Civics Group	Index Number	Name (use BLOCK LETTERS)	**H1**

ST ANDREW'S JUNIOR COLLEGE
2022 JC2 Weighted Assessment 3

H1 BIOLOGY **8876**

STRUCTURED QUESTIONS & ESSAY

40 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, civics group and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagram, graph or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

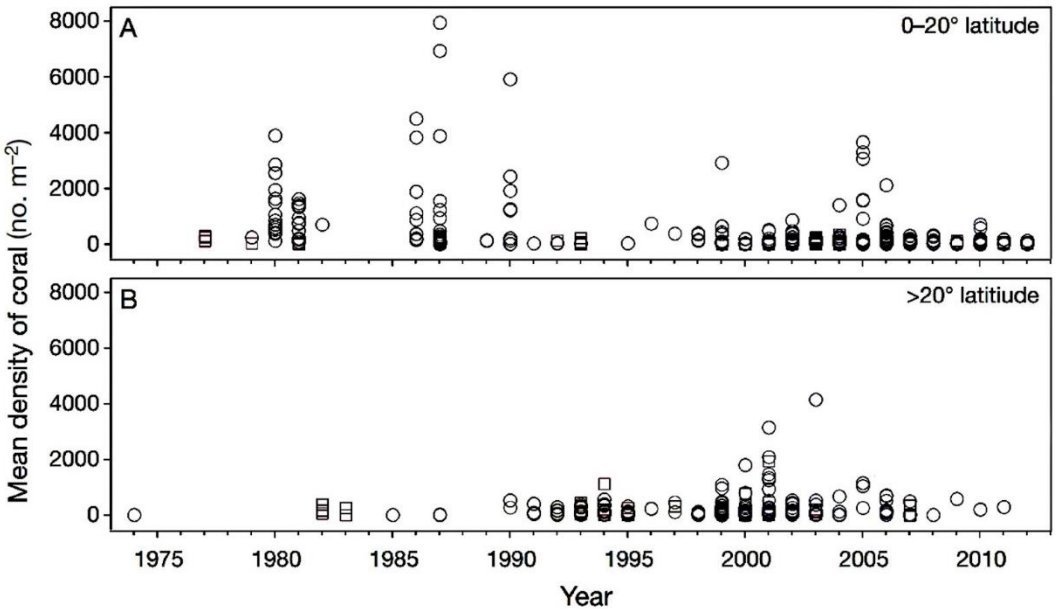
Answer **all** questions.
All working for numerical answers must be shown.

Conceptual error (C)	Data Quoting (D)	Expression (E)	Misreading the question (Q)

For Examiner's Use	
STQ 1	/9
STQ 2	/6
Essay	/10
Total	**/25**

QUESTION 1

Due to increase in greenhouse gases, global temperature has been on the rise, including the oceans. Marine organisms like corals are temperature sensitive. Fig. 8.1 shows the distribution of corals over a period of time.



Each circle represents a location with corals in it

Fig. 1.1

(a) With reference to Fig. 1.1, describe how the distribution of corals has changed from 1975 to 2010

…… [4]

1. [Describe trend]: At lower latitudes of 0-20°, coral density decreased from 1990 onwards.
2. [Quote data]: There were 7 locations with higher coral density of 4000-8000 corals/m^2 from 1975-1990 while only 1 location had coral density higher than 4000 corals/m^2 from 1990-2010 /AVP

3. [Describe trend]: At latitudes >20°, coral density increased from 1990 onwards / Corals have shifted from lower latitudes to higher latitudes.
4. [Quote]: There are hardly any corals found at latitudes >20° from 1975-1990, but saw an increase in coral density from 0 to 4000 corals/m^2 from 1990 to 2010.

(b) Explain why the change in distribution occurred.

…… [3]

1. At lower latitudes, warmer ocean temperature placed corals under heat stress
2. Which results in coral bleaching / expelling zooxanthellae
3. Which causes the coral polyps to be more susceptible to other stresses like disease and pollution.
4. At higher latitudes, water previously too cold to support coral and/or zooxanthellae survival are now warm enough to support their growth.

(c) Suggest possible impacts due to the change in distribution of corals.

…… [2]

1. When the corals shift to higher latitudes, marine species that depend on corals either shift with them,
2. or if unable to shift, become extinct.
3. This can negatively impact the local fishing / ecotourism industry
4. Leads to loss of biomedicine

[Total: 9]

QUESTION 2

(a) *Anopheles gambiae* go through four stages in its life cycle. Complete **Fig. 2.1** to show these stages. [1]

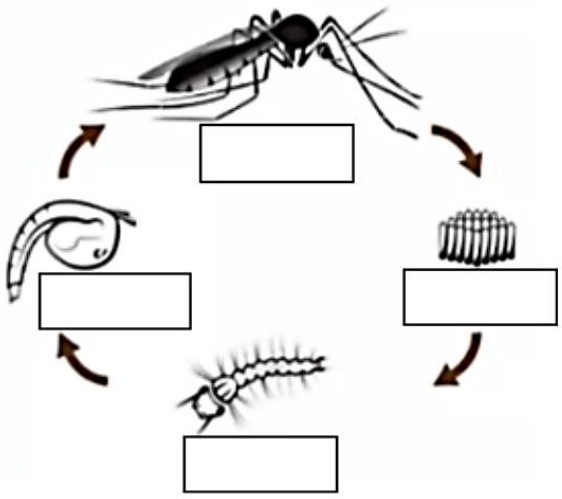


Fig. 2.1

Egg, larvae, pupae and adult; R mosquito for adult

(b) *Anopheles* mosquitoes thrive in regions with warm temperatures, humid conditions, and high rainfall. Thus, tropical and subtropical areas are ideal. Warm temperatures are also required for malarial parasites to complete their growth cycle within the mosquitoes.

Climate change due to global warming is expected to cause latitudinal and altitudinal temperature increases. Such a temperature increase will alter the biology and ecology of many mosquito vectors and subsequently, the dynamics of the diseases they transmit.

(i) Explain how increased temperatures could impact the biology of insects like mosquitoes.

…… [3]

1. **Compulsory point:** Idea of increased ambient temperatures lead to increased body temperatures of insects, resulting in <u>increased metabolism</u>

2. shorter / faster life cycles / lay more eggs / higher egg laying rate;
3. Female mosquitoes able to stay active for longer period e.g. of activity (feeding, mating)
4. Idea of narrower temperature tolerance – mosquitoes may not survive / have developmental problems when temperatures go too high (beyond the maximum temp they can tolerate)

(ii) Globally, average temperatures could increase by more than 2°C by the end of the 21st century.

Suggest **and** explain the effect this change in temperature will have on the distribution of malaria across the world.

…… [2]

1. Idea of spread <u>beyond the tropics</u> / malaria cases appearing in temperate areas / poleward expansion / at higher or lower latitudes / higher altitudes
2. Explain that spread of malaria will increase due to mosquitoes being able to thrive in areas where it was previously unsuitable for its breeding
3. Warmer temperatures means increased precipitation breeding sites for *Anopheles* mosquitoes

[Total: 6]

ESSAY QUESTION

In the oceans, the Chinook salmon migrate hundreds of kilometres from their place of birth to the ocean and back. Climate change has reduced the numbers that survive this journey. The effect of climate change is far reaching. Climate change affects an individual species in terms of its survival and spread, as well as all other species that are associated with it.

Discuss how human activities may lead to anthropogenic climate change, and how this consequently impacts marine ecosystems. [10]

1. Human activities (e.g. **fossil fuel burning, deforestation, ruminant ranching**; give at least 2)
2. increases greenhouse gas emissions, which causes the **global temperatures to increase**.

Effects of global warming:

3. **Melting of ice caps/sheets**, which results in loss of habitats in species like penguins and polar bears (which rely on them to reach hunting spots), threatening their survival as a species.
4. Without these apex predators to keep population size of their prey species in check, it could lead to imbalance in the marine ecosystem.

5. **Migration** of marine species to <u>higher latitudes</u> where the water is cooler.
6. This can result in **hybridization of species** which previously do not live together in the same region
7. May cause more **intense competition** for food and shelter due to the increase in number of “migrants”, which can **negatively impact the survival of the native species**.

8. Departure (or death) of some species from their original habitat creates a physical vacuum and if they are keystone species, can lead to the decimation of the intricately entwined ecosystem altogether.

9. Marine species shift the timing of their life events (e.g. in response to oceans warming earlier in spring), such as egg laying or migration pattern. This might cause a mismatch in the availability and timing of natural resources (e.g. food) that is needed for the survival and reproduction of marine species.
10. Some marine species face population declines and increased extinction risks if they are unable to shift their geographic range or timing of key life events.

11. Coral reefs are bleaching due to warmer temperatures due to stress-induced expulsion of their zooxanthellae.
12. Oceans absorb more CO_2 when they warm, which dissolves to form carbonic acid, leading to ocean acidification.
13. This reduces the ability of hard corals and shellfish to maintain their calcium carbonate exoskeletons (leads to death of coral & shellfish)

14. Warmer water may decrease the fertility of some marine species.

15. Warmer temperature generally favours the parasite in a parasite-host relationship and the predator in a predator-prey relationship. This results in stronger parasite and predation pressures on the marine species.

16. Rise in sea levels (due to melting of ice caps dumping more water into the ocean) can lead to low-lying coastal habitats like mudflats, mangroves and wetlands to be submerged under water.
17. This negatively affects the valuable ecosystem services provided by these habitats (e.g. as nurseries for juvenile marine species, or protection against coastal erosion) / loss of habitat to marine species living in them.

QWC- Good spread of points to explain the impact of climate change