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SARDAR PATEL UNIVERSITY
M.Sc.(ELECTRONICS) I SEMESTER EXAMINATION
SUBJECT: ANALYTICAL AND BIOMEDICAL INSTRUMENTS
PAPER: PS01EELE01

DATE: 7th December, 2012 TIME: 10:30 A.M. to 1:30 P.M.

TOTAL MARKS : 70

Q-1 Multiple choice questions.

8x1=8

[08]

- 1 What is the pH of a solution with hydronium ion concentration of 0.001 moles per liter?
(a) 1 pH (b) 2 pH
(c) 3 pH (d) None of the above.
- 2 Photomultiplier tube covers the range
(a) 50 nm to 100 nm. (b) 100 nm to 150 nm.
(c) 150 nm to 200 nm. (d) 185 nm to 650 nm.
- 3 In IR spectroscope ,the Quartz prism materials have optimum range
(a) 800 mμ to 3μ (b) 300 mμ to 2μ
(c) 200 mμ to 9μ (d) 200 mμ to 14.5μ
- 4 Quantum well infrared photo detector used for
(a) Low band gap semiconductor. (b) High band gap semiconductor.
(c)Very Low band gap semiconductor. (d)Very high band gap semiconductor.
- 5 Material for negative temperature coefficient of thermistor like a
(a) Thorium Oxide. (b) Rare earth oxide.
(c) Indium antimonide. (d) Sintered metal oxide.
- 6 In photo emissive tube, Cesium-Silver Oxide cell are sensitive to
(a) Visible range. (b) Ultraviolet range.
(c) Far IR range (d) Near IR range.
- 7 Intensity of an Ultrasound beam is
(a) Joules (b) Watts.
(c) Watts/cm² (d) Heat units.
- 8 In photo multiplier tube the 9-16 dynodes operates in steps of
(a) 50-100V (b) 100-150V
(c) 160-200V (d) 200-250V

- Q-2 Short question. (Write any 7) 7x2=14 [14]
- 1 Why the pH an important measurement?
 - 2 What are the basic requirements for a molecule to absorb infrared radiation?
 - 3 Why the thermistor has negative temperature coefficient?
 - 4 Why the right leg (RL) is used at ground potential in ECG measurement?
 - 5 Sketch the diagram of an Artificial kidney.
 - 6 Enlist the factors which limit the resolution of spectrometer.
 - 7 Why the sodium (Na⁺) ions migrate slowly compared to potassium ion (K⁺) in cell membrane?
 - 8 Enlist the basic requirements for Biopotential amplifier.
 - 9 What is the significant of a stable reference electrode in pH measurement?

Q-3 [a] Explain the principle of pH measurement. Studying various considerations, design a pH measuring system using Operational amplifier With temperature compensation circuit. [06]

Q-3 [b] Explain the principle of Ultraviolet spectroscopy and state the different types of detector used in Ultraviolet spectroscopy, explain any one of them. [06]

OR

Q-3 [b] Discuss the following pertaining to the Absorption Instruments. [06]
[1] Radiation source.
[2] Monochromator.

Q-4 [a] What is Nuclear Magnetic Resonance? Describe the constructional details of NMR spectrometer. [06]

Q-4 [b] Explain the principle and working of Optical null recording infrared spectrophotometer. [06]

OR

Q-4 [b] State the different types of thermal detector used in Infrared spectrophotometer and explain Pyroelectric detector. [06]

Q-5 [a] What is chromatograph? Explain constructional details of Gas chromatograph and the roll of columns in Gas chromatograph. [06]

Q-5 [b] State the different types of detector used in Gas chromatograph and explain the principle of Electron Capture Detector [ECD] in gas chromatography. [06]

OR

Q-5 [b] What is Doppler effect? Explain the block diagram of Doppler unit used in ultrasound. [06]

Q-6 [a] Sketch the Schematic diagram of Haemodialysis machine and explain the dialysis process. [06]

Q-6 [b] Sketch the Schematic diagram of Electrocardiogram machine and explain how its works? [06]

OR

Q-6 [b] Explain how an electrical impulse passes through the heart and form the ECG pattern. [06]

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