श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौघोगिकी संस्थान,तिरुवनन्दपुरम् - ६९५ ०११,केरल, भारत
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES &TECHNOLOGY
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WRITTEN TEST FOR MFCP TECHNICAL ASSISTANT (INSTRUMENTS) A TO B – CENTRAL ANALYTICAL FACILITY

Roll No. [ ]

Date: 25.09.2024
Time: 9.00 A.M

Duration: 60 Minutes
Total Marks: 50

INSTRUCTIONS TO THE CANDIDATE

1. Write your Roll Number on the top of the Question Booklet and in the answer sheet.
2. Write legibly the alphabet of the most appropriate answer in the separate answer sheet provided.
3. There will not be any Negative marking.
4. Over-writing is not permitted.
5. Candidate should sign in the question paper and answer sheet.
6. No clarifications will be given.
7. Candidate should hand over the answer sheet and question paper to the invigilator before leaving the examination hall.

Signature of the Candidate

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Head, BMT Wing

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((एक राष्ट्रीय महत्व का संस्थान, विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार)
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MFCP Examination – Written Test
Technical Assistant (Instruments) A to B, Central Analytical Facility

Date of Examination: 24 September 2024

1. Who is considered to be the father of chromatography techniques?
   a) J Heyrovsky, b) M Tswett, c) H Pinter, d) F Blotch

2. In the Raman spectroscopic analysis Nd: YAG laser is commonly used as a source for monochromatic radiations. YAG is
   a) Yellow aligned grating, b) Yttrium aligned grating, c) Yttrium aluminum garnet, d) Ytterbium aligned grating

3. …….. of the analyte is an important parameter in selecting the stationary phase.
   a) Melting point, b) Polarity c) Vapor pressure, d) point group

4. Which of the following constitutes a stationary phase?
   a) Neutral Alumina, b) Basic Alumina, c) Silica Gel, d) All of these

5. Payne Permeability cups are used for ……
   a) Density measurement, b) Surface tension analysis, c) contact angle analysis, d) Water vapor transmission rate analysis

6. In gel permeation chromatography the columns are packed with……..
   a) Aerogel, b) styragel, c) ultrahydrogel, d) either b or c

7. The number average molecular weight of a polymer was estimated by GPC analysis as 45 kDa. What will be its weight average molecular mass if PDI is 1.2?
   a) 50 kDa, b) 54 kDa, c) 90 kDa, d) 37.5 kDa

8. In chromatography, which of the following can the mobile phase be made of?
   a) Solid or liquid, b) Liquid or gas, c) Gas only, d) Liquid only

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9. Which one is known as the universal detector for GPC analysis?
   a) RI detector, b) UV detector, c) Fluorescent detector, d) ELS detector

10. ESI detector is employed in mass spectrometry. ESI stands for……?
    a) Electrical supported ionization, b) Electronic state ionization, c) Electrospray ionization, d) Electrospin ionization

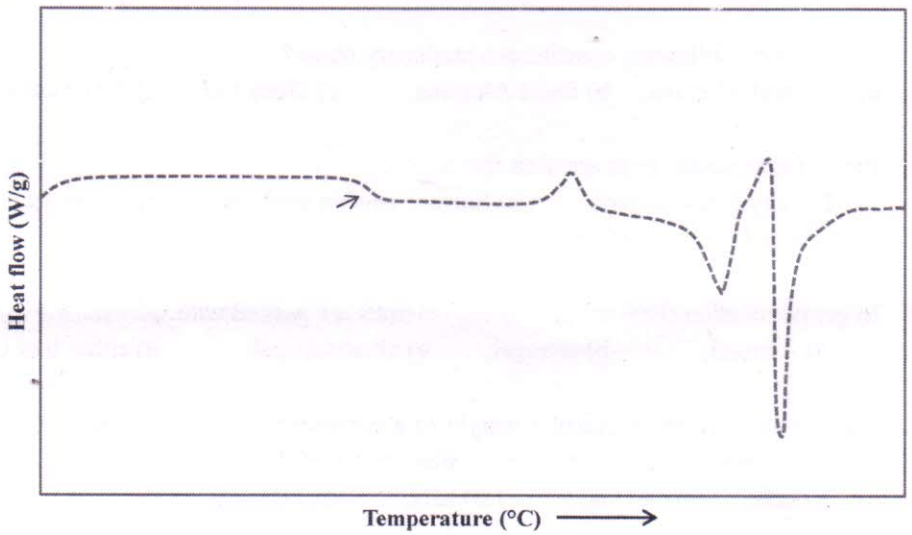
11. Ethylene when passed over Ag in the presence of oxygen resulted in the formation of……..
    a) Ethylene glycol, b) Ethanol, c) Ethylene oxide, d) Ethanal

12. Van Deemter plot is used for the determination of ……..
    a) The selectivity factor, b) The Optimum mobile phase flow rate,
    c) Optimum column temperature, d) Optimum column length

13. Resolution is proportional to the……
    a) number of theoretical plates in a column,
    b) square root of the number of theoretical plates in a column,
    c) square of the number of theoretical plates in a column
    d) cube root of the number of theoretical plates in a column

14. Derivatisation of analytes is often carried out to ……
    a) Improve detector response, b) increase the volatility of analyte, c) improve polarity of analyte, d) all of these.

15. In the given thermogram of a polymer given below, the marked thermal transition is ……



    a) Glass transition temperature, b) crystallization temperature, c) melting temperature, d) decomposition temperature

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16. During GC analysis column is maintained at a particular temperature in order to ….
    a) Avoid analyte condensation, b) control elution of analytes, c) reduce band broadening, d) all of these

17. The internal diameter of the column is inversely related to the……..
    a) Sample capacity, b) resolution, c) overloading, d) reproducibility

18. Elution of traces of stationary phase is called column……
    a) Scotching, b) Bleeding, c) Discharging, d) Erosion

19. A GC detector should have……1) high reproducibility, 2) high sensitivity 3) high linear dynamic range, 4) should be non-destructive, 5) volatile components
    a) All of these, b) none of these, c) 1,2,3, and 4, d) 1,2 4, and 5.

20. Which of the following is an isomer of ethylene oxide?
    1) Ethanol, 2) Ethanal, 3) Vinyl alcohol, 4) Ethanone, 5) Ethanoic acid
    a) Only 2 b) 1,2,4 and 5, c) 2 and 3, d) None of these

21. ……. based pellets are used for the functional group analysis of powder samples in the transmission mode.
    a) Sodium Chloride, b) Potassium chloride, c) Potassium bromide, d) Potassium iodide

22. ATR mode of FTIR analysis utilizes ……. property of IR radiations passing through the ATR crystal mounted with sample resulting in an evanescent wave.
    a) Interference, b) diffraction, c) refraction d) Total internal reflection

23. DTGS is commonly used as a detector for FTIR spectrometers. DTGS is……..
    a) Dibutylamine doped Tri-Glycine Sulphate,
    b) Deuterated alanine doped Tri-Glycine Sulphate
    c) Deuterated asparagine doped Thio-Guanidine Sulphate,
    d) Deuterated arginine doped Triglutamyl Sulphate

24. CN stretching of nitrile compounds form strong stretching vibrations around……..
    a) 3300 cm^{-1} b) 2200 cm^{-1} c) 1800 cm^{-1} d) 900 cm^{-1}

25. Mark-Howink equation relates the molecular mass of a macromolecule with ……
    a) Oxidation Potential b) Critical Micelle Concentration c) Intrinsic viscosity d) Absorbance

26. For a monodisperse polymer, the number average molecular weight (M_n) will be……..
    a) Twice the value of M_W b) half the value of M_W c) Equal to M_W d) none of these

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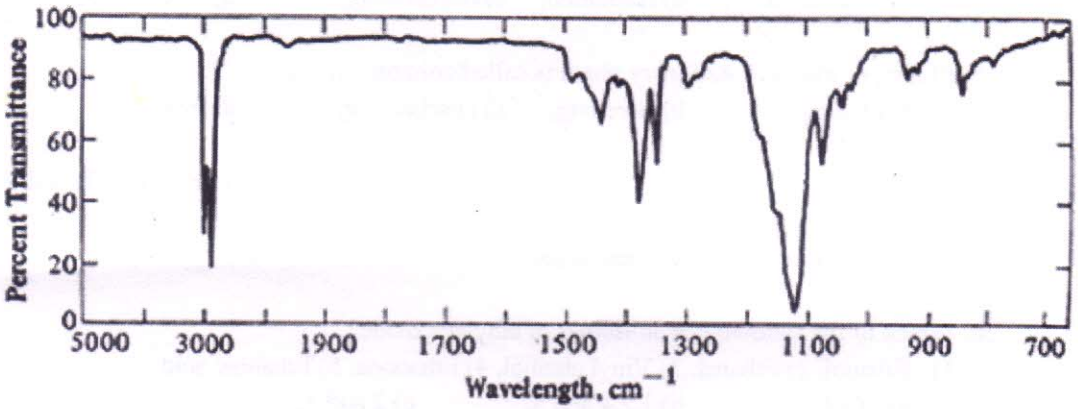
27. Cobalt - 60 is a commonly used chemical in radiation therapy of cancer patients because it emits……..

a) Visible light b) X-rays c) neutrons d) Gamma Rays

28. FTIR spectrum of a compound is given below. It could be ……

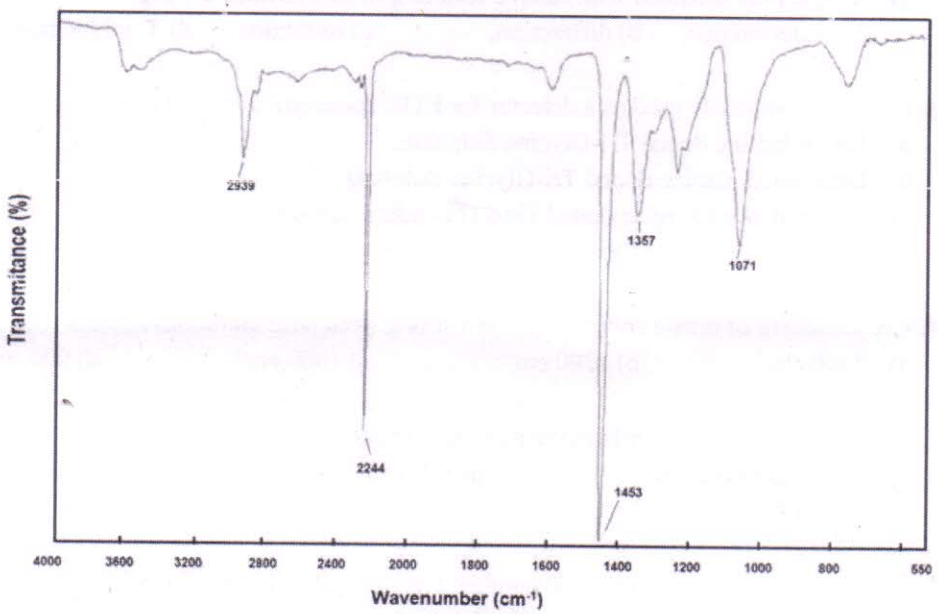


a) Alcohol b) Amine c) Ether d) Ketone

29. Ram prepared a 0.00001 M solution of a monobasic acid for titration experiments. If the acid is completely ionized, what would be the pH of the solution?

a) 9.0 b) 5.0 c) 7.4 d) 3.0

30. FTIR analysis of a polymer yielded the following spectrum. It can be…..



a) Poly (ethylene terephthalate) b) Poly(propylene) c) Poly(acrylonitrile),
d) Teflon

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31. The color of nanomaterials is due to……
    a) Diffraction b) nuclear magnetic resonance c) surface plasmon resonance d) Larmour resonance

32. The electronic transition from triplet excited state to singlet ground state will result in……..
    a) Fluorescence b) Phosphorescence c) Senescence d) None of these

33. Reflection of all light that arrives from a given direction at the same angle is called……..
    a) Total reflection b) specular reflection c) Diffuse reflection d) none of these

34. 1 MPa = …….. N/m^2
    a) 2.5×10^6
    b) 1.0×10^5
    c) 1.0×10^6
    d) 2.5×10^3

35. Radiations with a wavelength in between 280 and 315 nm are called……
    a) UVA b) UVB c) UVC d) UVD

36. Thermogravimetric analysis of Calcium oxalate pentahydrate under nitrogen atmosphere yields a three-step degradation profile. What will be the product remain after the final degradation?
    a) Ca b) Ca_3N_2 c) CaO d) Ca_2C

37. During the HPLC analysis of Curcumin, the analyst unknowingly doubled the mobile phase's flow rate. How will it affect the elution if all other parameters are kept constant?
    a) Retention time will decrease, b) Retention time will increase, c) Peak area will decrease, d) No change

38. A polymeric sample displayed a water contact angle of 120°. It can be called as……..
    a) Hydrophilic b) amphiphilic c) hydrophobic d) hydrostatic

39. At room temperature water possess a viscosity of 1.3 cP and a surface tension of 72 mN/m. How these values will change with increasing temperature?
    a) Viscosity will decrease and surface tension will increase b) Viscosity will increase and surface tension will decrease c) Both will decrease d) Both will increase

40. O-H bond of ethanol vibrates at 3300 cm^{-1}. What will be the vibration frequency of O-D bond in deuterated ethanol?
    a) 3300 cm^{-1} b) 3400 cm^{-1} c) 2400 cm^{-1} d) 1800 cm^{-1}

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41. Usually, the cuvettes used for UV spectroscopic analysis are made of Quartz. Quartz is chemically…….

a) ZnO b) TiO_2 c) SiO_2 d) Al_2O_3

42. Most of the regulatory agencies demand strict compliance of all materials used for electrical, electronic, and medical applications with the RoHS directive. RoHS is…..

a) Regulation of harmful substances b) Restriction of hazardous substances
c) Regulation of health statistics d) Restriction of harmful substances

43. ASTM D 3418 outlines the determination of ……

a) Coagulation index b) Melt flow viscosity c) Melting point d) Residual solvent

44. The detailed methods for the estimation of residual ethylene oxide in sterilized medical devices are described in …..

a) ISO 10993-5 b) ISO 10993-7 c) ISO 10993-19 d) ISO 10993-11

45. The glass transition temperature of natural rubber is ……

a) Above room temperature, b) below room temperature
c) same as room temperature d) Undeterminable

46. Which of the following method is adopted for the determination of surface tension of liquids?

a) Washburn method b) Du Nouy ring method c) Thomson method d) all of these.

47. As per ISO 17025: 2017 the validity of a test result can be ensured by…….

a) Using reference standards b) blind sample analysis c) interlaboratory comparisons
d) all of these.

48. In a proficiency testing coordinated by an accredited agency, Lab 1 got a z-score of 2.5. As per NABL document 163, the test result of the laboratory is……

a) Satisfactory b) questionable c) unsatisfactory d) indeterminate

49. Type A evaluation of uncertainty involves the estimation by using……

a) Statistical calculations b) manufacturer specification c) calibration certificates
d) reference handbooks

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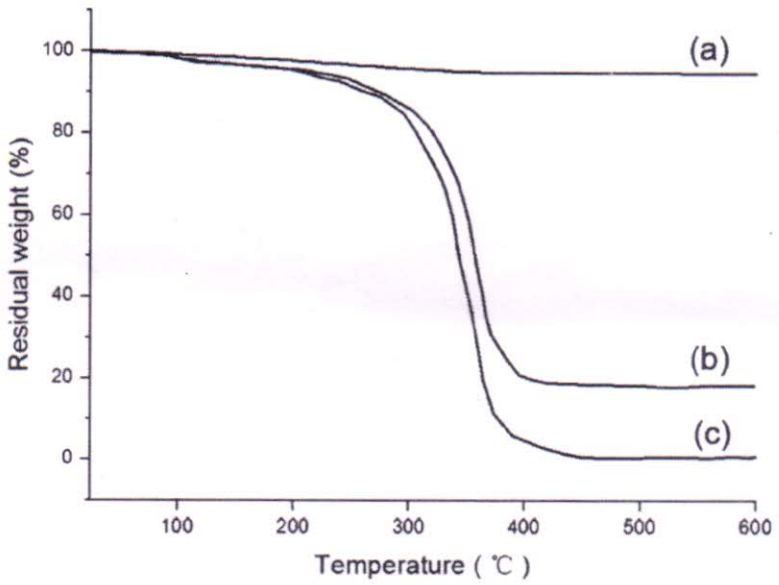
50. In the thermogram given below sample 'b' is a composite formed by combining an organic polymer 'c' with an inorganic filler 'a'. Approximately how much polymer will be in the composite?



a) 20% b) 30% c) 80% d) 40%

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MFCP Examination – Answer Key
Technical Assistant (Instruments) A to B, Central Analytical Facility

Date of Examination: 24 September 2024

1. b) M Tswett
2. c) Yttrium aluminum garnet
3. b) Polarity
4. d) All of these
5. d) Water vapor transmission rate analysis
6. d) either b or c
7. b) 54 kDa
8. b) Liquid or gas,
9. a) RI detector
10. c) Electrospray ionization
11. c) Ethylene oxide
12. b) The optimum mobile phase flow rate
13. b) square root of the number of theoretical plates in a column
14. d) all of these.
15. a) Glass transition temperature
16. d) all of these
17. b) resolution
18. b) Bleeding
19. c) 1,2,3, and 4
20. c) 2 and 3
21. c) Potassium bromide
22. d) Total internal refiection
23. b) Deuterated alanine doped Tri-Glycine Sulphate
24. b) 2200 cm^{-1}
25. c) Intrinsic viscosity
26. c) Equal to M_w

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27. d) Gamma Rays
28. c) Ether
29. b) 5.0
30. c) Poly(acrylonitrile)
31. c) surface plasmon resonance
32. b) Phosphorescence
33. b) specular reflection
34. c) 1.0×10^6
35. b) UVB
36. c) CaO
37. a) Retention time will decrease
38. c) hydrophobic
39. c) Both will decrease
40. c) 2400 cm^{-1}
41. c) SiO_2
42. b) Restriction of hazardous substances
43. c) Melting point
44. b) ISO 10993-7
45. b) below room temperature
46. b) Du Nouy ring method
47. d) all of these.
48. b) questionable
49. a) Statistical calculations
50. c) 80%