IB Questionbank Biology

**Year 12 Biology Test**

Name…………………………….

50 min

45 marks

*Answer all questions in the spaces provided*

**1.** A cell has cytoplasm, a cell wall, naked DNA and ribosomes. Based on this information, what type of cell could this be?

A. A cell from a pine tree

B. A grasshopper cell

C. A human red blood cell

D. A bacterium

(Total 1 mark)

**2.** Which pair of features is correct for both a human liver cell and an *Escherichia coli* cell?

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| --- | --- | --- |
|  | **Human liver cell** | ***Escherichia coli* cell** |
| A. | contains DNA associated with protein | contains naked DNA |
| B. | has 70S ribosomes | has 80S ribosomes |
| C. | contains mitochondria | contains mitochondria |
| D. | contains DNA enclosed by a membrane | contains DNA associated with protein |

(Total 1 mark)

**3.** If a *Sequoia sempervirens* tree is 100 m tall and a drawing of it is 100 mm tall, what is the magnification of the drawing?

A. ×0.001

B. ×0.1

C. ×1.0

D. ×1000

(Total 1 mark)

**4.** What feature do plant cells have but not animal cells?

A. Plasma membranes

B. Mitochondria

C. Cell walls

D. 80S ribosomes

(Total 1 mark)

**5.** The diagram below shows a cell during mitosis.



What are the structures and stage of mitosis?

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Stage of mitosis** | **Structure I** | **Structure II** |
| A. | metaphase | chromatid | nuclear membrane |
| B. | anaphase | centromere | plasma membrane |
| C. | anaphase | chromatid | nuclear membrane |
| D. | metaphase | centromere | plasma membrane |

(Total 1 mark)

**6.** The graph below represents the amount of DNA during the cell cycle. Which part of the graph represents metaphase?



(Total 1 mark)

**7.** (a) State the missing source, optimum pH requirement, substrate and product of the human enzymes in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Enzyme** | **Source** | **Optimum pH** | **Substrate** | **Products** |
| Amylase | Salivary gland | 7 |  |  |
| Lipase |  |  | Lipids | Fatty acids and glycerol |

(2)

(b) Explain the need for enzymes in digestion.

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(2)

(c) Draw a labelled diagram to show the interconnections between the gall bladder, pancreas and small intestine.

(3)

(Total 7 marks)

**8.** Male Lepidoptera (butterflies and moths) commonly drink from pools of water or from moist soil. This behaviour, called puddling, was investigated in an undisturbed area where male tiger swallowtails, *Papilio glaucus*, had been seen puddling.

Four successive sets of experiments were performed under similar conditions of temperature and humidity. In each set, equal samples of sand were spread out evenly on trays and then treated differently. Except for one dry sample (in the first set), all others were saturated with a different liquid. Results of the observations are given in the table below.



[Source: adapted from K Arms *et al*., “Sodium: Stimulus for Puddling Behaviour by Tiger Swallowtail Butterflies, *Papilio glaucus*” (1974) *Science*, **185**: 5 (5 July–27 Sept) #4148, pp. 372–374. Reprinted with permission from AAAS]

(a) Identify the dissolved element always present in the three samples with most puddling time.

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(1)

(b) Discuss the relationship between sampling visits (V) and puddling time (T) in experiments 1, 2 and 3.

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(2)

(c) Analyse the results for experiment 4.

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(2)

Study of the male moth *Gluphisia septentrionis* revealed that their puddling behaviour can last for hours. Though drinking results in the uptake of hundreds of gut-loads of fluid, this fluid becomes rapidly expelled from the digestive system through frequent anal ejections. In this experiment, the ion concentration change was calculated by subtracting ions ejected from ions taken in. The following data was collected from males drinking laboratory solutions and from natural puddles.



[Source: adapted from SR Smedley and T Eisner “Sodium Uptake by Puddling in a Moth” (1995) *Science*, **270** (15 Dec) #5243, pp. 1816–1818. Reprinted with permission from AAAS]

(d) (i) Identify which ion the moths are retaining in their body from the laboratory solutions.

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(1)

(ii) Compare the gain and loss of ions in the male moths which have drunk from laboratory solutions with the changes in those that have drunk from natural puddles.

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(3)

The diagram below shows the digestive system anatomy of the male and female moth.



[Source: adapted from SR Smedley and T Eisner “Sodium Uptake by Puddling in a Moth” (1995) *Science*, **270** (15 Dec) #5243, pp. 1816–1818. Reprinted with permission from AAAS]

(e) Using the diagram above, evaluate the hypothesis that male moths are better adapted than female moths to benefit from puddling behaviour.

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(2)

(f) Suggest **one** reason for puddling behaviour in male Lepidoptera.

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(1)

(Total 12 marks)

**9.** *Up to two additional marks are available for the construction of your answers.*

**(2)**

(a) Draw a labelled diagram of the heart showing the chambers, associated blood vessels and valves.

(4)

(b) Describe the relationship between the structure and function of blood vessels.

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(6)

(c) Explain the mechanisms involved in the ventilation of the lungs.

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(8)

(Total 20 marks)