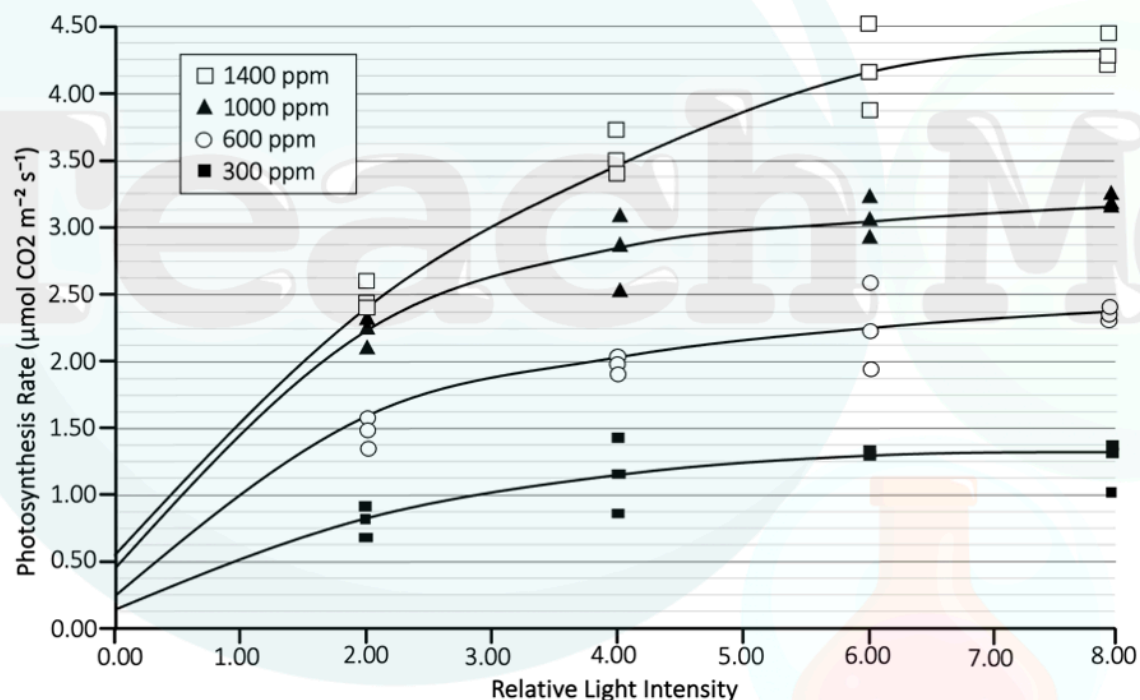


Answer **all** questions. Answers must be written within the answer boxes provided.

1. The graph below shows the rate of photosynthesis in spinach leaves at different light intensities and carbon dioxide concentrations.



- (a) At which relative light intensity does the photosynthetic rate plateau in the 300ppm group? [1]

- (b) Compare the photosynthetic rates of the 1400ppm and 600ppm group at a relative light intensity of 2.00. [1]

(c) Explain why photosynthetic rates plateau at high light intensities.

[2]

(d) Suggest one way by which plants can increase their photosynthesis efficiency under low light conditions.

[1]



2. In a histology class, the students are observing cytological smears of a kidney fine needle aspiration (FNA) on histological slides with the naked eye but cannot see anything clearly. A single proximal convoluted tubule (PCT) cell is 10µm large and a student would like to see it at 2cm large.

(a) What magnification is required to accomplish this?

[2]

(b) Explain how magnification will affect the resolution of the image when using a light microscope.

[2]

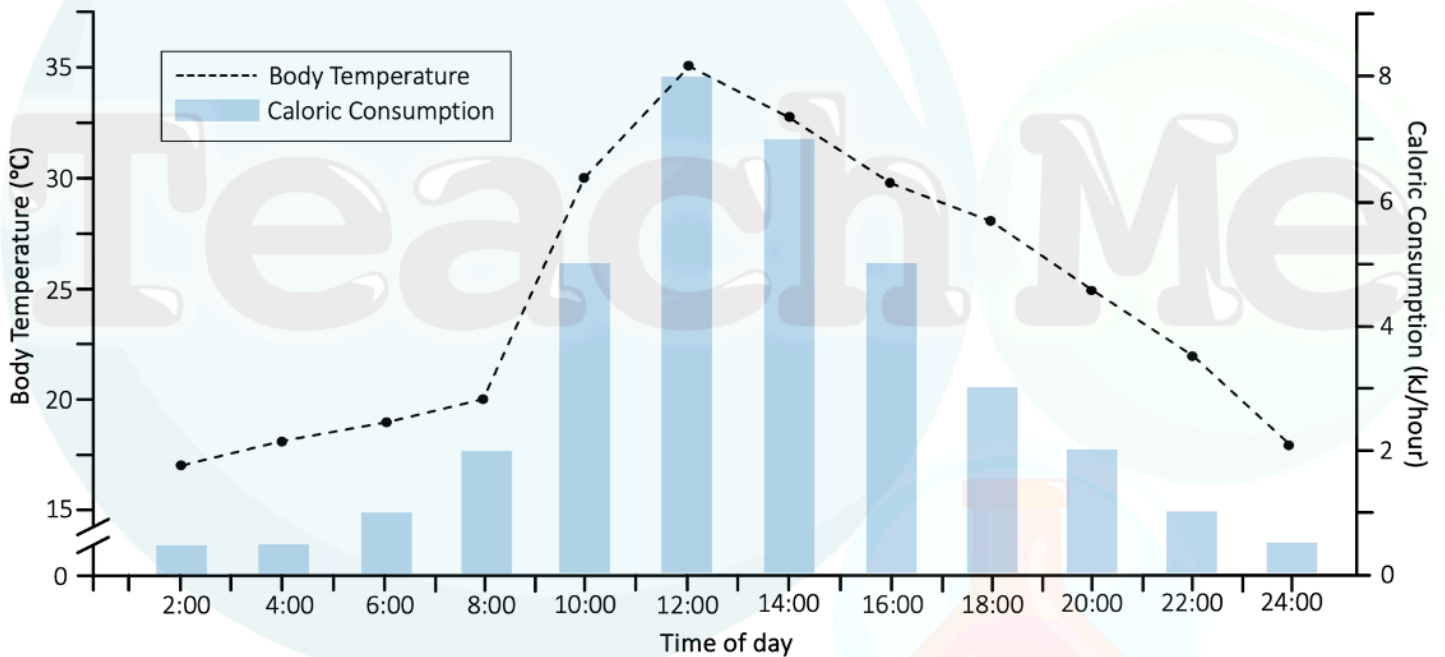
(c) For the students next task, they are asked to identify a mitochondrion from a PCT cell on their slide and to draw its structure. Suggest a modification to the microscope set-up or technique that could improve the observation and complete the task.

[1]

(d) Suggest one reason for the high abundance of mitochondria in this cell.

[1]

3. In the arid deserts of Australia, several wild lizards were monitored over a 24-hour period. The graph below shows the lizards average body temperature at different times of the day and their corresponding caloric consumption.



(a) (i) State the time when lizards exhibit the highest activity level.

[1]

(ii) Compare the body temperature of the lizards at 12:00 and 20:00.

[1]

(b) How do ectothermic organisms regulate their body temperature?

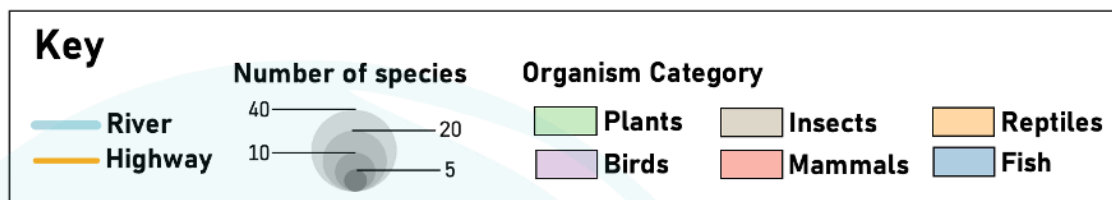
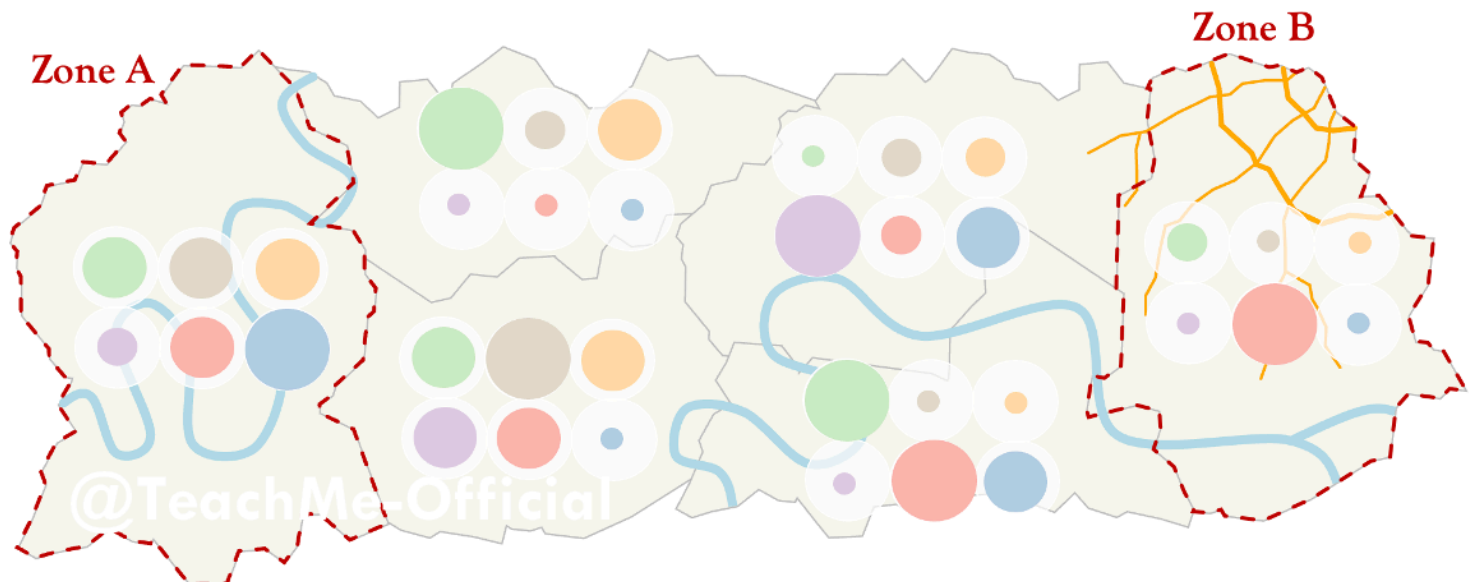
[1]

(c) Outline why endothermic organisms generally consume more food than ectothermic ones.

[2]



4. A tropical rainforest in Southeast Asia has been studied over several decades to monitor changes in biodiversity. The forest is home to a variety of species, including plants, insects, reptiles, birds, mammals, and fish. Researchers measured the number of species and their distribution in various regions of the forest.



- (a) Compare and contrast the species richness and species evenness of Zone A and Zone B. [2]

- (b) Suggest two possible factors that could contribute to these differences, particularly in the context of forest disturbance. [2]

(c) In the context of conservation biology, suggest which is the more important factor in maintaining ecosystem stability and why, species richness OR species evenness. [2]

(d) Suggest three in situ efforts of conservation in the context of the case study above. [3]

