

Weather Systems

A **weather system** is a set of temperature, wind, pressure, and moisture conditions for a certain region that moves as a unit for a period of several days.

Low-pressure weather systems form when a warm air mass and a cold air mass meet. The air around such systems tends to swirl in a counterclockwise direction due to the Coriolis effect, and usually brings cloudy skies and stormy weather.

The air around **high-pressure weather systems** tends to swirl in a clockwise direction, and usually brings clear skies.

Thunderstorms

A **thunderstorm** is a storm with lightning, thunder, heavy rain, and sometimes hail. Thunderstorms result from the rapid upward movement of warm, moist air. Generally, thunderstorms require three things in order to form:

1. Moisture is needed to form clouds and precipitation.
2. An unstable air mass.
3. A lifting force (heat).

All thunderstorms, regardless of type, go through three stages: the developing stage, the mature stage, and the dissipation stage. The average thunderstorm has a diameter of 24 km.

Developing Stage

In this stage, a warm air mass and a cold air mass collide. The warm air rises upward (this is known as an **updraft**), carrying moisture with it. As the warm air cools, the moisture within it condenses to form a cumulus cloud. The cloud will continue to grow as long as warm air below it continues to rise.

Mature Stage

As the cumulus cloud becomes larger, the water in it becomes larger and heavier. Raindrops start to fall through the cloud when the rising air can no longer hold them up. Meanwhile, cool dry air starts to enter the cloud. Because cool air is heavier than warm air, it starts to descend in the cloud (this is known as a **downdraft**). The downdraft pulls the heavy water downward, making rain.

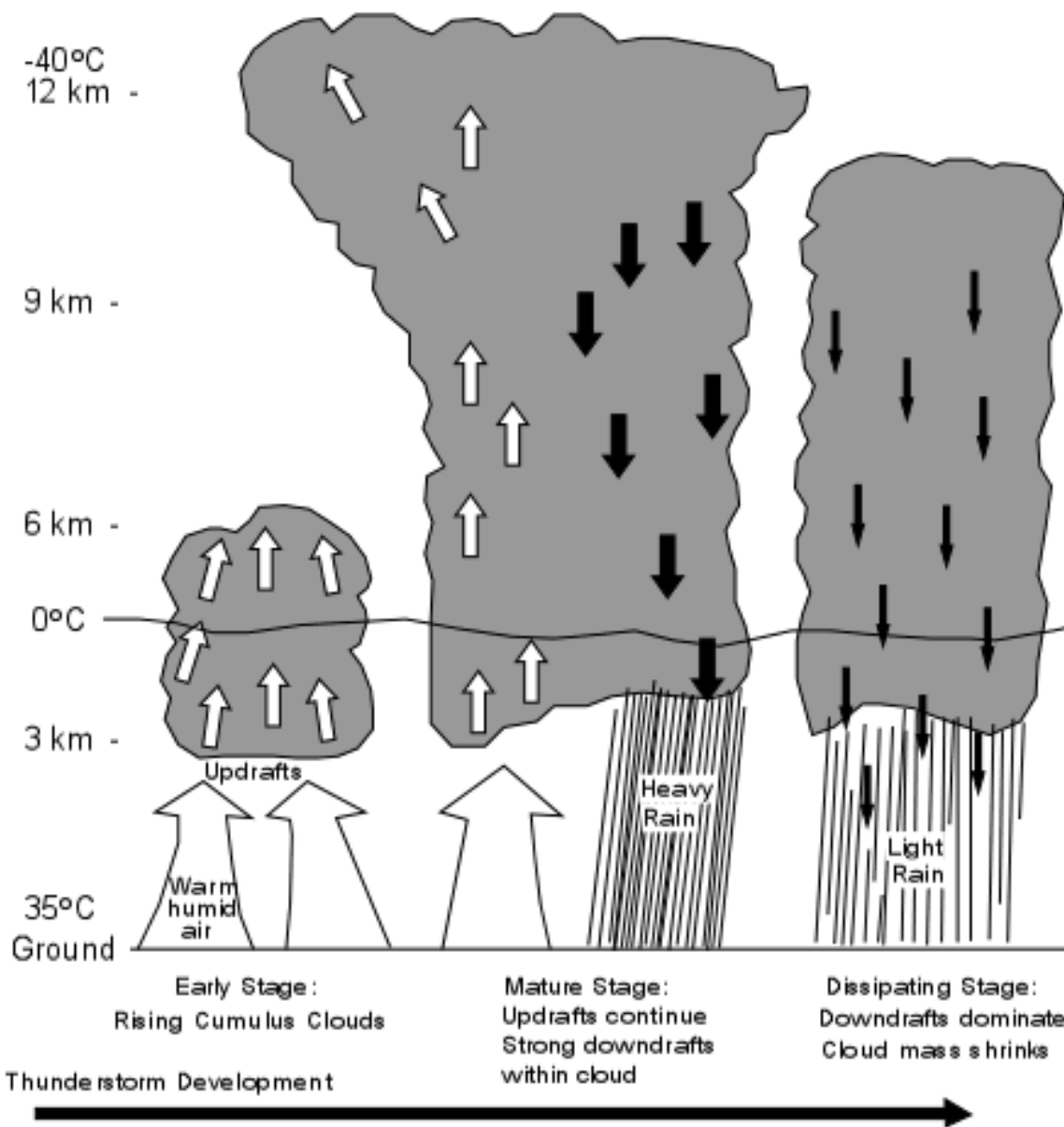
The cloud has now become a cumulonimbus cloud, because it has an updraft, a downdraft, and rain. Thunder and lightning start to occur, as well as heavy rain. The cumulonimbus is now a **thunderstorm cell**.

Dissipating Stage

After about 30 minutes, the thunderstorm begins to dissipate. This occurs when the downdraft in the cloud begins to dominate over the updraft. Since warm moist air can no longer rise, cloud droplets can no longer form. The storm dies out with light rain as the cloud disappears from bottom to top.

The whole process takes about one hour for an ordinary thunderstorm. **Supercell thunderstorms** are much larger, more powerful, and last for several hours.

The diagram below illustrates the stages in thunderstorm formation.



Tornadoes

A **tornado** is a violently rotating column of air that is in contact with both the surface of the Earth and a cumulonimbus cloud.

Tornadoes form in the most severe thunderstorms. Fast rising air in a thunderstorm sometimes starts spinning, forming a funnel of air and moisture. As more rising air is replaced by cooler air at the surface, the rotation gets faster and faster. The rising air causes a pressure difference that increases with speed. This pressure difference is capable of lifting roofs, cars, trailer homes, and people, sending them flying through the air.

The intensity of a tornado is rated according to the **Fujita scale**, as shown below.

Table 10–1 Fujita Intensity Scale

Scale	Wind Speed		Expected Damage
	(KPH)	(MPH)	
F0	<116	<72	Light Damage Damage to chimneys and billboards; broken branches; shallow-rooted trees pushed over.
F1	116–180	72–112	Moderate Damage The lower limit is near the beginning of hurricane wind speed. Surfaces peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the road.
F2	181–253	113–157	Considerable Damage Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	254–332	158–206	Severe Damage Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
F4	333–419	207–260	Devastating Damage Well-constructed houses leveled; structures with weak foundations blown some distance; cars thrown and large missiles generated.
F5	>419	>260	Incredible Damage Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air farther than 100 m; trees debarked; incredible phenomena occur.

Worksheet

1. Thunderstorms are associated with a specific type of cloud. Name it.

2. Thunderstorms require three conditions in order to form. What are they?

3. All thunderstorms go through three stages. Name these three stages.

4. What is the diameter of the average thunderstorm?

5. Briefly summarize the first stage in the life of a thunderstorm.

6. The second stage of a thunderstorm's life is marked by the presence of what two things simultaneously?

7. Briefly summarize the final stage in the life of a thunderstorm.
