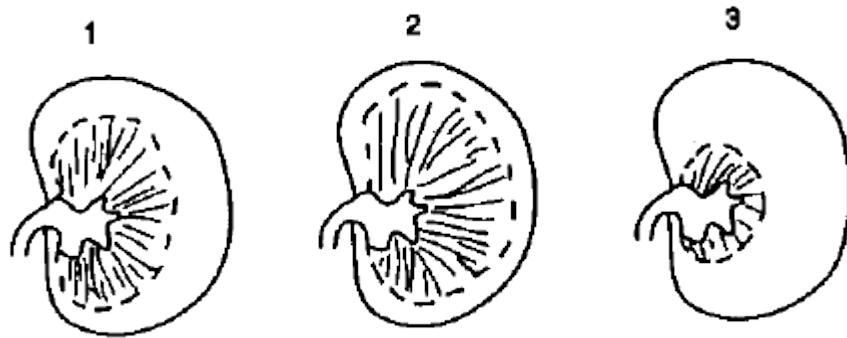


The diagrams show vertical sections of kidneys of coypu, brown rat and kangaroo rat, showing the relative size of cortex and medulla.

Coypu are found in fresh water and are never short of water to drink. Brown rats are able to go some days without drinking. Kangaroo rats are able to live in deserts without drinking at all. Which kidney belongs to which animal?



	1	2	3
a.	brown rat	coypu	kangaroo rat
b.	brown rat	kangaroo rat	coypu
c.	kangaroo rat	brown rat	coypu
d.	kangaroo rat	coypu	brown rat

Explain your choice.

The graph below shows the relationship between metabolic rate and body mass in mammals.



- (a) What type of correlation exists between these two variables?
- (b) Explain why the metabolic rate per gram of body mass is higher in a small mammal such as a mouse than in a large mammal like a horse.
- (c) Explain the advantages and disadvantages to small mammals of having tissues with larger number of mitochondria per gram of body mass than tissues of larger mammals.

The soil in many tropical rain forests is very poor in nutrients such as nitrate and calcium ion. In some rain forests there are herbaceous plants which, as well as having roots in the soil, have some roots that grow upwards over the surface of tree trunks.

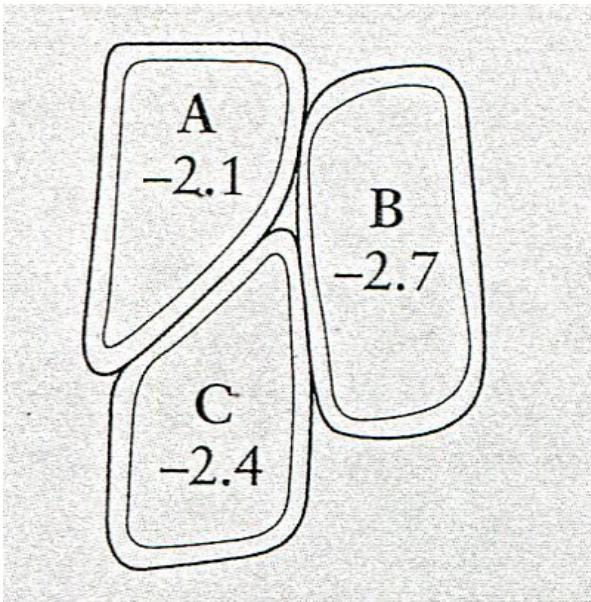
- (a) Give two external features by which you could distinguish a stem of one of these plants from an upward growing root.
- (b)(i) Give two stimuli to which these upward growing roots might be responding.
- (ii) What type of behavioral response are these roots displaying?
- (iii) Explain how this type of behavioral response might be an advantage to the plant in nutrient poor soil.

Under conditions of a high atmospheric humidity very little calcium is transported from the roots to the developing fruits. This is caused by:

- A calcium only being transported through the xylem and this transport not taking place anymore
- B calcium only being transported through the phloem and this transport not taking place anymore
- C transpiration stopping and, as a result both xylem and phloem transport stopping
- D the stomata closing and transport to the fruit stopping

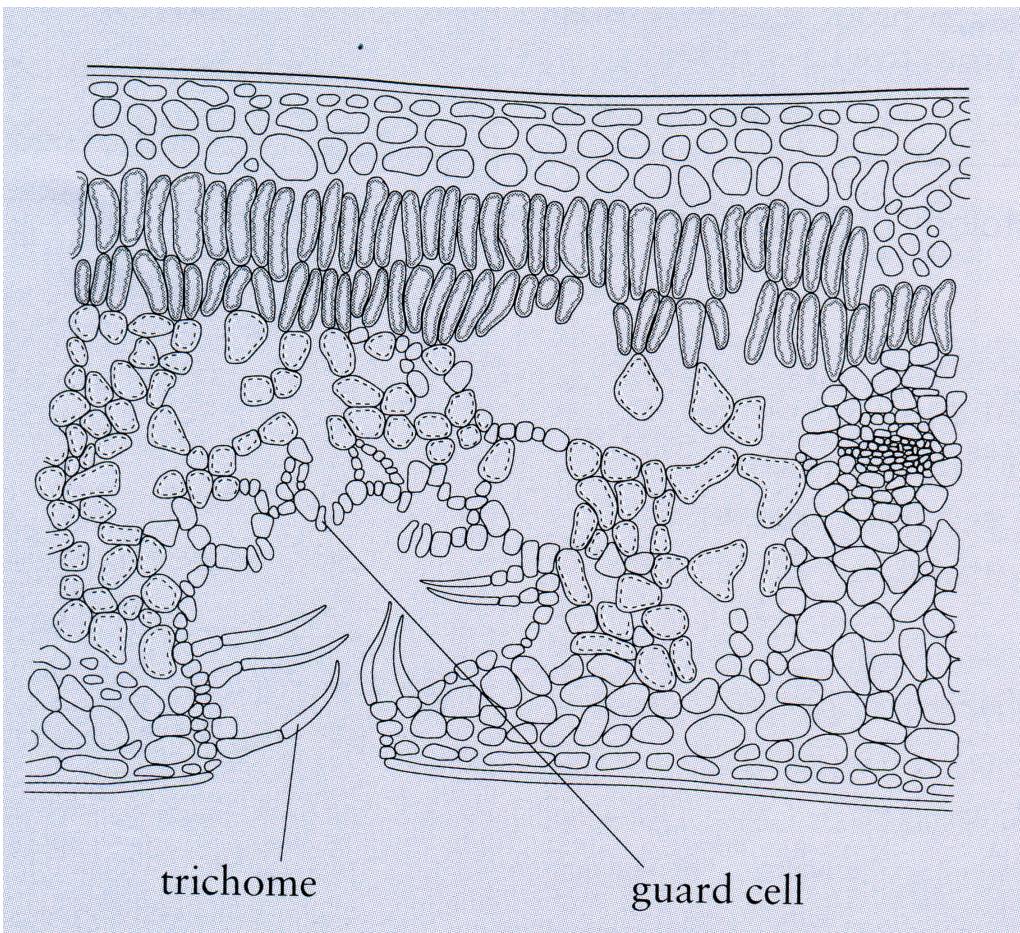
Explain why each of the other three answer choices are wrong.

A, **B**, and **C** represent three adjoining cells from a leaf. The cells have water potentials of -2.1, -2.4 and -2.7 MPa respectively.



- (a) Copy the diagram and draw arrows to show in which directions net water movement would occur between these three cells.
- (b) Explain in terms of water movement what occurs when a cell is placed in a solution of the same water potential as itself.

The drawing shows a sections through the leaf of *Nerium*, an evergreen shrub which lives in dry conditions.



Describe **three** features of a *Nerium* leaf and explain how each feature helps to reduce the rate of transpiration.