88126002

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BIOLOGY
HIGHER LEVEL
PAPER 2

Candidate session number

0	0							

Friday 16 November 2012 (afternoon)

2 hours 15 minutes

Examination code

8812 – 6002

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer two questions.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is *[72 marks]*.

20 pages

SECTION A

*Answer **all** questions. Write your answers in the boxes provided.*

1. Cells in the alveolus wall produce a surfactant. Its function is to prevent alveoli collapse at the end of expiration. Surfactants are used in the treatment of respiratory system disease in premature babies.

The table shows some of the components of different surfactant preparations.

	Percentage composition by mass			
Component	**Synthetic surfactant A**	**Synthetic surfactant B**	**Natural human surfactant**	**Modified human surfactant**
Phospholipids	99	84	81	100
Cholesterol	0	not stated	5 to 10	0
Fatty acids	<0.5	6	1.5	0
Proteins	1	0.5 to 1	5 to 10	0

[Source: *Clinical and Diagnostic Laboratory Immunology*, 2000, 7(5), pp. 817–822, 2012, January 9, 2013]

(a) State the surfactant that contains the least amount of phospholipids. *[1]*

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(b) Compare the composition of natural human surfactant with synthetic surfactants. *[2]*

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(Question 1 continued)

(c) Phospholipids found in the surfactants form a surface film on the moist lining of the alveoli. Outline how the hydrophilic and hydrophobic parts of the phospholipids in the surfactants are aligned on the alveolar surface. *[1]*

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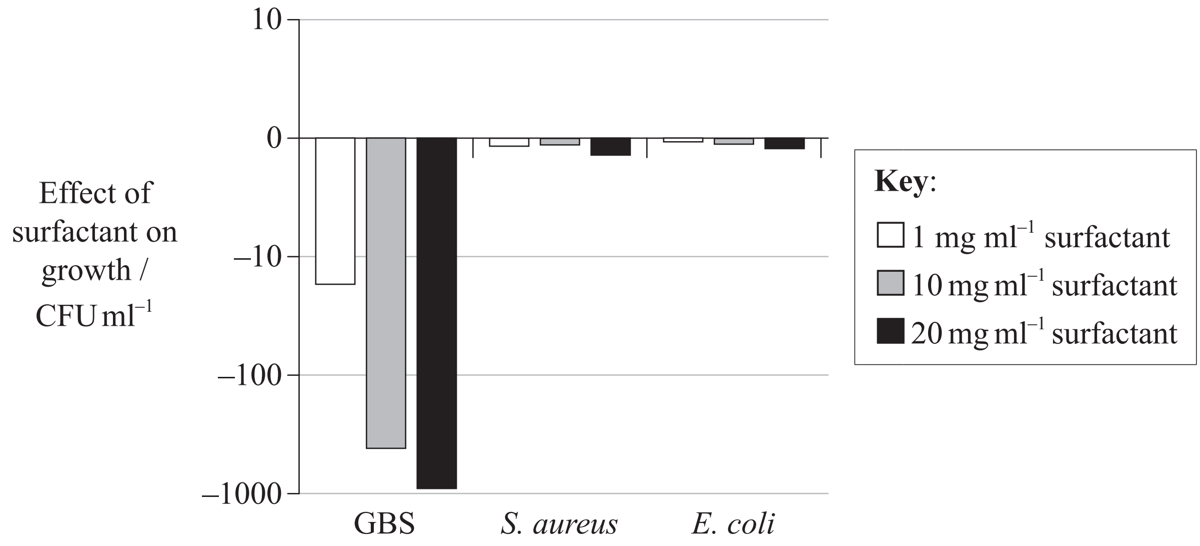
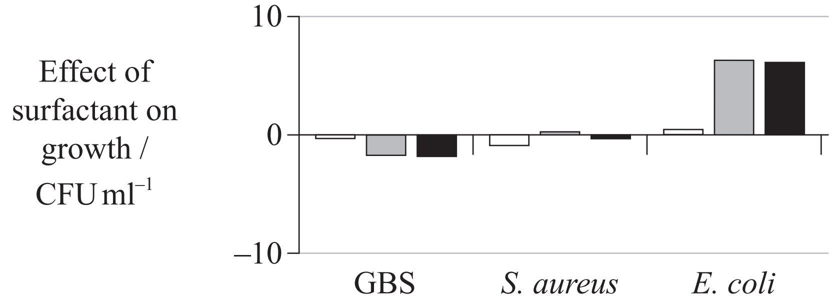
(Question 1 continued)

The effect of three different surfactants on the growth of three types of bacteria was assessed. Group B streptococci (GBS), *Staphylococcus aureus*, and *Escherichia coli* were incubated with three different concentrations of surfactant (1, 10 and 20 mg ml^{-1}).

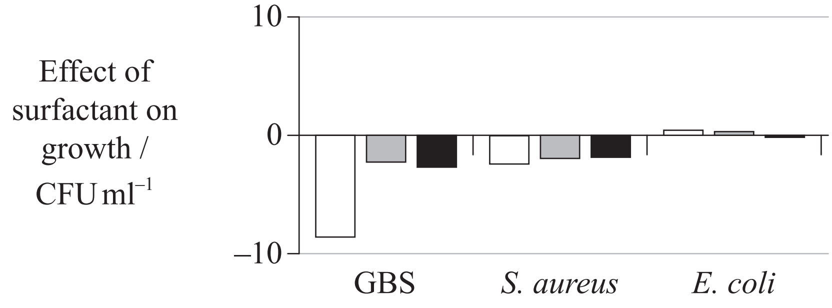
The bar charts show whether each concentration of surfactant increased or decreased bacterial growth, compared with the growth without surfactant. The difference in growth is shown as colony forming units (CFU) per millilitre.



Synthetic surfactant A



Synthetic surfactant B



Modified human surfactant

[Source: *Clinical and Diagnostic Laboratory Immunology*, 2000, 7(5), pp. 817–822, 2012, January 9, 2013]

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(Question 1 continued)

(d) Identify the effect of increasing the concentration of synthetic surfactant A on the growth of GBS. *[1]*

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(e) Compare the effect of the three surfactants, synthetic surfactants A and B and the modified human surfactant, on the growth of the different bacteria at a concentration of 20 mg ml^{-1}. *[3]*

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(f) Using all the data provided, evaluate the hypothesis that the presence of proteins in surfactants can decrease bacterial growth. *[3]*

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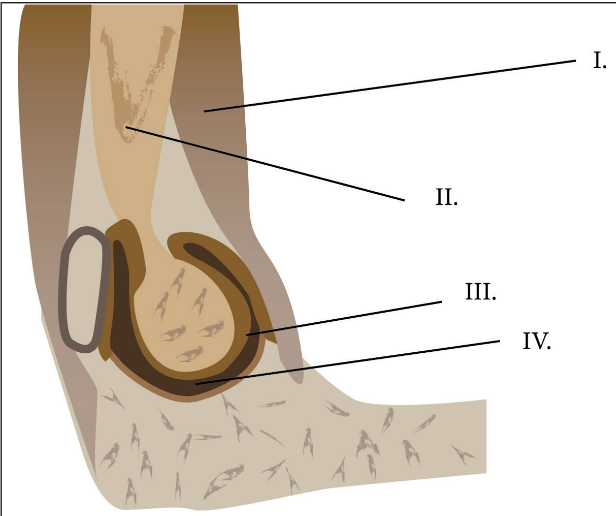
Turn over

(Question 1 continued)

Graph and questions 1 (g) and 1 (h) removed for copyright reasons

2. (a) Label I, II, III and IV on the diagram of the human elbow. *[2]*



I . . . .

II . . . .

III. . . . .

IV . . . .

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(b) Outline the functions of I and III. *[2]*

I. . . . .

III. . . . .

3. The greenhouse effect is a naturally occurring process.

(a) (i) State **one** greenhouse gas. *[1]*

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(ii) Explain how radiation of different wavelengths is involved in the greenhouse effect. *[2]*

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(Question 3 continued)

(b) The enhanced greenhouse effect can cause a rise in atmospheric temperature.

(i) Outline **two** consequences of a global temperature rise on arctic ecosystems. *[2]*

1. . . . .
2. . . . .

(ii) Outline **one** effect of a temperature rise on plants. *[1]*

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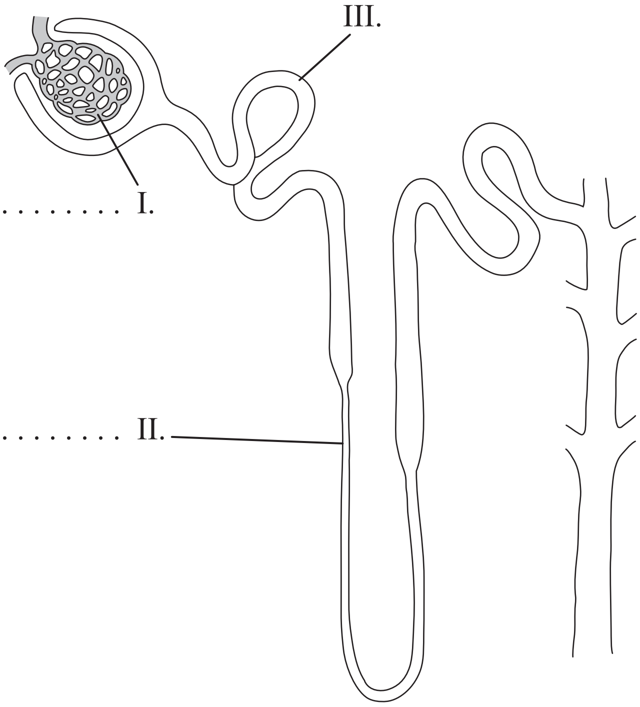
4. The diagram shows the structure of a nephron.

(a) (i) Label I and II. *[1]*



[© International Baccalaureate Organization, 2013]

(ii) Outline the function of III. *[1]*

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(Question 4 continued)

(b) Estimate the content of glomerular filtrate and urine of a healthy person by completing the following table. *[2]*

	Plasma proteins / mg 100 ml^{-1}	**Glucose / mg 100 ml^{-1}**	**Urea / mg 100 ml^{-1}**
Blood plasma in renal artery	740	90	30
Glomerular filtrate		90	
Urine			

(c) Explain the role of the medulla and the collecting duct of the kidney in the maintenance of the water balance in blood. *[3]*

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SECTION B

*Answer **two** questions. Up to two additional marks are available for the construction of your answers. Write your answers in the boxes provided.*

5. (a) Distinguish between autosomes and sex chromosomes in humans. *[4]*

(b) Describe the inheritance of hemophilia including an example using a Punnett grid. *[6]*

(c) Explain how meiosis results in an effectively infinite genetic variety of gametes. *[8]*

6. (a) State the role of **four named** minerals needed by living organisms. *[4]*

(b) Explain the processes by which minerals are absorbed from the soil into the roots. *[8]*

(c) In anaerobic conditions, plants release energy by glycolysis. Outline the process of glycolysis. *[6]*

7. (a) Draw a labelled diagram of the ultrastructure of a prokaryote. *[4]*

(b) Explain the process of DNA replication. *[8]*

(c) Outline how the structure of the ribosome is related to its function in translation. *[6]*

8. (a) Describe the process of fertilization in humans. *[6]*

(b) Explain how the structure and function of the placenta helps to maintain pregnancy. *[8]*

(c) Outline the hormonal control of the process of birth. *[4]*