Department of chemistry
Bioanalytical Chemistry (423 C)
Marks: 70
Time: 2 hours

جامعة دمياط
Damietta University
Faculty of science

1st Semester 2024/2025
Date: December 29, 2024
Group: 4th year students (Minor Chemistry)

Answer ALL the following questions — The Exam is on THREE pages

Part (I)

Question One: choose the most appropriate answer (1.5 points each) **(15 marks)**

1) The sensitivity of a biosensor is limited to
a) the type of recognition element
b) the type of the transducer
c) the sensor's design
d) (b and c)

2) The fourth generation-based glucometer is a kind of sensor that is based on -------as a recognition element
a) enzyme b) DNA c) antibody d) nanozyme

3) ..... selectively recognize the target of interest
a) Detector b) Transducer c) Recognition molecules d) Amplifier

4) ----------immunosensor offered the advantages of low cost and label-free format
a) Direct b) sandwich c) competitive d) (a, b, c)

5) Bacteriophage is employed in biosensing as a ----------
a) recognition molecule b) transducer c) scaffold d) (a& c)

6) Biosensors could be categorized according to the transduction mechanism into
a) electrochemical b) optical c) mass-based d) (a, b, and c)

7) Enzyme-based biosensors refer to----------
a) potentiometric b) amperometric c) conductimetric d) impedimetric

8) The biorecognition & transduction in the Hepatitis C virus test are
a) affinity, colorimetry
b) catalytic, fluorescent
c) catalytic, colorimetry
d) affinity, amperometry

9) Signal amplification is highly desired to improve the sensor's
a) selectivity b) sensitivity c) stability d) (a& c)

10) A DNA-based biosensor is constructed by ----------and used for ----------
a) Single DNA sequence, gene mutation detection
b) antibody, protein detection
c) aptamer, gene mutation detection
d) enzyme, protein detection

Question Two: Indicate which statements are True or False (1 point each) **(10 mark**

1) The aptasensor's design is limited to the target analyte and the length of the aptamer sequence. (✓)
2) The current personal glucometer is based on the oxidation of hydrogen peroxide. (✓)
3) Glutaraldehyde is used to link Ab to the carboxylate-modified electrode. (✗)
4) Phage-based biosensors are stable and selective. (✓)
5) ELISA includes only an immunochemical reaction (✗)
6) LFA offers a long shelf life (✓)
7) DNA-based biosensors are always fluorescent-labeled (✗)
8) The standard addition method is preferred to analyze the analyte in a crude sample. (✓)
9) Glucose can be estimated using colorimetry in the presence of horseradish peroxidase. (✓)
10) Antibodies can be conjugated to various functional groups without changing their affinity. (✓)

Question Three: Answer the following questions (5 points each) **(10 marks)**

1) Construction of an ideal biosensor is an important issue in biotechnology, Discuss.
2) Compare between aptamer and antibody. Which of them is better to use in biosensors in your opinion?

With my best wishes
Dr. Reda Elshafey

aptamer	Ab

Part II

Q 4) Choose the correct answer for the following (15 Marks)

1- The process which used for increasing the sensitivity was called
a) Separation b) Oxidation c) Reduction d) Preconcentration

2- The functional groups which used for ion exchanger were
a) OH&NR_2 b) SO_2H&COOH c- -NO_2&NH_2 d- COOH&NR_2

3- Its separation process depends on degree of crosslinkage of stationary phase
a) PAGE b) HPLC c) GC d) IE

4- Boiling points of components were the main factors for separation using in
a) HPLC b) IE c) GC d) PAGE

5- Rate theory is based on
a) Number of theoretical plate b) Electrical mobility c) Flow rate d) Charge density

6- Matter which prevent the sample components from the column chromatography
a) Mobile b) Stationary c) Plasma d) Eluent

7- Its separation depends on the process of partition and adsorption at the same time
a) TLC b) HPLC c) GC d) PAGE

8- The separation mechanisms for the paper chromatography was
a) Size/Charge b) Partition/Adsorption c) Partition/Exchange d) Adsorption/Charge

9- The area of chromatogram curve was used for
a) Detection b) Determination c) a and b d- None of these

10- Amino acids were changed to charge molecules in
a) Alkaline medium b) Acidic medium c) a and b d) None of these

Q 5) Choose the True or False word for the following (10 Marks)

1- PAGE is based on the differential migration of the individual components. ✗
2- Protein sample were socked in acidic medium before electrophoresis extraction. ✗
3- Agrose and sphadex are good materials used in ion exchanger stationary phase. ✗
4- The distillation range is point at which occur adsorption and desorption ✓
5- Separation by ion exchange method depends on the valence and ionic size. ✓
6- Eluent moves by the influence of gravity or capillary in paper Chromatography. ✗
7- The components were detected through retention time of chromatograms. ✓
8- The column chromatography is distinguished by a large length of the columns. ✓
9- The deprotonating of amino acids were occurred in alkaline medium. ✓
10- Selective method depends on elimination of interfering ions through separation> ✓

Q 6) Explain the separation of amino acids sample by using electrophoresis in alkaline medium (10 Marks)

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