

Practice Exercises

I. Match the tidal phenomenon in the left column to the physical mechanism in the right column. These simple matches are no substitute for understanding the phenomena & mechanisms.

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| Tidal day D | A. Lunar gravity |
| Semidiurnal tidal period A+F | B. Blocking effect of continents |
| Mixed semidiurnal tidal ranges G | C. Earth's rotation |
| Diurnal tidal period B+E | D. Duration of the moon's orbit around the Earth |
| Spring/neap tides H | E. Shape & depth of ocean basins |
| Rotary tidal motion C | F. Earth-moon center of mass & centrifugal effect |
| Tidal crests not directly under sun & moon B+C+E | G. Lunar declination (angle of moon's orbit to Equator) |
| Seasonal change in tidal range I | H. Lunar phases |
| | I. Solar declination (angle of Earth's axis to its solar orbit) |

II. The following data were gathered from a hypothetical station in the open ocean. Use the T-S diagram to determine the density values and stratification & stability of the water column.

Depth	Temperature (°C.)	Salinity, g/kg	Density (σ_t)	Density (ρ)
0	21	36	25.25	1.02525
250	20	35.9	25.5	1.0255
500	19	35.8	25.5	1.0255
750	12	35.5	27	1.027
1000	6	35.0	27.5	1.0275
1500	5	34.95	27.75	1.02775
2000	3.6	34.9	27.75	1.02775
2500	3.2	34.85	27.75	1.02775
3000	3.0	34.85	27.75	1.02775

a/ Using the T-S diagram, fill in the values for σ_t and ρ in the table above. Round to the nearest 0.25 σ_t units.

b/ Over what depth interval do you observe the thermocline? **500-1000 m**

The halocline? **500-1000 m** The pycnocline? **500-1000 m**

The mixed layer? **0-500 m**

c/ Is this water column **stratified** or **unstratified**? (Circle one) Why? **Layers of different T, S, ρ at different depths**

d/ If you looked at temperature alone, would this water column be **stable**, **unstable**, or **neutrally stable**? (Circle one) Why? **Higher temperature = lesser density at the surface & lower temperature = greater density below**

e/ If you looked at salinity alone, would this water column be **stable**, **unstable**, or **neutrally stable**? (Circle one) Why? **Higher salinity = greater density at the surface & lower salinity = lesser density below**

f/ Is this water column in fact **stable**, **unstable**, or **neutrally stable**? (Circle one) Why? **Lesser density at the surface & greater density below**

III. Summarize the properties of the 4 principal types of estuaries in the table below. You do not need to memorize numerical values of properties such as ΔS (salinity difference between layers in an estuary) & R/P (relative importance of river inflow compared to tidal mixing). Instead, use them as a guideline for the qualitative differences among the estuary types.

	Salt Wedge	Fjord	Partially Mixed	Well Mixed
ΔS	Large	Large	Moderate	Small
R/P	Large	Large	Moderate	Small
Stratification (strong/moderate/weak)	Strong	Strong	Moderate	Weak
Tidal Mixing (strong/moderate/weak)	Weak	Weak	Moderate	Strong
Halocline (strong/moderate/weak)	Strong	Strong	Moderate	Weak
Entrainment (strong/moderate/weak)	Weak	Weak	Strong	Strong
Net estuarine circulation (strong/moderate/weak)	Weak	Weak	Strong	Strong
Flushing (strong/moderate/weak)	Weak	Weak	Strong	Strong