BT308 BIOENGINEERING Midsem Exam 01.03.2023 (AN)

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Instructions:
Answer all the questions. Answers must be specific and concise. Ambiguous and verbose answers will carry no marks even if the answer is identified somewhere in the write-up. Questions are self-explanatory; hence no queries are responded during the exam time.
Each of the questions carries 3 marks. Total marks 30.

1. Show schematically with proper labels in steps the SELEX process for selecting an aptamer against a target.

2. (a) Define exciton in quantum dots.
(b) State the difference between small and large quantum dots of the same materials in terms of (i) fluorescence lifetime and (ii) Band gaps.
(c) State the effect of water concentration on the sol-gel synthesis reaction?

3. Draw the general configuration of ISFET device indicating clearly its parts with proper labels.

4. (a) Mention 3 main stages involved in the CRISPR-Cas immune response.
(b) State the role of the tracrRNA in the CRISPR-Cas system.
(c)Fill the gaps: -------- Cas endonucleases are used for developing biosensing system. ------ activity of Cas enzyme is employed for nucleic acid detection.

5. (a) Define Reynold number through an equation and relate its values to the flow characteristics of fluids.
(b) State the significance of Peclét number in operating the microfluidic devices and correlate its value range to the flow situations.

6. Show schematically the photolithography for creating microfluidic channels on a chromatographic paper. All steps must show clearly with proper labels.

7. Describe briefly:
(a) Molecular Beacons.
(b) Describe through a suitable diagram the critical steps involved in a typical dual-colour DNA microarray analysis using cancer and normal cells for comparison.
(c) Fill the gap: The majority of molecularly imprinted polymers used in biosensors are synthesized by ------polymerization from monomers.

8. (a) What is Site-binding model in FET? (b) Show the reaction scheme involved in the model.
(c) Name the type of transduction principle involved in the biofuelcell-based biosensors.

9. Explain schematically Kretschmann ATR configuration commonly used in SPR based biosensors.

10. What are the most serious disadvantages of the following detection principles: (a) Calorimetry (b) SPR and (c) FET/potentiometry.

END