

Cell communication

Name _____

Date _____

Period _____

Part 1 · Vocabulary

1. Write the letter of the matching description next to each term.

- | | |
|---------------------------|---|
| _____ Ligand | A Relaying a signal from the receptor through the cell to a response |
| _____ Receptor | B A small molecule, such as cAMP, that carries the signal through the cytoplasm |
| _____ Signal transduction | C Switched on when it swaps GDP for GTP; it has α , β and γ subunits |
| _____ G protein | D A response that returns a variable toward its set point |
| _____ Second messenger | E A signal carried in the blood to distant target cells |
| _____ Kinase | F An enzyme that removes phosphate groups |
| _____ Phosphatase | G A response that pushes a variable further from where it started |
| _____ Hormone | H A signaling molecule that binds a specific receptor |
| _____ Negative feedback | I An enzyme that adds phosphate groups from ATP to proteins |
| _____ Positive feedback | J A protein that binds a specific signal and starts the cell's response |

Part 2 · How cells communicate

2. Complete the table.

	How the signal travels	Example
Direct contact		
Local (paracrine)		
Long distance (endocrine)		

3. What is quorum sensing in bacteria?

Part 3 · The epinephrine pathway

4. Epinephrine changes what happens inside a muscle cell. Does it have to enter the cell?
- A Yes — it must reach the glycogen
B No — it binds a receptor on the cell surface, and the signal is relayed inside
C Yes — it binds a receptor in the nucleus
D No — it diffuses through the membrane without binding anything
5. Put the events in order, starting with the hormone. Number them 1–6.
- _____ The G protein swaps GDP for GTP
_____ Glycogen is broken down to glucose
_____ Phosphorylase kinase activates glycogen phosphorylase
_____ Adenylyl cyclase makes cAMP
_____ Epinephrine binds the β 2-adrenergic receptor
_____ cAMP activates protein kinase A
6. What switches the G protein on?
- A Its α subunit binds GTP in place of GDP
B It is phosphorylated by PKA
C It binds cAMP
D It moves into the nucleus
7. cAMP is called a second messenger. What does that mean?
- A It is the second hormone released by the gland
B It is a small molecule made inside the cell that carries the signal on from the receptor
C It carries the signal from the cell back to the gland
D It is a second receptor in the membrane
8. Sort the pathway into its three stages.

	What happens in the epinephrine pathway
Reception	
Transduction	
Response	

9. Why can a few hormone molecules make a muscle cell break down a lot of glycogen?
- A Each hormone molecule breaks down glycogen itself
B The signal is amplified: each step activates many molecules of the next
C The hormone is copied inside the cell
D Glycogen breaks down on its own once the receptor is touched

10. Name three ways the epinephrine signal is switched off inside the cell.

Part 4 · Receptors, responses and changes

11. Complete the table of receptor types.

	Where it is	What happens when the ligand binds
G protein-coupled receptor		
Ligand-gated ion channel		
Receptor tyrosine kinase		
Internal receptor		

12. Name four different kinds of response a cell can make to a signal.

13. A toxin keeps $G\alpha$ stuck with GTP bound. What happens even after the hormone is gone?

- | | |
|---|------------------------------------|
| A Nothing — the signal stops when the hormone leaves | C The receptor is destroyed |
| B cAMP keeps being made and the response continues | D PKA stops working |

14. How can a mutation in a signaling protein lead to cancer? Use RAS as the example.

Part 5 · Feedback

15. Blood glucose rises after a meal and insulin brings it back down. What kind of feedback is this?

- | | |
|----------------------------|--|
| A Negative feedback | C No feedback — just a reaction |
| B Positive feedback | D Amplification |

16. Describe how insulin and glucagon keep blood glucose near its set point.

17. Why is childbirth an example of positive feedback?
