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) Q10a

IR Infra-red light carries alot of heat energy. This infra-red light is being emitted from the sun and coming to earth. Greenhouse gases trap the infra-red light in the atmosphere this then warms up the atmosphere, melting ice caps and warming seas. This has a tremendous effect on the natural ecosystems.

*(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.

Healthy snail

smoothly contoured shell ridges

@NOAA

clear, glass-like shell

Snail with damaged shell

ragged, dissolving shell ridges

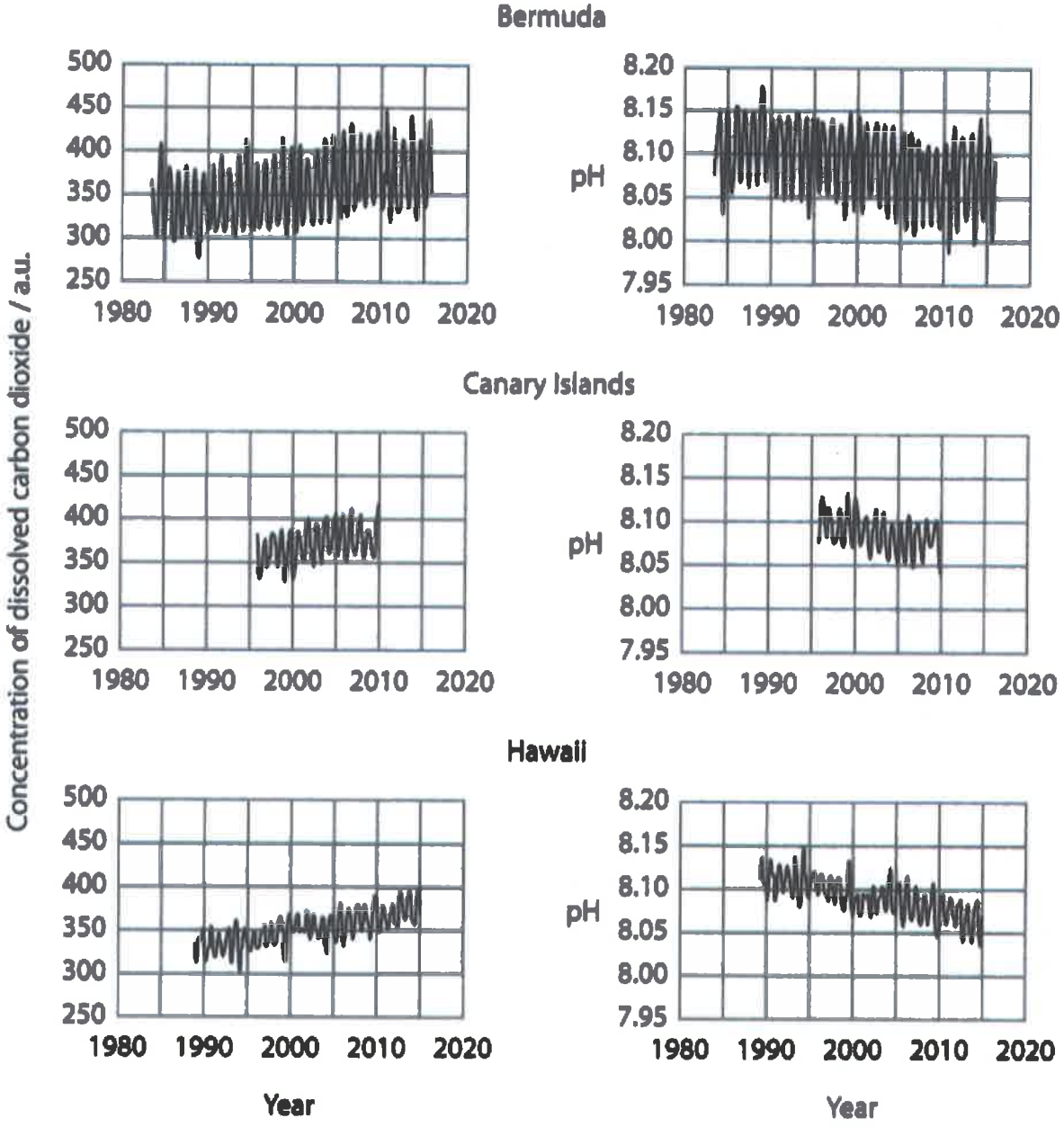
@NOAA

severe abrasions/weak spots

cloudy shell

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) 6 Q10b

An increase in CO_2 concentration in the atmosphere due to the burning of fossil fuels will increase the concentration of CO_2 in ocean because CO_2 will dissolve. In all three regions; there is shown an increase in dissolved CO_2 with a decrease in PH, the water becoming more acidic. This is a negative correlation. Animals that are damaged (e.g. pteropods' shell) are less likely to survive and therefore reproduce. This means that their population will decrease. As pteropods are probably primary consumers, this means that all subsequent trophic levels will not have as many pteropods to eat. This will result in a decrease population as there will not be sufficient food to support their life. If 53% of snails have a damaged shell and they cannot reproduce, this could mean a reduction in 53% of salmon, mackeral and herring which can affect human populations, aswell as bears and other and animals higher up on the food chain.

(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) 2 Q10c

As the temperature increases, the lifespan decreases. An increase of 15°C has resulted in an 88.84% decrease in the lifespan of the fruit fly. This is a negative correlation.

(Total for Question 10 = 11 marks) 8

11 Batten disease is a rare, inherited disorder of the nervous system. It usually begins in childhood. It is a recessive disorder.

(a) Explain what is meant by an inherited recessive disorder.

(2) 1 Q11a

To show their phenotype, you must have ø both recessive homologous pairs.

(b) (i) Parents without Batten disease have a child with Batten disease.

Which of the following describes the genotype of the parents?

(1) 1

- ☒ **A** bb and Bb
- ☒ **B** Bb and Bb
- ☒ **C** BB and BB
- ☒ **D** BB and bb

(ii) Draw a genetic diagram to show the probability of their future children developing Batten disease.

(2) 2 Q11bii

	B	b
B	BB	Bb
b	Bb	bb

25% of future children will suffere from Batten disease.

*(c) Genetic testing can be used to identify individuals who have genetic disorders such as Batten disease.

The table shows examples of some types of genetic screening and examples of where they may be used.

Type of screening	Method	Example
Blood test to identify risk of a disease	DNA from a blood sample is examined	Identifying presence of BRCA1 and BRCA2 mutations where there is a family history of breast cancer
Blood test to identify carriers of a genetic disease	DNA from a blood sample is examined	Establishing if a person is heterozygous for a recessive condition such as cystic fibrosis (CF)
Amniocentesis	Fetal DNA from amniotic fluid is tested	Identifying genetic disorders in the fetus
Chorionic villus sampling (CVS)	Fetal DNA from placental tissue is tested	Identifying genetic disorders in the fetus
Non-invasive prenatal diagnosis (NIPD)	Analysis of fetal DNA fragments from blood samples from the mother	Identification of chromosomal disorders and a small number of single gene disorders in the fetus
Pre-implantation genetic diagnosis (PGD)	Combined with IVF to test embryo at 8-cell stage	Ensures only embryos without a genetic disorder such as CF are implanted

Assess the advantages and disadvantages of these types of screening for genetic disorders.

(6) 4 Q11c

A blood test to identify risk of a disease and blood test to identify carriers of a genetic disease can only be used to find out the predetermined risk of ~~a~~ persons genes. ~~All~~ They cannot be directly used to identify the ~~change~~ chance of a child suffering. Amniocentesis is when a sample of the fluid is taken and analysed. This tells you any genetic disorders the child may have. ~~asked~~ This comes with risks though as there is the highest chance out of all of the tests for a miscarrige. CVS does the same but the placental tissue is sampled. There is a ~~slight~~ decrease in the chance of miscarrige but if the placenta does not repair itself then the a miscarrige is likely. NIPD only identifies single gene disorders like cystic fibrosis. Many genetic disorder are polygenic which means that to ~~sy~~ ~~suffer~~ suffer you will need to have it coded for on more than one chromosome. This means that many genetic disorders will go unnoticed. PGD can only be done ~~with~~ in conjuction with IVF. This most people do not use IVF so it is not applicable to most but it gives a certainty that the child will not have a genetic disorder

Total for Question 11 = 11 marks 8

TOTAL FOR PAPER = 100 MARKS

Suffer

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