UNIVERSITY OF RUHUNA

Bachelor of Science in Fisheries and Marine Sciences Degree, August 2016

Level I, Semester I

LIM 1122

Physical and chemical Limnology

Time: Two (02) hrs

Part A

Answer **all** questions of Part A. Underline the most suitable answer for each of the following multiple choice questions

Time: Thirty (30) minutes

(1) Of following atoms, which are more suitable for creating stronger hydrogen bonds with hydrogen atom?

(a) Carbon and Nitrogen (b) Nitrogen and Sulfur

(c) Carbon and Oxygen (d) Nitrogen and Oxygen

(c) Oxygen and Sulfur

(2) An example for a Lunate lake is,

(a) Cirque lake (b) Oxbow lake (c) Reservoir

(d) Landslide lake (e) Crater lake

(3) Bright pink hue in Lake Hillier in Western Australia is due to

(a) salt concentration than 5 times that of the seawater

(b) carotenoid pigments of red algae

(c) higher concentration of halophiles

(d) different concentrations of magnesium sulfate

(e) mineral contents of the water from volcanic activity

(4) Salinity of an unknown water sample was measured as 1 psu. This sample could be from

(a) an oligohaline lake

(b) the KCl solution of salinity standard

(c) an estuary

(d) a seasonal reservoir in dry zone, Sri Lanka

(e) any of the above

(5) What is the correct statement about TDS measurements?

(a) Include all of the disassociated electrolytes in the water

(b) Include urea in a wastewater sample

(c) Include suspended solids of 1 μm in size

(d) Higher values coincide with lower DO values

(e) All of the above

(6) What is the correct statement regarding hypsographic curves?

(a) Can be used to estimate the area of sediments exposed to low oxygen.

(b) Can be used to estimate the extent of littoral zone available for macrophyte growth.

(c) Can be used to estimate the extent of potential bottom spawning habitats for some fish species.

(d) Can be used to estimate the area of sediments influenced by epilimnetic heat.

(e) All of the above.

(7) The amount of light energy received by a lake is high when

(a) the lake is at its mean sea level

(b) the density of the atmosphere above the lake is high

(c) the lake surface is partly covered by ice

(d) the azimuth angle of sun at the lake is low

(e) the zenith angle of sun at the lake is low

(8) What is the false statement regarding the thermal stratification of lakes?

(a) A lake with a maximum depth of 4m can be stratified if it is in a protected basin

(b) A lake with a maximum depth of 12m can be stratified if the fetch is long enough

(c) Thermal bars may differentiate the stratification of shallower part from rest of the lake

(d) In the tropical regions, relatively deep lakes with smaller surface areas may have stronger stratifications.

(e) Hurricanes may reduce the surface temperature without breaking the stratification.

(9) Select the correct statement

(a) 5°C increase in water temperature will half the rate of physiological function in most fish.

(b) Quantum yield is the number of photons absorbed by the system for a radiation-induced process.

(c) Rate of photosynthesis increases with increasing light intensity until CO_2 concentration limits the process.

(d) Larger the density difference stronger the molecular diffusion of heat between water layers.

(e) Photosynthetic rate depends on action spectrum not the absorption spectrum of chlorophyll.

(10) What is the correct statement on solubility of gases in water?

(a) Solubility depends on chemical properties of the gas, not the water.

(b) High altitude lakes dissolve more gases.

(c) Solubility of the gas is proportionate to its partial pressure at a given temperature.

(d) Salinity is not an important factor regarding the solubility of gases in water.

(e) Highly turbid lakes dissolve more gases.

(11) DO reading of a lake can be

(a) higher than 100% saturation value at a particular temperature

(b) uniform from surface to bottom during some seasons

(c) higher at thermocline due to photosynthetically-active species

(d) originated from pure oxygen rather than air.

(e) Any of the above.

(12) Figure 1 shows DO profile of a lake. Temperature profile is marked with a dotted line. This DO profile can be described as a,

(a) Positive heterograde

(b) Negative heterograde

(c) Extreme clinograde

(d) Hypolimnetic oxygen maxima

(e) Metalimnetic oxygen maxima

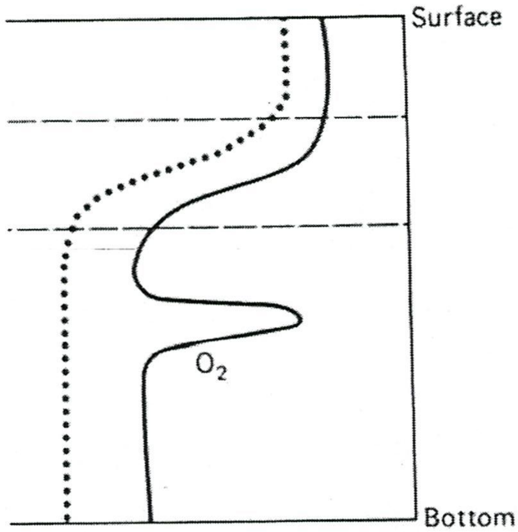

Figure 1

(13) DO profile of Figure 1 can be a result of

(a) high organic matter content in the hypolimnion

(b) high sulfide content in the hypolimnion

(c) high organic matter content in the metalimnion

(d) high algal biomass in the metalimnion

(e) high macrophyte density in the metalimnion

(14) Trophogenic zone of a lake

(a) is another name for euphotic zone

(b) is another name for profundal zone

(c) has a higher respiration rate than photosynthesis

(d) has equal rates of respiration and photosynthesis

(e) has a higher decomposition rate of organic matter

(15) Anammox is a process

(a) occurring under anoxic conditions

(b) carried out by the Planctomycetes

(c) oxidizing ammonia by using nitrite

(d) producing gaseous nitrogen

(e) all of the above are correct

Part B

Answer **<u>any three (03)</u>** questions

Time: 1 ½ hrs

1. "Hydrogen bonding gives some specific properties to water that would support life on earth".Explain.

2. Describe the areal characteristics that can be used to explain the morphometryof lakes.

3. Give an introduction to the behavior and distribution of carbon dioxide in a lentic water-body.

4. Write short notes on the following,
   (i) The Beer –Lambert Law
   (ii) Scattering of light underwater
   (iii) Dimictic lakes

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