BSc / MSc Degree Examinations 2018-9

Department:
Biology

Title of Exam:
Understanding health and disease

Time Allowed:
1.5 hours

Allocation of Marks:
Total marks available: 60
Section A: Short answer questions = total 30 marks
Section B: Essay question = total 30 marks

Instructions for Candidates:
Answer all of the short questions
Answer one of the essay questions. Either Essay A OR Essay B.

Do not write on this booklet before the exam begins
Do not turn over this page until instructed to do so by an invigilator
SECTION A: Short Answer Questions
Answer all the questions in the spaces provided
Total marks for this section: 30

1. R120G is a mutation resulting in hypertrophic cardiomyopathy. An experimental study on mice with the R120G mutation was performed and the results are shown below. Explain the data and identify a link between the 2 pieces of data. (3 marks)

![Graph A: PCR/ATP vs WT and R120G](image)

![Graph B: TUNEL-positive cardiomyocytes per 10^6 nuclei](image)

2. Describe one piece of evidence for energy depletion as a cause of cardiac hypertrophy. (2 marks)
3. Explain the role of macrophages in the development of an atherosclerotic plaque.  

(3 marks)

4. Patients with Glanzmans' thrombasthenia have mutations in gene encoding for glycoprotein (GP) IIb or IIIa that reduce the expression and/or function of the protein. Why does this cause bleeding?  

(2 marks)
5. A new diagnostic test for infection with hepatitis B virus that involves measuring the amount of antibody in a blood sample was compared to the gold standard. The results are given in the table below. Calculate and interpret the sensitivity and negative predictive value for this test. (2 marks)

<table>
<thead>
<tr>
<th>Gold standard</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>New test</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>177</td>
</tr>
</tbody>
</table>

6. Increased alcohol consumption is associated with an increased risk of coronary vascular disease (CVD). Explain what is meant by the following statement: Sex is a confounder of this association. (3 marks)
7. Relative risk and attributable risk are two ways to compare the incidence of disease between groups of people with differing exposures. Explain how these two measures differ in how they are calculated and how they are used. (3 marks)

8. Define what is meant by Primary Prevention and give an example. (2 marks)
9. Below is a schematic of the amino acid arrangement in the distinctive coiled quaternary structure of the rod domain of Myosin heavy chain β protein.

![Schematic of amino acid arrangement](image)

a) Label the hydrophobic residues

b) Label the non polar residues

(2 marks)  
(1 mark)

c) What would the possible consequence of a non-conservative amino acid change at position a or d be? Explain your answer.

(7 marks)
SECTION B: Essay Question

Answer one question.

total marks for this section: 30

EITHER

Essay A

Explain how reperfusion can worsen cardiac injury following a period of ischaemia

OR

Essay B

Describe how single cell genomics can be used in the diagnosis and treatment of disease, as well as fundamental research into disease mechanisms.