

EASTERN UNIVERSITY, SRI LANKA  
THIRD YEAR SECOND SEMESTER EXAMINATION IN  
SCIENCE - 2018/2019  
(JUNE/JULY - 2022)  
PH 3101 BIOPHYSICS

Time: 01 hour.

Answer ALL Questions

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- 1.
- (a). Define the term flow rate of a liquid? (10 Marks)
- (b). The blood is pumped from the heart into arteries that subdivide into smaller arteries (arterioles), which branch into very fine vessels called capillaries. In this situation, continuity of flow is maintained but it is the *sum* of the flow rates in each of the branches in any portion along the tube, because the blood is incompressible, the same amount of blood must flow past any point in the vessels in a given time to ensure continuity of flow. This logic can be extended to say that the flow rate must be the same at all points along the vessels. Using this concept, derive an expression for equation of continuity is valid for any incompressible fluid. (40 Marks)
- (c). The average flow rate of the blood in a human body is 5.00 L/min. Determine the no of cubic meters of blood does the heart pump in a 75-year lifetime. (10 Marks)

(d). An injection barrel with a radius of 0.250 cm is attached to a needle with a radius of 0.09 cm. The flow rate through barrel and needle is 0.500 L/s. Determine the speed of the liquid medicine in the;

i. Injection barrel (10 Marks)

ii. Needle (10 Marks)

(e). The aorta is the principal blood vessel through which blood leaves the heart in order to circulate around the body.

i. Calculate the average speed of the blood in the aorta if the flow rate and the radius of the aorta are 5.0 L/min and 10 mm respectively. (10 Marks)

ii. Blood flows through smaller blood vessels known as capillaries. When the rate of blood flow in the aorta is 5.0 L/min, the speed of blood in the capillaries is about 0.33 mm/s and the average diameter of a capillary is 8.0  $\mu\text{m}$ , calculate the number of capillaries in the blood circulatory system. (10 Marks)

2. Briefly explain the followings;

(a). Auxiliary factors of blood circulation (20 Marks)

(b). Four levels of organization of protein structure (20 Marks)

(c). Structure and properties of the cell membrane (20 Marks)

(d). Active and passive transport (20 Marks)

(e). Sensory receptors and the function of synapses. (20 Marks)