

Numbers in Biology

Reading numbers and measurements:

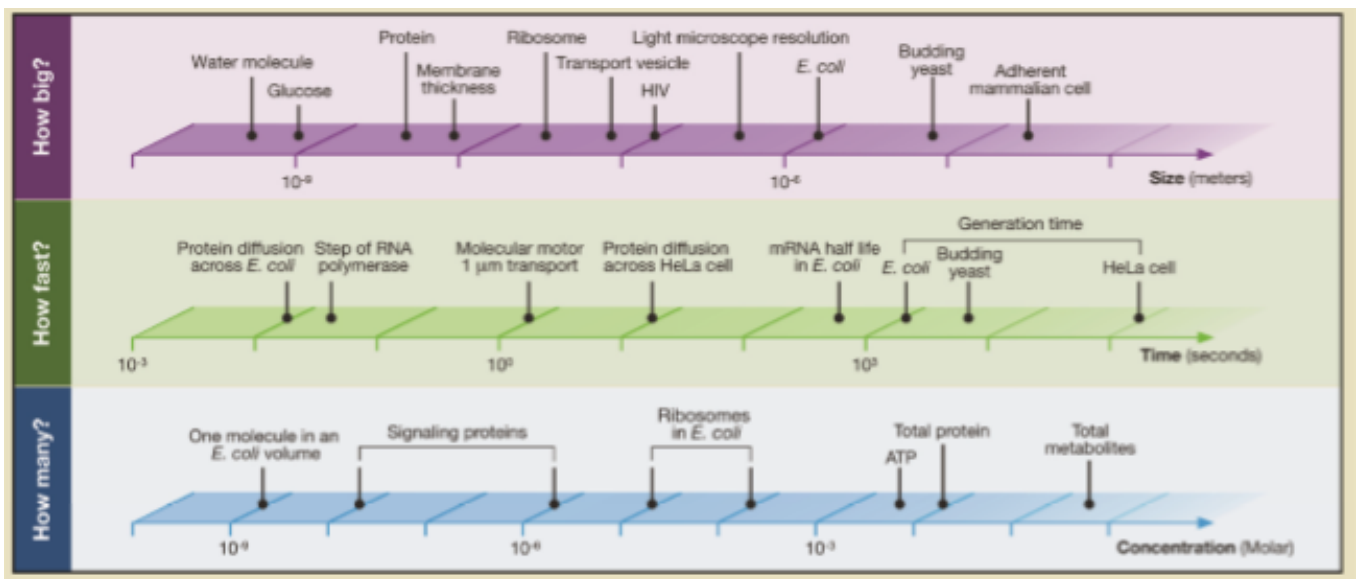
31% k³ y² -70°F x


1,203.4 10°C 3a⁴ :

3.14 0.631 = 30.7° 0.002

6.7x10⁻⁹km 2376.69 0.735μm 42.9 kmh⁻¹

How Many Carbon Atoms Are in a Cell? A cell with a volume of 1 μm³ and a density of about 1 g/ml has a total mass of 10⁻¹² grams. From the formula C₄H₇O₂N and the weights of the elements, we derive a carbon content of about $12 \times 4 / (12 \times 4 + 7 \times 2 \times 16 + 14) = 48/101$ or about one half of the dry mass. With 30% dry mass (70% water), we obtain ~10⁻¹³ gm of carbon. Next we transformed the number of molecules using Avogadro's constant: $6 \times 10^{23} \times 10^{-13} / 12 = 5 \times 10^9$ carbon atoms per cell. To verify this, we have done the calculation in a different way: assuming there are about 3 × 10⁶ proteins, each one consisting of about 300 amino acids, we get a total of ?10⁹ amino acids. An amino acid has about five carbon atoms, so we arrive at a similar value. Both estimates depend linearly on the cell volume, which can vary significantly based on growth conditions.



11  34 Listen and answer questions 1–10.

Questions 1–3

Complete the table. Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** for each answer.

Animal	Brought by	Reason
1	settlers	for food
fox	settlers	2
cane toad	3	to kill beetles

Questions 4 and 5

Complete the flowchart below.

Write **NO MORE THAN TWO WORDS AND/OR A NUMBER** for each answer.

Beetles' effect on sugar cane

Beetle lays eggs

Eggs become grubs

Grubs eat the 4

Sugar cane 5



Questions 6–10

Choose the correct letter, **A**, **B** or **C**.

- 6 The cane toad originated in
A Central America.
B Hawaii.
C Australia.
- 7 In Australia, the toads
A grew extremely large.
B multiplied in number.
C ate the cane beetles.
- 8 The farmers' plan failed because
A there were too many beetles.
B their own research was faulty.
C they believed the reports they read.
- 9 The sugar cane industry
A thrives today.
B has died out in some areas.
C survives alongside the beetle.
- 10 The second lesson to be learned from this story is that
A the environment is constantly at risk.
B first-hand research is not always necessary.
C caution is necessary when dealing with nature.

Questions 1–3

Complete the summary. Write **NO MORE THAN TWO WORDS AND/OR A NUMBER** for each answer.

ROVER ROBOT

The robot does the same work as a 1 Some people think it looks like a 2 on wheels. It is quite small, weighing only 16.5 kg and it moves relatively slowly, with a maximum speed of 3 km an hour.

Questions 4–7

Label the diagram of the rover robot.

Write **NO MORE THAN THREE WORDS** for each answer.



Questions 8–10

Answer the questions below.

Write **NO MORE THAN THREE WORDS AND/OR A NUMBER** for each answer.

- 8 How long does it take the radio signal to travel from Earth to Mars?
- 9 What stops the scientists from steering the rover in real time?
- 10 What do scientists believe Mars has, which is similar to Earth?