

UNIVERSITY OF RUHUNA
BACHELOR OF SCIENCE IN FISHERIES AND MARINE SCIENCES DEGREE

Level I Semester I Examination

July 2015

LIM 1122 - Physical and chemical Limnology

Follow the instructions given under **Part A and B** to answer the questions

Time: 02 hours

Part A

Answer all questions

Time: Thirty (30) minutes

01. Underline the most suitable answer for each of the following questions.

(1) What would be incorrect about properties of water?

- | | |
|--------------------------------------|-----------------------|
| (a) High latent heat of vaporization | (b) Low viscosity |
| (c) High cohesion and adhesion | (d) High conductivity |
| (e) Lower density in solid state | |

(2) For making your own bathymetric map, you would need

- (a) a weighted Secchi disk
- (b) an echo sounder
- (c) a map showing shoreline of that water body
- (d) all of the above
- (e) either (a) or (b) with (c)

(3) Lake morphometry has no direct impact on

- | | |
|--------------------------------------|-------------------------|
| (a) extent of littoral-zone wetlands | (b) lake stratification |
| (c) light attenuation | (d) turbulence |
| (e) sedimentation and re-suspension | |

(4) The term “fetch” is used for the

- (a) maximum length of the lake
- (b) distance that wind can travel over water before intersecting a landmass
- (c) depth at which wave energy extends below the water’s surface
- (d) both (a) and (b) are correct
- (e) all (a), (b) and (c) are correct

(5) If A and L are lake area and shoreline length respectively, shoreline development of a lake can be given as,

(a) $\frac{L}{3.54\sqrt{A}}$ (b) $\frac{L}{\sqrt{2\pi A}}$ (c) $\sqrt{\frac{L}{2\pi A}}$ (d) $\frac{L}{2\pi\sqrt{A}}$ (e) $\frac{L}{6.28\sqrt{A}}$

(6) A lentic water body with shoreline development of 1.32 could be

- (a) a cirque lake
- (b) a crater lake
- (c) a seasonal reservoir of Sri Lanka
- (d) any one of the above
- (e) none of the above

(7) What could be an indicator of higher productivity in a lake?

- (a) Higher value for watershed: lake surface area ratio
- (b) Lower value for shoreline: lake surface area ratio
- (c) Higher value for index of basin permanence
- (d) Lower value for dynamic sediment ratio
- (e) Higher value for volume: surface area ratio

(8) Rayleigh scattering intensity is proportionate to wavelength as

(a) $I \propto \frac{1}{\lambda}$ (b) $I \propto \frac{1}{\lambda^2}$ (c) $I \propto \frac{1}{\lambda^3}$ (d) $I \propto \frac{1}{\lambda^4}$ (e) $I \propto \frac{1}{\lambda^5}$

- (9) In turbidimetry, the intensity of
- (a) unscattered light is measured at 180°
 - (b) scattered light is measured at 180°
 - (c) unscattered light is measured at 90°
 - (d) scattered light is measured at 90°
 - (e) scattered light is measured at 135°
- (10) Nephelometry is much suitable for waters with
- (a) lots of air bubbles due to wave action
 - (b) extremely dark profundal zone
 - (c) higher concentration of mud particles
 - (d) suspending particles of uneven sizes
 - (e) uniformly scattered colloids

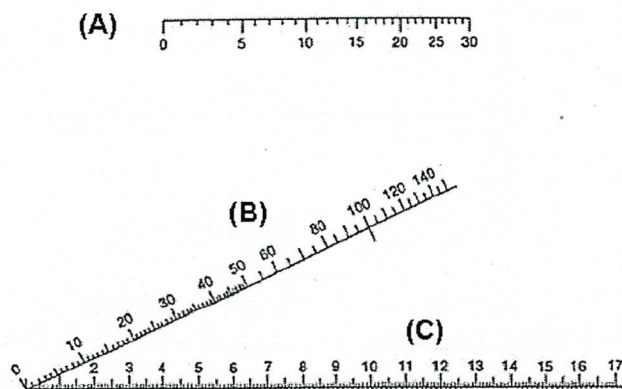


Figure 1

- (11) Three scales mentioned as (A), (B) and (C) in Figure 1, are respectively,
- (a) water temperature, dissolved oxygen and saturation level of oxygen
 - (b) dissolved oxygen, water temperature and saturation level of oxygen
 - (c) saturation level of oxygen, dissolved oxygen and water temperature
 - (d) water temperature, saturation level of oxygen and dissolved oxygen
 - (e) dissolved oxygen, saturation level of oxygen and water temperature

- (12) Temperature of the hypolimnion of a lake is 4 °C. If dissolved oxygen level is 8 ppm, what would be the saturation level of oxygen according to the Figure 1?
- (a) 1.2 (b) 60 (c) 0.7 (d) 32 (e) 23
- (13) Temperature, dissolved oxygen and saturation values mentioned in Question (12) represent the condition in
- (a) fall turnover
 (b) winter stratification of an oligotrophic lake
 (c) winter stratification of a eutrophic lake
 (d) a typical meromictic lake
 (e) none of the above

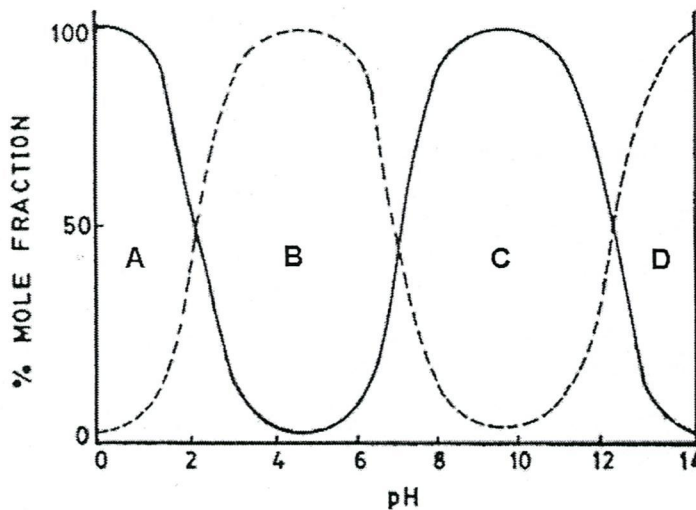


Figure 2

- (14) Figure 2 shows the equilibrium of orthophosphate ions at different pH values. In a lake subject to urban industrial pollution, a dense algal bloom could be seen. What would be the dominant phase of orthophosphate ions during the day time in the epilimnion of this lake?
- (a) A (b) B (c) C (d) D (e) none
- (15) Lake mentioned in Question 14 has a dense layer of vivianite. What would be the correct statement about the lake?
- (a) hypolimnion is not anoxic
 (b) water has a higher concentration of Fe^{+2}
 (c) 'D' is the dominant phase of orthophosphate ions in hypolimnion
 (d) bottom-dwelling fish disturb the sediments
 (e) all the above statements are correct

Part B

Answer **any three (03)** questions

Time: 1 ½ hrs

02. Write an essay on water density-driven stratification and mixing patterns in lakes.

03. Give a detailed account on different types of dissolved oxygen profiles found in lake ecosystem, and explain how those profiles are affecting distribution and survival of aquatic species.

04. Write in details about the journey of electromagnetic waves from sun to the bottom of a lake.

05. Describe the nitrogen cycle referring to a typical lacustrine environment.

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