1. Identify the air masses (m, c, P, T) associated with the following fronts (1 pt ea):

<table>
<thead>
<tr>
<th>Weather</th>
<th>Air Mass</th>
<th>Advancing</th>
<th>Retreating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squall line: cold front with heavy rain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haboob: cold front with dust storm and no rain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wintry mix: warm front with snow, sleet, and freezing rain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windy and fair: warm front with no weather change</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Draw a Hadley Cell on Planet Earth. Show where the air is rising (the ITCZ), causing heavy rainfall. Also show where air is falling, causing the great deserts of the world. Place appropriate latitudes on your drawing. Show the equator. (5 pts)

3. Identify six biotic and/or abiotic factors that affect evapotranspiration rates. (1 pt ea)

1. 
2. 
3. 
4. 
5. 
6. 

4. Lake Blackshear, on the Flint River, has an average depth of 10.5 ft and a total lake area of 8,500 acres. The Flint River, which feeds the lake, has a watershed area of 3,880 mi² and a mean discharge of 4,180 ft³/s (cfs). (3 pts ea)

(a) Find the total lake volume in AF (ac-ft):
(b) Find the mean discharge in AF/day (1 cfs = 2 AF/day):
(c) Find the mean residence time in days:
(d) Find the mean runoff for the upstream watershed in inches/year:
(e) Find the runoff ratio assuming a mean annual precipitation of 50 in/yr:

5. Match: Streamflow terms (2 pts ea)

<table>
<thead>
<tr>
<th>Stage</th>
<th>T, Moving solids on streambeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating curve</td>
<td>N, Water clarity</td>
</tr>
<tr>
<td>Secchi disk</td>
<td>A, Relationship between stage and discharge</td>
</tr>
<tr>
<td>Turbidity</td>
<td>W, Water level in stream</td>
</tr>
<tr>
<td>Total suspended solids</td>
<td>L, Device used to measure lake clarity</td>
</tr>
<tr>
<td>Bedload sediment</td>
<td>U, Filterable solids</td>
</tr>
</tbody>
</table>
6. The Oconee River was gaged last week. (4 pts ea)

<table>
<thead>
<tr>
<th>Station ID</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (ft)</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Depth (ft)</td>
<td>6.3</td>
<td>8.5</td>
<td>12.2</td>
<td>12.4</td>
<td>10.9</td>
<td>6.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Velocity (ft/s)</td>
<td>3.2</td>
<td>4.5</td>
<td>5.6</td>
<td>5.1</td>
<td>3.9</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Area (ft²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge (cfs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

(a) Total area (A, ft²)  
(b) Total discharge (Q, cfs)  
(c) Mean velocity (\( \bar{v} = Q/A \), ft/s)  
(d) Travel time (\( \tau \), min) for a length of one mile  
(e) Mean velocity (\( \bar{v} \), ft/s) using Manning’s equation, \( \bar{v} = (1.49/n) R^{2/3} S^{1/2} \)  

Assume a roughness coefficient of 0.038, a channel slope of 0.0016, and a hydraulic radius equal to the mean depth.

7. Neatly plot soil infiltration rates vs. time with and without mulch on the graph at right. Label axes & lines. (5 pts)

8. Match: Universal Soil Loss Equation factors (2 pts ea)

- Erodibility  
- Erosivity  
- Topographic  
- Tolerance  
- Total soil loss  
- Vegetation  
- Conservation Practices

T  
A  
P  
R  
C  
K  
T  
LS

9. For the USLE, what could you do if \( T > A \)? (4 pts)

10. The Flint River Watershed is located in Southwest Georgia. It joins with the Chattahoochee River near Bainbridge to form the Apalachicola River (delineation is 5 pts, calculations are 2 pts each)

(a) Delineate the watershed on map shown on the following page  
(b) Estimate the total length (mi) of the Flint River:  
(c) How long would it take to float the river if your average velocity is 2 mph?  
(d) Estimate the total watershed area (mi²) based on your delineation:  

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