Additional Assessment Materials
Summer 2021

Pearson Edexcel GCE (Biology A)

Resource Set Topic 1: Lifestyle, Health and Risk

Question Paper

(Public release version)

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

General guidance to Additional Assessment Materials for use in 2021

Context
- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose
- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

4 Cardiovascular disease (CVD) is a major cause of death in developed countries.

(a) A high body mass index (BMI) and diabetes are two risk factors for CVD.

(i) Which of the following is another risk factor for CVD?

(1)

☒ **A** high blood pressure

☒ **B** low blood cholesterol

☒ **C** low salt intake

☒ **D** using statins

(ii) A woman is 154 cm tall and has a mass of 61 kg. Her body mass index is calculated using the following formula.

$$BMI = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

Calculate her BMI to one decimal place.

(2)

Answer ....

(iii) The graph shows the effect of additional risk factors on deaths due to CVD for people with and without diabetes.

Number of additional risk factors
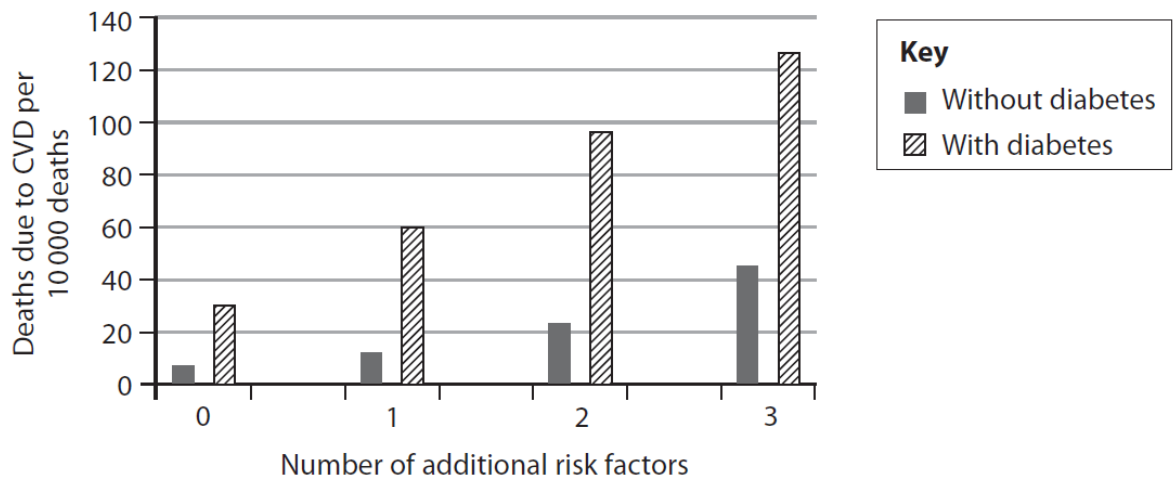
Identify the effect of the number of additional risk factors on deaths due to CVD for people with and without diabetes.

(2)

....

....

....

....

....

....

....

....

(b) It is possible to reduce the risk of CVD by taking medication or changing diet.

Explain the role of antihypertensive drugs in reducing the risk of atherosclerosis.

(4)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 4 = 9 marks)

8 Thrombophilia is a condition that increases the risk of blood clots forming.

This condition increases the risk of venous thromboembolism (VTE), a condition where a blood clot forms in a vein. Thrombophilia due to the production of overactive factor V can be inherited.

Factor V is involved in the conversion of prothrombin to thrombin.

(a) (i) Describe the role of thrombin in blood clotting.

(3)

....

....

....

....

....

....

(ii) Explain why a mutation in the gene coding for the protein factor V may increase the risk of VTE.

(3)

....

....

....

....

....

....

(b) A study was carried out to determine the incidence of VTE in people of different ages. Those who developed VTE were then tested for the factor V gene mutation.

The results of this study are shown in the table.

Age range	Percentage incidence of VTE in the study group (%)	Percentage of VTE patients with factor V mutation in the study group (%)
less than 20 years of age	1.3	49.3
over 70 years of age	34.0	20.9

Deduce the relative impact of the genotype and environmental factors on the development of VTE.

(4)

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 8 = 10 marks)

4 Some human babies are fed on breast milk.

The composition of breast milk changes throughout a feed. The milk at the start of a feed differs from the milk at the end of a feed.

The table shows how the nutrient proportions of breast milk change throughout a feed.

Stage of feeding	Mass of nutrient / g per 100 cm³ of milk		
	Carbohydrate	Lipid	Protein
Start	6.6	1.8	0.6
End	6.5	7.5	0.6

(a) Calculate the percentage change in lipid during this feed.

(2)

Answer .... %

(b) Milk at the start of a feed does not contain any vitamin C. Milk at the end of a feed can contain 10 mg of vitamin C per 100 cm³ of milk.

Milk samples were taken at different times during the course of one feed.

Devise a method to measure how the concentration of vitamin C changes during the course of a feed.

(4)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....
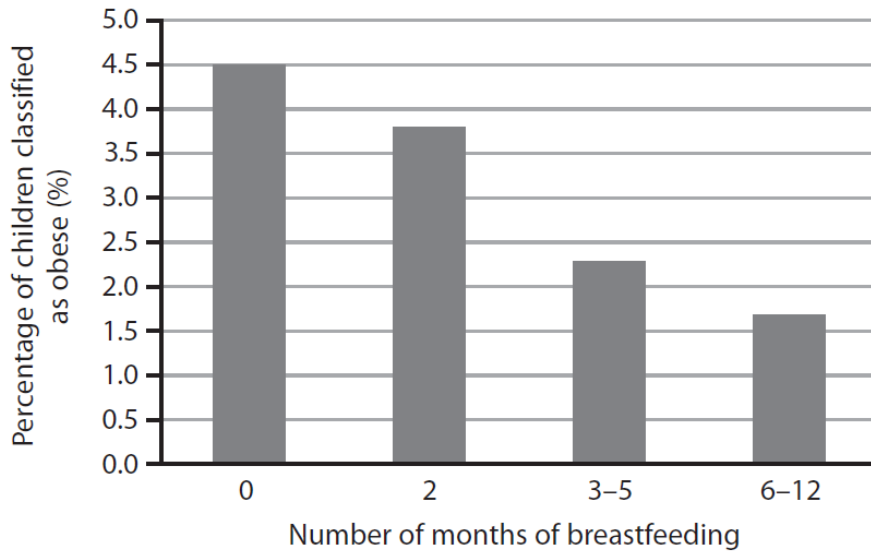
(c) The development of childhood obesity is affected by many factors.

Breastfeeding can affect the development of childhood obesity.

The graph shows the relationship between obesity in six-year-old children and the number of months that they were breastfed as babies.

(i) Describe the relationship between the number of months of breastfeeding and childhood obesity.

(2)

....

....

....

....

....

....

....

(ii) A six-year-old child can be classified as obese based on their body mass index (BMI) being over $19\,kg\,m^{-2}$.

BMI is calculated using the following formula.

$$\text{Body mass index (BMI)} = \frac{\text{body mass}}{\text{height}^2}$$

A six-year-old child is 115 cm tall with a BMI of 20.

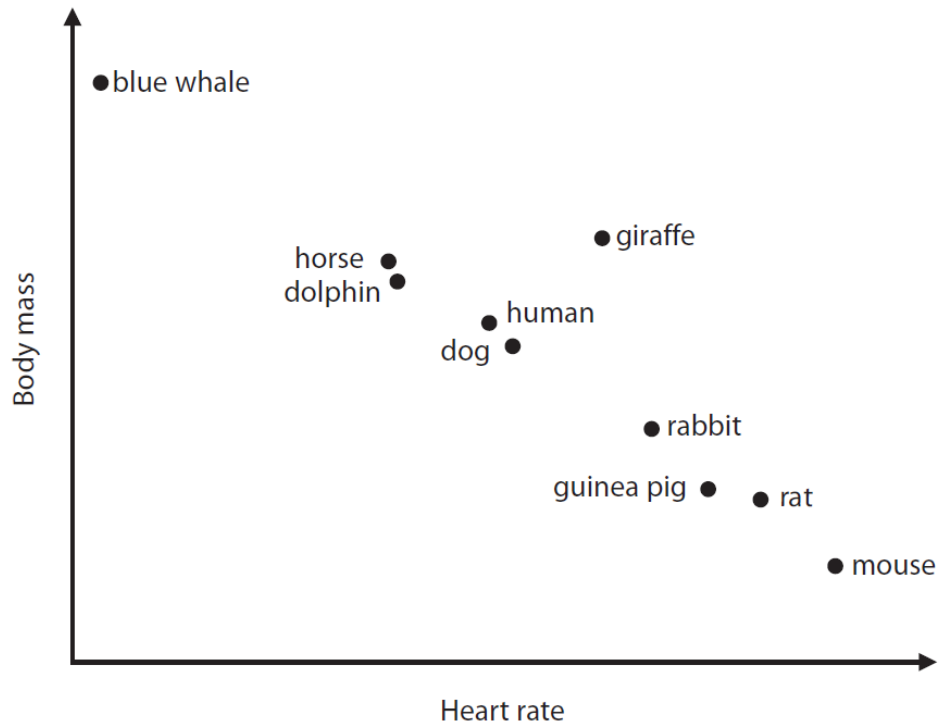Calculate the mass of this child to one decimal place.

(2)

Answer ....

(Total for Question 4 = 10 marks)

7 The heart rate of an animal often depends on its body mass.

The graph shows the mean heart rate of some animals and their mean body mass.

(Adapted from: http://www.cardio-research.com/quick-facts/animals)

(a) State the relationship between the average heart rate and the average body mass of these animals.

(1)

....

....

....

(b) Some chemicals can affect the heart rate of animals.

The effects of dopamine and caffeine on the heart rate of *Daphnia* were investigated.
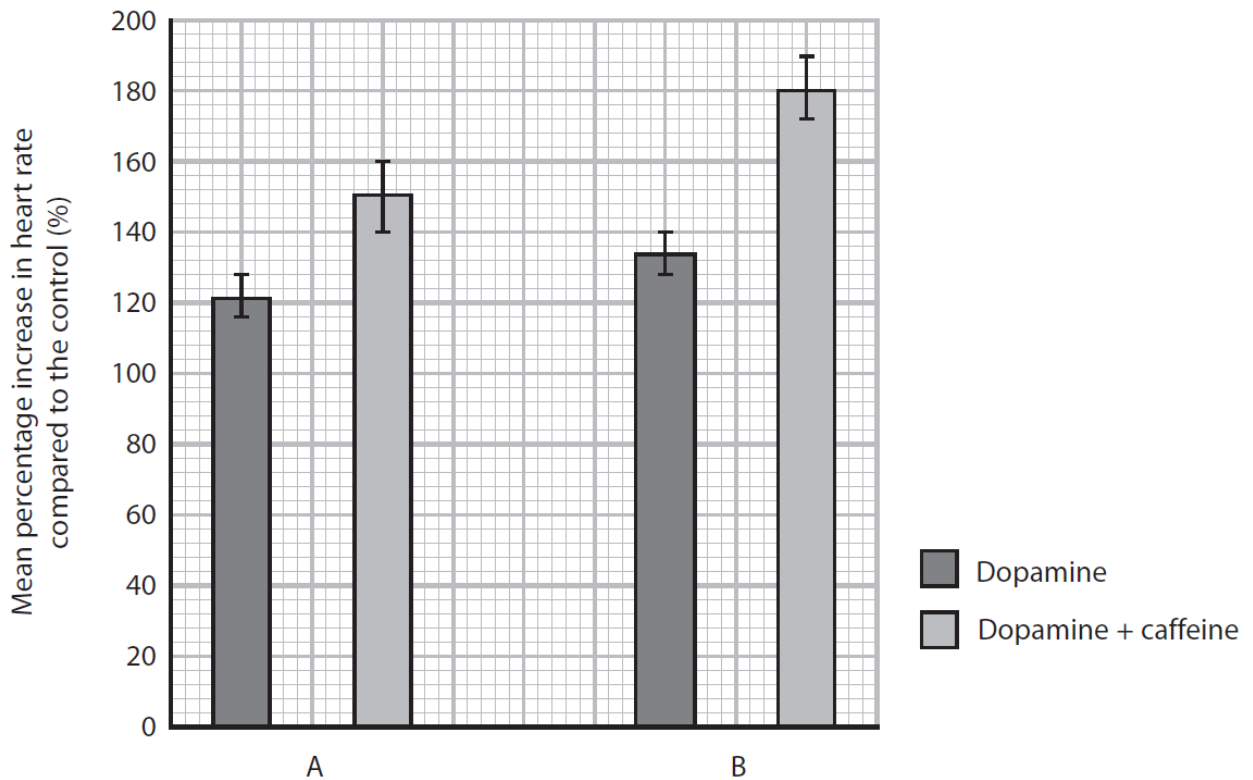
Investigation A used three different solutions:

- a control solution
- a solution containing 0.8 mg cm^{-3} dopamine
- a solution containing 80 µg cm^{-3} caffeine and 0.8 mg cm^{-3} dopamine

Investigation B used three different solutions:

- a control solution
- a solution containing 1.6 mg cm^{-3} dopamine
- a solution containing 80 µg cm^{-3} caffeine and 1.6 mg cm^{-3} dopamine

The graph shows the percentage increase in heart rate compared with the controls, for both investigations.

(i) Comment on the effects of dopamine alone and dopamine with caffeine on the heart rate of *Daphnia* in this investigation.

(4)

....

....

....

....

....

....

....

....

....

....

....

....

(ii) State and justify a suitable control for these investigations.

(2)

....

....

....

....

....

(iii) Devise a procedure that could have been used to produce the results shown in the graph.

(5)

(Total for Question 7 = 12 marks)

5 An investigation was carried out to study the effect of alcohol concentration on heart rate in *Daphnia*.

(a) Give one reason why some people believe that there are fewer ethical issues when using *Daphnia* for this investigation rather than using a species of mammal.

(1)

....

....

....

(b) In this investigation, *Daphnia* were placed into three groups of 10. Each group was placed in alcohol of a different concentration for five minutes.

After five minutes, each *Daphnia* was removed from the alcohol and its heart rate recorded every 15 seconds for one minute. A mean for each concentration was calculated.

The results are shown in the table.

Alcohol concentration / mol dm^{-3}	Mean *Daphnia* heart rate / beats per minute
0.00	221
0.17	176
0.34	97

(i) Give one reason why 10 *Daphnia* were used for each alcohol concentration.

(1)

....

....

....

....

(ii) Explain why the *Daphnia* were left for five minutes in the alcohol before the heart rate was recorded.

(2)

....

....

....

....

(c) Devise an investigation to find the lowest concentration of alcohol that has an effect on the heart rate of *Daphnia*.

(5)

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 5 = 9 marks)

TOTAL FOR TEST = 50 MARKS