BT620 BIOSENSORS Endsem Exam 27.11.2022

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

2. (a) Mention the 3 main stages involved in the CRISPR-Cas immune response. (b) State the role of the tracrRNA in the CRISPR-Cas system. (c) State without elaboration, how the CRISPR-Cas complex identifies the target DNA? Mark:1x 3

3. (a) Define exciton in quantum dots. (b) State the difference between small and large quantum dots of the same materials in terms of fluorescence lifetime and give the reason. (c) What are the major advantages of quantum dots over traditional organic fluorophores? Mark:1x 3

4. Show schematically the SELEX process with proper labels in steps for selecting an aptamer against a target. Mark: 3

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. Mark: 2+1

6. Show schematically the photolithography for creating microfluidic channels on a chromatographic paper surface. All steps must show clearly with proper labels. Mark: 3

7. Depict through a diagram the CRISPR method for detecting viral RNA following SHERLOCK method. Mark: 3

8. Describe briefly: (a) Molecular Beacons (b) Molecular imprinting technique and (c) Critical steps involved in performing a typical dual-colour DNA microarray analysis. Mark:1x 3

9. Describe schematically the Lateral Flow Immunoassay for detecting SARS-CoV-2. Mark:3

10. (a) What is Site-binding model in ISFET? (b) Show the reaction scheme involved in the model. (c) State the relation among threshold voltage, drain to source current and gate-source potential through a suitable equation. Mark:1x 3

END