## SO231 General Oceanography I

## **Twelve Week Exam Fall, 1999**

## For example only in 2012

- 4. Monsoons are developed due to
  - a) Differences in density between land and water
  - b) Differences in heat capacity between land and water
  - c) The high latent heat of evaporation of water
  - d) The close proximity of land and water in the Indian Ocean
  - e) Prevailing wind conditions
- 5. Equatorial currents are developed due to the effects of
  - I. Ekman transport
  - II Wind forcing
  - III. Pressure Gradient Force
  - a) I and II.
  - b) I and III
  - c) II and III
  - d) III only
  - e) I, II, and III.
- 6. A warm core eddy, spawned from the Gulf Stream will rotate
  - I. Clockwise
  - II. Counter Clockwise
  - III. Geostrophically
  - a) I only
  - b) II only
  - c) III only
  - d) I and III
  - e) II and III

7. The method of current measurement that involves sensors which float along with the current is

- a) Eulerian
- b) Nansen
- c) Lagrangian

- d) Ekmanian
- e) Fourierian
- 9. Coastal upwelling
  - a) Occurs only on western basin boundaries
  - b) Results from prevailing trade winds and Ekman transport
  - c) Is a result of the sloping thermocline along the equator
  - d) Is driven by geostrophics
  - e) Occurs due to relaxing sea slopes in the vicinity of high pressure systems
- 10. The phenomenon that explains intensification of boundary currents is
  - a) Coriolis and the rotation of the earth
  - b) Conservation of potential vorticity
  - c) Pressure gradient forcing
  - d) Geostrophics
  - e) Conservation of absolute vorticity
- 11. In baroclinic conditions, which of the following will occur?
  - I.. Isobars will intersect the sea surface.
  - II. Isopycnals will intersect the sea surface.
  - III. Isobars will be inclined in the deep isothermal layer
  - IV. Isopycnals will be horizontal in the deep isothermal layer.
  - a) I and III only.
  - b) I and IV only.
  - c) II and III only.
  - d) II and IV only.
  - e) I, II, III, and IV.

- 12. A geostrophic current is one in which
  - a) Density drives circulation
  - b) Coriolis balances hydrostatic pressure
  - c) Is set up only by wind forcing
  - d) Coriolis balances pressure gradient forcing
  - e) Vorticity is conserved
- 13. Navy "wind birds" (anemometers) are installed on the yardarms to eliminate the effects of
  - a) Wind stress
  - b) Surface friction
  - c) Lagrangian motion
  - d) Langmuir circulation
  - e) Turbulent flow around the superstructure
- 14. Which of the following is the hydrostatic equation?
  - a)  $m (2 \Omega \sin \Phi) u = mf u$
  - b)  $(\zeta + f) / D = \text{constant}$
  - c)  $\tan \Theta = f u/g$
  - d)  $p = \rho gz$
  - e)  $u = gh_B/(f L) * [1 \rho_B/\rho_A]$

16. A cyclonic wind system blowing in the southern hemisphere will impart to the water below it:

- a) Positive relative voriticity.
- b) Positive planetary vorticity
- c) Negative relative vorticity
- d) Negative planetary vorticity
- e) Counterclockwise rotation.
- 17. An easterly surface winds blows:
  - a) From west to east.
  - b) From low pressure toward high pressure.
  - c) From high pressure toward low pressure.
  - d)  $90^{\circ}$  cum sole to the pressure gradient force.
  - e) In the direction of the Coriolis force.

## 18. The ITCZ is the

- I. Horse latitudes
- II. Doldrums
- III. Zone of high rainfall
- a) I only.
- b) II only.
- c) III only
- d) I and III.
- e) II and III.

- 19. The Ekman spiral results in net water motion in the mixed surface layer
  - a) 45° cum sole to the wind direction
  - b) 90° to the left of the wind direction in the northern hemisphere
  - c) 90° to the left of the wind direction in the southern hemisphere
  - d) 45° to the left of the wind direction in the northern hemisphere
  - e) 45° to the right of the wind direction in the northern hemisphere
- 20. An atmospheric high pressure system will change sea level by:

I. Raising it due to the effect of increased atmospheric pressure.

II. Raising it do to Ekman pumping

III. Have no effect on sea level

- a) I only.
- b) II only
- c) III only
- d) I and II.
- e) II and III.

1. Upwelling ( $\uparrow$ ) and downwelling ( $\downarrow$ ) along the equator in the eastern Pacific are indicated on the north-south section below. From this information,

- sketch the sea surface topography,
- sketch the position of the top of the thermocline,
- sketch the direction of the pressure gradient force(s),
- sketch the resulting geostrophic current(s).
- name the surface currents depicted.

	⇑	$\Downarrow$	↑	$\Downarrow$	
30°N	10°N	4°N	0	4°S	20°S



2. The diagram above shows the results of transect along the equator in the Pacific Ocean. The length of the section is about 11,500 km. The diagram shows contours of the isotherms (every  $1^{\circ}$ C).

- The section runs east-west. Which side is which, and how could you tell? Be specific about the features you see which support your interpretation.
- This region experiences El Niño. Discuss the atmospheric and oceanic events that make up an El Niño, and what you see in the ocean in this diagram that is related to El Niño.