AP ENVIRONMENTAL SCIENCE • EXERCISE SHEET

8.13 Dose Response Curve

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

Objective

Build the skills to answer exam questions on **dose-response curves**.

You must be able to:

- read a **dose-response curve** 剂量反应曲线
- identify the **threshold** 阈值 dose
- explain the difference between threshold and linear (no-threshold) responses

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.

The dose-response curve

A **dose-response curve** plots the **effect (response)** against the **dose**. Usually a higher dose gives a larger response.

Threshold

Many substances have a **threshold** dose —below it there is **no observable effect**; above it, the response rises. This is common for nutrients and many toxins.

No-threshold (linear)

Some agents (like certain **carcinogens** and radiation) are assumed to have **no safe threshold** —any dose carries some risk, and response rises roughly linearly from zero.

A worked reading

If a curve stays flat until dose 5, then rises, the **threshold is 5** —below it there is no effect. A curve rising straight from zero has **no threshold**.

2 Practice

Now apply the methods above.

2.1 What does a dose-response curve plot? [1]

2.2 What is a threshold dose? [1]

2.3 What is assumed about a no-threshold agent? [1]

3 Exam-style questions

3.1 A substance with a threshold dose has [1]

- **A** an effect at any dose
- **B** no effect below a certain dose
- **C** the same effect at all doses
- **D** no effect ever

3.2 A dose-response curve is flat up to a dose of 20 mg, then rises.

(a) State the threshold dose. [1]

(b) Explain what happens below and above it. [2]

3.3 Explain why some carcinogens are treated as having no safe threshold. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **8.13 Dose Response Curve** lesson on the **Learn** page;
- read the **Dose Response Curve** section of the AP Environmental Science handout on the **Know** page.

Solutions

2.1 The effect (response) against the dose.

2.2 A dose below which there is no observable effect.

2.3 Any dose carries some risk (no safe level).

3.1 B —no effect below a certain dose.

3.2 (a) 20 mg. (b) Below 20 mg there is no observable effect; above it, the response increases with dose.

3.3 Even a single exposure could damage DNA and start a cancer, so any dose is assumed to carry some risk —there is no dose considered completely safe.