Reg. No. :

Question Paper Code: 55094

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fifth Semester

Chemical Engineering

15UCH504 - INSTRUMENTAL METHODS OF ANALYSIS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Identify the UV wavelength range

    (a) 180-400 nm   (b) 435-480 nm
    (c) 570-600 nm   (d) 610-750 nm

2. Noise that originates from the thermally induced motions in charge carriers is known as

    (a) shot noise   (b) Flicker noise
    (c) Environmental noise   (d) Thermal noise

3. In _____ the lower energy photon is emitted in an arbitrary direction and at wavelength longer than the excitation wavelength.

    (a) Absorbance   (b) Transmittance
    (c) Phosphorescence   (d) Reflactance

4. When monochromatic radiation is scattered by molecules a small fraction of the scattered radiation is observed to have a different frequency from that of the incident radiation, this is known as

    (a) Raman effect   (b) Laser effect
    (c) UV effect   (d) Vibrational effect

5. In different chemical environmental the same type of nucleus is shielded from the applied field in a manner that depends on the distribution of the surrounding electron. This is known as

   (a) Translocation   (b) Chemical shift

   (c) Band shift   (d) Transformation

6. 1 torr =

   (a) 133.3 Pascal   (b) 142.3 Pascal

   (c) 152.3 Pascal   (d) 176.3 Pascal

7. In the theory of band broadening the liquid and gas chromatography are

   (a) Different   (b) Identical

   (c) High   (d) Low

8. Which chromatography involves the covalent attachment of an immobilized biochemical to a solid support?

   (a) Partition Chromatography   (b) Adsorption chromatography

   (c) Affinity chromatography   (d) Liquid Chromatograph

9. A reference electrode is an oxidation / reduction half cell of known and constant potential at a particular

   (a) Temperature   (b) pH

   (c) Solvent   (d) Hydrogen ion concentration

10. The figure shown below indicates the result of which experiment
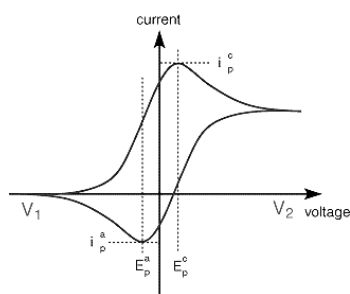
   (a) HPLC   (b) Cyclic voltammetry

   (c) UV spectroscopy   (d) IR spectroscopy

<center>PART - B (5 x 2 = 10 Marks)</center>

11. How are fast Fourier transformation used to reduce noise?

12. What are the difference between Raman spectroscopy and IR spectroscopy?

13. Calculate the g value if the methyl radical shows ESR at 0.3290 T in a spectrometer operating at 9230mHz. (Planck constant (h) – 6.627 X 10^{-34}Js, Bohr's magnetron (β) – 9.274X10^{-24} JT^{-1}).

14. What do you understand by HPLC? Give its applications?

15. Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life. Why?

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Brief about general design of optical instruments. (6)

    (ii) Demonstrate Fourier transformer measurements and its applications. (10)

Or

    (b) Explain the software techniques used for signal to noise enhancement. (16)

17. (a) Illustrate in detail about the instrumentation of Raman spectroscopy with a neat diagram. (16)

Or

    (b) State Beer-Lambert law. Mention its limitations and deviation. (16)

18. (a) Explain the functions of NMR and Explain its working principles and applications. (16)

Or

    (b) Explain in detail about the theory of electron paramagnetic resonance. (16)

19. (a) Explain the principle and separation technique of high pressure liquid chromatography. (16)

Or

    (b) (i) Discuss about four major types of resins commonly used in ion exchange chromatography. (10)

    (ii) What are the factors affecting column efficiency in chromatography? (6)

20. (a) Describe about the principle and applications of atomic force microscopy. (16)

Or

    (b) Discuss in brief about (i) Voltammetry and (ii) Potentiometry. (16)

55094