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## **BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017**

### **TEST 1: PLASMA MEMBRANES, NUCLEIC ACIDS AND PROTEINS**

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#### **SUGGESTED SOLUTIONS AND MARKING SCHEME**

##### **SECTION A – MULTIPLE-CHOICE QUESTIONS**

**Question 1      B**

DNA is composed of lipids. Complex sugars are carbohydrates. Oils and fats are in the group lipids. Proteins can also be called polypeptides.

**Question 2      D**

The building blocks of proteins are amino acids. Simple sugars are the building blocks of polysaccharides. Nucleotides are the building blocks of nucleic acids. Fatty acids are one of the components that combine to form lipids.

**Question 3      A**

Amino acids are transferred to the ribosome by transfer RNA (tRNA).

**Question 4      C**

This sequence contains uracil so must be from an RNA molecule. The only RNA molecule present is mRNA.

**Question 5      A**

Proteome includes all the proteins produced by an organism, not just some of the proteins produced.

**Question 6      A**

Although hydrogen bonds are present within a single amino acid, they do not hold separate amino acids together when they undergo condensation polymerisation.

**Question 7      C**

Although DNA does have a phosphate group, so does RNA, hence having two nucleotide strands differentiates DNA from RNA.

**Question 8** C

Water moves via osmosis to dilute the solute.

**Question 9** C

Cholesterol is a solid lipid, therefore the more cholesterol, the more ridged the membrane is. Less cholesterol means the membrane is less rigid and more fluid.

**Question 10** D

Production of proteins occurs at the ribosomes. Proteins are transported within the cell by the endoplasmic reticulum. The Golgi apparatus modifies and packages the proteins in vesicles. The vesicles move and fuse with the plasma membrane releasing their contents out of the cell.

**SECTION B – SHORT-ANSWER QUESTIONS**

**Question 1** (8 marks)

- a. i. phospholipid 1 mark
- ii. glycoprotein 1 mark
- iii. protein/protein channel 1 mark
- b. i. cell surface receptor for recognition or a docking point for a signalling molecule 1 mark
- ii. allows movement of substances into and out of the cell 1 mark

c.  2 marks

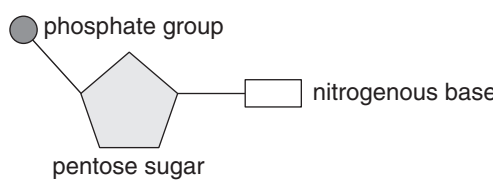
*1 mark for labelling correct polar head.*  
*1 mark for labelling correct non-polar tail.*

Phospholipids consist of a polar head and a non-polar tail. The polar heads are found on the outsides of the membrane whilst the non-polar tails face inwards in a double layer. 1 mark

**Question 2** (3 marks)

- a. Visking tubing is semi-permeable/partially permeable. 1 mark
- b. Sac A will be smaller in size. This is due to distilled water moving out of the sac and into the concentrated sucrose solution by osmosis. 1 mark
- Sac B will be larger in size. This is due to distilled water moving into the sac to dilute the concentrated sucrose solution by osmosis. 1 mark

**Question 3** (3 marks)

a.  1 mark

**b.**

| DNA               | RNA             |
|-------------------|-----------------|
| double-stranded   | single-stranded |
| deoxyribose sugar | ribose sugar    |
| thymine           | uracil          |

2 marks

**Question 4** (5 marks)

**a.** A U A U A U G C C C G C U A C U G A G U A U C C

1 mark

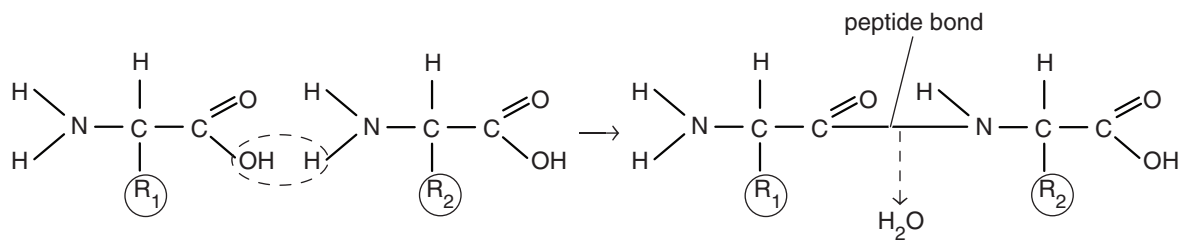
**b.** eight

1 mark

**c.** ribosomes

1 mark

**d.**



2 marks

1 mark for production of water molecule.

1 mark for C – N peptide bond.

**Question 5** (3 marks)

**a.** Any three of:

| Function             | Examples                       |
|----------------------|--------------------------------|
| motility             | tubulin<br>actin<br>myosin     |
| structural           | collagen<br>fibroin<br>keratin |
| transport            | haemoglobin                    |
| signalling molecules | insulin<br>neurotransmitters   |
| biological catalysts | enzymes                        |

2 marks

1 mark for providing three functions.

1 mark for providing examples of each function.

**b.** The structural difference between amino acids is due to the R group being specific to each of the 20 amino acids.

1 mark

**Question 6** (2 marks)

- a. The bond will be broken. 1 mark
- b. Condensation refers to the formation of a water molecule each time a peptide bond is formed. Polymerisation refers to the joining of many monomer subunits to form a polymer; thus many amino acid subunits are joined to form a polypeptide/protein. 1 mark

**Question 7** (2 marks)

a.



1 mark

*Note: Any diagram illustrating a shape change due to the bonds breaking is acceptable.*

- b. Another way to denature a protein is by heating the protein beyond its optimum temperature. 1 mark

**Question 8** (4 marks)

| Level of structure | Diagram (A–D) | Diagram (W–Z) |
|--------------------|---------------|---------------|
| primary            | C             | X             |
| secondary          | B             | Z             |
| tertiary           | D             | W             |
| quaternary         | A             | Y             |

4 marks

*1 mark for each correctly filled row.*