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Fossil Occurrence and the Age of Rocks

Problem:

How can the occurrence of fossils and their known age ranges be used to date rocks?

Materials:

* Geologic time scale
* Graph paper
* Pencil

Procedures:

1. A section of rock made up of layers of limestone and shale has been studied and samples have been taken. A large variety of fossils were collected from the rock samples. Use a sheet of graph paper to make a bar graph using the information shown in the Fossil Data Table. Begin by listing the types of fossils on the horizontal axis. Use Figure A to list the units of the geologic time scale on the vertical axis.
2. Transfer the range data of each fossil onto your graph. Draw an X in each box, beginning at the oldest occurrence of the organism up to the youngest occurrence. Shade in the marked boxes. You will end up with bars depicting the geologic ranges of each of the fossils listed.
3. Examine your graph. Are there any time units that contain all of the fossils listed? Write this time period at the bottom of the graph.

Diagrams:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Type of Fossil | Oldest occurrence | Youngest occurrence |
| 1 | Foraminifera | Silurian (444 MYA) | Quaternary (0.01 MYA) |
| 2 | Bryozoan | Silurian (444 MYA) | Permian (251 MYA) |
| 3 | Gastropod | Devonian (416 MYA) | Pennsylvanian (299 MYA) |
| 4 | Brachiopod | Silurian (444 MYA) | Mississippian (323 MYA) |
| 5 | Bivalve | Silurian (416 MYA) | Permian (251 MYA) |
| 6 | Gastropod | Ordovician (488 MYA) | Devonian (359 MYA) |
| 7 | Trilobite | Silurian (444 MYA) | Devonian (359 MYA) |
| 8 | Ostracod | Devonian (416 MYA) | Tertiary (1.8 MYA) |
| 9 | Brachiopod | Cambrian (542 MYA) | Devonian (359 MYA) |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.01 | X |  |  |  |  |  |  |  |  |
| 1.80 |  |  |  |  |  |  |  | X |  |
| 5.30 |  |  |  |  |  |  |  |  |  |
| 23.00 |  |  |  |  |  |  |  |  |  |
| 33.70 |  |  |  |  |  |  |  |  |  |
| 54.80 |  |  |  |  |  |  |  |  |  |
| 65.00 |  |  |  |  |  |  |  |  |  |
| 145.00 |  |  |  |  |  |  |  |  |  |
| 200.00 |  |  |  |  |  |  |  |  |  |
| 251.00 |  | X |  |  | X |  |  |  |  |
| 299.00 |  |  | X |  |  |  |  |  |  |
| 323.00 |  |  |  | X |  |  |  |  |  |
| 359.00 |  |  |  |  |  | X | X |  | X |
| 416.00 |  |  | X |  | X |  |  | X |  |
| 444.00 | X | X |  | X |  |  | X |  |  |
| 488.00 |  |  |  |  |  | X |  |  |  |
| 542.00 |  |  |  |  |  |  |  |  | X |
|  | Foraminifera | Bryozoan | Gastropod | Brachiopod | Bivalve | Gastropod | Trilobite | Ostracod | Brachiopod |

All of the fossils were present between 359-416 million years ago.

Analyze and Conclude:

1. The age of the hypothetical layer that these fossils were collected from is 359-416 million years ago.
2. Based on the age determined, I think it could be a group of index fossils because when considered as a group they give a very specific time period, so we could conclude if these fossils were found elsewhere in a group, that the rock layer would be the same age.
3. If a particular trilobite is limited to the rocks of lower Devonian age then it could be considered an index fossil on it’s own because anything found in a layer of rock where this fossil was found could be considered the same age and could be dated.
4. Based on the rocked types of limestone and shale these organisms probably lived in an ocean shoreline.
5. We cannot use radioactive dating to assign a numerical date to this rock unit because it has a half-life of 5730 years and it decays too fast and these rock layers are much older than that. They are 359-416 million years old.