B1 L10 Challenge worksheet: Active transport and exchange surfaces

Name: _____ Class: _____

A. Potassium in a pond alga

Help: online screens 3 and 6 [6]

A pond alga is made of large cells. A student measured the concentration of potassium ions in the pond water and inside the alga's cells. Table 1 shows the results.

Where	Concentration of potassium ions (arbitrary units)
pond water	0.05
inside the alga's cells	50

(a) Calculate how many times greater the concentration is inside the cells than in the pond water. [2]

_____ times

(b) Name the process the cells use to take in potassium ions. [1]

_____

(c) Explain why the cells cannot take in potassium ions by diffusion. [2]

_____

_____

_____

(d) The student adds a substance that stops respiration. Predict what happens to the uptake of potassium ions. [1]

_____

B. Sizing up organisms

Help: online screens 7 and 9 [6]

A single-celled organism is roughly a cube with sides of 50 µm. A small water animal is roughly a cube with sides of 5 mm. 1 mm = 1000 µm.

surface area of a cube = 6 × side × side
volume of a cube = side × side × side

(a) Convert 50 µm into mm. [1]

_____ mm

(b) Calculate the surface area to volume ratio of the single-celled organism. Use your answer to (a). [2]

_____ : 1

(c) The small animal has a surface area to volume ratio of 1.2 : 1. How many times larger is the single-celled organism's ratio? [1]

_____ times

(d) The small animal has gills and blood. Use your answers to explain why it needs them, but the single-celled organism does not. [2]

_____

_____

_____

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C. Gill area and lifestyle

Help: online screens 10 and 11 [5]

Table 2 shows the gill surface area of three kinds of fish, for each gram of body mass.

Fish	How it lives	Gill surface area in mm² per g of body mass
A	swims fast all the time	1100
B	swims at a medium speed	450
C	rests on the sea bed	200

(a) How many times larger is the gill surface area of fish A than that of fish C? [1]

_____ times

(b) Suggest why fish A has the largest gill surface area. [3]

(c) Fish A swims with its mouth open. Suggest how this helps it take in oxygen. [1]

D. Extended response

Help: online screens 3, 10 and 11 [6]

Compare how fish gills and plant roots are adapted for exchanging substances. [6]

Say what is the same and what is different. Name the substances each one takes in, and how they get in.