Neap

Trial Examination 2020

VCE Biology Unit 1

Written Examination

Suggested Solutions

SECTION A – MULTIPLE-CHOICE QUESTIONS

1	**A**	B	C	D
2	A	B	C	**D**
3	A	**B**	C	D
4	A	**B**	C	D
5	A	B	C	**D**
6	**A**	B	C	D
7	A	B	**C**	D
8	A	B	C	**D**
9	**A**	B	C	D
10	**A**	B	C	D
11	A	**B**	C	D
12	A	B	**C**	D

13	A	B	C	**D**
14	**A**	B	C	D
15	A	B	**C**	D
16	A	**B**	C	D
17	A	**B**	C	D
18	A	B	**C**	D
19	A	B	C	**D**
20	A	B	**C**	D
21	A	**B**	C	D
22	A	**B**	C	D
23	A	B	**C**	D
24	A	B	C	**D**
25	A	B	C	**D**

Question 1 A

A is correct, as many lysosomes are found in phagocytes (special white blood cells) and they contain digestive enzymes to destroy ingested bacteria. For **B** to be correct, it would have to specify rough endoplasmic reticulum, as smooth endoplasmic reticulum is for lipid synthesis and transport, not protein. **C** is incorrect as bone cells do contain nuclei and require regulation. **D** is incorrect because Golgi bodies are essential to modify and package the enzyme for secretion out of the cells into the duct before reaching the mouth.

Question 2 D

D is correct, as the biconcave shape and the extremely small size of the mature red blood cells means that they have a much larger surface area to volume ratio for exchange of inputs and outputs than any of the other three cell types.

Question 3 B

B is correct, as all cells viewed under an electron microscope must be stained with heavy metal stains to detect the beam of electrons and produce an image, and the cells are therefore dead. All other choices are incorrect, as some organelles such as chloroplasts are large enough to see unstained on high power, and nuclei can be viewed in some cells on low power without staining. Ribosomes are very small and can only be seen with an electron microscope.

Question 4 B

B is correct, as one of the main functions of the plasma membrane is to control the movement of substances in and out of the cells. It is found in both eukaryotic and prokaryotic cells, thus **A** is incorrect. The plasma membrane is fluid in nature, not fixed, and cholesterol makes it more stable, not less.

Question 5 D

D is correct, as water moves from a higher concentration to a lower concentration in the gut through osmosis and is a passive process. All other choices contain incorrect phrases; in **A**, low to high concentration is not diffusion; in **B**, facilitated diffusion does not use energy; in **C**, movement down the concentration gradient is passive, not active transport.

Question 6 A

A is correct, as separated internal organelles/compartments means different cellular processes can occur in each compartment as different enzymes can be active in each. Different biological processes need different enzymes and environments, so **D** is incorrect. Prokaryotes have no membrane-bound organelles, and so no such compartments. The organelle membranes are similar in structure to the plasma membrane, consisting of proteins and phospholipids.

Question 7 C

C is correct, as the eyespots would detect the light needed for photosynthesis so the *Chlamydomonas* can move towards light for more efficient photosynthesis. They would also require mitochondria for aerobic respiration to break down the glucose synthesised in photosynthesis, so **A** is incorrect. They would move towards shallower water for more light during the day. Nuclei are present in their cells but are not seen, as they are colourless and obscured by the large chloroplast.

Question 8 D

D is correct, as the kingdom Protista contains plants, animals and single-celled organisms that have features of both plants and animals. They do not fit into either kingdom Plantae or Animalia, and are certainly not in kingdom Monera, which contains prokaryotic bacteria and cyanobacteria.

Question 9 A

A is correct, as they can use their eyespots to detect the stimulus (light) and swim using their effector (the flagella) towards it in a stimulus-response model. This will not make the light go away, so there is no feedback, but it will increase their efficiency in photosynthesis and therefore their survival. This is not regulated as there is no coordinating centre, and it is not an example of homeostasis.

Question 10 A

A is correct, as there will be competition for between *Chlamydomonas*, *Volvox* and *Euglena* for resources, such as light, carbon dioxide and even space. All the other alternatives involve the three species helping each other in some way to the benefit of all species.

Question 11 B

B is correct, as the organisms are all photosynthetic and act as producers to provide food for the food web, thus forming the first trophic level. They are not zooplankton, which is part of the second trophic level that feeds on the producers. They are not decomposers, and there is no such term as second order producers.

Question 12 C

C is correct, as aerobic cellular respiration generates more ATP per glucose molecule than anaerobic cellular respiration. Aerobic cellular respiration is complete breakdown of glucose producing water and carbon dioxide as wastes. It occurs all the time in living cells, not just during daylight hours.

Question 13 D

D is correct, as chlorophyll pigments are essential for absorption of light for photosynthesis in all the organisms listed. **B** is incorrect, as there are no chloroplasts in the prokaryotic cells of cyanobacteria. Photosynthesis does not occur in mitochondria and uses the external energy source of light.

Question 14 A

A is correct, as the brain is the major coordinating organ in the nervous system for temperature regulation. The endocrine/hormonal system also plays an important role but is not given in the other choices. The other three organs listed all play a role in loss and gain of heat, but have no controlling role.

Question 15 C

C is correct, as the internal environment consists of all the body fluids bathing the cells – the tissue/extracellular/interstitial fluid, the blood and the lymph. The cells themselves are not included, nor are the blood vessels. The lung air sacs would be considered part of the external environment, together with the inside of the respiratory, digestive and excretory systems and the surroundings of the organism.

Question 16 B

B is correct, as increased cellular metabolism produces more energy in the form of ATP and heat. All other alternatives would increase heat loss or reduce heat loss and are not involved in generating more heat.

Question 17 B

B is correct, as bioprospecting, in the case of warfarin, involved recognising a disease in cattle caused by grazing on mouldy hay, followed by various observations and experiments that ultimately led to warfarin being used on humans as an anti-coagulant. None of the other terms refer to this process.

Question 18 C

C is correct, as the otter is behaving in a way to aid its survival by reducing heat loss and fixing itself in a more permanent position during sleep, and thus is a behavioural adaptation. The other three alternatives are structural adaptations.

Question 19 D

D is correct, as the otter is the predator, catching and eating the sea urchin, its prey. The otter and sea urchin do not compete with each other, and there is no parasitism involved where one organism benefits and the other is harmed.

Question 20 C

C is correct, as if nearly all the otters were killed or died, the sea urchin numbers would rapidly increase. The large numbers of sea urchins would eat the kelp, resulting in the loss of the large kelp forests. This would ultimately affect all the organisms in the ecosystem, resulting in its collapse. All other three alternatives refer to increases in populations of other organisms, regeneration and a flourishing reef, all of which would not occur if otter numbers declined drastically.

Question 21 B

B is correct, as keystone species have a disproportionately large effect on the other organisms in the ecosystem. They play an important role in keeping the ecosystem well maintained and developing in a positive direction, despite not being the most abundant species. All of the other terms are inappropriate for the otters in the kelp forest ecosystem.

Question 22 B

B is correct, as a hypothesis is a proposed explanation to explain previous observations that can be tested through study and experimentation. It is more than just a suggestion, as it must be logical and sensible. It may result in a prediction or ultimately a theory after many further tests are carried out to see if they support the hypothesis.

Question 23 C

C is correct, as these are all controlled variables that need to be kept the same for all repetitions to show that it is the independent variable being altered that has caused the results, and not one of these other factors. This is different to the control group, in which the independent variable is not altered so it can be used as a comparison to the experimental group.

Question 24 D

D is correct, as the dependent variable is the factor being observed or measured in the experiment. In this case, it was the volume of carbon dioxide being given off every twenty seconds, not the total volume after five minutes. The temperature of the solution, either 25°C or 15°C, was the independent variable, and the amount of yeast was kept the same in each experiment and thus was a controlled variable.

Question 25 D

D is correct as, to check the consistency and reliability of the results, it is necessary to replicate the results by having multiple trials of each control and experimental group, and to repeat the experiment a number of times. The experimental equipment, materials and method should be the same each time, and all results should be included as one unexpected result may be due to a chance error or inaccuracy, but will average out in the overall results obtained.

SECTION B

Question 1 (7 marks)

a. The two cells would be considered eukaryotic cells, as the diagram shows that both the sperm and pollen grain contain membrane-bound nuclei and organelles, which are not present in prokaryotic cells. 1 mark

b. **i.** Sperm have a long tail (or flagellum) that allows it to swim to the egg. 1 mark

ii. The mid-tail cluster of mitochondria are important for providing the energy needed for movement of the sperm. 1 mark

c. **i.** *Any one of:*

- It could be blown by the wind to reach an egg.
- It could be carried by birds, bees or other animals to reach an egg.

1 mark

ii. *Any one of:*

- It is small and light.
- It has a hard outer coat so it can be carried without damage to reach the egg.
- It has a sticky outer coating to allow it to attach to pollinators.

1 mark

d. **i.** A tissue is a group of cells that work together to carry out a common function. 1 mark

ii. When mature, neither of these two cell types could be considered a tissue because they both act independently of other cells to fertilise an egg. 1 mark

Question 2 (4 marks)

a. **i.** The two slices of bread represent the two phospholipid layers. 1 mark

The cheese tubes represent protein channels. 1 mark

ii. *Any one of:*

- cholesterol, to make the membrane more stable
- glycoprotein, for cell recognition and adhesion/as a receptor site
- carbohydrate chains, for cell recognition and adhesion/as a receptor site

1 mark

b. Cells of mammalian systems are interrelated and interdependent, working to maintain the functioning of the whole organism. 1 mark

Question 3 (9 marks)

a. Using eight 1 cm^3 cubes is an example of replication and is a more efficient experimental technique than using only one cube, as it allows experimenters to check the precision of the result and to uncover any systematic errors that may effect the accuracy of the result. 1 mark

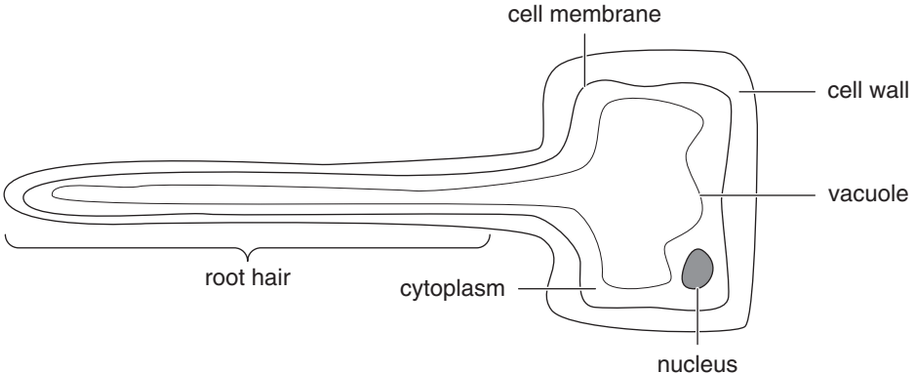
b. osmosis 1 mark

Osmosis is the net movement of water from a region of higher water concentration to a region of lower water concentration (or lower solute concentration to higher solute concentration) through a semipermeable membrane. 1 mark

c. The smaller cube (1 cm^3) had a greater change/increase in mass than the larger cube (2 cm^3). 1 mark

The smaller cube has a greater surface area to volume ratio, and therefore allows more movement of water into the potato cells. 1 mark

d.



2 marks
1 mark for drawing.
1 mark for labels.

e. *For example, any two of:*

- dead cells with thickened walls for support of tubes during upward pull of water
- end walls of cells broken down to form hollow tubes for effective water channels
- cell contents (nucleus and cytoplasm) absent, so form hollow tubes for transport
- walls of cellulose and lignin for adhesion with water molecules to aid in upward movement of water

2 marks

Question 4 (6 marks)

a. The bacteria are autotrophs, as they can convert simple inorganic molecules into complex organic molecules using an external energy source. 1 mark

They are photosynthetic as they contain chlorophylls and other pigments that absorb light energy; thus, photosynthetic autotrophs. 1 mark

b. Green plants carry out a chemical process in which they capture and covert **light** energy and transform it into **chemical** energy, which is stored in complex molecules of **glucose/starch/cellulose**. In this process, the by-product **oxygen** is released. 2 marks

Award one mark for 2–3 correct terms.
Note: Any one of glucose, starch or cellulose is an acceptable answer.

c. **i.** A family is a higher level of classification than genus. All three genera of the purple bacteria belong to the same family. A genus is a lower level of classification in which the members are more similar. 1 mark

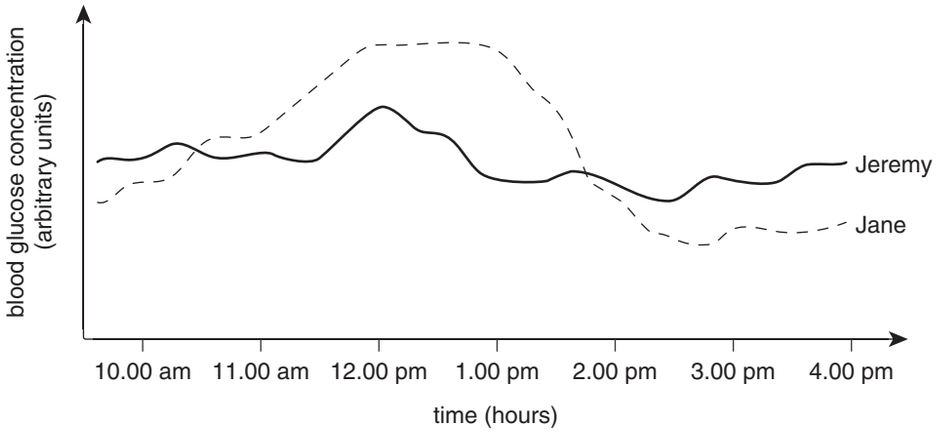
ii. Using such a classification system in research laboratories world-wide provides a universal system of naming so that all scientists can understand which organisms are being studied for better communication. 1 mark

Question 5 (6 marks)

a. **i.** Jeremy was incorrect. Soon after eating his lunch, digestion and absorption into the bloodstream would have occurred, so his blood glucose would have gone up. 1 mark

ii. Jane's lethargy was caused by a different factor. Although she also has high blood glucose due to absorption of digested food, her blood glucose remains high. Glucose cannot be absorbed into her cells as insulin is required for this to occur, and she had forgotten to inject her morning insulin. 1 mark

b. **i.**



2 marks
1 mark for each graph line.
Note: Graph lines could have more or less detail than those shown above, but Jane's line should peak higher than Jeremy's between 11.30 and 1.30, and Jeremy's line should be higher outside of this period.

ii. homeostasis 1 mark

This process involves negative feedback, in which the stimulus of high blood glucose would be detected and result in a response that lowers blood glucose. This also occurs in the reverse direction, thereby maintaining blood glucose levels within a narrow range. 1 mark

Question 6 (9 marks)

a. **i.** Aquatic means living in water, as do salmon. Terrestrial means living on land, as do bears. 1 mark

ii. scavengers **OR** detritivores 1 mark

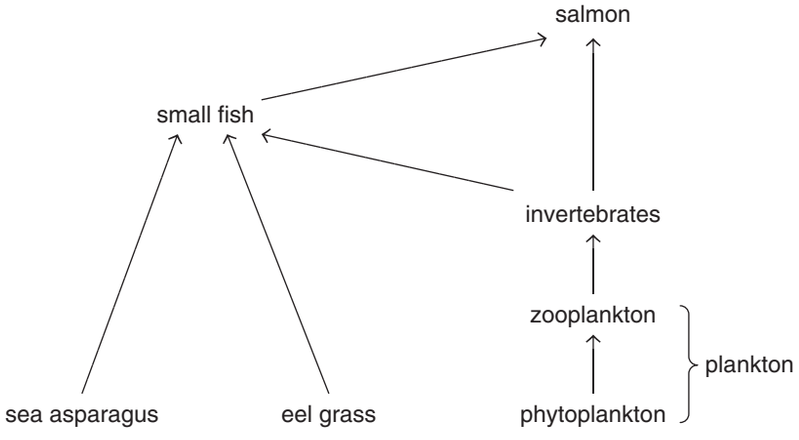
b. *For example, any one of:*

- Smolts may be able to excrete highly concentrated urine.
- Smolts may secrete salt from glands or ducts in their eyes.

1 mark

c. **i.** The main producers are phytoplankton, as abundant nutrients are available for their growth and reproduction in the water of the estuary. 1 mark

ii. *For example:*



2 marks
1 mark for organisms in correct positions.
1 mark for all arrows pointing towards consumers.

iii. The arrows show the direction of energy flow in the food web. 1 mark

iv. The original source of energy is the sun. 1 mark

v. *For example, any one of:*

- invertebrates: phytoplankton → zooplankton → invertebrates
- small fish: plankton → invertebrates → small fish

1 mark

Question 7 (9 marks)

a. **i.** parasite and host 1 mark

ii. The fungus benefits by gaining foo and a place to grow and reproduce in the fly; the fly gains no benefit and is killed by the fungus. 1 mark

b. The advantage of firing fungal spores that attach to other flies is to aid the dispersal of the fungus to new hosts and different areas by attaching to other flies or being carried in high wind currents. 1 mark

c. In the name of the fungus, *Entomophthora muscae*, the word *muscae* is the second word, which is the specific/descriptive name in the name of the species. 1 mark

In the name of the housefly, *Musca domestica*, the word *musca* is the first word, which is the genus name. 1 mark

d. **i.** biomimicry 1 mark

ii. *For example, any one of:*

- Swimsuits based on shark skin are designed to be smooth and streamlined.
- Bullet trains based on bird beaks are designed to be aerodynamic
- Velcro based on plant seeds is designed to attach things together.

1 mark

e. *For example, any two of:*

- Insects act as food for other higher order consumers in food webs.
- Insects are important pollinators of flowering plants.

2 marks