Q3 The Geologic Time scale and relative dating

Read and think about.

Geologic time stretches 4½ billion years from the time of the formation of Earth to the present day. The Geologic Time Scale lists the succession of sedimentary rock deposits that are recognized on and immediately beneath the Earth's surface. These rock deposits form stratigraphic columns with the youngest on top and the oldest on the bottom.
Geologic time scales are the time framework for:

- Dating, correlating and classifying rock formations and geological events
- Providing the time framework for the history of Earth and its life
- Giving a geological age to rocks and fossils
- Calibrating the rates of geological processes such submergence, uplift and erosion of the land, earthquake frequency and volcanic activity.
- Measuring rates of change of climate, sea-level rises and falls, and biodiversity.

The diagram below is only a subsection of the whole geologic time scale but it relates to New Zealand because we are geologically a young country.

Note that the geologic time scale starts with the most recent time at the top. Also, there are 3 divisions – Era, Period and Epoch. Mya stands for millions of years ago. The divisions are based on breaks in the geologic record and represent geological events or events such as mass extinction. For example, the boundary between the Cretaceous period and the Tertiary period is defined by the extinction event which marked the death of the dinosaurs and many other groups of life.

You don't have to learn this but you need to be able be able to read and interpret it.

Era	Period	Epoch	Age
Cenozoic	Quaternary	Holocene	0.01 mya
		Pleistocene	1.8 mya
	Tertiary	Pliocene	5 mya
		Miocene	23 mya
		Oligocene	34 mya
		Eocene	55 mya
		Paleocene	65 mya
Mesozoic	Cretaceous	Late	99 mya
		Early	144 mya
	Jurassic	Late	159 mya
		Middle	180 mya
		Early	206 mya

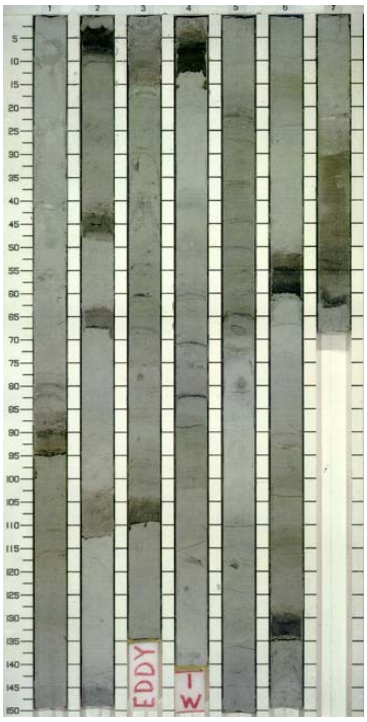
mya: Million years before present

http://www.sciencelearn.org.nz/Contexts/A-Fizzy-Rock/Sci-Media/Images/Geological-timescale-section

Relative dating

Relative dating is the process of determining the order that things happen in geological time. Important points are:

- When sediments are deposited the oldest is always on the bottom and the youngest on the top
- Sediments are deposited in flat, horizontal layers
- Each layer will extend for a long way in all directions
- Sometimes volcanic rock will rise through the layers. This is called an igneous intrusion. It will be younger than the surrounding rocks.
- When a fault cuts across layers of sedimentary rocks the fault will be younger than the layers



http://www.teara.govt.nz/en/photograph/5630/sediment-cores

A sediment core is a cylindrical sample of material from the seabed. This is a sediment core taken 670 km east of the North Island at a depth of 4 km. The youngest part is top left and the bottom is halfway down column 7. The column is very long which is why the photograph shows several columns.
The light grey areas contain fossilised plankton and indicate changes in the ocean over thousands of years. The darker layers are ash deposits erupted from volcanoes in the Taupo region.

Exercise:

1. How many separate volcanic events does this sediment core show?
2. Which layer possibly shows the most violent eruption?
3. Could these as deposits be cross-correlated with ash deposits on land in order to help date the eruptions? What might a road cutting look like that could be used for such cross-correlation?
4. If the eruptions could be accurately dated, how would that aid research on the plankton layers?