Register Number:

M.TECH DEGREE EXAMINATIONS: JANUARY 2009

First Semester

TEXTILE TECHNOLOGY

P07TX104 Theory of Coloration and Finishing

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (20 x 1 =20 Marks)

1. Dye-concentration profile from surface to the centre of the fibre that is used for determining diffusion coefficient at various points and concentrations in the fibre, can be obtained by
   A. Spectrophotometer Technique
   B. Densitometer Technique
   C. DSC Technique
   D. IR Technique

2. WLF equation represents the influence of
   A. Temperature on Diffusion
   B. Cohesive energy density on Fixation
   C. Entropy on standard affinity
   D. Dye-fibre bond stability on equilibrium adsorption

3. The standard affinity is related to
   A. Diffusion coefficient and partition coefficient
   B. Solubility parameter and entropy
   C. Standard heat of dyeing and standard entropy of dyeing
   D. Gibbs free energy and rate of dyeing

4. The ratio between concentration of dye on fibre and dye in solution is known as
   A. % Exhaustion
   B. % Fixation
   C. Equilibrium adsorption
   D. Substantivity ratio

5. The bonds between reactive dyes and cellulosic fibres & bond energy are
   A. Covalent bond; 20-200 kcal/mol
   B. Hydrogen bond; 2-10 kcal/mol
   C. Van der Waals force; 1-2 kcal/mol
   D. Covalent bond; 10-100 kcal/mol

6. Disperse dyeing of hydrophobic fibres follows
   A. Langmuir isotherm
   B. Freundlich isotherm
   C. Nernst isotherm
   D. None of the above

7. Which one of the following is not useful directly or indirectly in identification of dye-fibre forces
   A. Vapour phase adsorption
   B. Permittivity and refractive index measurement
   C. Chromatography
   D. Gilbert-Rideal equation

8. When the concentration gradient (rate of transfer) in a steady state of flow across the section is constant, it follows
   A. First law of thermo dynamics
   B. Fick's first law
   C. Fick's second law
   D. Donnan membrane equilibrium

9. If the subtracted value of *LAB* of standard from those of object is $+\Delta B$, it means
   A. Darker ; redder
   B. Lighter ; bluer
   C. Darker; greener
   D. Lighter ; yellower

10. Colour difference ΔE is given by
   A. $(2L+2A+2B)^{½}$
   B. $(1-R)^2/2R$
   C. $(L^2+A^2+B^2)^{½}$
   D. $(Dt-4\pi r^2)^{½}$

11. CIE stands for
   A. Commission Internationale de Eclairage
   B. Colour Index Examination
   C. Colour at Infinite Exhaustion
   D. Colour Intensity Evaluation

12. Functional groups present in commercial acrylic fibre for the dye to interact are
   A. NH_2, COOH, OH
   B. COOH, SO_3H, OSO_3H
   C. OH, COOH, COO
   D. OH, $OCOCH_3$

13. Beer-Lambert Law is useful for measuring
   A. Reflectance
   B. Metamerism
   C. Absorbance
   D. Affinity

14. The isoelectric point of wool and silk respectively are
   A. pH 4.5-4.8 and pH 3.2-3.8
   B. pH 4.5-4.8 and pH 5.5-6.5
   C. pH 3.5-4.5 and pH 6.5-7.0
   D. pH 1.5-2.2 and pH 3.2-3.8

15. Drawing, Texturising and Heat setting that are normally carried out for synthetic fibres
   A. affect their thermal and mechanical history & dyeabilty
   B. do not alter their thermal and mechanical history & dyeability
   C. affects their thermal and mechanical history but not dyeabilty
   D. do not affect their thermal and mechanical history but dyeabilty

16. The viewing geometry recommended by American Society for Testing and Materials for visual assessment of colour difference in ASTM D1729-89 is
   A. $0/45^0$ geometry
   B. $45/0^0$ geometry
   C. $0/90^0$ geometry
   D. $90/0^0$ geometry

17. The main function of stabilizer during hydrogen peroxide bleaching is to have
   A. Controlled pH and slower release of hydroxyl ions
   B. Controlled temperature and faster release of perhydroxyl ions
   C. Controlled decomposition and slower release of perhydroxyl ions
   D. Controlled decomposition and faster release of nascent oxygen

18. During enzymatic degumming of silk using trypsin proteases, the major cleavages in sericin occurs, wherever
   A. Glycine and Arginine amino acids are present
   B. Lysine and Arginine amino acids are present
   C. Glycine and Alanine amino acids are present
   D. Serine and Tyrosine amino acids are present

19. The surface energy in the interface between water and fibre forming polymers is
   A. Higher than pure water surface
   B. Equal to pure water surface
   C. Lower than pure water surface
   D. None of the above

20. Generally, lower the time of half-dyeing
A. Lower will be the diffusion coefficient
B. Can not be correlated
C. Same will be the diffusion coefficient
D. Higher will be the diffusion coefficient

PART B (5 x 16 = 80 Marks)

21. (a) (i)Explain the mechanism of mecerisation of cotton with reference to temperature, concentration of caustic, tension and time. (8)

(ii)What is the effect of organic, inorganic and mineral acids on cotton, wool and silk? (8)

(OR)

21. (b) (i) Draw the chemical structure of any three textile fibres indicating the functional groups present in them and the suitable classes of dyes for dyeing. (8)

(ii)What do you understand by Donnan membrane equilibrium? Explain with reference to addition of electrolytes in dyeings. (8)

22.(a) (i)What do you mean by thermochemistry? Explain the second law of thermodynamics. (6)

(ii) What do you mean by affinity and how it is different from substantivity? How will you measure the affinity of a dye? Explain the standard affinity equation and its significance (10)

(OR)

22. (b) (i) Explain the effect of fine structure of fibres on the dye up-take. Explain as how the fine structure gets modified due to drawing and heat setting and influences in dyeing. (8)

(ii) Explain the Fick's law of diffusion. (8)

23 (a) (i) What do you understand by adsorption isotherm? Explain briefly, the different adsorption isotherms, mentioning clearly the dye-fibre combinations in which those are seen in dyeing. (10)

(ii)How are the differentially-dyeable, also known as dye-variant fibres produced? (6)

(OR)

23. (b)Explain the different bonds/forces that can form between different fibres and dyes. Explain any one method by which the dye-fibre bond can be identified. (16)

24 (a)(i)Explain the principle and working of a colour measuring instrument. What are the advantages and limitations of colour measuring systems? (10)

(ii) Applying a colour data, how is the pass/fail analysis done? (6)

(OR)

24. (b) (i) Explain metamerism, tristimulus values, Kubelka-Munk equation, colour difference equations and CIELab with reference to instrumental colour assessment. (10)

(ii)Explain the surface energy and interfacial effects in dyeing. (6)

25.(a)Explain the thermodynamics of dye sorption with reference to any one dye-fibre combination. (16)

(OR)

25. (b) Explain as how the effect of temperature on rate of diffusion may be expressed quantitatively by determining the activation energy of diffusion. (16)

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