

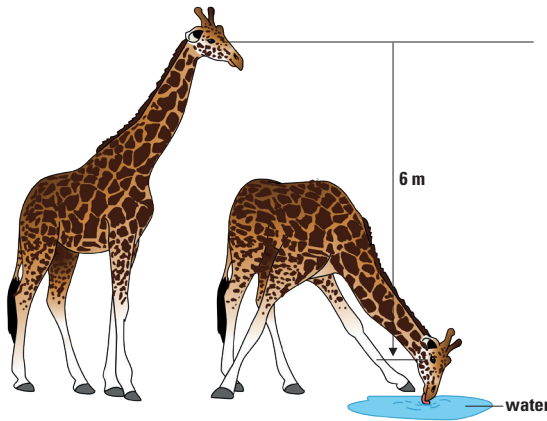
INTERDISCIPLINARY QUESTIONS

in Lower Secondary Science

Interdisciplinary questions in Lower Secondary Science test students' ability to consolidate and apply concepts from various science disciplines.

Interdisciplinary science questions are questions that require knowledge from various science disciplines such as **Physics**, **Chemistry**, and **Biology** to answer. As science questions tend to be based on one discipline at a time, interdisciplinary science questions are not commonly available for practice. Yet, such questions are the most interesting as they use 'unseen' context that link various concepts from different disciplines. The following shows an example of a 10-mark interdisciplinary question with suggested answers.

The diagram shows a giraffe lowering its head to drink water.



(A) When the giraffe is upright, its heart has to do work to move blood over a height of 3 m to its head.

(i) Define *work done*. [1] [Physics]

Work done ($W = Fd$) is the energy transferred to or from an object when a force F is applied to the object causing it to move over a distance d in the direction of the force. [1]

(ii) Write down the word equation for respiration that occurs in the heart muscle cells. [1] [Chemistry]

Sugar + oxygen \rightarrow carbon dioxide + water [1]

(iii) State the energy conversions from the giraffe's heart muscle to the blood in its head when the giraffe is upright. [2] [Physics]

Chemical potential energy in sugar \rightarrow mechanical energy of heart muscle [1] \rightarrow kinetic energy of blood \rightarrow gravitational energy of blood in the head [1]

(B) Scientists would expect the giraffe to faint when it lowers its head to drink water.

(i) Why? [1] [Physics]

There would be a large increase in blood pressure in the head that is due to the weight of the column of blood which is 6 m high. [1]

(ii) In the giraffe's neck, there is an increased muscle fibre in the artery walls. Suggest how this adaptation prevents the giraffe from fainting when it drinks. [1] [Biology]

The increased muscle fibre in the artery walls can constrict to restrict blood flow to the head as the giraffe lowers its head to drink. [1]

(C) Oxpeckers eat the ticks that feed on the blood of giraffes. Name the symbiotic relationship between:

(i) the tick and giraffe [1] [Biology]: Parasitism [1]

(ii) the oxpecker and giraffe [1] [Biology]: Mutualism [1]

(D) Giraffes eat the leaves of tall trees. Suggest how climate change may reduce the population of giraffes. [2] [Biology]

Due to climate change, there may be more droughts and more floods in different areas. [1] The trees that the giraffes depend on for food may not survive due to the large change in rainfall. [1]

Interdisciplinary questions are more likely to appear in summative assessments than topical exercises. Students do not need to have prior knowledge of the contexts used in the questions to answer; it is more important to demonstrate their knowledge and understanding of concepts from the different disciplines.

That said, students are encouraged to read widely on topics that connect various disciplines such as sustainability, emerging technology, climate change, and healthcare to broaden their interdisciplinary knowledge.

