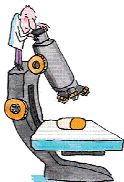


Biology Top-Up

Short Answer Questions

1. Which element is found in all proteins but not in carbohydrates or lipids? 1
2. Suggest how the structure of starch and cellulose will lead to differences in strength. 2
3. Give two organelles which have a double membrane. 2
4. By what factor is the magnification of an electron microscope better than a light microscope? 2
5. What are the four bases in DNA and which pairs are they always found in? 2
6. Explain what chromatids are. 3
7. Which cells are diploid and by what process are they formed? 2
8. Briefly explain how a zygote has one complete set of genetic information. 3
9. Which organ produces all enzymes from all three groups? 1
10. What are the three functions of the digestive system? 3
11. Give three causes of disease. 3
12. Explain how a vaccinated person may still become infected by a pathogen. 2
13. Which organism will have a larger surface area: volume ratio - a guinea pig or a saddleback pig? 1
14. Give three features of an efficient exchange surface. 3
15. What are the four chambers of the heart called, and which side contains deoxygenated blood? 3
16. Describe and explain the differing thickness of the walls of the heart. 4
17. Describe what is meant by the term 'myogenic' and give the region of the heart in which myogenic tissue is found. 3
18. Which blood vessel do the coronary arteries branch off from? 1
19. Which blood vessels contain the highest proportion of muscle fibres? 1
20. Briefly explain what is meant by the Bohr effect. 3
21. What causes different variants of the same characteristic? 1
22. How many levels of organisation are used to classify organisms? 1
23. 'Hydrogen bonds form between water molecules, causing the column of water to stick together'. Which force is being described? 1
24. Which transport vessels in a plant are alive and which are dead? 2
25. Give two functions of transpiration. 2
26. Why is drying clothes outside likely to cause problems for plants? 3



Biology Top-Up

Data Analysis Questions

1. The table below shows the sizes of several different cells. You need to draw a bar chart to show the relative sizes of these cells. 10

Conversion of units: $\text{mm} \times 1000 = \mu\text{m}$ (micrometers)

$\mu\text{m} \times 1000 = \text{nm}$ (nanometers)

| Cell | Size of cell |
|-------------------------|-----------------|
| Red blood cell | 9 μm |
| Motor neurone | 20cm |
| Human egg cell | 0.0001m |
| Human sperm cell | 4000nm |
| Palisade mesophyll cell | 0.09mm |
| Spongy mesophyll cell | 0.000045m |

2. An investigation was carried out to find the effect of exercise on oxygen consumption in athletes and non-athletes. The table gives the results of this investigation (all units are per kilogram of body mass per minute).

| | Athlete | Non-athlete |
|-----------------------------|--------------------------------------|--------------------------------------|
| Energy requirement (joules) | Oxygen consumption (cm^3) | Oxygen consumption (cm^3) |
| 600 | 30 | 30 |
| 800 | 40 | 40 |
| 1000 | 47 | 45 |
| 1200 | 58 | 45 |
| 1400 | 58 | 45 |
| 1600 | 58 | 45 |

Draw a line graph to show these results. 4

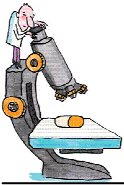
Use your graph to find the difference in oxygen consumption of athletes and non-athletes at an energy requirement of $1100 \text{ J kg}^{-1} \text{ min}^{-1}$. 2

3. The table gives information about the clotting time of blood when a person is injected with heparin. Plot this information in a suitable format. 4

| Clotting time (seconds) | 22 | 29 | 35 | 60 | 77 | 98 |
|---|-----|-----|-----|-----|-----|-----|
| Heparin concentration (arbitrary units) | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |

Does heparin make the blood thicker or thinner? With reference to the graph, explain your answer. 2

Continue your graph to predict the clotting time of blood with 0.7 units of heparin. 2



Biology Top-Up

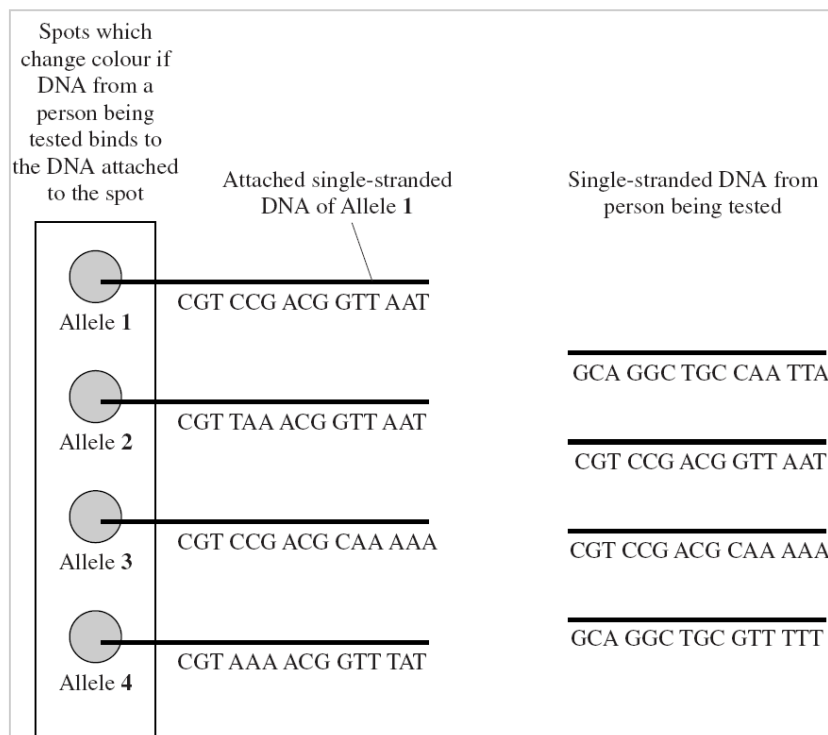
Data Analysis Questions

4. The sea-fir is a marine animal. It has two body forms in its life cycle: the polyp and the medusa. The polyp lives its whole life attached to a rock, and reproduces asexually. All of the offspring have the medusa body form and can swim freely. Mature medusas reproduce sexually, producing offspring which have the polyp body form

Draw a simple diagram to show the life cycle of the sea-fir, showing where mitosis, meiosis and fertilisation take place. 3

Suggest one advantage to the sea-fir of reproducing sexually and one advantage to reproducing asexually. Explain your answer. 4

5. DNA testing can determine which person a particular sample has come from, sometimes by identifying the alleles present in the sample. A test strip has been developed which will change colour if the allele being tested for is present. It is not a foolproof test though, and may return incorrect results.



Using the information from the diagram above, suggest the results of this test and explain your answer. 2

A second test used a short sample of DNA consisting of 17 bases. This was then analysed to determine the bases present in the sample. Use your knowledge of DNA structure to complete the table below. 2

| | Number of bases | | | |
|----------|-----------------|---|---|---|
| | A | T | C | G |
| Strand A | 6 | | | 2 |
| Strand B | | | | 5 |