Map the Morning

Turn station reports into a surface weather map.

ESS.7.e "Analyze and interpret data to create a surface map, including high-pressure and low-pressure systems, isobars, wind barbs, cloud types, precipitation, and fronts."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the highest and lowest pressures in the table, underline the repeated pressure, and put a star beside the cool and warm readings you would use to locate fronts.

Five Stations at Dawn

1. At dawn, five weather stations send readings from a flat coastal region. A forecaster places each station on blank paper using the location in the table. Air pressure is measured in hectopascals (hPa). On a surface map, H marks a pressure maximum and L marks a pressure minimum. Isobars connect places with equal pressure.

2. A wind barb points toward the direction wind comes from. One long feather means 10 knots, and one short feather means 5 knots. On a Northern Hemisphere map, wind generally spirals inward around lows and outward around highs. Cloud and precipitation reports help check whether a proposed front is plausible.

3. The stations also report air temperature, clouds, and rain. A cold front marks advancing cold air, often near showers or thunderstorms. A warm front marks advancing warm air, often near broad, steady rain. A front's exact position is an estimate between stations, not a line proved by one reading. Use the observations below as evidence for your map.

COASTAL STATION REPORTS

Station, location	Temperature	Pressure	Wind barb reading	Clouds, precipitation
A, west	9°C	1024 hPa	From N, 5 knots	Clear, none
B, center	13°C	996 hPa	Calm	Overcast, light rain
C, northeast	8°C	1008 hPa	From SE, 10 knots	Nimbostratus, steady rain
D, east	22°C	1012 hPa	From S, 15 knots	Scattered cumulus, none
E, southeast	23°C	1008 hPa	From SW, 20 knots	Cumulonimbus, heavy rain

2 ANSWER WITH EVIDENCE

Use the passage

1. Where would you place H and L on a surface map? Use pressure readings to explain.

2. Which two stations should a 1008 hPa isobar pass through? Should it enclose station B or station A?

3. Where would you estimate a cold front and a warm front? Support each estimate with station reports.

4. How would you draw the wind barbs at C and D? Give each wind's direction and number of feathers.

3 YOUR TURN

Your own words

Draw a surface map in the box using all five stations. Add H and L, a 1008 hPa isobar, estimated cold and warm fronts, wind barbs at C and D, and cloud or precipitation notes at two stations; then write one sentence explaining one front's placement.

ANSWER KEY

Map the Morning

HIGH SCHOOL · ESS.7.e

PART 1 · READ AND MARK

Circle the highest and lowest pressures in the table, underline the repeated pressure, and put a star beside the cool and warm readings you would use to locate fronts. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Where would you place H and L on a surface map? Use pressure readings to explain.	**Place H near western station A, which has the highest pressure at 1024 hPa. Place L near central station B, which has the lowest pressure at 996 hPa.**
2	Which two stations should a 1008 hPa isobar pass through? Should it enclose station B or station A?	**It should pass through C and E and enclose B, the lower-pressure station. It should not enclose A, which has much higher pressure.**
3	Where would you estimate a cold front and a warm front? Support each estimate with station reports.	**Estimate a cold front southwest of B between cool A and warm E, where cumulonimbus and heavy rain are reported. Estimate a warm front east or northeast of B between cool, rainy C and warm D.**
4	How would you draw the wind barbs at C and D? Give each wind's direction and number of feathers.	**At C, point the barb toward the southeast and add one long feather for 10 knots. At D, point it toward the south and add one long and one short feather for 15 knots.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The sketch places A west of B, C northeast of B, D east of B, and E southeast of B. H is near A, L is near B, and a 1008 hPa isobar curves through C and E around B. A cold front extends southwest from B between A and E; a warm front extends east-northeast between C and D. C has a southeast-pointing wind barb with one long feather and a note for steady rain. D has a south-pointing barb with one long and one short feather. E has a heavy-rain note. The warm front lies between C and D because C is cool with steady rain while D is warm and dry.

Accept approximate front positions that separate the reported cool and warm stations. The 1008 hPa isobar should pass through C and E without crossing itself or enclosing higher-pressure A.