AP BIOLOGY • EXERCISE SHEET

4.6 Regulation of Cell Cycle

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

KEY WORDS checkpoints 检查点 • cancer 癌症 • cell cycle 细胞周期 • homeostasis 稳态 • signals 信号

Objective

Build the skills to answer exam questions on the **regulation of the cell cycle**.

You must be able to:

- describe **checkpoints** 检查点 that control the cycle
- explain the role of regulatory proteins
- link loss of control to **cancer** 癌症

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.

■ Checkpoints

The cell cycle has **checkpoints** (mainly G1, G2, and M) where the cell verifies conditions are right — enough resources, DNA copied correctly, chromosomes attached — before proceeding.

■ Regulatory proteins

Proteins (like cyclins and their kinases) control passage through checkpoints. They act as the "go/stop" signals for division.

■ The G1 checkpoint

At the **G1 checkpoint** the cell decides whether to divide. If conditions are poor or DNA is damaged, it pauses or exits the cycle to repair or wait.

■ Loss of control → cancer

If checkpoints fail (e.g. mutated regulatory genes), cells may divide uncontrollably, forming a tumor — the basis of **cancer**.

2 Practice

Now apply the methods above.

2.1 What do cell-cycle checkpoints do? [1]

2.2 At which checkpoint does the cell decide whether to divide? [1]

2.3 What can result from a loss of cell-cycle control? [1]

3 Exam-style questions

3.1 Uncontrolled cell division caused by failed checkpoints can lead to [1]

A apoptosis
B cancer
C homeostasis
D meiosis

3.2 A cell has DNA damage at the G2 checkpoint.

(a) State what a healthy checkpoint should do. [1]

(b) Explain what could happen if the checkpoint fails. [2]

3.3 Explain why checkpoints are important for producing healthy daughter cells. [2]