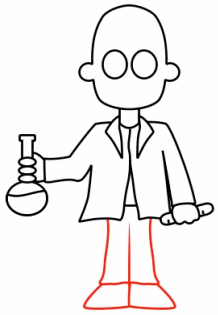
Student Name _____ ***Date Submitted*** _____



SCIENCE 10 (v4)

Section 1.0 Send-In

Complete this send-in as part of your course enrollment. This will be your first mark entered for the course. When this assignment has been received by SCIDES, your course materials will be sent to you.

This send-in consists of:

- Science 10 Course Planner _____/ 5 marks
- Guided Practice 1.1A1 _____/ 8 marks
- Guided Practice 1.1A2 _____/ 7 marks

TOTAL: _____/ 20 marks _____%

Mail:

1) This **Cover Sheet**
2) **Return Address** (page 2 or Comment Sheet) – Fill out with your complete name and address.
3) **Send-In Assignments** – Completed Part A and Part B assignments.

*Be sure to put proper **postage** on the envelope (if necessary) and add your **return address**.*

Name: _____

___ / 5 marks

Science 10 Course Planner

Complete <u>all</u> the following contact information that applies to you and check the one that is the best way to contact you during the day:

❑ Home Phone: _____ ❑ Work Phone: _____ ❑ Cell: _____

❑ Email: _____

❑ other way to contact you (explain) _____

When is the best time for your teacher or tutor/marker to contact you? ___:_____ AM PM

Check your Grade: ❑ Grade 9 ❑ Grade 10 ❑ Grade 11 ❑ Grade 12 ❑ Graduated

Timetable Options/Course Plan

One of the keys to being successful in anything that you do is to take the time to plan carefully. The objective of this section is to help you create a timetable for managing your schoolwork and enable you to set goals for finishing all of your courses by your desired completion date. **Most full-time students complete 3 to 5 assignments each week.**

The flexibility of our distributed learning program offers you many choices but a plan for completion is essential to success. Most full-time students complete 8 courses in a school year (10 months). The most common timetables are 'semestered" (4 courses at a time) or "linear" (8 courses at a time).

What is your planned schedule? ❑ Semester System (22 weeks) ❑ Linear System (44 weeks)

❑ other: *(explain)* _____

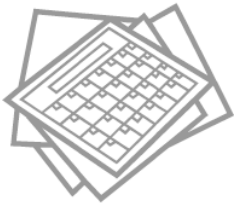
What is your intended START date for this course? ❑ Now ❑ other date: _____

What is your intended completion date for this course? _____ (month) _____ (year)

How many courses are you taking with us this year? ____ How many with other schools/programs? _____

Science 10 consists of 19 more send-in assignments and 5 module tests. How many assignments/tests per week must you do to complete this course as planned? _____

- *Mark target submission dates on a calendar.*
- *Add this same information from other courses to help you create a schedule for completion.*
- *Record the actual dates you submit work so you can track your progress.*



Delivery Method

Science 10 is offered as an online-supported print course. You will receive workbooks in print form and you have the option of also accessing the online support. If you sign up for the Science 10 online classroom, you may still choose to do assignments on paper and send in by regular mail.

In the online classroom, you will find:

- assignments uploaded as templates in Word. You submit the completed assignments electronically.
- tips & pointers for doing the course including comments from the marker/tutor and links out to websites that clarify the concepts
- access to other Science 10 learners and your marker/tutor

Benefits to the online classroom:

- word-processing ability on assignments
- clarification of concepts and/or assignment instructions
- quicker turn-around time for marked assignments
- improved/corrected assignments (the uploaded assignments may differ from the print versions)
- participation is completely optional even once you have access

Would you like access to the online classroom for Science 10?

❑ *YES* ❑ *NO THANKS*

Provincial Exam

Science 10 is a provincially examinable course for all students on the 2004 (current) Graduation Program. You will receive information about the provincial exam process and schedule with your course materials--review this information carefully. The provincial exam counts for 20 percent of your final grade in Science 10.

In which session do you intend to write? _____

Anything else?

Is there anything else you would like us to know about you or your education plans or learning style that will help us provide you with better service?

You are REQUIRED to fill out your return address on this page if you DOWNLOADED this Assignment. [If the Assignment was mailed to you, please fill out the back of the white page of the 3 part District Education Comment Sheet.]

Please Print Clearly

NAME	
ADDRESS	
CITY / TOWN	
PROVINCE / COUNTRY	
POSTAL CODE	

Complete your MAILING address.

Is this a change of address? ☐ **Yes** ☐ **No**

Lesson 1.1A
A Continental Drift Theory

Overview

Since the European discovery of the Americas over 600 years ago, explorers and scientists have observed many curious land formations. From newly drawn maps, they noticed similar coastline shapes of certain continental landmasses. Those travelling to the new world saw similar mountain formations to those found in northern Europe. They saw features in warm equatorial locations that looked very similar to features seen in ice-covered regions such as Greenland and Antarctica. These and other discoveries puzzled scientists at the time. Why were features on such distant lands so similar? And why were some features found in places where they didn't seem to belong?

The first person who attempted to make sense of it all was a young German scientist called Alfred Wegener, and he did so in the early part of the 20th century. In this lesson, you will learn about his new idea about continental movement. You will also read about the evidence he used to support his radical theory. Finally, you will discover the reasons why most scientists at the time disagreed with his ideas.

■ **Figure 2.2**

Alfred Wegener, a German meteorologist, proposed the continental drift hypothesis in 1912 based on a tremendous amount of geologic, paleontologic, and climatologic evidence. He is shown here waiting out the Arctic winter in an expedition hut in Greenland.

The Birth of a Theory

Thanks to exploration, the first world maps were created over 350 years ago. Explorers and scientists who read these maps noticed something odd. They noticed that the edges of some continents and landmasses seem as though they could 'fit' together. A good example is the coastline of South America, which looks as though it could neatly fit into the West African coastline.

While similar coastlines do seem to fit together like a jigsaw puzzle, no one seriously believed that large landmasses could move around on the Earth's surface—no one that is, until scientist Alfred Wegener, in the early 20th century.

Evidence Supporting the Theory of Continental Drift

Scientists are curious people. They always try to explain what they see happening around them. If they can provide lots of proof for their explanation, then their explanation becomes a theory. On the other hand, if there is enough evidence to show the explanation is wrong, the theory is thrown out.

A theory, then, is an explanation that has been tested, and has lasted for a long time. A theory requires supporting evidence; Wegener found lots of evidence to support continental drift.

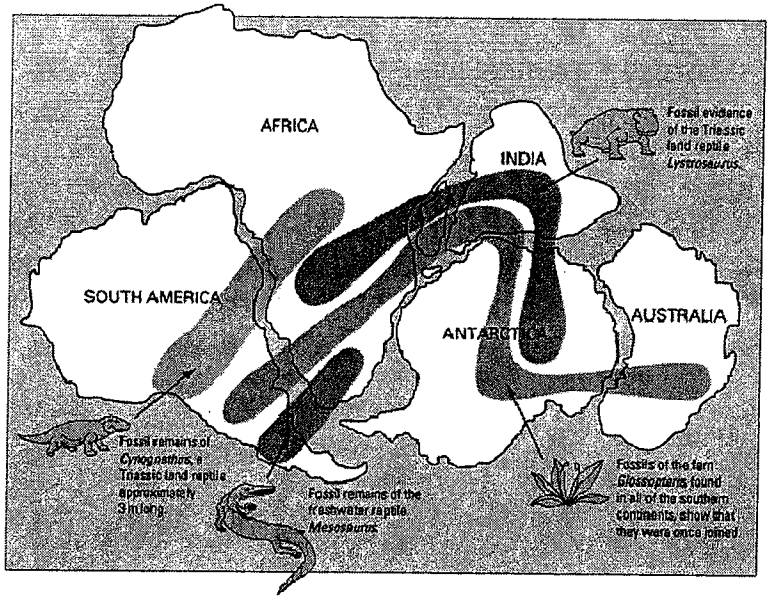
The Fit of Continental Coastlines — Wegener used the jigsaw puzzle fit between the South American and African coastlines as his first piece of evidence to support continental drift. He didn't believe that these "pieces" would be so well matched-that is, not unless they had actually once been connected.

Similar Mountain Ranges and Rock Sequences —

Explorers quickly discovered that distant continents contained rock of similar ages and features. These findings seemed to show that the continents may not have always been separated as they are now. For example, this is what they found when they looked at the Appalachian Mountain Range of North America:

- This range stretches northward from the eastern United States up into the Atlantic provinces of eastern Canada. There, it seems to suddenly stop at the island of Newfoundland.
- Very similar mountain ranges of the same age and rock-type also appear in eastern Greenland, Ireland, Great Britain, and Norway.When these landmasses are placed together, the mountains form a single long range, as shown in the following image.

Fossil Evidence — A fossil is any evidence of ancient life. In the beginning of the 20h Century, fossil evidence was also found to support continental drift. Identical fossilized plant and animal species have been found in many different places, on different continents. It seems hard to believe that such similar organisms would exist so far away from each other, or that they could have swam from one continent to another. It is more likely that these life forms once lived all together on a single continent, as shown in the following image.



Credit: Fossil Evidence for Continental Drift, USGS, United States Geological Survey

At the same time, there was also fossil evidence showing extreme climate changes on some continents. For example, remains of tropical plants, like fern fossils, were found in areas that are now in the ice-covered polar region of Antarctica. This showed that Antarctica may once have been located in a warmer part of the Earth.

Glacial Evidence — Wegener wasn't the only scientist looking for evidence to prove the theory of continental drift. Many others were hunting for clues using **paleoglaciation**. Paleoglaciation is the study of surface features formed by ancient glaciers.

Evidence of glaciers was discovered in warm places like Africa, South America, India, and sunny Australia. How could large moving sheets of ice have once existed in these places? The best explanation was that these continents were once together in a much colder place than they are now. At the same time, northern continents, which do not show this evidence of ancient glaciers, might have once been located in warmer places closer to the equator than they are today.

Guided Practice 1.1A 1
Evidence for the Continental Drift Theory

Each of the pieces of evidence below supports continental drift theory. Give a specific example for each piece of evidence. (You may want to look at the diagrams and key points in Section 1.1A.)

(2 marks each)

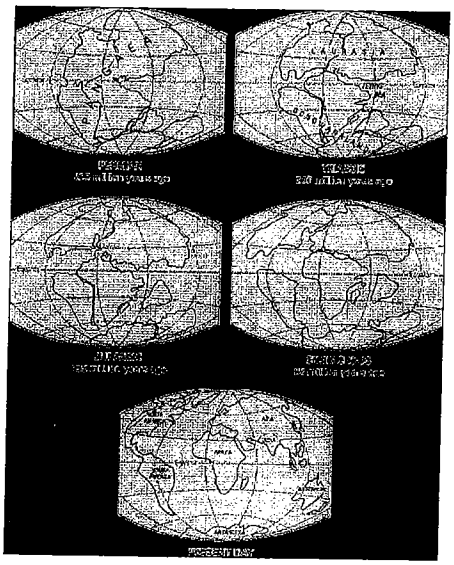
Continental Drift Evidence	Example
The "jigsaw" fit of continents.	
Paleoglaciation in unusual places.	
Discoveries of the same land-based fossils on distant continents.	
Similar mountain ranges found on distant lands.	

Putting It All Together

Based on this evidence, Wegener developed the **continental drift theory** in 1912, and published his theory in 1915. The theory states the following:

- Long ago in Earth's history, there was a single **supercontinent**, which Wegener named Pangea.
- Starting about 200 million years ago, Pangea began to slowly break apart.
- Large land masses (continents) started to "drift" and changed position relative to each other.
- The continents consist of lighter rocks that "float" on the heavier crust.
- The relative positions of the continents are not rigidly fixed, but are slowly moving at a rate of a few centimetres per year. (To compare, this is about the same speed at which your fingernails grow!)

From Wegener's description, it seems as though continents are moving very slowly. But remember, the Earth has also existed for a VERY long time: 4 600 000 000 years! In terms of *geologic time* (as in Earth history), Pangea took very little time to break up and form the continental landmasses we know today. Continental drift only seems slow to us because the average person lives only about 80 years. This amount of time is so short compared to the Earth's age. Eighty years is also much shorter than some of the geological events that take place on our planet, such as the breakup of Pangaea.



Skeptics in Science

At the time, not all of Wegener's proposals made sense in the scientific community. In attempting to explain how the continents were able to move, he suggested two possibilities:

1. Continents plowed through the oceanic crust like a ship plowing through water.
2. Continents simply slid over top of oceanic crust like a hockey puck on ice.

Scientists quickly and correctly disproved these suggestions. They noted that the oceanic crust is far too solid and rigid to be pushed aside like water. They also pointed out that there is too much friction to allow continents to slide over oceanic crust. In the minds of most scientists, these arguments proved that Wegener's entire theory of continental drift was wrong.

However, it is important to note that only the *method* of continental movement was proven incorrect. The idea that continental drifting occurred was **not** disproved. Nor was the evidence that supported this movement. However, no one came forward with a better idea of how the movement occurred. Because of this, Wegener's theory was forgotten for another 50 years. Then, a new theory was developed: the theory of plate tectonics.

Guided Practice 1.1A 2
Continental Drift Theory

Refer to the attached **GEOLOGICAL TIME** data sheet

(page 7 from the Sc 10 Data Booklet)

For this activity, go to page 7, the *Geological Time Chart.* Examine this chart carefully; it shows the following information:

- large and small sections of Earth history, listed as *eras, periods,* and *epochs* (left side of chart); these time sections are created to mark important events in geologic time

- timeline to show both the length of each section, as well as when significant events took place—note that all times are listed in Ma, or *millions of years* (i.e., x 1 000 000 years): for example, the beginning of the Cenozoic Era was 65 000 000 years ago
- a list of six tectonic plate maps, showing the positions of continents at different times in Earth history
- under the heading *Lithosphere*, a listing of important events that took place in Earth history

After examining the chart, read each statement that follows. Then based on the information given on the chart, decide whether:

A. *The statement is supported by the information given.*

B. *The statement is refuted by the information given.*

C. *The statement is neither supported nor refuted by the information.*

___ 1. Pangea formed 270 Ma ago.

___ 2. The Atlantic Ocean formed before Pangea began to break apart.

___ 3. Of the four eras listed, the shortest length of time took place during the Precambrian Era.

___ 4. A new supercontinent will form at some point in the future.

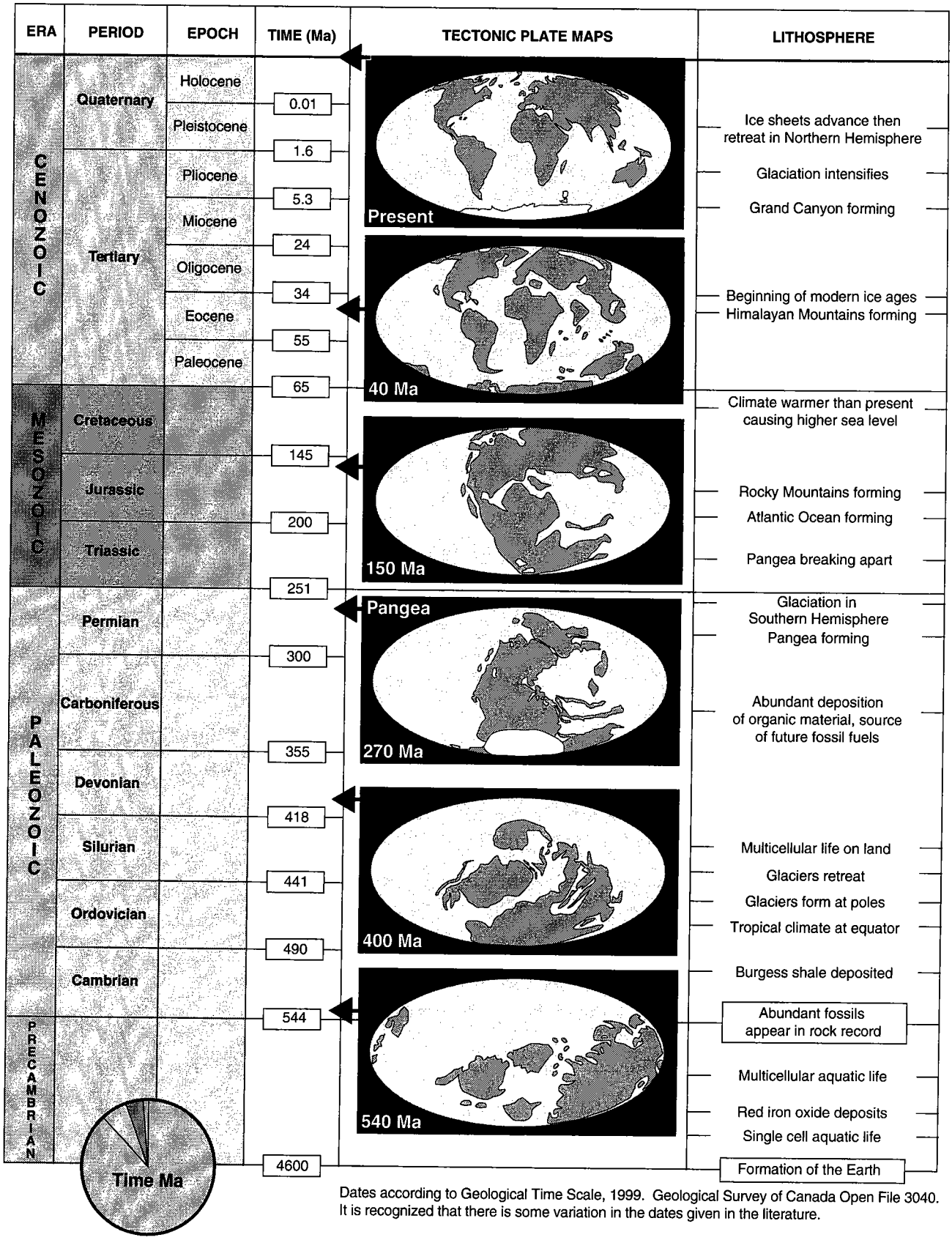
___ 5. The Earth's climate was warmer during the Cretaceous Period than it is now.

___ 6. The modern ice ages were caused by the breakup of Pangea.

___ 7. The Holocene Epoch began 1 000 years ago.

(_____ /7 marks)

GEOLOGICAL TIME



Dates according to Geological Time Scale, 1999. Geological Survey of Canada Open File 3040.
It is recognized that there is some variation in the dates given in the literature.