PG/IS/H.PHY-102/14

M.Sc. 1st Semester Examination, 2014

HUMAN PHYSIOLOGY

PAPER– H.PHY-102

Full Marks : 40

Time : 2 hours

Answer **all** questions

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

UNIT – III

1. (*a*) Bernoulli's principle proves the conservation of energy. Explain with suitable model.

(*b*) A liquid of density 1.45 gm/cc flows along a horizontal tube the cross-section of which is not constant. Compare the change in

pressure when the velocity of flow changes from 15 cm/s to 25 cm/sec. 3 + 2

Or

(*a*) Blood is a non-Newtonian fluid – Explain.

(*b*) Discuss the application of Laplace's law in haemodynamics. 2 + 3

2. (*a*) Write the correlation between photoreceptor spectral absorption and wavelength.

(*b*) Briefly write the visual phototransduction conversion mechanism during vision.

(*c*) What is light ? 1 + 3 + 1

Or

(*a*) Mean blood pressure acting on large artery is 100 mm Hg (radius of artery = 1·2 cm) while a capillary pressure is 30 mm Hg (radius = 5×10^4 cm). Compare the tensions offered on the walls of the artery and capillary comment.

(*b*) According to Laplace's law, the smaller alveolus connected to larger alveolus should have a tendency to collapse. Discuss how the problem is solved in lungs. 2 + 3

3. (*a*) Write the mechanism of bioluminescence and regeneration of Ca^{2+} binding photoproteins.

(*b*) Write the modern biotechnological application of Bioluminescence. 3 + 2

Or

(*a*) What is entropy ?

(*b*) Discuss the application of the laws of thermodynamics on the living system. 1 + 4

4. (*a*) Describe briefly the transducer beam pattern with suitable schematic diagram.

(*b*) How can you calculate the normalized directivity pattern of the plane circular piston transducer ?

(*c*) Write the characteristic phenomenon of transducer beam spread. 3 + 1 + 1

Or

(*a*) With a diagram describe the basic components of a spectrophotometer.

(*b*) What are the limitations of Beer's law ? 3 + 2

UNIT – IV

1. (*a*) Write the limitation of a spirometry.

(*b*) How Clark's polarographic oxygen electrode measures the partial pressure of oxygen ? 2 + 3

Or

(*a*) Write the importance of two prime parameters of microscope objectives.

(*b*) What do you mean by resolving power of microscope ?

(*c*) How can you calculate the resolution of microscope ? 2 + 2 + 1

2. (*a*) What do you mean by multiplawar reconstruction during CT scan ?

(*b*) Write the signal processing mechanism of TDM system of wireless telemetry. $2\frac{1}{2}+2\frac{1}{2}$

Or

(*a*) How can you calculate the voltage pulse generation in ionisation chamber during radiation measurement ?

(*b*) Why scintillation counter is preferred over GM counter ?

(*c*) Write the mechanism of scintillation counter at the time of radiation measurement. 1 + 1 + 3

3. (*a*) Write the principle how electrotherapy instrument functions ?

(*b*) Write the current clinical application of electrotherapy.

(*c*) How can you treat the inflammatory diseases through physiotherapy ? 1 + 2 + 2

Or

(*a*) Describe briefly the general block diagram of an audiometer.

(*b*) Write the basic principle of hemodialysis method. 3 + 2

4. (*a*) Briefly explain the mechanism of action of Laser Doppler blood flow meter.

(*b*) Write the four aspects of NMR theory at the time of blood flow measurement. $2\frac{1}{2}+2\frac{1}{2}$

Or

(*a*) Discuss the basic components of a microprocessor based multichannel ECG machine.

(*b*) Briefly write how electrical signal is being received from the heart by the electrode, placed on arms or legs in electrocardiography. 3 + 2