

M.Sc. 1st Semester Examination, 2019

PHYSIOLOGY

(Human Physiology)

PAPER –PHY-102(Unit-102.1 & 102.2)

Full Marks : 40

Time : 2 hours

*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

**Write the answers to Questions of each Units
in separate books**

UNIT – PHY-102.1

1. Answer any *two* questions from the following : 2 × 2
(a) Write the Newton's mathematical expression 1 + 1
for viscosity. What are shunt vessels ?

(b) Write the principle of Carnot's cycle. What do you understand by the term thermodynamic efficiency of the Carnot cycle ? 1 + 1

(c) What do you understand by piezoelectricity ? Give an example. 1 + 1

(d) What do you understand by supraglottal phonation ? Classify it. 1 + 1

2. Answer any *two* questions from the following : 4×2

(a) What do you understand by static and dynamic lung compliance ? The pressure of 1.35 moles of a gas in a container was 580 torr. What would be the pressure inside the container if 2-2 moles of gas was in it ? 2 + 2

(b) Give a mathematical relation for the specific heat at constant pressure (C_p) with specific heat at constant volume (C_v). Explain Hess's law in the light of first law of thermodynamics. 2 + 2

(c) Write the relation between acoustic impedance, density and speed of ultrasound. What is

Snell's law ? State the nature of "Aliasing" of ultrasound. 1 + 2 + 1

(d) Classify ferroelectricity and describe its polarisation nature. Calculate the capacitance of ferroelectric elements. 3 + 1

3. Answer any *one* question from the following : 8×1

(a) Write briefly about the application of Laplace's law in biological systems with special reference to hemodynamics. What are static variables ? Write the differences between isothermal expansion and isothermal compression. Calculate the Reynold's number of a Newtonian fluid with absolute viscosity of 0.38 Nm/m^2 and density of 910 kg/m^3 when flowing through a 25 mm diameter pipe with a velocity of 2.6 m/s. Is the flow of the fluid laminar or turbulent ? 2 + 2 + 2 + 2

(b) What is bioluminescence ? State the non-marine distribution of bioluminescence. How does it work ? Briefly explain the role of calcium ion during luminescence reaction. 1 + 2 + 3 + 2

UNIT – PHY-102.2

4. Answer any *two* questions from the following : 2×2
- (a) Write the principle of a defibrillator with a circuit diagram. 2
- (b) State the role of multiplexer in telemetry system. 2
- (c) Briefly explain the Faraday's law of magnetic induction in measuring blood flow. 2
- (d) Write the principle of 3D-echocardiography. What is intracardiac echocardiography(ICE)? 1 + 1
5. Answer any *two* questions from the following : 4×2
- (a) What are pregelled electrodes ? Write the merits and demerits of glass microelectrodes. What is electropointing ? 1 + 2 + 1
- (b) Draw a block diagram of airborne signal acquisition system of telemetry mechanism. Write it's functions of different components. What is modulation of telemetry system ? 1 + 2 + 1

(c) What are the artifacts during ECG monitoring? Briefly explain the 10/20 system used in recoding EEG. $2 + 2$

(d) Formulate the detection limit (DL) of radiation measurement. Write the principle of ionization radiation measurement. How could you calculate the ionization current (I) during measurement of radiation? $1 + 2 + 1$

6. Answer any *one* question from the following : 8×1

(a) Define half-cell potential? Why are Ag-AgCl used for electrodes? Draw a schematic outline of Stow Severinghaus PCO_2 sensor which is suitable for invitro blood gas measurement. Write the working principle of this sensor. $2 + 2 + 2 + 2$

(b) Draw a labelled diagram of a miniaturized telemetry capsule module. Write its working principle with special reference to image formation by CMOS image sensor. State the

(6)

role of dialyzer during kidney hemodialysis.

Write the side effects and complications

during renal dialysis.

2 + 2 + 2 + 2
