

## **K1 Level**

1. Which error detection method uses one's complement arithmetic?  
a) Simple parity check b) Two dimensional check c) CRC **d) Checksum**
2. Which distribution values of median, mean and mode are not equal is  
a) Experimental distribution **b) Asymmetrical distribution** c) Symmetrical distribution  
d) Exploratory distribution
3. What test can be used for the chi-square goodness of fit test?  
a) Significance of sample statistics b) Difference between population means  
**c) Normality** d) probability
4. Which test to be applied when number of observations is less than 30 and variance is not known  
a) Z-test **b) T-test** c) F-test d) Chi-square test
5. Which of the following values is not typically used for  $\alpha$   
a) 0.01 b) 0.05 c) 0.10 **d) 0.25**
6. Which of the following chromatographic processes have solution as the sample phase?  
a) Adsorption b) ion exchange c) thin layer **d) all**
7. Name the following techniques are based on size of the solute  
a) Molecular sieves b) gel filtration c) gel permeation d) gel chromatography **e) all**
8. Find the  $R_f$  value of stigmasterol  
**a) 0.55** b) 1.2 c) 5.5 d) all
9. Choose the following compound used for cation exchangers  
a) Zeolite **b) Dowex** c) both a and b d) furan
10. List the carrier gas used in GC  
a) Helium b) Nitrogen **c) both a and b** d) none
11. The property measured in TGA is  

<b>(a) change in weight</b>	(b) rate of change in weight
(c) heat evolved or absorbed	(d) change of temperature
12. The thermogram in differential thermal analysis (DTA) is obtained by plotting  

(a) $dw/dt$ versus Temperature	<b>(b) <math>\Delta T</math> versus Temperature</b>
(c) $\Delta H$ versus Temperature	(d) Temperature versus Volume

13. The most widely used flame in atomic absorption is  
(a) Air – coal gas    (b) Air – propane    **(c) Air – acetylene**    (d) Oxyacetylene
14. Which of the following detection system is most suitable for the detection of lines in the spectra of the alkali metals?  
(a) Photoconductive cells    (b) Photovoltaic cells    **(c) Red- sensitive photomultipliers**  
(d) All
15. Which of the following fuels produces hottest practical flame when combusted in oxygen.  
(a) Acetylene    **(b) Cyanogen**    (c) Hydrogen    (d) Butane
16. Acetylene – nitrous oxide flames produce temperatures of about  
(a)  $2700^{\circ}\text{C}$     (b)  $4200^{\circ}\text{C}$     **(c)  $2950^{\circ}\text{C}$**     (d)  $4500^{\circ}\text{C}$
17. Which of the following element can be used as ionization suppressor?  
**(a) Cs**    (b) Cl    (c) Bi    (d) Cu
18. In surface spectroscopy, the secondary beam results from  
(a) Scattering    (b) Sputtering    (c) Emission    **(d) Any of these**
19. In XPS or ESCA, the primary and secondary beams consist respectively the  
**(a) X-ray photon, electrons**    (b) Electrons, X-ray photons  
(c) Electrons, electrons    (d) UV photons, electrons
20. In AES, the primary beam is made up of.  
(a) Electrons    (b) X-ray photons    **(c) Electrons or X-ray photons**    (d)  
Ions
21. Electron spectroscopy can be used for the identification of all the elements in periodic table,  
except  
**(a) Hydrogen and Helium**    (b) Carbon    (c) Chlorine    (d) Copper
22. Which of the following source is used for ESR spectrometers?  
**a) Klystron** b) He c) Hg d) all
23. Name the following detectors are used for ESR  
a) Diamond **b) silicon crystal** c) Graphite d) all
24. Find the g value of DPPH  
**a) 2.0036** b) 1.2 c) 5.5 d) all
25. Choose the following information get from Mossbauer spectroscopy  
a) Carbon b) **Environment surrounding the nucleus** c) both a and b d) none
26. List the radioactive isotope used for study the Mossbauer spectroscopy  
a)  $\text{Fe}^{57}$  b)  $\text{Zn}^{67}$  **c) both a and b** d) none
27. What does a polarimeter measured?  
a) Polarity of the substance **b) Angle of rotation of an optical active compound**  
c) Concentration of the substance d) pH of the substance
28. What is the effect of the I on the specific optical rotation ( $\alpha$ ), if I gets double?  
**a)  $\alpha$  gets double** b)  $\alpha$  gets halved c)  $\alpha$  gets four times d)  $\alpha$  eight times

29. Which of the following are anisotropic crystals?

- a) Calcite
- b) Quartz
- c) Ice
- d) All**

30. Which of the following optical activity is closely connected with the molecules?

- a) Symmetry
- b) Asymmetry**
- c) Crystalline
- d) All

31.. Which of the following compounds exhibit fluorescence?

- a) Quinoline
- b) iso Quinoline
- c) Indole
- d) All**

### **K2 Level**

1. What is the function of a post test in ANOVA?
2. What would happen if instead of using an ANOVA to compare 10 groups, you performed multiple t-test?
3. How systematic errors are eliminated?
4. Which standard is fixed and used for industrial laboratories?
5. What is t-Test?
6. Show the advantages of TLC over paper chromatography.
7. What is derivatization in HPLC?
8. Why NPD detector is called as AFID?
9. Define exclusion chromatography.
10. Spell the characteristics of ion exchange resin?
11. Define the principle of TGA.
  
12. What are the important requirements of a good recording thermobalance?
13. What is the Principle of thermometric titrations?
14. Give the reason about in DTA, endothermic processes are more likely to occur than exothermic.
  
15. What is the basic principle of atomic absorption spectroscopy?
16. What is the main difference between AAS and FES?
17. What is signal to noise ratio?
18. Why acetylene – nitrous oxide flame is suitable for elements such as Al, Be and rare earths?
19. What are the functions of flame in flame emission spectroscopy?
20. Why the large differences in emission intensities are observed in different parts of flame?
21. What is the most common method of exciting Auger Spectra?
22. Define the principle of UPS.
23. Why XPS is also known as ESCA?
24. What is the main difference between UPS and XPS?
25. Define binding energy.
26. Why XPS is essentially a surface technique?
27. Show any two advantages of ESR spectroscopy

27. What is spin tables?
28. Why  $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}].2\text{H}_2\text{O}$  appeared as a doublet ?
29. Define IS.
30. Classify the general application of Mossbauer spectroscopy?
31. What is circular dichroism?
32. Why monochromatic light is used in polarimetry?
33. What are the main areas where ORD curves have been applied to structural determinations?
34. What is external conversion?
35. What is intersystem crossing?

## K3 Level

- endothermic indicate?

12. a) How a purity of a compound can be checked by differential scanning calorimetry (DSC) ?  
(OR)

b) Compare the difference between TGA and DTA.

13. a) Explain the factors affecting TGA curve.  
(OR)

b) Describe the applications of TGA and DSC.

14. a) Discuss the types of recording thermobalances.  
(OR)

b) Explain the Principle and Instrumentation of DSC.

15. a) Discuss about the applications of Thermometric Titrations.  
(OR)

b) Distinguish between the thermometric curves for endothermic and exothermic reactions.

16. a) Describe the Principle and Chemical shifts of XPS.  
(OR)

b) Explain the description of ESCA spectrometer.

17. a) Discuss the X-ray sources, Samples and analysis of ESCA  
(OR)

b) Describe the detectors and recording devices of ESCA

18. a) Explain the ionization process occurring in XPS  
(OR)

b) Discuss the applications of ESCA.

19. a) Discuss the apparatus used for Mossbauer spectroscopy.  
(OR)

b).Explain hyperfine splitting

20. a) Describe the essential characteristics of nuclide should have exhibiting Mossbauer effect.  
(OR)

b) Analyse hyperfine splitting for isotropic and anisotropic system.

21. a) Explain the Mossbauer nuclides formation.  
(OR)

b) Illustrate the hyperfine structure in the ESR spectrum for following elements.

i) H      ii)  $\cdot\text{CH}_3$

22. a) Demonstrate the following notes on  
i) Mossbauer effect ii) Mossbauer factor  
(OR)

b) Describe the application for study of inorganic compounds by ESR

23. a) Compare recoilless emission and chemical shift.  
(OR)  
b) Distinguish between the Mossbauer spectroscopy and ESR spectroscopy
24. a) Discuss the principles of ORD and CD.  
(OR)  
b) Explain the instrumentation of CD.
25. a) Illustrate the axial halo ketone rule.  
(OR)  
b) Analyse the octant rule.
26. a) Discuss the quenching mechanism.  
(OR)  
b) Illustrate the tetracycline in serum.
27. a) Discuss the cotton effect.  
  
b) Distinguish ORD and CD.
28. a) Compare fluorescence and phosphorescence.  
(OR)  
b) Construct energy level diagram.

## **K4 Level**

1. Discuss about Q and f-test and its importance in data analysis.
2. Describe the least square and chi square test.
3. Explain correlation and regression.
4. Discuss in detailed of curve fitting.
5. Elaborate the r and its abuse.
6. Describe the multiple regression analysis.
7. Distinguish the working principle of the following detectors with diagrams.
  - i) TCD ii) FID iii) ECD iv) NPD
8. Describe the instrumentation of HPLC.
9. Explain in detail of the instrumental set up for GC.
10. Discuss in detailed of TLC.
11. Elaborate the following solid phase extraction technique.
  - i) Normal phase SPE ii) reverse phase SPE iii) Ion exchange SPE iv) cartridges v) SPME
12. Describe the various ion exchange resin, ion exchange techniques and application of ion exchange Chromatography.
13. Elaborate the Principle, Instrumentation and Applications of DTA.
14. Illustrate the Principle, Instrumentation and Thermometric Titration curves.
15. Elaborate the Principle, Instrumentation and Applications of Atomic absorption Spectroscopy.
16. Illustrate the Principle, Instrumentation and Applications of Flame Emission Spectroscopy.
17. Elaborate the Principle, Instrumentation and Applications of ESCA.
18. Illustrate the Principle, Instrumentation and Applications of Auger Electron Spectroscopy (AES).
19. Elaborate the Principle, Instrumentation and Applications of UV Photo electron Spectroscopy (UPS).
20. Discuss in detailed about the application of Mossbauer spectroscopy
21. Describe isomer shift for iron and tin compounds in different states of oxidation.
22. Explain in detail of principle, theory, doppler effect and quadruple interactions of Mossbauer spectroscopy.

23. Discuss in detailed of application of ESR spectroscopy.
24. Elaborate the mechanism of hyperfine interaction in the ESR spectra of organic radicals.
25. Illustrate the principle, theory and instrumentation of ESR spectroscopy.
26. Discuss the instrumentation of fluorescence.
27. Describe the secondary structure of protein conformation by using CD.
28. Explain the principle of polarimetry.
29. Discuss in detailed study of the following spectroscopy a) ORD b) phosphorescence
30. Elaborate the application in inorganic chemistry.