Grade 8

Blackline Masters

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The Compound Microscope

Purposes:

- Identify and describe the function of the parts of a compound microscope.
- Demonstrate proper care and use of the microscope (i.e., carrying the microscope, cleaning lenses, focusing carefully).
- Demonstrate the ability to prepare wet mounts, focus, calculate magnification, estimate specimen size, and sketch specimens as they appear under magnification using a compound microscope.

Procedure:

A. Handling the Microscope

1. Clean lenses as needed using lens paper only. Normal tissue is too coarse and may scratch lenses.
2. Microscopes are fragile and must be handled with care. Carry the microscope with one hand under the base and one hand grasping the arm. Make sure the electrical cord is secured to prevent accidents.
3. Put the lowest power objective lens in place and cover the microscope with the dust cover when finished.
4. Never use direct sunlight as a light source.

B. Adjusting Light

The diaphragm regulates the amount of light passing through a specimen. Too much light results in flare, causing a lack of contrast or lost detail when viewing the specimen.

C. Preparing a Wet Mount

1. Place a drop of water on the slide.
2. Place a very thinly sliced specimen in the water.
3. Hold the cover slip against the water at a 45-degree angle, and then release. This will reduce the number of air bubbles, which may obscure portions of the specimen or the entire specimen. Gently pressing on the coverslip with a pencil eraser can eliminate some air bubbles.

D. Focusing

1. Always begin with the lowest power objective lens in position. This gives the largest field of vision and the greatest depth of field. It also reduces the chance of the lens striking the slide.
2. To avoid breaking the slide during focusing, move the lowest power objective lens as close as possible to the slide while watching from the side of the microscope. Centre the specimen and focus by moving the objective lens away from the slide.
3. Turn the adjustment dials to sharpen the image.
4. Adjust the diaphragm for optimum contrast.
5. When going from a lower power objective lens to a higher power objective lens:
   - centre the specimen in the field of view
   - change to the next power objective lens
   - use the adjustment dials to sharpen the image and adjust the diaphragm for optimum contrast

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E. Determining Total Magnification

Total magnification = ocular lens power x objective lens power (e.g., 5X x 4X = 20X)

Note: the units are times (X).

1. Determine the total magnification for each combination of ocular and objective lenses found on your microscope. Complete the table below:

	Ocular Lens Power (X)	Objective Lens Power (X)	Total Magnification (X)
Low Power			
Medium Power			
High Power			

2. Prepare a wet mount slide of the following letter: e (lower case). Use an "e" from a newspaper or magazine or draw your own.
   a. In the space below, draw the letter as it appears with the unaided eye on the stage of the microscope. To the right of this diagram, draw the letter as it appears in the field of view under low power.

   b. Compare the two drawings and describe what you see. (In your description, answer the following questions: What is the consistency of the ink or pencil lead? Describe the texture of the paper. Is the position or orientation of the letter in the two drawings the same or different?)

   c. Describe the movement of the specimen in the field of view when you move the slide to the left. Describe the movement of the specimen in the field of view when you move the slide away from you.

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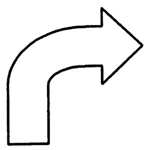
d. Make a general statement about the orientation and movement of objects viewed through a microscope.

e. What would you say to help a friend who is having trouble locating a specimen in the field of view?

f. The image below is drawn as viewed through the microscope. Draw what you would expect to see on the stage.



3. Prepare a wet mount slide of two overlapping hairs or thin threads.

   a. Locate the hairs under low power. Is it possible to have both hairs in focus?

   b. Locate the hairs under medium power. Is it possible to have both hairs in focus? Draw what you see. Indicate the total magnification.

   c. Locate the hairs under high power. Is it possible to have both hairs in focus?

   d. What happens to the depth of field (i.e., the ability to focus on more than one object when the objects are at different depths on the slide) as magnification increases?

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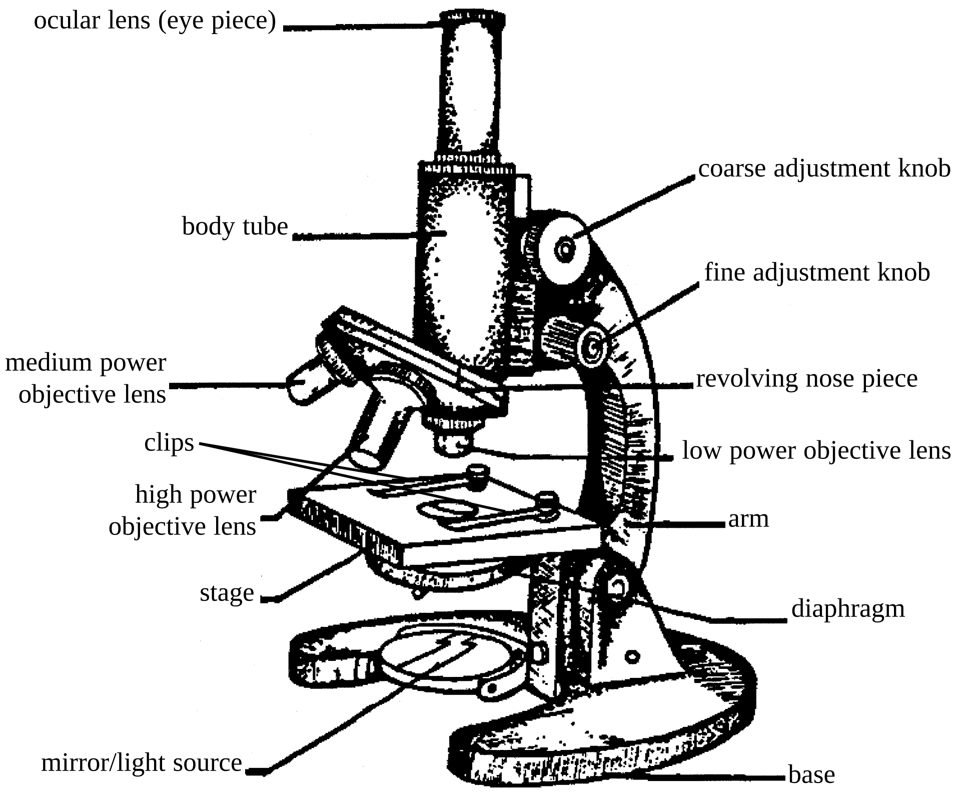
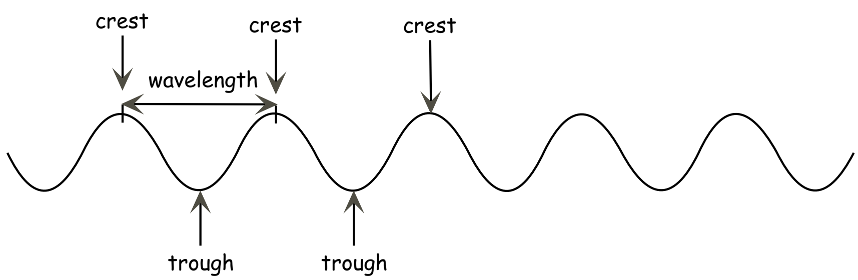
The Microscope



Waves

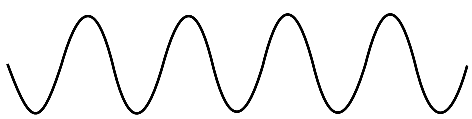
Electromagnetic radiation describes a stream of massless particles, each travelling in a wave-like pattern at the speed of light, and containing a certain amount of energy. The *electromagnetic spectrum* is the term used to describe the whole range of different types of electromagnetic radiation, each with its own wavelength, frequency, and amount of energy. Types of electromagnetic radiation include: radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, X-rays, and gamma rays.

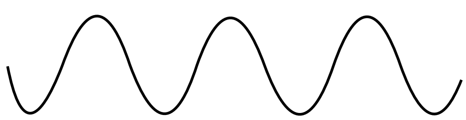
1. Observe a still surface of water that is touched by a vibrating rod. Describe the movement of the water when the rod touched the surface of the water and draw an overhead view and a side view of the water movement.
2. Electromagnetic radiation also moves in waves. To find the wavelengths of the representative diagram below, use a ruler to measure the distance from one crest to another.

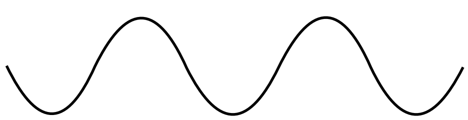


3. The number of waves within a specified distance is the frequency of a wave of electromagnetic radiation. Using a ruler, determine which of the following has the highest (most waves per cm) frequency.

Number of waves per cm

a.  ________________________

b.  ________________________

c.  ________________________

4. What is the relationship between the wavelength and the frequency of a wave of electromagnetic radiation?

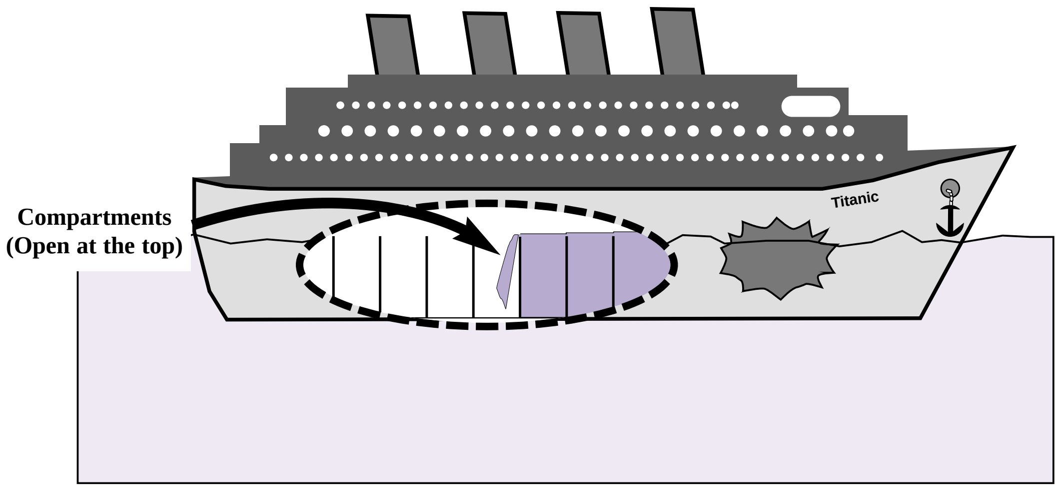
Look for:

1. Waves rippled out in circles from the point of contact. Higher waves emanated from the centre, eventually becoming lower waves and then disappearing.
2. 2 cm
3. (a) has the highest frequency.
4. The higher the frequency, the shorter the wavelength.

The Titanic

The Titanic, a passenger liner launched April 10, 1912, was considered unsinkable. Because it was believed that lifeboats would never be needed, the ship was equipped with fewer lifeboats than were necessary to hold all of the passengers on board. Designers had built in some safeguards, however. Besides having a well-built hull, the bottom portion of the ship was hollow with walled-off compartments of air so that in case the hull was damaged and water seeped in, the water would fill up only one compartment and the ship could still float.

On the night of April 14, off the coast of Newfoundland, the Titanic ran into an iceberg that ripped open the side of its hull. The compartments worked; water filled the once air-filled compartments and then did not invade the rest of the ship . . . initially, that is.



Based on your findings regarding density and buoyancy, create a newspaper article informing the public of the scientific flaws of the Titanic's specially made compartments and their inability to keep the Titanic afloat. Suggest design modifications to improve the effectiveness of the compartments.

Look for:

The compartments were initially filled with air, which made the ship's average density less than that of sea water. As sea water filled the compartments, the ship began to lose its ability to float. As the Titanic began to tip, more of the compartments filled with water, creating an average density that became greater than the buoyant force of the sea water. If the compartments had been closed off at the top, water might not have overflowed into the neighbouring compartments.

A Tiring Story

One fine spring day, Sam took his car to a local garage, had the oil in his car changed and, as part of the car maintenance program, had the air pressure in his tires checked. The mechanic said that the air pressure was good.

One chilly morning a few days later, Sam went out to his car and noticed that his back left tire looked a little flatter. On his way to work he stopped at a local self-serve gas station to put some air in his tire but realized he didn’t have his tire air pressure gauge with him. Not having time to go back home to get it, Sam put a small amount of air in his tire.

Weeks passed and Sam went for a summer trip across the prairies. One day after he had been driving several hundred kilometres during a scorching heat wave, Sam experienced a blowout. Luckily it was a rear tire, no other cars were around, and he was able to keep control of his car and come to a safe stop.

Sam purchased a new tire at a nearby town. He had it installed and had all his tires checked for wear and tear and air pressure. The mechanic assured Sam that everything was up to specifications.

Months passed and Sam had no problems with his tires until one cold night in January. In fact, it was so cold that the thermometer outside his window read –40°C. Sam was called into work for an emergency and when he got to his car he noticed all four tires were low. Sam decided to call a taxi cab to avoid the chance of getting stuck with a flat tire on the road late at night.

Explain what happened to Sam’s tires.

Look for:

The tires are being affected by the temperature of the air. (Cold temperatures caused the pressure in the tires to drop and subsequently reduce the volume, which gave the tire the appearance of being flat.) High temperatures and increased heat energy due to the friction of the road caused the pressure and the volume to increase until the tire burst.

How We Worked Together

Name: ________________________________

Date: ________________________________

Task: ________________________________

Group Members:

____

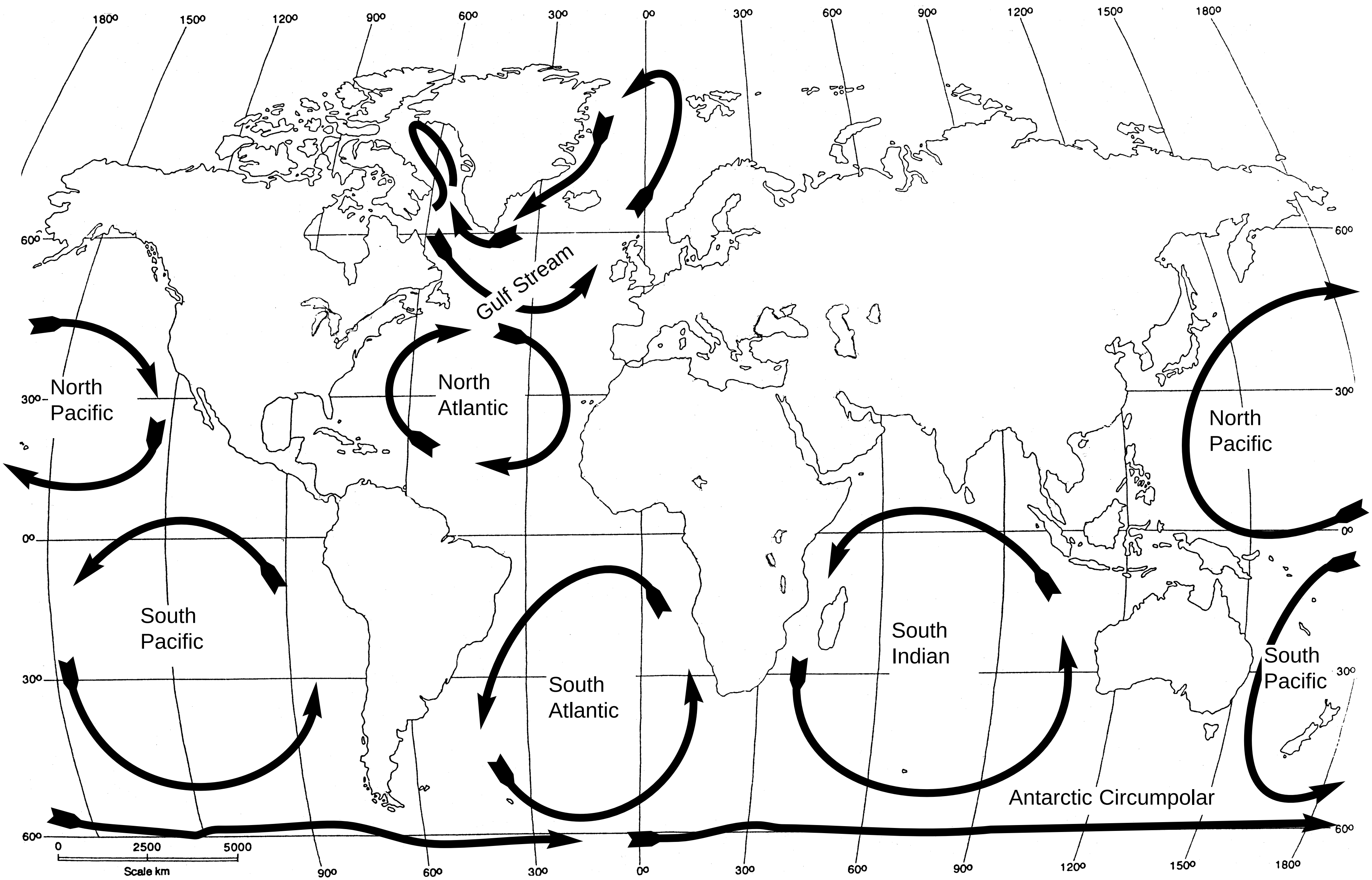
____

____

	Yes	**Sometimes**	**No**
Everyone participated.			
We listened to each other.			
We encouraged each other.			
We took turns sharing ideas.			
The group stayed together.			
We accomplished our task.			

How We Worked Together: Reproduced from *Grades 5 to 8 Mathematics: A Foundation for Implementation*. Winnipeg, MB: Manitoba Education and Training, 1997. Appendix.

World Map: Ocean Currents



Facts about Ocean Currents

- Ocean waters are constantly on the move. How they move influences climate and living conditions for plants and animals, even on land.
- Currents flow in complex patterns affected by wind, the water's salinity and heat content (density), bottom topography, the position of continents, and the Earth's rotation (Coriolis effect).
- The ocean is layered. It is cold at the bottom and warmer on top.
- Warm surface currents invariably flow from the tropics to the higher latitudes, driven mainly by atmospheric winds and the Earth's rotation.
- Cold surface currents come from polar and temperate latitudes, and they tend to flow toward the equator, driven mainly by atmospheric forces.
- Our planet's rotation produces a force on all bodies of water moving relative to the Earth. That force is greatest at the poles and least at the equator. It is called the Coriolis effect, and it causes the direction of winds and ocean currents to be deflected. Water is deflected clockwise, or to the right, in the northern hemisphere, and counterclockwise, or to the left, in the southern hemisphere.
- Ocean water at the surface is warmed at the tropics and moves toward the poles where it loses heat, becomes saltier and denser, and sinks.
- The cold bottom layer of ocean water circulates through the oceans, taking up to 1,000 years to circulate completely throughout the oceans of the Earth.
- The Gulf Stream surface current is one of the strongest currents. It is warm, deep, fast, and relatively salty.
- Organisms move from one layer of the ocean to another, and plant and animal remains containing nutrients "rain" down. Upwelling stirs the oceans and brings nutrients that have settled in deep water back to the surface, providing a rich source of nutrients for marine organisms, particularly fish. Coastal upwelling occurs against the western sides of continents in the Atlantic, Indian, and Pacific Oceans. There, colder water rises to replace warm surface water blown out to sea by strong winds. Upwelling supports about half of the world's fisheries.

The Antarctic Circumpolar Current

- The Southern Ocean is the only ocean that circles the globe without being blocked by land. It contains the Antarctic Circumpolar current and is the world's largest ocean current.
- The Antarctic bottom water (cold, salty, and dense) sinks into the deep sea, spills off the continental shelf, and travels northward hugging the ocean floor beneath other water masses. This is a huge amount of water that pushes the warmer water out of the way, usually by flowing underneath it, causing new flows and currents in other directions. It travels as far as the North Atlantic and North Pacific Oceans. The bottom water flowing away from Antarctica has to be replaced by other water, so the warmer waters in the north tend to flow southward to fill the gap. Then they cool down and the cycle keeps going.
- The Antarctic Circumpolar current has a powerful influence on much of the word's climate as it redistributes heat, influencing patterns of temperature and rainfall.

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Ocean Currents: Questions

1. List the factors that affect the movement of ocean currents.
2. Indicate which of these factors predominantly affect the surface (horizontal) movement of currents. Indicate which factors affect the ocean's lower layer and result in convection currents (vertical movement) as well as horizontal movement.
3. What impact does the Coriolis effect have on the direction of wind and ocean currents?
4. Why is density important to understanding the movement of ocean currents?
5. What affects the density of ocean water?
6. Draw two labelled diagrams to contrast what takes place in coastal upwelling with what takes place with the Antarctic bottom water. The diagrams should clearly show the movement of warm and cold water.
7. Why is ocean water upwelling important to the economy?
8. Why is the movement of the Antarctic bottom water important?

Look for:

1. Wind, water's salinity and heat content (density), bottom topography, position of continents, and the Coriolis effect influence the movement of ocean currents.
2. Surface: wind, position of continents, Coriolis effect
   Lower layer: water's salinity and heat content (density), bottom topography, Coriolis effect
3. The Coriolis effect deflects wind and ocean currents to the right in the Northern hemisphere, and to the left in the southern Hemisphere.
4. Denser water sinks.
5. The temperature and salinity of the water affect the density of ocean water.
6. In coastal upwelling, cold water rises to replace the warm surface water blown out to sea by strong winds. The dense Antarctic bottom water sinks into the deep sea, spills off the continental shelf, and travels north. As a result, warm water is drawn south to replace it.
7. Upwelling brings nutrients to the surface for fish, resulting in good fishing areas.
8. The movement of the Antarctic bottom water circulates water around the world and redistributes heat, influencing temperature and rainfall.

HOW BIG LAKES AND OCEANS AFFECT CLIMATE

WEATHER BY THE WATER

Among water's amazing properties is its capacity to hold and transfer heat. This property has significant implications for arctic weather patterns, especially for those of us who live right next door to the sea or one of the many "Great Lakes" of the north.

Water absorbs and releases heat like little else can. That's why it is so commonly used as a coolant for transferring heat away from engines, whether in a 100 horsepower car or 5 megawatt electrical generator. It's the same in nature when rivers, lakes and oceans absorb the day's heat then release it through evaporation or as the air cools during the night.

Water's distinctive capacity to efficiently transfer thermal energy is due to its high "Heat Capacity", the amount of heat needed to raise the temperature of a substance by one degree Celcius. A common way of comparing the heat capacity of various substances is by recording the amount of heat, measured in Joules (J), needed to raise a fixed mass of that substance – one kilogram (kg) – by one degree Celcius.

Using this approach, the heat capacity of water comes out way ahead of several other common compounds listed in the following chart.

HEAT CAPACITIES OF SOME COMMON COMPOUNDS

Compound	Heat Capacity Joules/kg^{0}C
WATER (liquid)	4.18×10^3
Methanol	2.55×10^3
Ethanol	2.46×10^3
Hexane	2.26×10^3
Ice	2.06×10^3
Water vapour	1.87×10^3
Toluene	1.80×10^3
Sulphuric acid	1.13×10^3

Outside of the laboratory, you can observe the effects of water's high heat capacity not by comparing the temperature of different substances but by comparing the weather in different places.

If you live on a seacoast or beside a large lake like Athabasca, Great Slave, Great Bear or Baker Lake, you probably know from direct experience that large amounts of stored water can influence local weather patterns in a big way. It's because large bodies of water can act as giant heat reservoirs, wind generators, cloud factories, and snow and rain-makers.

Since water heats up more slowly than land and holds its heat longer, large water bodies generally a have moderating influence on adjacent lands, slightly delaying the arrival of green-up in the spring and postponing the arrival of frost in the fall. For example, Yellowknife, perched on the north shore of Great Slave Lake,

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averages 111 frost-free days a year, giving it a longer growing season than landlocked Regina almost 2,000 kilometres to the south.

During stable periods in mid-summer, winds on the big lakes follow a predictable daily rhythm well known to sailors and fishermen: *'In by day, out by night'*. Onshore "sea breezes" are set in motion when strong daytime heating causes warm air to rise over the land, sucking in cooler air from over the water. At night, gusty offshore "land breezes" often develop in the opposite direction as the land cools and warm air begins to rise over the water. As this air rises, it usually takes a moisture load with it, contributing to local cloud cover and, eventually, showers.

Large water bodies can effect not only the general direction of local winds but also their speed. Knowing boaters or fishermen are aware of the following tips to estimate the relative wind speeds over water.

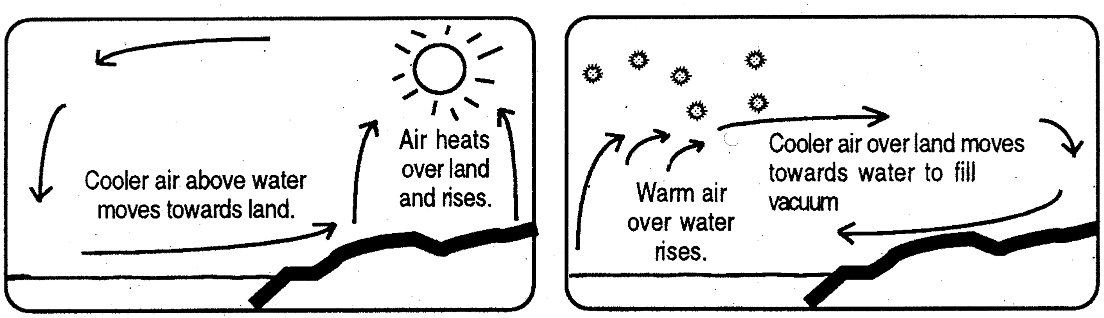
In general, winds over water are stronger than those over land because water offers less friction to moving air than the land. With a land wind of 5 to 10 knots, winds over water can be 50 to 100% stronger!

When winds are strong and the air temperature is colder than the water temperature, expect the wind over land and water to be the same. This situation is most common in the fall.

When the air is warmer than the water and the wind is moderate to strong (15 to 33 knots), expect the wind over water to be up to 30% stronger than on land.

Besides water bodies, there are many factors that could influence your local climate including the comings and goings of sea or lake ice, the presence of nearby mountains, local vegetation cover and many other factors. Is water somehow helping to bring today's weather report where you live?

LAND AND SEA BREEZES



SEA BREEZE ->
"In by Day"

<- LAND BREEZE
"Out by Night"

Land and sea breezes are observed when the prevailing winds are light and daytime heating is strong. This is often the case in summer when a large, stable area of high pressure can dominate the weather pattern.

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Temperature and Precipitation Summary for Sample NWT Communities—Can You See the Influence of Large Water Bodies on Local Climate?

The six communities presented below were selected because they include pairs of climate data sets taken from approximately the same latitude but only one of which comes from beside the shore of a large water body, in this case, Great Slave Lake and Hudson Bay. Do these water bodies influence the local climate? Look for trends between the two data sets to try and explain them in terms of factors influencing the local climate (look beyond just the possible influence of adjacent water bodies). Try graphing these data to help your analysis. Compare Yellowknife with Fort Simpson, Hay River with Fort Smith, and Rankin Inlet with Baker Lake.

	Yellowknife	Fort Simpson	Hay River	Fort Smith	Baker Lake	Rankin Inlet
Normal Temperatures (Celsius)						
January	–27.9	–26.7	–24.5	–25.4	–32.6	–32.9
February	–24.5	–22.0	–21.2	–21.2	–32.1	–30.3
March	–18.5	–14.2	–15.8	–14.0	–28.0	–25.8
April	–6.2	–1.3	–3.5	–1.4	–17.8	–16.6
May	5.0	8.5	5.9	8.1	–6.7	–6.6
June	13.1	14.7	12.3	14.0	4.1	3.5
July	16.5	16.9	15.8	16.3	11.1	9.9
August	14.1	14.3	14.4	14.3	9.4	9.0
September	6.7	7.5	8.2	7.6	2.4	3.3
October	–1.4	–2.0	0.9	0.4	–7.4	–5.5
November	–14.8	–16.8	–12.4	–12.6	–20.6	–18.4
December	–24.1	–23.8	–20.9	–21.7	–28.3	–27.9
Normal Precipitation (mm)						
January	14.9	19.6	22.2	19.9	8.4	6.5
February	12.6	17.8	17.6	14.3	6.9	8.1
March	10.6	17.6	16.1	13.9	10.5	14.6
April	10.3	16.4	15.3	13.5	15.6	14.7
May	16.6	29.8	21.7	29.2	13.9	17.7
June	23.3	44.3	35.0	45.3	22.1	39.0
July	35.2	53.3	45.3	56.8	39.8	42.7
August	41.7	50.7	43.8	49.1	40.3	60.2
September	28.8	30.2	37.7	38.5	40.5	40.7
October	34.8	36.1	34.2	28.1	35.1	35.6
November	23.9	25.7	32.6	25.2	19.3	24.5
December	14.7	18.9	20.8	19.2	9.4	8.5

The Incredible Journey

Background

While water does circulate from one point or state to another in the water cycle, the paths it can take are variable.

Heat energy directly influences the rate of motion of water molecules. When the motion of the molecule increases because of an increase in heat energy, water will change from solid to liquid to gas. With each change in state, physical movement from one location to another usually follows. Glaciers melt to pools which overflow to streams, where water may evaporate into the atmosphere.

Gravity further influences the ability of water to travel over, under, and above Earth's surface. Water as a solid, liquid, or gas has mass and is subject to gravitational force. Snow on mountaintops melts and descends through watersheds to the oceans of the world.

One of the most visible states in which water moves is the liquid form. Water is seen flowing in streams and rivers and tumbling in ocean waves. Water travels slowly underground, seeping and filtering through particles of soil and pores within rocks.

Although unseen, water's most dramatic movements take place during its gaseous phase. Water is constantly evaporating, changing from a liquid to a gas. As a vapor, it can travel through the atmosphere over the Earth's surface. In fact, water vapor surrounds us all the time. Where it condenses and returns to Earth depends upon loss of heat energy, gravity, and the structure of Earth's surface.

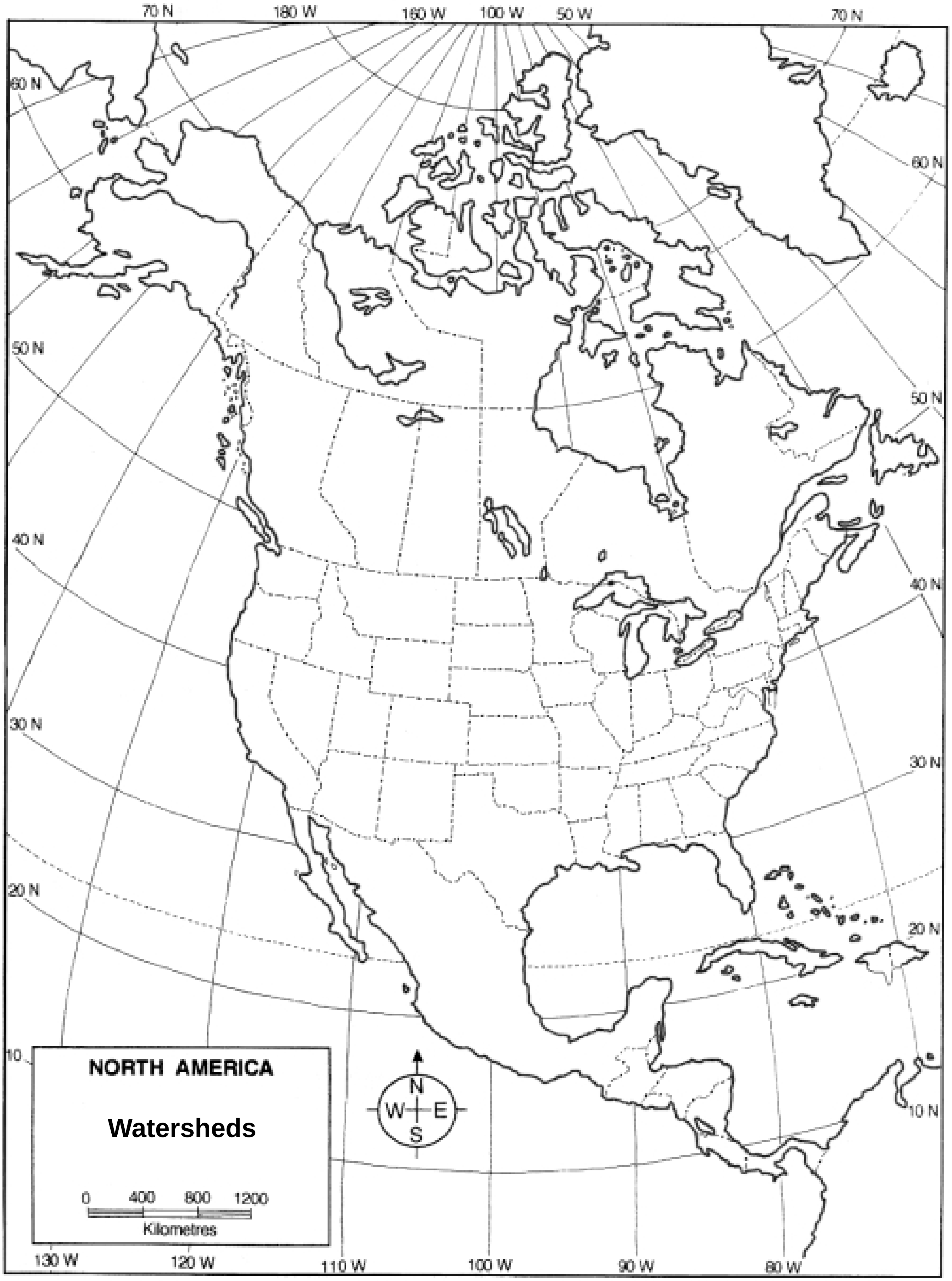
Water condensation can be seen as dew on plants or water droplets on the outside of a glass of cold water. In clouds, water molecules collect on tiny dust particles. Eventually, the water droplets become too heavy and gravity pulls the water to Earth.

Living organisms also help move water. Humans and other animals carry water within their bodies, transporting it from one location to another. Water is either directly consumed by animals or is removed from foods during digestion. Water is excreted as a liquid or leaves as a gas, usually through respiration. When water is present on the skin of an animal (for example, as perspiration), evaporation may occur.

The greatest movers of water among living organisms are plants. The roots of plants absorb water. Some of this water is used within the body of the plant, but most of it travels up through the plant to the leaf surface.

When water reaches the leaves, it is exposed to the air and the sun's energy and is easily evaporated. This process is called transpiration.

All these processes work together to move water around, through, and over Earth.


NORTH AMERICA
Watersheds
0 400 800 1200
Kilometres
N
W
E
S
70 N
180 W
160 W
100 W
50 W
70 N
60 N
60 N
50 N
50 N
40 N
40 N
30 N
30 N
20 N
20 N
10
10 N
130 W
120 W
110 W
100 W
90 W
80 W

The Effects of Tides

Living organisms near large bodies of water have felt the effects of the rise and fall of tidal waters for thousands of years. Saltwater organisms, such as snails and starfish, move to small tidal pools that are left behind as the water recedes from the shoreline. They hide in dark, wet places under rocks which protect them from predators and the drying Sun. Sea anemones close up to conserve water and, like other saltwater organisms, camouflage themselves from predatory birds. While low tide is a dangerous time for exposed creatures, it is also an opportunity for birds and humans to feast on mussels, crabs, and other sea creatures left stranded by the receding waters.

While organisms have long dealt with the changes that tides have caused, the shorelines themselves have been greatly affected. The ebb and flow of large masses of water have eroded rocky cliffs into pebbles, created beaches, and changed the shapes of shorelines. The rise and fall of the water in Hudson Bay may only vary approximately 6 metres, but the Bay of Fundy in Nova Scotia sees a change of approximately 16 metres. That is a large amount of water with energy to move things.

Humans also have a long history of adapting to tides. For example, they have had to time their entrances into, and departures from, harbours. In some cases, harbours are mainly sand at low tide. Knowing when a tide would be high or low was essential for safety and prosperity in the fishing industry, so people began to make observations about the relationships between tides and other phenomena.

Early seafarers noticed that the phases of the moon coincide somewhat with tidal changes. Today we know that the gravity of the moon has the greatest impact on tides. The spinning of the Earth on its axis causes the waters on the Earth to bulge out at the equator. This bulge is further affected by the gravity of the moon in that the waters on the side of the Earth closest to the moon bulge further, raising water levels and causing high tides. Subsequently the waters on the opposite side of the Earth recede from shorelines, causing low tides.

Yet another contributing factor to the production of tides is the Sun’s gravity. Due to its great distance away from the Earth, the Sun does not exert as much pull on the Earth as the moon; however, when the Sun and moon are aligned and act together, they cause especially large tides. When the Sun is in a position that counteracts the pull of the moon, especially low tides result.

Word List: Tides

tidal pools

gravity

Earth's spin

eroded

beaches

recede

rocky cliffs

starfish

predator

water

Sun

ebb and flow

drying sun

shorelines

low tide

timing

enter a
harbour

high tide

How I Worked in My Group

Name: ______________________________ Date: ______________________________

Task: ____

	Comments
I took turns.	
I participated.	
I encouraged others.	
I shared materials.	
I stayed with my group.	
I listened.	
I accomplished the task.	

How I Worked in My Group: Reproduced from *Grades 5 to 8 Mathematics: A Foundation for Implementation*. Winnipeg, MB: Manitoba Education and Training, 1997. Appendix.

Constructing a Prototype: Observation Checklist

Date: ________________________________ Problem/Challenge: _______________________________

A group of students can be selected as a focus for observation on a given day, and/or one or more of the observational areas can be selected as a focus. The emphasis should be on gathering cumulative information over a period of time.

Names	Has Safe Work Habits (ensures personal safety and safety of others)	Works with Group Members to Carry Out Plan	Participates in Analysis and Modification of Prototype	Shows Evidence of Perseverance and/or Confidence	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					

(continued)

Constructing a Prototype: Observation Checklist *(continued)*

Names	Has Safe Work Habits (ensures personal safety and safety of others)	Works with Group Members to Carry Out Plan	Participates in Analysis and Modification of Prototype	Shows Evidence of Perseverance and/or Confidence	Comments
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					

Notes:

Design Project Report

Name: ______________________________ Date: ______________________________

Problem/Design Challenge:

Criteria:

Brainstorming (What are all the different ways . . .):

Planning:

Steps to Follow:

Materials:

Safety Considerations:

(continued)

Design Project Report *(continued)*

Testing:

Criteria	Test Used

Test Results: Attach Data Summary

Evaluating and Improving:

- Justification of changes to original design:

- Strengths and weaknesses of final design:

- Comment/Reflection (Next time . . . , A New Problem . . . .):

(continued)

Design Project Report *(continued)*

Prototype Sketch 1 (Plan):

Prototype Sketch 2 (Final):

Design Project Report: Assessment

Prototype: ________________________ Date: ________________________

Team Members: ____

Criteria	Possible Points*	Self-Assessment	Teacher Assessment
Identifying the Practical Problem and Criteria for Success • the problem is clearly stated • class and/or group criteria are identified • criteria address all or some of the following: function, aesthetics, environmental considerations, cost, efficiency			
Planning • all steps are included and clearly described in a logical sequence • all required materials/tools are identified • safety considerations are addressed • a three-dimensional sketch of the prototype is included (Sketch 1)			
Testing the Prototype • tests are described and align with criteria (e.g., each criterion has been tested) • test results are presented in an appropriate format (data sheet is attached)			
Evaluating and Improving the Design • a final sketch of the prototype is included (Sketch 2) • changes to the original plan are justified • strengths and weaknesses of the final prototype are presented • suggestions for "next time" are included and/or "new problems" are identified			
Total Points			
Comments:			

*__Note:__ The teacher and/or the class assigns possible points to reflect the particular emphasis/es of the project.

Conducting a Fair Test: Observation Checklist

Date: ___________________________________ Experiment: _________________________________

A group of students can be selected as a focus for observation on a given day, and/or one or more of the observational areas can be selected as a focus. The emphasis should be on gathering cumulative information over a period of time.

Names	Has Safe Work Habits (workspace, handling equipment, goggles, disposal)	Ensures Accuracy/ Reliability (e.g., repeats measurements/ experiments)	Works with Group Members to Carry Out Plan	Shows Evidence of Perseverance and/or Confidence	Comments
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					

(continued)

Conducting a Fair Test: Observation Checklist *(continued)*

Names	Has Safe Work Habits (workspace, handling equipment, goggles, disposal)	Ensures Accuracy/ Reliability (e.g., repeats measurements/ experiments)	Works with Group Members to Carry Out Plan	Shows Evidence of Perseverance and/or Confidence	Comments
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					

Notes:

Experiment Report

Name: ______________________________ Date: ______________________________

Experiment: ____

Testable Question:

Independent Variable:

Dependent Variable:

Prediction/Hypothesis: (Identify a cause and effect relationship between independent and dependent variables.)

Planning for a Fair Test

- **Apparatus/Materials:**

- **Variables to Control:**

- **Method:** (Include steps to follow, safety considerations, and plan for disposal of wastes.)

(continued)

Experiment Report *(continued)*

Observation: (Include data tables/charts on a separate sheet, if required.)

Analysis of Data: (Identify patterns and discrepancies.)

Note: Attach graph on a separate page, if required.

(continued)

Experiment Report *(continued)*

Strengths and Weaknesses of Approach/Potential Sources of Error:

Conclusion: (Support or reject prediction/hypothesis; pose new question(s).)

Applications/Implications: (Link to daily life or area of study.)

Experiment Report: Assessment

Experiment Title: ______________________________ Date: ____________________________

Team Members: ____

Criteria	Possible Points*	Self-Assessment	Teacher Assessment
Creating a Testable Question • the question is testable and focused (includes a cause and effect relationship)			
Making a Prediction/Hypothesis • independent and dependent variables are identified • the prediction/hypothesis clearly identifies a cause and effect relationship between independent and dependent variables			
Planning for a Fair Test • required apparatus/materials are identified • major variables to be controlled are identified • steps to be followed are included and clearly described • safety considerations are addressed • a plan for disposing of wastes is included			
Conducting a Fair Test/Making and Recording Observations • evidence of repeated trials is provided • detailed data are recorded, appropriate units are used • data are recorded in a clear/well-structured/appropriate format			
Analyzing and Interpreting • graphs are included (where appropriate) • patterns/trends/discrepancies are identified • strengths and weaknesses of approach and potential sources of error are identified • changes to the original plan are identified and justified			
Drawing a Conclusion • cause and effect relationship between dependent and independent variables are explained • alternative explanations are identified • prediction/hypothesis is supported or rejected			
Making Connections • potential applications to or implications for daily life are identified and/or links to area of study are made			
Total Points			

*__Note:__ The teacher and/or the class assigns possible points to reflect the particular emphasis/es of the project.