Additional Assessment Materials Summer 2021

Pearson Edexcel GCE (Biology A)

Resource Set Topic 5: On the Wild Side

Question Paper

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

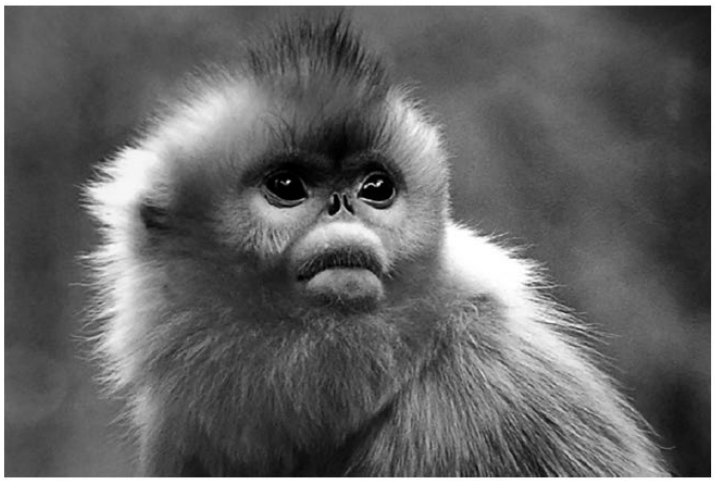
- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional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- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.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

2 The golden snub-nosed monkey (*Rhinopithecus roxellana*) is endemic to high mountainous regions of China.

This endangered species of monkey feeds on seeds.



(b) The population size of this species has decreased due to changes in its habitat. Climate change is one of the factors affecting the habitat of this species.

(i) Which of the following causes global warming?

(1)

☒ **A** a decrease in carbon dioxide and methane in the atmosphere that trap infrared radiation

☒ **B** a decrease in carbon dioxide and methane in the atmosphere that trap ultraviolet radiation

☒ **C** an increase in carbon dioxide and methane in the atmosphere that trap infrared radiation

☒ **D** an increase in carbon dioxide and methane in the atmosphere that trap ultraviolet radiation

(ii) Which of the following could provide evidence for climate change?

(1)

☒ **A** dendrochronology, peat bog pollen analysis and ice cores

☒ **B** ice cores, classification and peat bog pollen analysis

☒ **C** niche, dendrochronology and classification

☒ **D** niche, dendrochronology and ice cores

(c) Golden snub-nosed monkeys live in areas with very cold winters.

The seeds in their diet contain lipids and carbohydrates.

Climate change is reducing seed production by plants in their habitat.

Discuss the impact of climate change on the monkey population.

(4)

(Total for Question 2 = 6 marks)

4 Photosynthesis is a two-stage process by which plants fix carbon dioxide.

(a) Describe the light-dependent reactions of photosynthesis.

(5)

(b) The products of the light-dependent reactions are used in the light-independent reactions.

(i) In which part of the chloroplast do the light-independent reactions take place?

(1)

☒ **A** envelope

☒ **B** granum

☒ **C** stroma

☒ **D** thylakoid

(ii) What is the name of the enzyme used by plants to fix carbon dioxide?

(1)

☒ **A** GALPase (glyceraldehyde-3-phosphatase)

☒ **B** GPase (glycerate-3-phosphatase)

☒ **C** RUBISCO (ribulose bisphosphate carboxylase/oxygenase)

☒ **D** RuBPase (ribulose bisphosphatase)

(iii) Which of the following is the immediate product of the light-independent reactions of photosynthesis?

(1)

☒ **A** glucose

☒ **B** GP

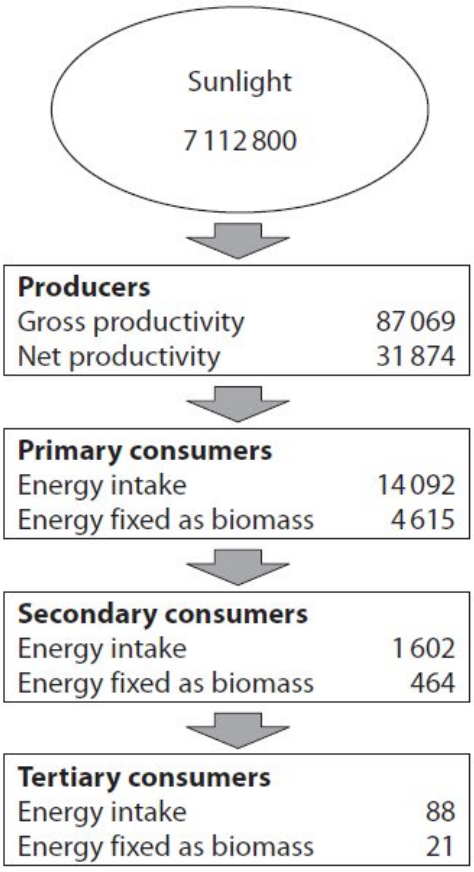
☒ **C** RuBP

☒ **D** starch

(Total for Question 4 = 8 marks)

2 Silver Springs is a state park in Florida. The photograph shows one of the many waterways in this state park.

(a) Energy flow through this ecosystem has been studied. The results are shown in the flow chart. All values are given in $kJ\,m^{-2}\,yr^{-1}$.



(i) Calculate how much energy is lost through respiration by the primary consumers.

(1)

Answer ..... kJ $m^{-2} yr^{-1}$

(ii) The table gives details of energy transfers at the different trophic levels.

Trophic level	Energy fixed as biomass / kJ $m^{-2} yr^{-1}$	Transfer efficiency (%)
Producers	31 874	
Primary consumers	4615	14.5
Secondary consumers	464	
Tertiary consumers	21	4.5

Calculate the efficiency of energy transfer between primary consumers and secondary consumers.

(1)

..... %

(iii) The efficiency of photosynthesis can be measured as the percentage of energy from sunlight that is converted to gross primary productivity (GPP).

Which of the following shows the percentage efficiency of photosynthesis in this ecosystem?

(1)

☒ **A** 1.2%

☒ **B** 12%

☒ **C** 36.6%

☒ **D** 55.8%

(b) Explain why the value for GPP is lower than the light energy available to the ecosystem.

(3)

(Total for Question 2 = 6 marks)

5 Climate change has been correlated with changing atmospheric carbon dioxide levels.

(a) Scientists studying climate change have examined peat bogs to observe pollen grains such as those shown in the photograph.

Explain how studying pollen grains in peat bogs can provide evidence of climate change.

(4)

(b) Scientists measured the productivity of two types of forest and recorded the mass of carbon taken up per square metre per year (gC m^{-2} y^{-1}).

The table shows data on the mean net primary productivity (NPP) and mean gross primary productivity (GPP) of these two types of forest.

Type of forest	Mean NPP / gC m^{-2} y^{-1}	Mean GPP / gC m^{-2} y^{-1}	Ratio of NPP to GPP
Boreal	322	1013	0.32
Temperate deciduous	1301	2165	0.60

(i) Calculate the percentage increase in mass of carbon released due to respiration by temperate deciduous forests compared with that by boreal forests.

(3)

.....%

(ii) The ratio of net primary productivity to gross primary productivity is a measure of the ability of forests to transfer carbon from the atmosphere into biomass.

Scientists concluded that temperate deciduous forests would reduce levels of carbon dioxide in the atmosphere more than boreal forests.

Justify this conclusion.

(3)

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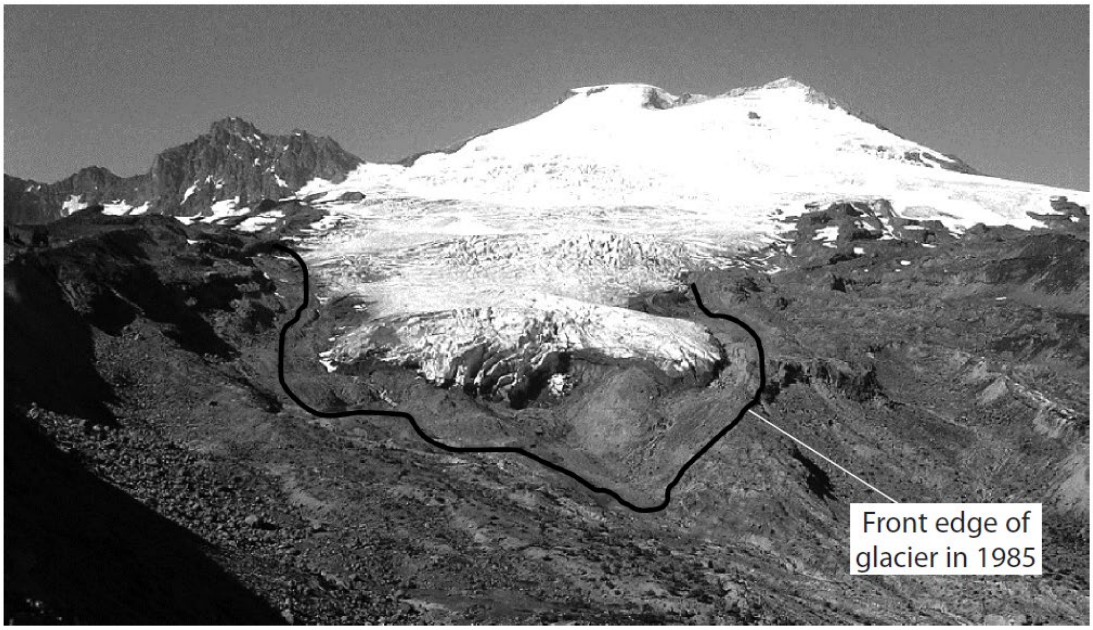
(Total for Question 5 = 10 marks)

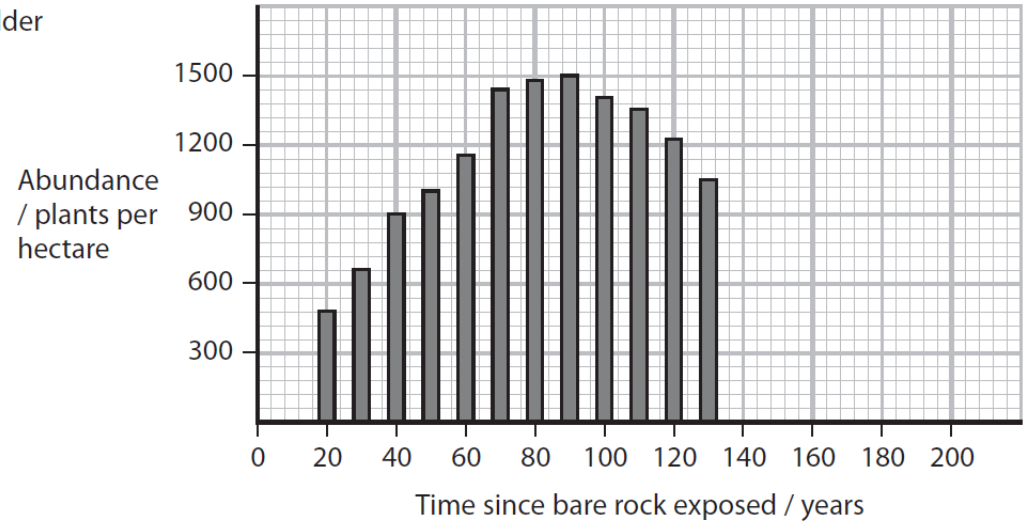
6 The photograph shows a glacier at the top of a mountain.
Glaciers in many areas of the world are retreating (reducing in size).
The line on the photograph shows the position of the front edge of the glacier in 1985.



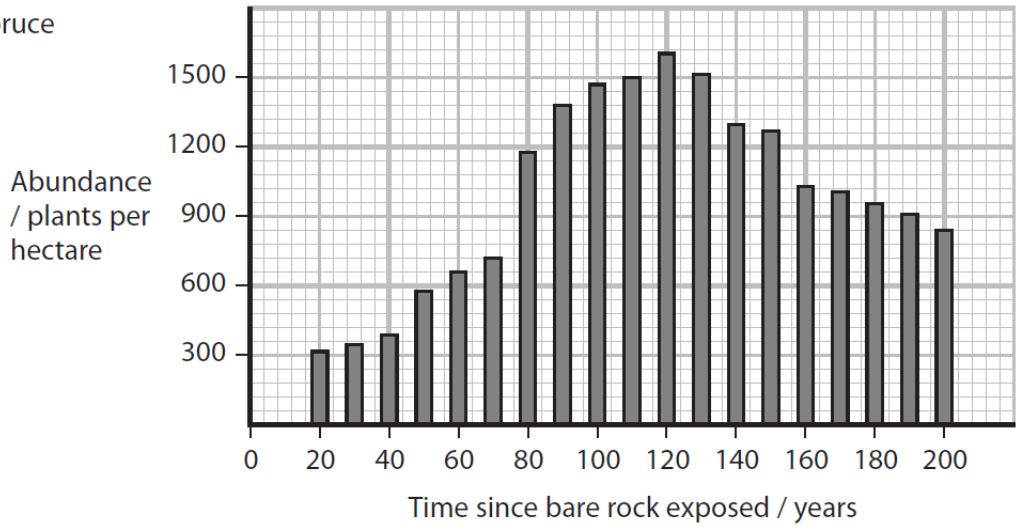
Bare rock is exposed as the glacier retreats. Two hundred years ago, bare rock was exposed after a glacier retreated. A study has been made of the long-term changes in vegetation on that area of rock after the retreat of the glacier.

The graphs show the abundance of three species of tree since the bare rock was exposed as the glacier retreated. The abundance of each species was measured every ten years for 200 years.

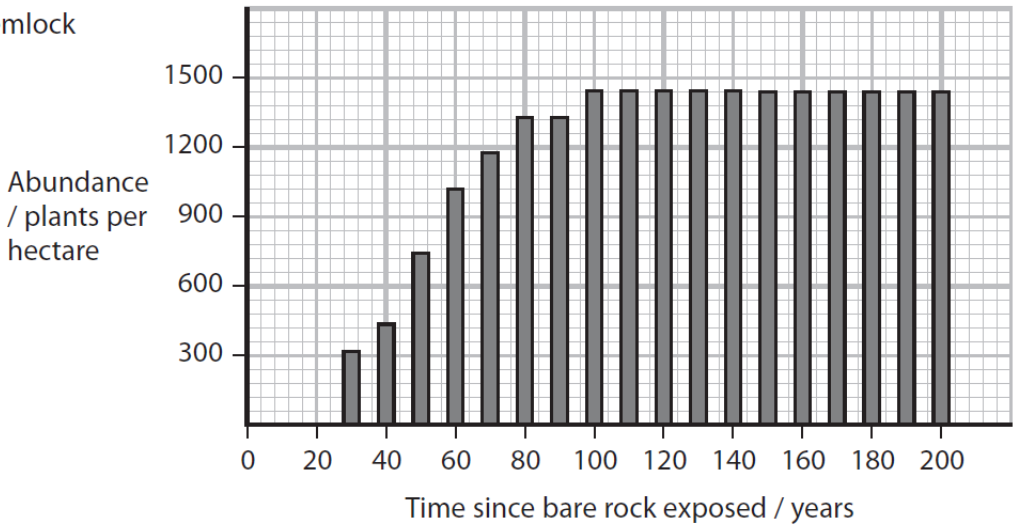
Alder



Spruce



Hemlock



(a) Comment on the changes in the abundance of these three species over 200 years.

(4)

(b) Explain what happened to the bare rock to allow the growth of these trees.

(3)

(c) Plants such as lupin are often found in the early stages of glacial retreat. Lupin plants have nodules on their roots containing nitrogen-fixing bacteria that convert atmospheric nitrogen to ammonium ions. Plants can use ammonium ions as a source of nitrogen.

Explain why lupin plants are able to grow in the early stages of glacial retreat.

(3)

(Total for Question 6 =10 marks)

10 The Intergovernmental Panel on Climate Change (IPCC) has issued the following statement:

"Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems."

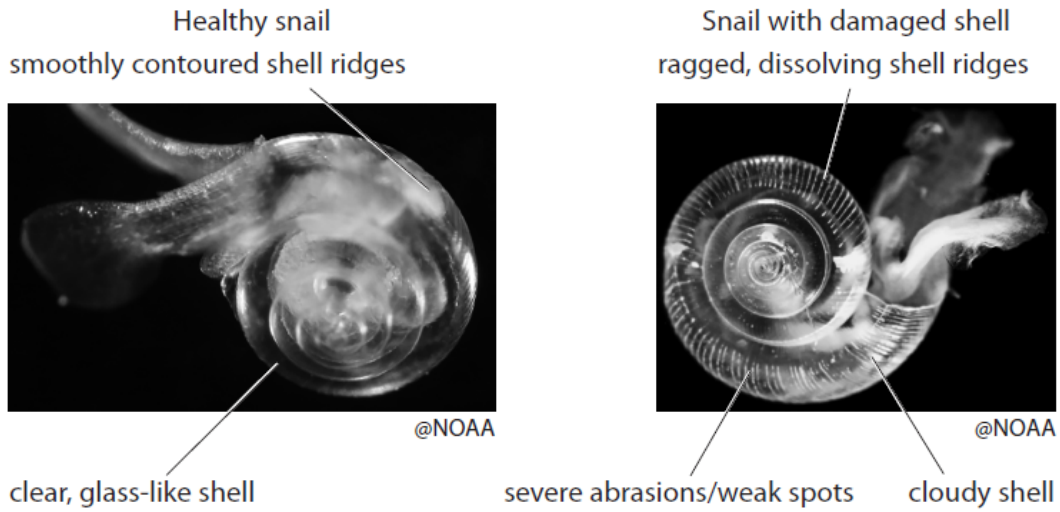
(a) Explain why anthropogenic emissions of greenhouse gases are affecting the climate.

(3)

*(b) Pteropods are small free-swimming snails found in oceans throughout the world. They are a food source for a variety of fish including salmon, mackerel and herring.

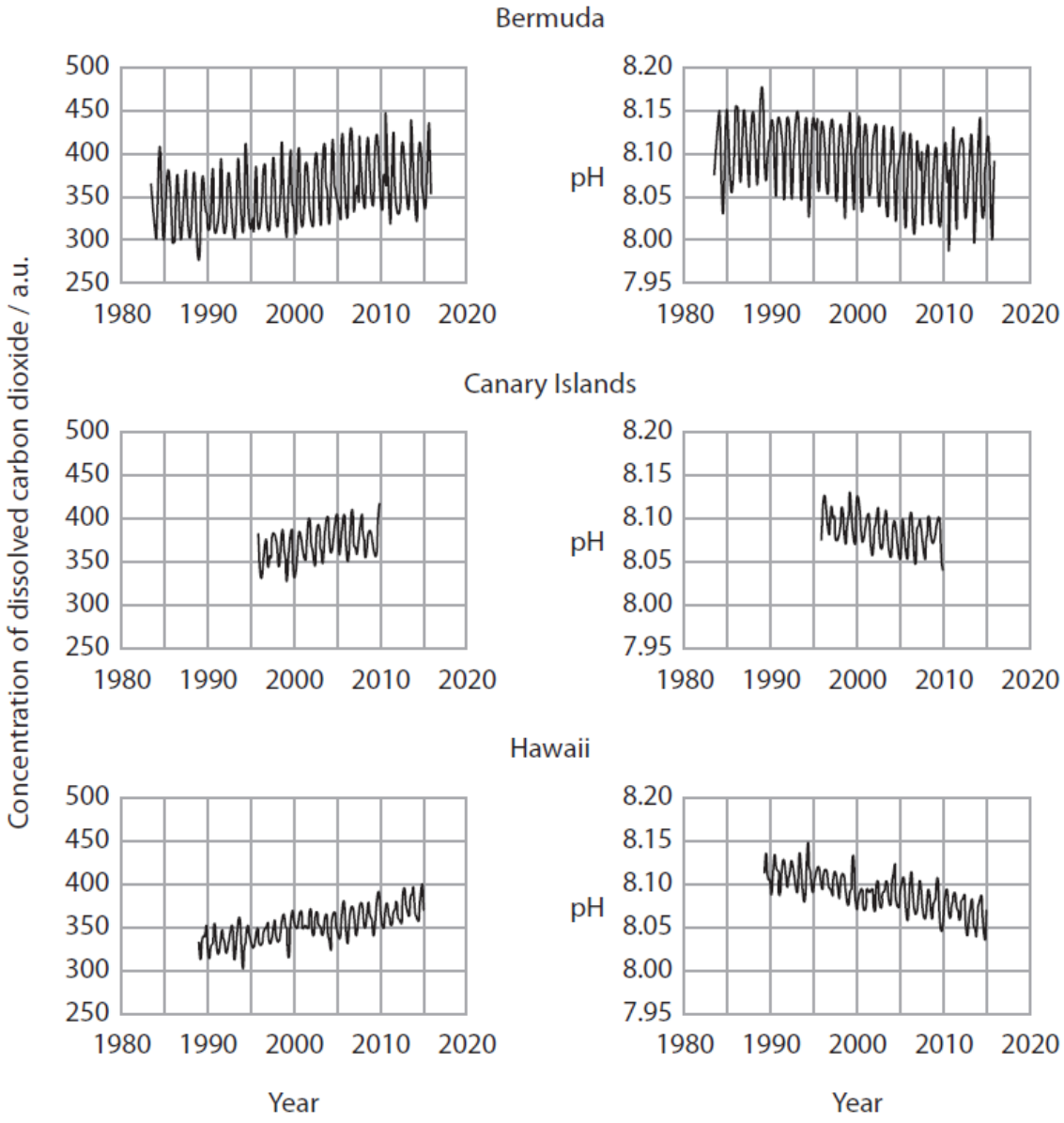
In 2011, the health of these snails was studied in the ocean around Hawaii. A sample of these snails showed that 53% of them had damaged shells.

The photographs show a healthy snail and a snail with a damaged shell found in the ocean around Hawaii.



The pH of sea water affects shell formation in these snails. The changes in carbon dioxide concentration and pH have been recorded in oceans surrounding several islands.

These records are shown in the graphs.



Analyse the data to discuss the likely impact of increased carbon dioxide emissions on fish populations in these oceans.

(6)

(c) Climate change can also affect the life cycle of organisms.

The effect of temperature on the lifespan of fruit flies (*Drosophila melanogaster*) was investigated.

The results are shown in the table.

Temperature / °C	Lifespan / days
15	130.3
21	86.3
27	41.6
30	20.4

Determine the relationship between the increase in temperature and the change in lifespan.

(2)

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(Total for Question 10 = 11 marks)

TOTAL FOR TEST = 51 MARKS