



*(University of Choice)*

# MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR**

**SECOND YEAR SECOND TRIMESTER EXAMINATIONS**

**FOR THE DIPLOMA  
OF  
MEDICAL LABORATORY SCIENCE**

**COURSE CODE: BMD 227**

**COURSE TITLE BIOINSTRUMENTATION II**

**DATE: 10<sup>th</sup> DECEMBER 2020**

**TIME: 8.00 -10.00AM**

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## **INSTRUCTIONS TO CANDIDATES**

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**).

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

1. COMPETITIVE ELISA which is detected in sample?

- A. antigen
- B. anti body
- C. a and b
- D. none of the above

2). Which of the following is an example of an indirect immune test?

- a). blood typing
- b). a point of care pregnancy test
- c). an HIV test
- d). a group A Streptococcus test

3). Which one of the following is not found in a colorimetric

- a). cuvet
- b). light source
- c). photo sensor and analyzer
- d). filters

4). PCR is DNA

- a). degradation technique
- b). DNA amplification technique
- c). DNA sequencing
- d). all of these

5). An electron microscope use what as a source of illumination?

- a). light
- b). beam
- c). xrays
- d). Infra-red light

6). Thermus aquaticus is the source of?

- a). Taq polymerase
- b). Vent polymerase
- c). both a) and b)
- d). primerase enzyme

7). The basic requirement for PCR include all these except?

- a). DNA segment to be amplified
- b). Taq polymerase, nucleotides
- c). plasmid
- d). oligonucleotide primers

8) Gamma-ray photons have:

- a). no mass and no electric charge
- b). no mass and an electric charge of +1
- c). no mass and an electric charge of +2
- d). no mass and an electric charge of -1

9). Electron Capture involves:

- a). an electron combining with a neutron
- b). a neutron being ejected from the nucleus
- c). an electron combining with a proton
- d). an electron being ejected from the nucleus

10) Isomeric Transition involves:

- a). the emission of a gamma-ray
- b). the conversion of a neutron to a proton
- c). the conversion of a proton to a neutron
- d). K-capture

11). In spontaneous fission:

- a). nuclear stability is always achieved
- b). the nucleus splits into 2 or 3 fragments
- c). the fragments are never radioactive

d). the nucleus is unchanged

12). An alpha-particle consists of:

- a). one proton and two neutrons
- b). two protons and one neutron
- c). two protons and two neutrons
- d). one proton and one neutron

13. Internal Conversion involves:

- a). the emission of a gamma-ray
- b). the conversion of a neutron to a proton
- C). K-capture
- d). none of the above processes

14). Electron Emission involves the ejection of:

- a). a beta-minus particle
- b). an alpha-particle
- c). a beta-plus particle
- d). a proton and two neutrons

15). Positron Emission involves the ejection of:

- a). an alpha-particle
- b). a beta-minus particle
- c). a beta-plus particle
- d). a proton and a neutron

16). The basis of separation is based on the following except?

- a). shape
- b). size
- c). density
- d). mass

17) The analytical ultracentrifugation determines which of the following?

- a). mass, shape, quaternary structure, stoichiometric ratio
- b). mass, shape, density, area
- c). shape, energy, voltage
- d). Mass, shape, area, quaternary structure

18) In Electron microscope, light source is replaced by a beam of very fast moving

- a). electron
- b). neutron
- c). proton
- d). photon

19). Who developed PCR?

- A). Kary Mullis
- B). Kohler
- C). Milstein
- D). Fengmin

20). What is PCR ?

- A). DNA degradation
- B). DNA amplification
- C). DNA sequencing
- D). All the above

**21. Beer Lambert's law gives the relation between which of the following?**

- a) Reflected radiation and concentration
- b) Scattered radiation and concentration
- c) Energy absorption and concentration
- d) Energy absorption and reflected radiation

**22. In which of the following ways, absorption is related to transmittance?**

- a) Absorption is the logarithm of transmittance
- b) Absorption is the reciprocal of transmittance
- c) Absorption is the negative logarithm of transmittance
- d) Absorption is a multiple of transmittance

23. Which of the following is not a limitation of Beer Lambert's law, which gives the relation between absorption, thickness, and concentration?

- a) Concentration must be lower
- b) Radiation must have higher bandwidth
- c) Radiation source must be monochromatic
- d) Does not consider factors other than thickness and concentration that affect absorbance

24. Electrophoresis of histones and myoglobin under non-denaturing conditions (pH = 7.0) results in

- A. both proteins migrate to the anode
- B. histones migrate to the anode and myoglobin migrates to the cathode
- C. histones migrate to the cathode and myoglobin migrates to the anode

both proteins migrate to the cathode

25. How might solid sodium carbonate be obtained from sodium carbonate solution?

- a) Centrifugation
- b) Filtration
- c) Evaporation
- d) It cannot be extracted

26. What is the best description of blood?

- a) Sol
- b) Foam
- c) Solution
- d) Aerotion

27. A suspension is formed from uniform particles of solid, of diameter 10 Mm, suspended in a solvent. What is the best

description of this system?

- a) Monodisperse and coarse
- b) Monodisperse and colloidal
- c) Polydisperse and coarse
- d) Polydisperse and colloidal

28. Which one of the following dispersions does not have liquid continuous phase?

- a) Nanosuspension
- b) Microemulsion
- c) Gel
- d) F

29. Which one of the following systems has the smallest sized domains in its dispersed se?

- a) Nanoemulsion
- c) Coarse emulsion
- b) Coarse suspension
- d) Microemulsi

30. Which of the following sequences correctly describes the change in domain structure as more oil is added to a water-in-oil emulsion?

- a) Bicontinuous, spherical, cylinder-like
- b) Spherical, cylinder-like, bicontinuous
- c) Spherical, bicontinuous, cylinder-like
- d) Cylinder-like, spherical, bicontinuo

31. Which method for the production of dispersions involves the formation of particles from materials dissolved in true solutions?

- a) Bottom-up

- b) Top-down
- c) Milling
- d) High pressure homogenization

32. The scattering of light by coarse and colloidal dispersed systems is known as?

- a) Contrast matching
- b) DLVO theory
- c) Tyndall effect
- d) Cr
- d) Hydrolysis

Question 10

33. Which of the following is not a mechanism for the separation of a physically unstable suspension of magnesium hydroxide in water?

- a) Flocculation
- b) Aggregation
- c) Ostwald ripening

34. In the DLVO theory of colloids, normal thermal motion may be sufficient to overcome the energy barrier that leads to irreversible particle aggregation. The name of this energy barrier is which one of the following?

- a) Primary maximum
- b) Secondary maximum
- c) Primary minimum
- d)

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35. In isoelectric focusing, proteins are separated on the

basis of their

- A. relative content of positively charged residue only
- B. relative content of negatively charged residue only
- C. Size
- D. relative content of positively and negatively charged residue

36. The PCR technique was developed by\_\_\_\_\_.

- (a) Kohler
- (b) Altman
- (c) Milstein
- (d) Kary Mullis

37. The polymerase chain reaction is\_\_\_\_\_.

- (a) It is a DNA sequencing technique.
- (b) It is a DNA degradation technique
- (c) It is a DNA amplification technique
- (d) All of the above

38. Which of the following statements is accurate for the PCR – polymerase chain reaction?

- (a) Automated PCR machines are called thermal cyclers
- (b) A thermostable DNA polymerase is required
- (c) Millions to billions of desired DNA copies can be produced from microgram quantities of DNA
- (d) All of the above

39. Thermus aquaticus is the source of \_\_\_\_\_.

- (a) Vent polymerase
- (b) Primase enzyme
- (c) Taq polymerase
- (d) Both a and c

40. Which of the following is not a thermostable polymerase?

- (a) pfu polymerase
- (b) Taq polymerase
- (c) Vent polymerase
- (d) DNA polymerase III

41. Which of the following is the basic requirement of PCR reaction?

- (a) Two oligonucleotide primers
- (b) DNA segment to be amplified
- (c) A heat-stable DNA polymerase
- (d) All of the above

42. Why are vent polymerase and Pfu more efficient than the Taq polymerase?

- (a) Because of proofreading activity
- (b) Because of more efficient polymerase activity
- (c) Both a and b
- (d) None of the above

43. Which of the following is the first and the most important step in the polymerase chain reaction?

- (a) Annealing
- (b) Primer extension

- (c) Denaturation  
(d) None of the above
44. What is the process of binding of primer to the denatured strand called?  
(a) Annealing  
(b) Renaturation  
(c) Denaturation  
(d) None of the above
45. Denaturation is the process of \_\_\_\_\_.  
(a) Heating between 72°C  
(b) Heating between 40 to 60°C  
(c) Heating between 90 to 98°C  
(d) None of the above
46. Which of the following statements are true regarding PCR?  
(a) Primer extension occurs at 72°C  
(b) Denaturation involves heating at 90 to 98°C  
(c) Annealing involves the binding of primer between 40 to 60°C  
(d) All of the above
47. Polymerase used for PCR is extracted from \_\_\_\_\_.  
(a) Homo sapiens  
(b) Thermus aquaticus  
(c) Escherichia coli  
(d) Saccharomyces cerevisiae
48. At what temperature does denaturation of DNA double helix takes place?  
(a) 54°C  
(b) 74°C  
(c) 94°C  
(d) 60°C
49. How many DNA duplexes are obtained from one DNA duplex after 4 cycles of PCR?  
(a) 8  
(b) 4  
(c) 32  
(d) 16
50. Primers used for the process of polymerase chain reaction are \_\_\_\_\_.  
(a) Single-stranded RNA oligonucleotide  
(b) Single-stranded DNA oligonucleotide  
(c) Double-stranded RNA oligonucleotide  
(d) Single-stranded DNA oligonucleotide
51. At what temperature does annealing of DNA and primer take place?  
(a) 54°C  
(b) 96°C  
(c) 42°C  
(d) 74°C
52. Reverse transcription PCR uses \_\_\_\_\_.  
(a) RNA as a template to form DNA  
(b) mRNA as a template to form cDNA  
(c) DNA as a template to form ssDNA  
(d) All of the above
53. Which of the following is an application of polymer chain reaction?  
(a) Site-directed mutagenesis  
(b) Site-specific recombination  
(c) Site-specific translocation  
(d) All of the above
54. Which of the following is true for asymmetric PCR?  
(a) Used for generating double-stranded copies for DNA sequence  
(b) Used for generating single-stranded copies for DNA sequence  
(c) Both a and b  
(d) None of the above
55. The polymer chain reaction is used for \_\_\_\_\_.  
(a) Amplifying gene of interest  
(b) Constructing RAPD maps  
(c) Detecting the presence of the transgene in an organism  
(d) All of the above
56. which is working principle of ELISA ?  
A. Ag-Ab neutralization  
B. Ag-Ab complex  
C. A and B  
D. None of the above.
57. which is not application of ELISA ?  
A. Detection of hepatitis B markers in serum.  
B. Percentage of Hb in blood.  
C. Detection of HIV antibodies in blood sample.  
D. Detection of mycobacterium antibodies in tuberculosis.
58. Indirect ELISA which is detected in sample ?  
A. Antigen  
B. Anti body  
C. A and B  
D. None of the above
59. Indirect ELISA which is detected in sample ?  
A. Antigen  
B. Anti body  
C. A and B  
D. None of the above
60. sandwich ELISA which is detected in sample?  
A. Antigen  
B. Anti body  
C. A and B  
D. None of the above