

**2013**

**M.Sc.**

**1st Semester Examination**

**HUMAN PHYSIOLOGY**

**PAPER—PHY-102**

*Full Marks : 40*

*Time : 2 Hours*

*The figures in the right-hand margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

**Unit—03**

*Answer all questions.*

1. (a) Discuss the application of Poiseuille's law in physiological systems.
- (b) In an experiment with Poiseuille's apparatus the following data were obtained.
  - (i) Volume of water flowing/sec. =  $0.117 \text{ cm}^3 \text{ Sec}^{-1}$
  - (ii) Radius of the tube =  $0.0514 \text{ cm}$ .

*(Turn Over)*

- (iii) Length of the tube = 56.45 cm.
- (iv) Density of water = 1 gm cm<sup>-1</sup>
- (v) Height of the liquid = 34.10 cm.
- (vi) Acceleration due to gravity = 981 cm Sec<sup>-1</sup>.

Calculate the viscosity of liquid in poise. 2+3

Or

- (a) What do you mean by Newtonian and non-Newtonian fluid ?
- (b) Estimate the velocity of blood producing turbulence in an artery of 2.2 cm diameter, when the density and viscosity of blood are 1 gm cm<sup>-3</sup> and 0.03 poise respectively.

$$2\frac{1}{2} + 2\frac{1}{2}$$

2. (a) In conformity with Dalton's law of partial pressure, Henry's law of solubility of gases in liquid and Fick's law of diffusion, discuss the gaseous (CO<sub>2</sub> & O<sub>2</sub>) exchange between —

- (i) alveoli and pulmonary arterial blood and
- (ii) arterial blood to tissue.

- (b) Explain the lung-compliance curve and the hysteresis loop.

$$(1\frac{1}{2} + 1\frac{1}{2}) = 2$$

Or

- (a) Explain the aerodynamic theory of phonation in relation to Bernoulli energy law.
- (b) What do you mean by articulation ?

3+2

3. (a) Discuss the concept of open and closed system in the light of thermodynamics.
- (b) Write the basic features of living system in reference to thermodynamics.

$$2\frac{1}{2} + 2\frac{1}{2}$$

Or

- (a) What do you mean by bioluminescence?
- (b) How does bioluminescence work?

2+3

4. (a) Explain the ultrasonic wave propagation in reference to Biot theory.
- (b) How can you calculate the intensity reflection coefficient (IRC)?
- (c) What do you mean by attenuation of sound waves?

$$2\frac{1}{2} + 1 + 1\frac{1}{2}$$

Or

- (a) Explain the mechanism of ultrasound drug delivery during ultrasound therapy.
- (b) Draw a polar plot beam pattern of 300 mm transducer array.
- (c) What do you mean by system beam pattern of transducer?

3+1+1

**Unit—04**

Answer *all* questions.

1. (a) Describe with the help of a block diagram the basic components of an EEG machine.
- (b) Write short notes on (any one) :
  - (i) Microelectrodes;
  - (ii) Montage;
  - (iii) Properties of electrode jelly.

Or

- (a) How is Faraday's law of magnetic induction responsible for electromagnetic blood flow measurement?
- (b) Explain the transit-time operating principle in case of ultrasonic flow measurement.

$$2\frac{1}{2}+2\frac{1}{2}$$

2. (a) Write the working principle of Stow-Severinghaus sensor for determination of arterial  $\text{PCO}_2$ .
- (b) What is pulse oxymetry?

4+1

Or

(a) How can you measure  $PO_2$  in the blood with intervascular sensors in vivo.

(b) Why is the capnography most important during anaesthesia in ICU chamber?

3+2

3. (a) Discuss the mechanism of image formation from Sound in 3D ecocardiography.

(b) Write the importance of B-Scan.

3+2

Or

(a) Write the description and operation of Geiger-Müller (GM) counter during radiation measurement.

(b) What do you mean by quenching?

(2+2)+1

4. (a) Mention the different transducer components with a suitable diagram.

(b) Classify transducer depending on transduction principle.

(c) Discuss the different types of pressure sensor with examples.

1+1+3

Or

- (a) How is direct digital synthesis (DDS) technique important for signal generation in advanced audiometer?
- (b) Mention the side effects and complications developed during haemodialysis.

3+2

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