P. P. SAVANI UNIVERSITY

Third Semester of B.Sc. Examination
December -2021
SSES2190-Instrumentation & Analytical Techniques I

11.12.2021, Saturday   Time: 09:00 a.m. to 11:30 a.m.   Maximum Marks: 60

Instructions:
1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1	**Short Questions**		[10]

1.1 Objectives [05]

1.1a Elastic scattering and reflection spectroscopy is:
- A The reflection or scattering the incident radiations by a material
- B Measured by measuring the fraction of energy transmitted through the material
- C The release of energy absorbed by the material.
- D None

1.1b Alkynes absorbs near to ___ nm in ultraviolet region.
- A 50
- B 175
- C 270
- D 620

1.1c Flame photometer consist of following parts
- A Burner
- B Monochromator
- C Detector
- D All of the above

1.1d The emission wavelength for Lithium is _____.
- A 515 nm
- B 622 nm
- C 670 nm
- D 766 nm

1.1e In flame photometry, the flame color for potassium is _____.
- A Green
- B Orange
- C Red
- D Violet

1.1f Sequence of events that occur in the flame are:
- A Desolvation – Vaporization – Atomization – Excitation - Emission
- B Emission – Vaporization – Atomization – Excitation - Desolvation
- C Vaporization – Emission – Atomization – Excitation - Desolvation
- D Desolvation – Vaporization – Emission – Excitation - Atomization

1.1g Study of the ability of a medium to slow the transmittance of energy is:
- A Elastic scattering
- B Impedance spectroscopy
- C Emission
- D Absorption

1.1h Which type of transition is seen in saturated compounds containing atoms w̶ unshared pair of electrons such as oxygen, nitrogen, sulfur and halogens.

A $\pi \rightarrow \pi^*$ Transition
B $\sigma \rightarrow \sigma^*$ Transition
C $n \rightarrow \pi^*$ Transition
D $n \rightarrow \sigma^*$ Transition

1.1i The range of UV radiation is _____.

A 200-400 nm
B 400-700 nm
C 700-900 nm
D 900-1400 nm

1.1j The temperature range for oxygen acetylene fuel + oxidant mixture is _____.

A 3100 – 3200 Celsius
B 2900 – 3000 Celsius
C 2700 – 2800 Celsius
D 2500 – 2700 Celsius

1.2 Answer the Following: (True/False/Short Question/Fill in the Blanks) [05]

1.2a In UV/visible spectroscopy molecule can undergoes electronic transitions involving σ, π and non-bonding (n) electrons. (True/False)

1.2b The spectroscopy is a branch of science that involves the study of the interaction of electromagnetic radiations with matter. (True/False)

1.2c Fuel-oxidant ratio is not very important in flame, it is not responsible for maintaining the flame temperature. (Truc/Falsc)

1.2d The most probable or common electronic transition is from highest occupied molecular orbital (HOMO) to lowest unoccupied molecular orbital (LUMO) in a molecule. (True/False).

1.2e Define nebulization

Q.2 Short Notes (Attempt any two) [06]
A Write steps involved in nebulization process.
B Explain the origin of UV Visible spectra.
C Explain types of transitions in UV visible spectroscopy.

Q.3 Explain in detail (Attempt any two) [14]
A Explain in detail: Chromophores
B Explain the effect of conjugation on UV visible absorbance.
C Explain the principle of flame photometry

Section-II (Total Marks - 30)

Q.1 **Short Questions** [10]

1.1 **Objectives** [05]

1.1a AAS was introduced by:
  A Alice Ball
  B Walsh and Alkemade
  C R Franklin
  D None of the mentioned above

1.1b Atomization is:
  A The sample solution is aspirated into the flame or heated in a tube to convert them into atoms
  B The sample solution is filtered
  C Both A & B
  D None of the above mentioned

1.1c AAS is based upon the principles of:
  A Charles law
  B Boyle's law to higher states
  C Henry's law
  D Lambert – Beer's Law

1.1d Radiation source in AAS is _____.
  A Hollow cathode lamp
  B Xenon
  C Argon
  D Deuterium

1.1e The ionisation of some gas atoms occurs by applying a potential difference of about _____ between the anode and the cathode.
  A 100 – 200 V
  B 150 – 200 V
  C 300 – 400 V
  D 600 – 700 V

1.1f In AAS, upper temperature limit for Butane - Air mixture is:
  A 2200 K
  B 3000 K
  C 3100 K
  D 3160 K

1.1g Accuracy is defined as:
  A The closeness of a result to the true value.
  B Difference between measure value and true value
  C Arithmetic mean
  D Replacing a number with an approximate value

1.1h Which type of error causes the mean of the dataset to differ from theaccepted value?
  A Indeterminate error
  B Random error
  C Systematic error
  D Gross error

1.1i Standard deviation is a measure of:
  A The amount of variation or dispersion of a set of values.
  B The amount of similarity in a set of values.
  C Faulty calibrations or standardizations.
  D Closeness of a result to the true value.

1.1j The extent to which results agree with one another is:

A Approximate value
B Type 1 error
C Type 2 error
D Precision

1.2 **Answer the Following: (True/False/Short Question/Fill in the Blanks)** [05]
1.2a AAS is found to be superior to other techniques as it can be used to determine elements from trace to large quantities. (True/False)
1.2b AAS is used for the analysis of 50-60 elements. (True/false).
1.2c The absorption of radiation by the free atoms is not proportional to their concentration. (True/False).
1.2d Write population standard deviation equation.
1.2 e Systematic errors may be either constant or proportional. (True/false).

Q.2 **Short Notes (Attempt any two)** [06]
A Write 3 uses of AAS.
B Explain the radiation source in AAS.
C Explain gross error.

Q.3 **Explain in detail (Attempt any two)** [14]
A Explain the procedure involved in determination of elements in AAS.
B Explain the instrumentation or apparatus of AAS.
C What is F-test? Explain