A-level Worksheet Answers

Caswell Bay Geotrail Answers

To use this worksheet you will need access to Google MyMaps

Click here to go to the Caswell Bay Geotrail

Introduction

This geotrail was inspired by the Scratching the Surface geology and landscape walks series by Dr Geraint Owen. It covers a broad range of geological concepts including sedimentary rocks, fossils, mountain building, folding and faults. Exercises focus on drawing field sketches, building a stratigraphy, describing sedimentary rocks in the field and understanding the geological history of an area.

This worksheet is for stops 1-8 which focus on the geology within Caswell Bay. Stops 9-12 can be done as part of a guided walk along the coastal path to Langland Bay.

How to use this worksheet

The location of each stop is indicated on Google MyMaps. Each stop has an explanation with accompanying photographs showing key features of the site. This worksheet provides activities that can be done at each of the stops.

Stop 1: Caswell Bay stratigraphy

Q1. Draw 2 different species of fossil.

Remember to add a scale and label your sketch

Crinoid fossils

Coral fossil

Q2. Add the Caswell Bay Mudstone and High Tor Limestone to the stratigraphic column. Write a description for each rock formation.

Formation name	Formation description
High Tor Limestone	**High Tor Limestone** Brown/grey crinoidal limestone, containing abundant fossil fragments of predominantly crinoids but also solitary corals and brachiopods.
Caswell Bay Mudstone	**Caswell Bay Mudstone** Dark blue/grey to red/yellow, thinly bedded fine, muddy limestone with lamination.
Caswell Bay Oolite	**Caswell Bay Oolite** Massive pale blue/grey oolitic limestone.
Langland Dolomite	**Langland Dolomite** Grey/brown, bedded dolomite with occasional crinoid fossils and calcite nodules.

Stop 2: Langland Dolomite

Q1. Add the Langland Dolomite to the stratigraphic column from stop 1.

Q2. Look carefully at the white lumps pictured below. What mineral are they made of and what properties of this mineral could be used to identify it?

White lumps in the Langland Dolomite

The lumps are made of calcite. The properties of calcite that could help with identification in the field include:

- fizzing reaction to HCl
- 3 directions of cleavage creating a rhombic shape
- hardness of 3 meaning it can be scratched with steel.

Stop 3: Caswell thrust

Q1. Draw a schematic sketch of the Caswell thrust, showing the dip of the rocks, the direction of movement across the fault and the names of the formations either side of the fault.

Remember to add a scale and orientation to your sketch

Q2. What type of stress needs to be applied to the rocks to create this type of fault? Compressional or extensional?

Compressional

Q2. Why are the rocks dipping in opposite directions either side of the fault?

The fault is through the hinge of a fold. The rocks either side of the fault are the limbs either side of an anticline.

Stop 4: Syncline

Q1. Draw a field sketch of the syncline.

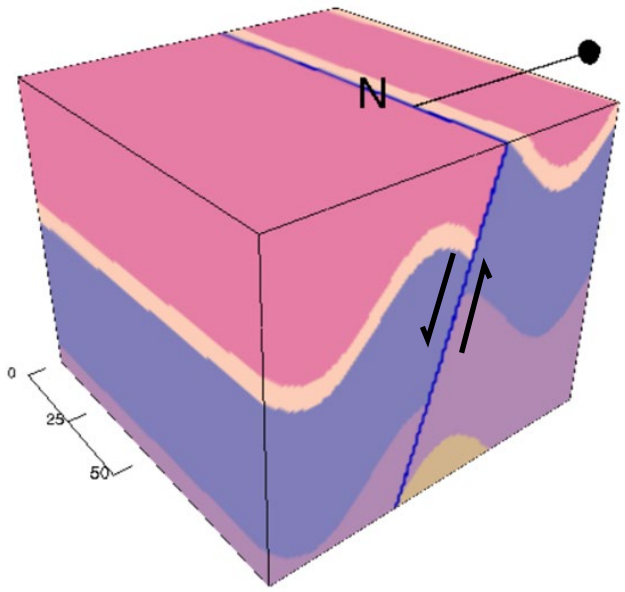
Remember to add a scale and orientation to your sketch

Syncline

Stop 5: Faulting in the bay

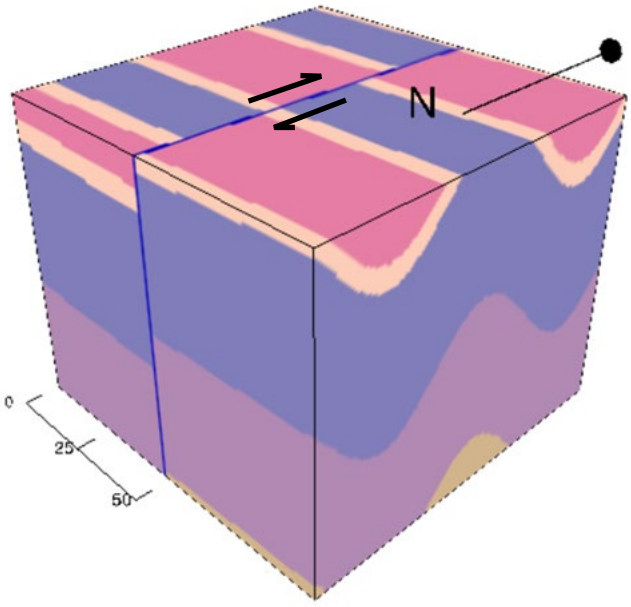
Q1. Label the block diagrams giving the name of the type of faulting and the example seen at Caswell Bay. You might need to wait until stop 8 before adding movement direction arrows to the fault in block 2.

Block 1



Reverse fault- Caswell Thrust

Block 2



Strike-slip fault- Fault through the Bay

Stop 6: Quaternary deposits

Q1. What is a superficial deposit? Give two examples of superficial deposits found at Caswell Bay.

Young geological deposits from the Quaternary. They are usually unconsolidated deposits such as gravel, silt, sand and clay. The glacial head and raised beach deposits at Caswell are examples of superficial deposits.

Q2. Describe the glacial head deposit.

Use the following prompts to help:

- What colour is the rock?
- What size are the clasts? Give a range.
- How rounded are the clasts? This is not how circular they are but how smooth the edges are. Use one of the following terms to describe their roundness:
  Well rounded, Rounded, Sub-rounded, Sub-angular, Angular, Very Angular
- What type of clasts are there? What is the most common?
- What is surrounding the clasts? Is it a mineral (known as cement) or finer sediment (known as matrix)?

Glacial head

Raised beach

The rock is made up of grey clasts surrounded by a finer orange/brown matrix. The clasts range in size from 1cm-50cm, with an average of around 10cm. The clasts are very angular. Over 95% of the clasts are carboniferous limestone although there are a few white/yellowish clasts of calcite. The clasts are surrounded by an orange/brown sandy matrix. This rock would be described as a breccia.

Q3. What is the geological name for the surface between the Carboniferous limestone and the much younger Quaternary deposits?.

An Unconformity. This is an example of an angular unconformity.

Q4. What is the geological history of the Caswell Bay geology? Write a list of events with the oldest at the bottom of the page.

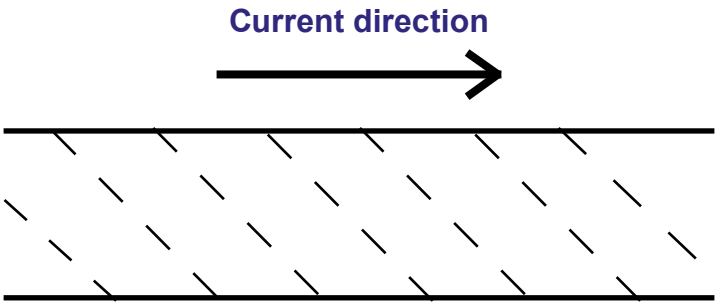
Youngest

- Erosion
- Deposition of periglacial head
- Erosion
- Drop in sea level
- Deposition of raised beach
- Rise in sea level
- A long-time of uplift and erosion (Unconformity)
- Strike slip faulting in centre of the bay
- The Caswell Thrust most likely happened during the folding deformation stage since it is formed by the same type of stress.
- The Variscan orogeny folding the rocks
- Compaction and diagenesis turning sediments to rock
- Deposition of Langland Dolomite
- Deposition of Caswell Bay Oolite
- Rise in sea level
- Formation of palaeosol and erosion
- Drop in sea level
- Deposition of the Caswell Bay Mudstone
- Deposition of the High Tor Limestone

Oldest

Stop 7: Cross lamination

Q1. Draw a sketch of the cross lamination and add an arrow to show which direction the current was flowing. Use the diagram of the cross lamination below to help.



Remember to add a scale and orientation to your sketch

Stop 8: Sea level changes

Q1. Is the strike-slip fault through Caswell Bay sinistral (moving left) or dextral (moving right)? Check your answers from stop 5.

Dextral

Q2. Why is the sea level higher during interglacial periods and lower during glacial periods?

During glacial periods water is trapped on land as large ice sheets, during interglacial periods the ice melts and returns the water to the sea causing global sea level rise.

Try our other geotrails at www.s4science.co.uk/geotrails/geologytrails

Find the worksheet at www.s4science.co.uk/geotrails/geologytrails/caswellbay

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