Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 2

Wednesday 14 November 2018 (afternoon)

Candidate session number

1 hour 15 minutes

Instructions to candidates

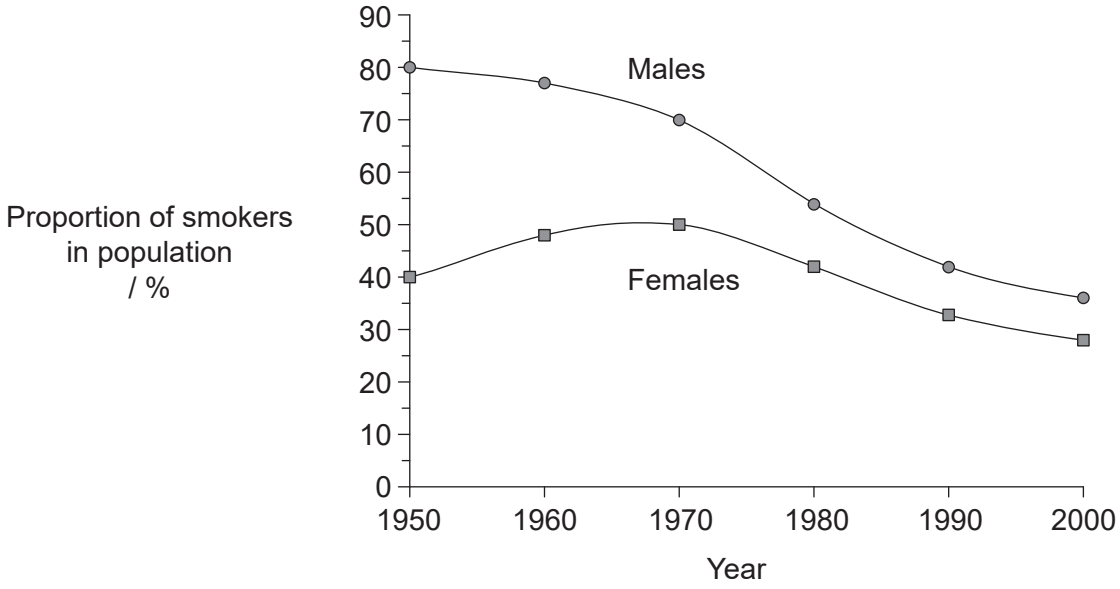
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.

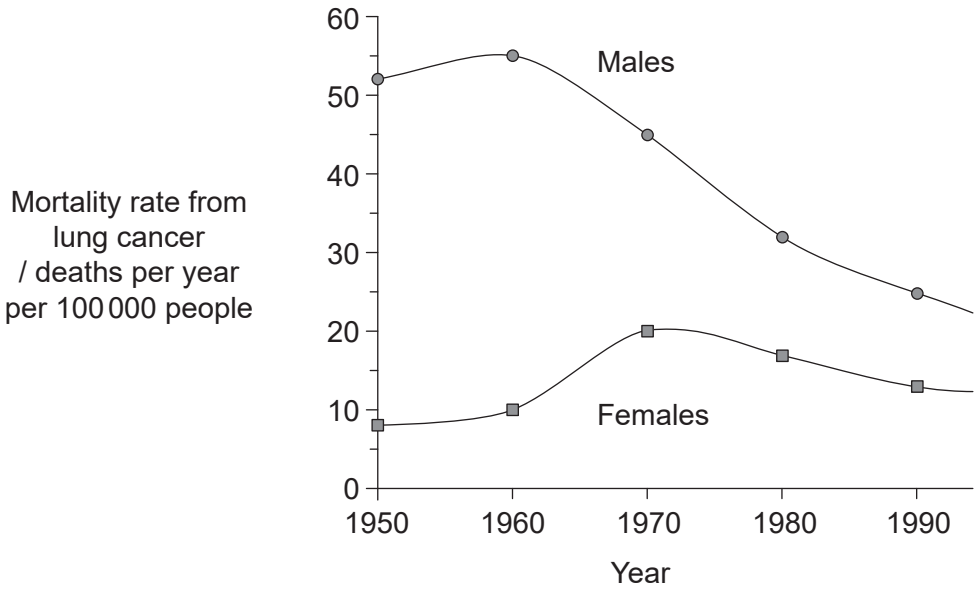
8818 – 6005

Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

1. Trends in tobacco smoking and mortality due to lung cancer were measured in male and female smokers aged 35 to 59 living in the United Kingdom from 1950 to 2000. The first graph represents the proportion of smokers in the population. The second graph represents the mortality rate (deaths per year per 100 000 people) from lung cancer.





[Source: Figure 1 (adapted) from R Petro, *et al.*, (2000), *British Medical Journal*, **321**, number 7257, pages 323–329, https://www.bmj.com/content/321/7257/323. Reproduced with permission from the BMJ Publishing Group.]

(This question continues on the following page)

(Question 1 continued)

(a) Calculate the change in the percentage of the male population that smoked from 1950 to 2000. [1]

. . . . . %

(b) Compare and contrast the trends in smoking behaviour between males and females between 1950 and 2000. [2]

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(c) Evaluate the evidence provided by the data in the graphs for smoking as a cause of lung cancer. [3]

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(Question 1 continued)

The incidence of lung cancer in 75-year-old males was studied comparing current smokers, former smokers and non-smokers.

	Smoking status in males aged 75 years	Sample size	Incidence of lung cancer	Percentage incidence / %
	Current smokers	981	379	38.6
Former smokers	<10 years since stopping smoking	485	146	30.1
	10–19 years since stopping smoking	398	92	23.1
	20–29 years since stopping smoking	252	31	12.3
	≥ 30 years since stopping smoking	256	16	6.3
	Lifelong non-smokers	403	3	0.7

[Source: adapted from R Peto, *et al.*, (2000), *British Medical Journal*, **321**, number 7257, pages 323–329]

(d) Describe the relationship between the incidence of lung cancer and stopping smoking. [2]

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(e) Explain evidence from the data in the table that could be used to persuade a smoker to give up smoking. [2]

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(Question 1 continued)

(f) Among 75-year-old lifelong non-smokers the percentage incidence of lung cancer was 0.01 %. Suggest **one** possible cause of lung cancer in non-smokers. [1]

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(g) State **two** respiratory diseases, other than lung cancer, caused by smoking. [2]

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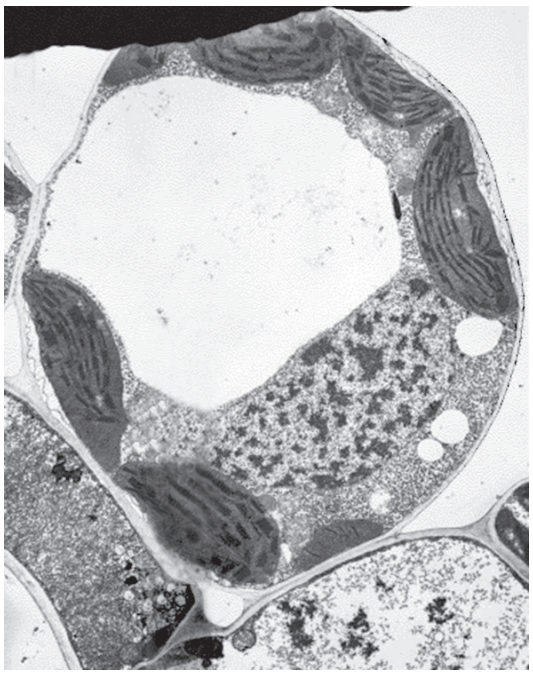
2. . . . . .

2. (a) (i) Label the area where cellulose is found in the micrograph of a plant cell. [1]



[Source: BIOPHOTO ASSOCIATES/Getty Images]

(ii) Cellulose is the most abundant organic polymer on Earth. Describe the structure of cellulose. [3]

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(Question 2 continued)

(b) Outline **one** reason for humans being unable to digest cellulose. [1]

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(c) Explain the advantages of having both lipid and carbohydrate as energy stores in the human body. [2]

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3. Boreal forests stretch across Canada, Russia and Scandinavia. This northern ecosystem accounts for 29 % of the world's forest areas. The long, cold winters favour tall evergreen trees with either needles or scale-like leaves. These trees are wind-pollinated and their seeds are not enclosed in a fruit. The photograph shows a typical boreal forest in winter.

[Source: TTphoto /Shutterstock]

(a) Identify the dominant plant phylum in the boreal forest. [1]

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(b) In some areas there are gaps in the boreal forest where trees fail to grow and peat tends to accumulate. Suggest reasons for this. [2]

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(Question 3 continued)

(c) An increase in global temperatures poses a critical threat to boreal forests. Explain the consequences of climate change to this northern ecosystem. [2]

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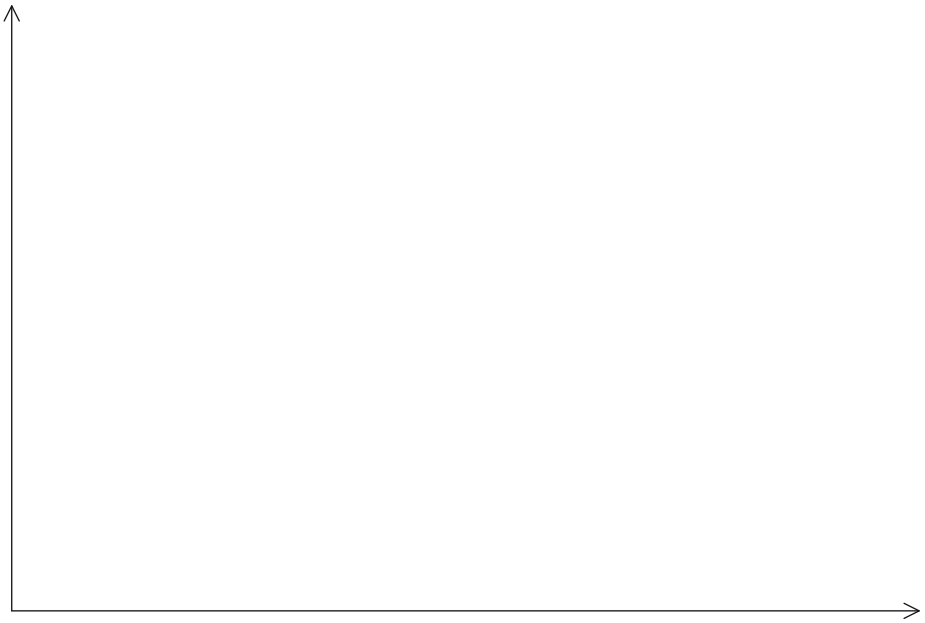
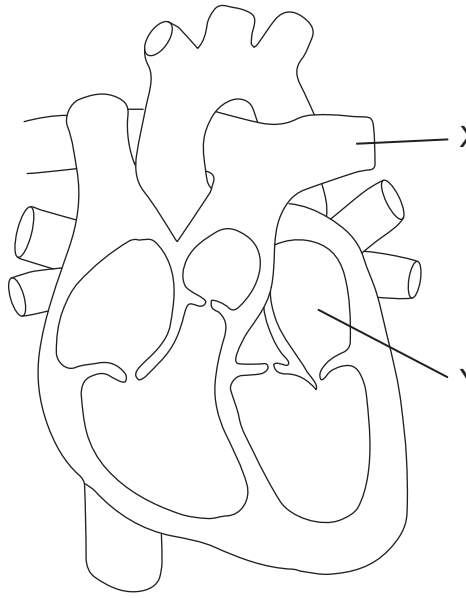
(d) The boreal forests are situated close to the north pole and even in summer the intensity of sunlight is lower than at the equator. Sketch a graph showing the effect of light on the rate of photosynthesis, labelling the axes. [2]



4. (a) Label X and Y on the diagram of the heart. [2]



X: . . . . . .

Y: . . . . . .

(b) Explain how the circulatory system is able to transport the blood under high pressure from the heart to the rest of the body. [3]

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(c) The heart responds quickly to physical activity. Describe how heart rate is controlled to meet the increased circulatory demands. [2]

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Section B

Answer **one** question. Up to one additional mark is available for the construction of your answer. Answers must be written within the answer boxes provided.

5. (a) The structure of prokaryotic cells has been investigated using electron microscopy. Draw a labelled diagram to show prokaryotic cell structure. [4]

(b) Outline the reasons for differences between the proteomes of cells within a multicellular organism. [4]

(c) Discuss the cell theory and its limitations. [7]

6. (a) Isolated communities in rural Finland, Hungary and some of the Scottish islands have a high incidence of red-green colour blindness. Describe the inheritance of red-green colour blindness. [3]

(b) The human hand is an example of adaptive radiation. Outline adaptive radiation. [5]

(c) Explain how the human body defends itself against pathogens. [7]