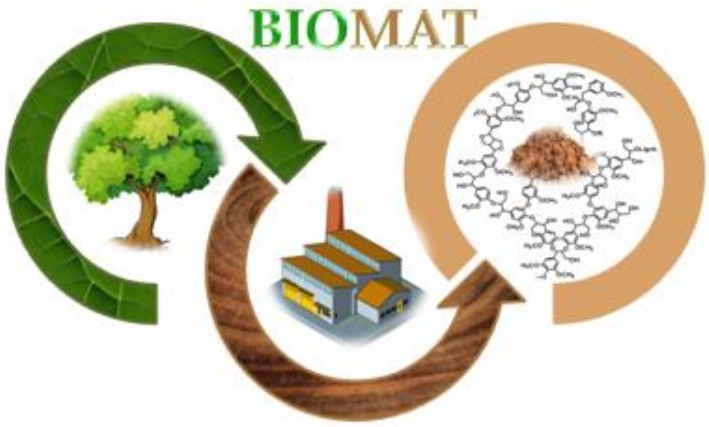
SS. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE, MACEDONIA




# *Part 3*
# *E-test*

# *Green composites obtaining with valorization of wood lignin, and their characterization*

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**Choose and mark one correct answer:**

**1. What does the abbreviation LASER stand for?**
A. light absorption by stimulated energy radiation
B. light amplification by stimulated emission of radiation
C. light application for spectral emission of radiation
D. light adjustment by sequential energy reflection

**2. Which property of lasers refers to generating a beam with a single wavelength?**
A. coherence
B. monochromaticity
C. collimation
D. intensity

**3. What does collimation of a laser beam mean?**
A. the beam spreads in all directions
B. the beam is polarized
C. the beam is not dispersed and can be focused into a small point
D. the beam continuously changes wavelength

**4. What does ablation refer to in laser processing?**
A. reflection of laser light
B. removal of material through melting or evaporation
C. generation of a magnetic field
D. all of the above

**5. Which types of lasers are used for ablation?**
A. only continuous wave lasers
B. only pulsed lasers
C. both continuous wave and pulsed lasers
D. only gas lasers

**6. What happens when a solid surface absorbs laser energy?**
A. the material becomes superconductive
B. thermal motion of some particles is accelerated
C. the material immediately cools down
D. none of the above

**7. What is the laser ablation rate defined as?**
A. mass of material per minute
B. particles ablated per unit area per second

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C. energy absorbed per second
D. change in wavelength during ablation

**8. In the ablation rate formula $\dot{N} = \varrho d / \tau m$, what does $\tau$ represent?**
A. thickness of the ablated material
B. duration of the laser pulse
C. density of the target
D. beam spot size

**9. Thermal ablation mainly occurs when using:**
A. very short laser pulses
B. longer laser pulses
C. infrared lamps instead of lasers
D. visible light only

**10. Photochemical ablation is characteristic of which type of lasers?**
A. ultraviolet lasers
B. continuous wave lasers
C. infrared lasers
D. X-ray lasers

**11. Which of the following is NOT a step in pulsed laser deposition?**
A. thin-film deposition on the substrate
B. isothermal and adiabatic expansion of plasma
C. mechanical grinding of the target
D. laser ablation and plasma formation

**12. During plasma expansion in pulsed laser deposition, the plasma cloud forms:**
A. parallel to the target surface
B. perpendicular to the target surface
C. randomly in all directions
D. the plasma does not expand

**13. What is formed when gaseous particles aggregate on the substrate?**
A. plasma cloud
B. thin film
C. ionized layer
D. none of the above

**14. Which laser beam characteristic affects ablation efficiency the most?**
A. colour of the housing

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B. pulse duration, wavelength, and focus position
C. brand of the laser
D. the distance between the target and substrate

**15. Shorter laser pulses result in:**
A. more melting and thermal damage
B. greater vaporization with minimal melting
C. no material removal
D. longer reaction times

**16. Why must the laser wavelength match the material's optical properties?**
A. to avoid reflection
B. to prevent plasma formation
C. to reduce beam diameter
D. to minimize thermal damage and maximize absorption

**17. What role does the pulse repetition rate play?**
A. pulse repetition rate is not important
B. prevents heat buildup and allows plasma dispersion
C. determines the chemical composition of the target
D. it changes the laser colour

**18. What must the laser energy density exceed for successful ablation?**
A. melting point
B. ablation threshold
C. wavelength limit
D. all of the above

**19. Why is laser ablation/deposition widely used in industry and science?**
A. because it is cheap and requires no training
B. because of its simplicity, speed, and precise control
C. because of the use of water as solvent
D. because it uses high amounts of energy

**20. What is the final product of pulsed laser deposition?**
A. thin films or structures on a substrate
B. low-density plasma
C. a continuous laser beam
D. high-density plasma

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**21. What is a major advantage of polymerization in an aqueous medium?**
A. it requires organic solvents
B. it is environmentally friendly and safer
C. it produces very high viscosity
D. it is faster than all other methods

**22. Why does water improve the polymerization process?**
A. increases viscosity
B. improves heat transfer
C. reduces monomer reactivity
D. speeds up chain termination

**23. What is reduced when using aqueous polymerization compared to organic solvents?**
A. water content
B. emission of volatile organic compounds
C. polymer molecular weight
D. reaction time

**24. Which type of polymerization is most commonly used for aqueous polymer dispersions?**
A. bulk polymerization
B. suspension polymerization
C. emulsion polymerization
D. solution polymerization

**25. Emulsion polymerization provides control over:**
A. polymer morphology and structure
B. reaction vessel size
C. temperature only
D. time of polymerization

**26. What type of polymerization is emulsion polymerization?**
A. homogeneous ionic polymerization
B. condensation polymerization
C. anionic bulk polymerization
D. heterogeneous free radical polymerization

**27. What is the role of a surfactant in emulsion polymerization?**
A. initiates polymerization
B. stabilizes hydrophobic monomers in the aqueous phase
C. increases viscosity of water
D. speeds the polymerization

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**28. What initiates the conversion of monomers to polymers?**
A. surfactant
B. heat only
C. micelles
D. addition of an initiator generating free radicals

**29. What is the final product of emulsion polymerization in water called?**
A. gel
B. latex or polymer dispersion
C. solution
D. suspension

**30. Which of the following is NOT a basic reactant in lab-scale emulsion polymerization?**
A. monomers
B. surfactant
C. organic solvent
D. initiator

**31. How many components can industrial emulsion polymerization formulations contain?**
A. over 20
B. 4
C. 10
D. 2

**32. What types of monomers are commonly used in emulsion polymerization?**
A. highly water-soluble monomers
B. acrylates, methacrylates, styrene, vinyl chloride
C. only vinyl alcohol
D. none of the above

**33. Which types of initiators are used in emulsion polymerization?**
A. initiators are not used in emulsion polymerization
B. aqueous-soluble, organic-soluble, and sometimes redox initiators
C. only inorganic salts
D. only organic-soluble initiators

**34. What are the types of surfactants used in emulsion polymerization?**
A. only anionic
B. only non-ionic
C. anionic, cationic, non-ionic, or amphoteric
D. only amphoteric

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**35. What forms when surfactant reaches the critical micellar concentration?**
A. monomer droplets
B. micelles
C. precipitate
D. thin film

**36. What portion of monomers diffuses inside micelles before initiation?**
A. 1%
B. 50%
C. 10%
D. 0.5%

**37. What type of nucleation dominates when surfactant concentration is above the critical micellar concentration?**
A. homogeneous nucleation
B. micellar or heterogeneous nucleation
C. thermal nucleation
D. both homogenous and heterogenous

**38. At lower surfactant concentrations, which type of nucleation occurs?**
A. micellar
B. micellar and heterogenous
C. heterogeneous
D. homogeneous

**39. During which interval of emulsion polymerization does the polymerization rate remain constant?**
A. first interval
B. second interval
C. third interval
D. polymerization rate continuously decreases

**40. What is the monomer conversion at the end of the first interval?**
A. 50–80 wt%
B. 10 wt%
C. 100 wt%
D. below 20 wt%

**41. What are the three types of emulsion polymerization based on droplet size?**
A. microemulsion, macroemulsion, miniemulsion
B. bulk, suspension, solution
C. radical, ionic, coordination

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D. anionic, cationic and zwitterionic

**42. What distinguishes batch, semi-continuous, and continuous emulsion polymerization?**
A. color of latex
B. degree of process continuity
C. temperature
D. type of the reactor

**43. What happens during the deformation stage in film formation?**
A. polymer chains evaporate
B. surfactants precipitate
C. chains become densely arranged and deform
D. water evaporates

**44. What is coalescence in the context of latex film formation?**
A. diffusion of polymer chains across particle boundaries forming a continuous film
B. evaporation of water
C. formation of micelles
D. evaporation of organic solvent

**45. What is the main advantage of in-situ composite polymerization over emulsion mixing?**
A. greater control over viscosity
B. formation of stable bonds between filler and polymer
C. requires fewer reactants
D. all of the above

**46. What is the main advantage of FTIR-ATR over regular FTIR?**
A. it requires less expensive equipment
B. it penetrates deeper into the sample
C. it uses visible light instead of infrared
D. it allows analysis directly on the sample surface without special preparation

**47. When the contact angle of a liquid on a solid surface is less than 90°, what happens?**
A. the liquid forms a spherical droplet
B. the liquid spreads and the surface is well wetted
C. the liquid evaporates immediately
D. all of the above

**48. In superhydrophobic surfaces, what is true about the contact angle?**
A. it is <90° and the liquid spreads easily
B. it is between 90° and 150°

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C. it is >150° and the liquid barely touches the surface (“lotus effect”)
D. the contact angle is between 180° and 200°

**49. What parameter is obtained from the ratio of engineering stress to engineering strain?**
A. yield strength
B. tensile strength
C. modulus of elasticity (E)
D. stress at break

**50. What is used to eliminate the influence of geometry in mechanical testing?**
A. normalized parameters (engineering stress and strain)
B. extensometer calibration
C. increasing the sample size
D. none of the above

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# *Part 3_ Answer Sheet*
# *E-test*

## *Green composites obtaining with valorization of wood lignin, and their characterization*

*Name and surname: ……..……..…… Date: ……..……..……*

*Points: ……..……/50 pts, Percentages:……/100%*

| Number questions | Answer | Number questions | Answer | Number questions | Answer | Number questions | Answer | Number questions | Answer |
|---|---|---|---|---|---|---|---|---|---|
| 1. | | 11. | | 21. | | 31. | | 41. | |
| 2. | | 12. | | 22. | | 32. | | 42. | |
| 3. | | 13. | | 23. | | 33. | | 43. | |
| 4. | | 14. | | 24. | | 34. | | 44. | |
| 5. | | 15. | | 25. | | 35. | | 45. | |
| 6. | | 16. | | 26. | | 36. | | 46. | |
| 7. | | 17. | | 27. | | 37. | | 47. | |
| 8. | | 18. | | 28. | | 38. | | 48. | |
| 9. | | 19. | | 29. | | 39. | | 49. | |
| 10. | | 20. | | 30. | | 40. | | 50. | |

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# *Part 2_ Answer Key*

# *E-test*

## *Green composites obtaining with valorization of wood lignin, and their characterization*

**Each correct answer: 1 point, maximum number of points to be obtained: 50 points.**

| | | | | |
|---|---|---|---|---|
| **1. B** | **11. C** | **21. B** | **31. A** | **41. A** |
| **2. B** | **12. B** | **22. B** | **32. B** | **42. B** |
| **3. C** | **13. B** | **23. B** | **33. B** | **43. C** |
| **4. B** | **14. B** | **24. C** | **34. C** | **44. A** |
| **5. C** | **15. B** | **25. A** | **35. B** | **45. B** |
| **6. B** | **16. D** | **26. D** | **36. A** | **46. D** |
| **7. B** | **17. B** | **27. B** | **37. B** | **47. B** |
| **8. B** | **18. B** | **28. D** | **38. D** | **48. C** |
| **9. B** | **19. B** | **29. B** | **39. B** | **49. C** |
| **10. A** | **20. A** | **30. C** | **40. D** | **50. A** |

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