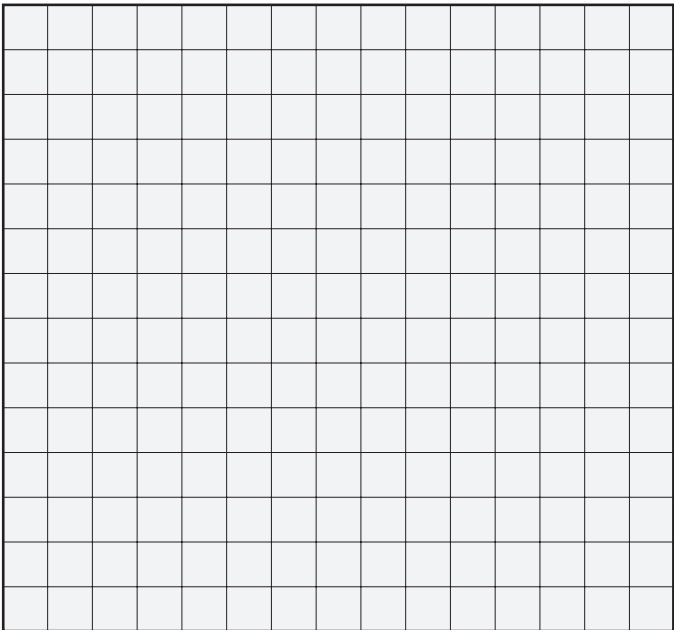


Calculating Diffusion Rates

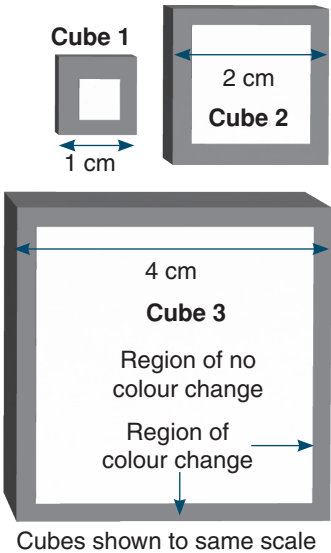
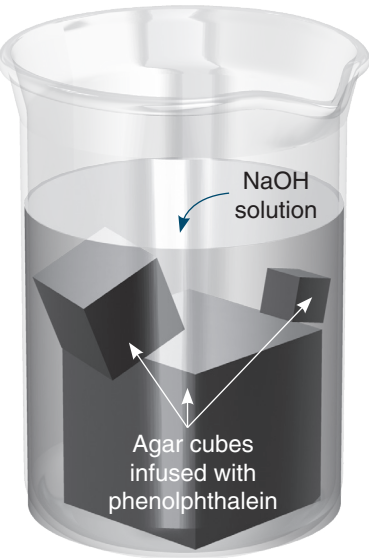
Key Idea: The surface area to volume ratio decreases as cell volume increases.

- 1. Use the information you calculated in Q1 page 122 to create a graph of the surface area against the volume of each cube, on the grid on the right. Draw a line connecting the points and label axes and units.
- 2. Which increases the fastest with increasing size: the **volume** or the **surface area**?
- 3. Explain what happens to the ratio of surface area to volume with increasing size.



4. The diffusion of molecules into a cell can be modelled by using agar cubes infused with phenolphthalein indicator and soaked in sodium hydroxide (NaOH). Phenolphthalein turns a pink colour when in the presence of a base. As the NaOH diffuses into the agar, the phenolphthalein changes to pink and thus indicates how far the NaOH has diffused into the agar. By cutting an agar block into cubes of various sizes, it is possible to show the effect of cell size on diffusion.

(a) Use the information below to fill in the table on the right:



Cube	1	2	3
1. Total volume (cm ³)			
2. Volume not pink (cm ³)			
3. Diffused volume (1. – 2.) (cm ³)			
4. Percentage diffusion			

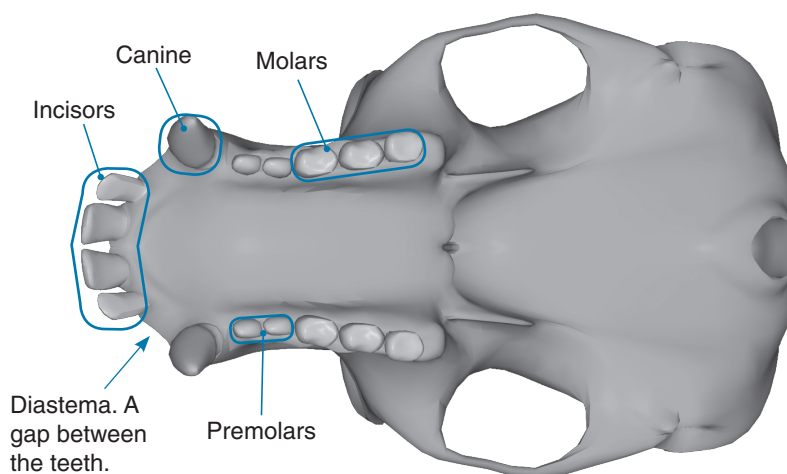
(b) Diffusion of substances into and out of a cell occurs across the plasma membrane. For a cuboid cell, explain how increasing cell size affects the effective ability of diffusion to provide the materials required by the cell:

Comparison of Mammalian Teeth

Key Idea: The tooth shape and arrangement of mammals is an adaptation to their diet.

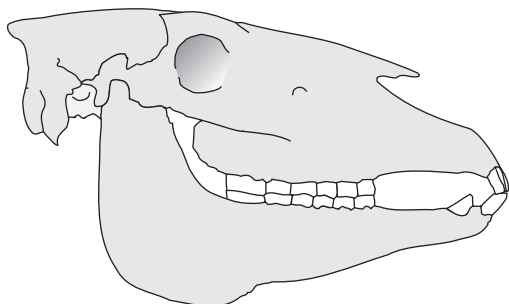


The chimpanzee skull shown right is a useful example of generalist dentition. Chimpanzees eat a wide range of food and so have a dentition that is adapted to deal with it.



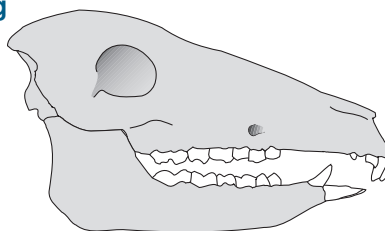
- Use the information to answer the following questions: above and in the activity *The Teeth of Mammals* to identify the following in the skulls shown below:
 - Identify the type of diet associated each skull (carnivorous, herbivorous, omnivorous):
 - Colour in the incisors (yellow), canines (green), premolars (blue) and molars (red):

Zebra



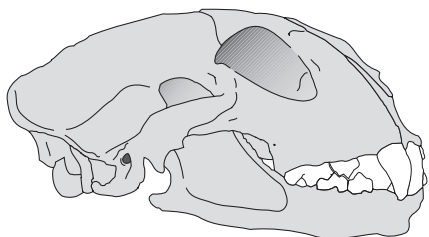
Type of diet: _____

Pig



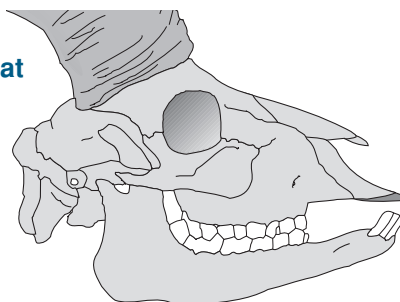
Type of diet: _____

Lion



Type of diet: _____

Goat



Type of diet: _____

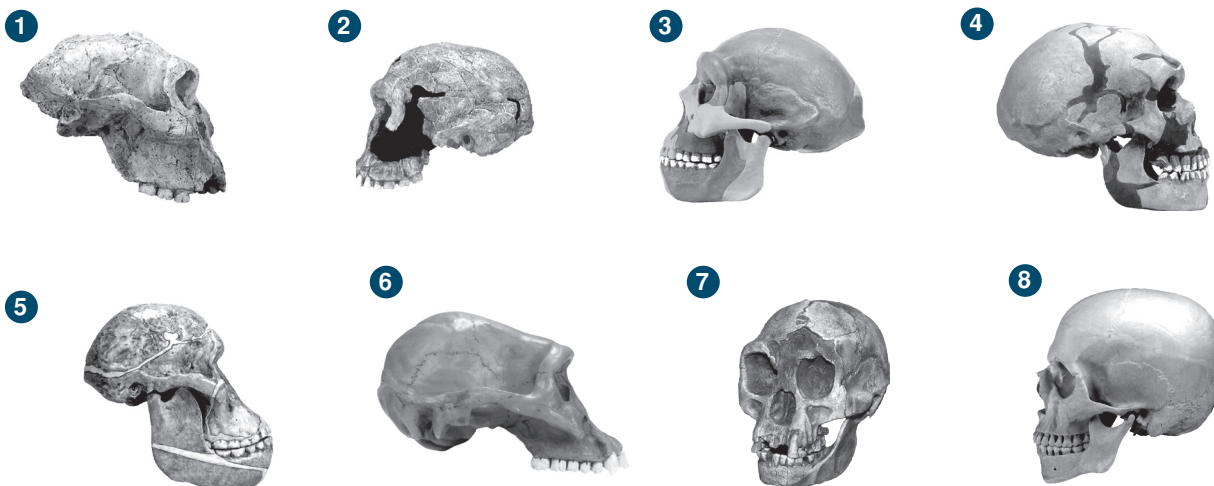
- Compare the shape of the lion's teeth to those of the horse. Explain why these shapes are so different.



Comprehension and Vocabulary

1. Draw lines to match up the hominid name with its meaning, then match the name to the correct skull number (1-8 below).

Name:	Meaning:	Skull number:
<i>Australopithecus afarensis</i>	Man from the Neander Valley.	_____
<i>Australopithecus africanus</i>	Beside man	_____
<i>Paranthropus</i>	Handy man	_____
<i>Homo neanderthalensis</i>	Southern Ape from Afar, Ethiopia	_____
<i>Homo sapiens</i>	Southern Ape from Africa	_____
<i>Homo habilis</i>	Man from the island of Flores or Flores man	_____
<i>Homo erectus</i>	Upright man	_____
<i>Homo floresiensis</i>	Knowing, or wise man	_____



2. Draw lines to link the statements in the three columns below to form complete sentences and so form a coherent paragraph. The first column is in order, the centre and right columns are not. The centre column provides appropriate joining words to link the first and second parts of the sentence.

The evolutionary trend in the physical features of hominins has been towards a more upright, bipedal stance, larger brain case...

The early hominins had prognathic faces...

Fossils such as *Australopithecus afarensis* show the teeth and jaw shape were ape-like...

Homo sapiens instead have a parabolic dental arcade...

Prognathism diminished in genus *Homo*...

The volume of the brain case also increased, the brain case of *H. habilis* being around 500 cc...

Bipedalism originated early on in hominin evolution...

Adaptations to the spine, pelvis, legs, knees and feet...

have

and

with

and

as

while

and

with

... low, sloping foreheads.

... resulted in bipedalism being habitual in *H. sapiens*.

... large canines and parallel or V-shaped dental arcades.

... the forehead became increasingly high.

... small canines and molars.

... higher forehead, flatter face, and smaller teeth and jaws.

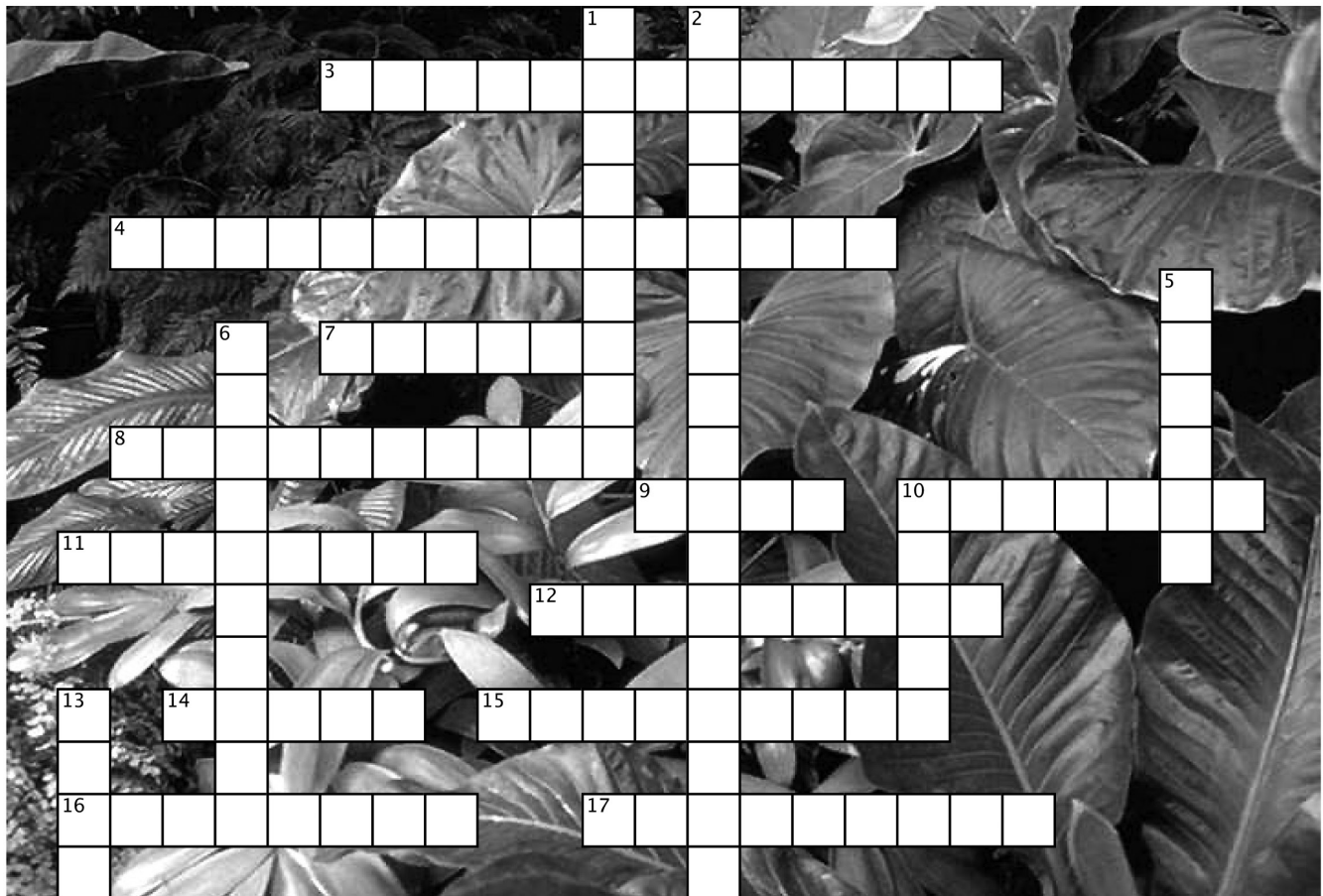
... modern *H. sapiens* have a braincase volume of around 1400 cc.

... shown by such fossils as *Ardipithecus ramidus*.



KEY TERMS: Crossword

Complete the crossword below, which will test your understanding of key terms in this chapter and their meanings



Clues Across

3. The loss of water vapour by plants, mainly from leaves via the stomata.
4. Partial explanation for the movement of water up the plant in the transpiration stream (2 words: 8, 7).
7. Vascular tissue that conducts foods (e.g. sugars and proteins) through the plant. Characterised by the presence of sieve tubes.
8. The innermost layer of the cortex surrounding the stele.
9. A plant structure that supports the leaves in the light and provides a place for flowers and fruit.
10. Pores in the leaf surface through which gases can pass through.
11. Group of angiosperms that produce only one cotyledon in the seed.
12. Device used for investigating the rate of transpiration.
14. Vascular tissue that conducts water and minerals salts from the roots to the rest of the plant.
15. Plant adapted to dry conditions.
16. Property of water molecules that means they stick to surfaces.
17. A plant that can grow and survive in environments with a high salt content (low availability of free water).

Clues Down

1. The outermost layer of cells. In plants it is one cell layer thick and usually covered with a protective cuticle.
2. A force created by the evaporative loss of water from the leaves (2 words: 13, 4).
5. Group of angiosperms that develop two cotyledons in the seed.
6. A plant that has adapted to living either partially or fully submerged in water.
10. Cylinder of vascular tissue consisting of the xylem, phloem and the pericycle surrounded by the endodermis.
13. Part of the plant that collects sunlight and contains cells that carry out photosynthesis.

