-dependent limiting factor. [1]

3.3 Explain how density-dependent factors keep a population near its carrying capacity. [2]

Solutions

2.1 The maximum population an environment can support long-term.

2.2 When a population grows past its carrying capacity.

2.3 Any one: food, water, space, disease.

3.1 B — a die-off (crash).

3.2 (a) A die-off (crash) — resources are used faster than they renew, so many individuals die. (b) Any one: competition, disease.

3.3 As density rises, competition and disease increase, raising deaths and lowering births; this pushes the population back down toward K.