Module Code: BIO00018C

Examination Candidate Number: _____________
Desk Number: _____

BSc Degree Examinations 2019-20
SECURE EXAM

Department:
BIOLOGY

Title of Exam:
Introduction to Biomedical Sciences Part 1

Time Allowed:
1 hour and 30 minutes

Allocation of Marks:
Total marks available for this paper: 50
The marks available for each question are indicated on the paper.

Instructions for Candidates:
Answer all questions in the spaces provided on the examination paper

Materials Supplied:
CALCULATOR

For marker use only:

<table>
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<th>12</th>
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Do not write on this booklet before the exam begins
Do not turn over this page until instructed to do so by an invigilator
1. What does the acronym DALY stand for and how is it calculated? (3 marks)

2. Explain how antibiotic resistance is propagated between different bacteria. (3 marks)

3. Name a disease that has been globally eradicated through vaccination. (1 mark)

4. a) What is another term for the posterior (back) surface of the human body in the anatomical position? (1 mark)

b) What is the name of the spinal curve disorder which results in a 'humpback', and in which plane is the condition best visualised? (2 marks)

c) Osteoporosis is a disease characterised by increased bone loss. Which bone cell type is likely to be overactive in these patients and why? (2 marks)
5. Shortly after death, skeletal muscles enter a state of continuous and maximal contraction, a process known as rigor mortis. Using the data in the figure below, explain the mechanism of rigor mortis. 

(4 marks)

Figure. [Figure legend title redacted]. Skeletal muscle samples were taken from a deceased patient at 0, 2, 4 and 6 hours after death. (A) Myocyte calcium concentration. (B) Myocyte ATP concentration. (C) Rigor Index (which reflects whole muscle tension).
6. How do muscles in the eye produce small highly controlled contractions?  
   (2 marks)

7. a) Draw a diagram of the hepatic lobule, labelling all of the vessels and ducts present.  
   (5 marks)

   b) How does the organization of the liver’s circulatory system achieve detoxification?  
   (2 marks)

8. Explain how iodine deficiency causes Goiter.  
   (4 marks)
9. Explain how reduced water intake causes the formation of concentrated urine.  
   (9 marks)

10. What are the functions of gastric acid?  
    (3 marks)

11. Explain the importance of haemoglobin in ensuring that the tissues of the human body are supplied with enough oxygen.  
    (2 marks)
12. You are the lead researcher in a clinical trial testing the effectiveness of DG-00018C on exercise endurance in adults (aged 40-85) with Chronic Obstructive Pulmonary Disorder (COPD). DG-00018C is a newly invented agonist at β2 adrenoceptors. Your manager has asked you to review the patient data to confirm that all participants have been correctly diagnosed with COPD. The spirometry results of patient #126 are shown in the table below.

Lung function (spirometry) data for patient #126

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Attempt 1</th>
<th>Attempt 2</th>
<th>Attempt 3</th>
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</thead>
<tbody>
<tr>
<td>FVC (L)</td>
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<td>3.92</td>
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<tr>
<td>FEV₁ (L)</td>
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<td>PEFR (L/s)</td>
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<tr>
<td>F₂₅ (L/s)</td>
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<tr>
<td>F₅₀ (L/s)</td>
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<td>4.00</td>
</tr>
<tr>
<td>F₇₅ (L/s)</td>
<td>1.06</td>
<td>1.05</td>
<td>1.00</td>
</tr>
</tbody>
</table>

a) Has patient #126 been diagnosed correctly? Justify your answer. (4 marks)

___________________________________________________________________
THE SPACE ABOVE THIS LINE SHOULD BE SUFFICIENT FOR YOUR ANSWER
b) Your assistant has prepared a chart of the final clinical trial results (shown below). Provide a conclusion based on these results and justify any changes you would make to the figure before presenting the data to your manager. (3 marks)

![Bar chart showing endurance time for patients with COPD treated with placebo or DG-00018C (20 mg/kg) for 5 days. Each group consisted of 100 patients. The next day, the amount of time that patients could spend on an exercise bike at their functional threshold power was determined. Bars represent mean ± SEM. Statistics were performed using t-test.]

Figure. [Figure legend title redacted]. Patients with COPD were treated with either placebo or DG-00018C (20 mg/kg) for 5 days. Each group consisted of 100 patients. The next day, the amount of time that patients could spend on an exercise bike at their functional threshold power was determined. Bars represent mean ± SEM. Statistics were performed using t-test.

End of Exam