Universidad de Navarra

Instrumental Analytical Chemistry

INSTANCHEM

Part II

Self-assessment

Chemistry Degree

3rd Year

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Sample INSTANCHEM test questions:

1. Fluorescent emissions ...

A. Are obtained at wavelengths shorter than those corresponding to the respective absorption process
B. They may involve excited states with different multiplicity of that of the ground state
C. Occur between high vibrational levels of the first excited electronic state and the 0 vibrational level of the electronic ground state
D. Occur between the 0 vibrational level of the first excited electronic state and one of the vibrational levels associated with the ground electronic state

2. In fluorescence and phosphorescence measurements , the detector is normally placed

A. in line with the source B. perpendicularly to the source C. at an angle of 135 degrees

3. Deactivation by emission of a photon from an excited triplet state to the singlet ground state is much more likely that from an excited singlet state

A. True B. False

4. Stokes shift

A. Indicates a shift to higher energies of the fluorescent process with respect to the absorption process
B. Refers to a shift in the wavelength of fluorescence to higher values with respect to thre absorption wavelength
C. It is not related to radiational energy dissipation

5. The predissociation and dissociation phenomena are more favorable if absorbed energies cause transitions of the type:

A. n-π^* B. σ-σ^* C. π-π^*

6. The fluorescence of Fluorescein will be diminished

A. At cryogenic temperature
B. In the presence of 1- bromopropane
C. In a micellar medium

7. Typical phosphorescent measurements are performed

A. At room temperature
B. At cryogenic temperatures
C. With the detector in line with the excitation source

8. The phosphorescence is usually measured

A. Simultaneously with the light excitation of the sample
B. With the light source off

9. The turbulence of the flame is higher in:

A. A premix burner B. A total consumption burner

10. In atomic absorption spectroscopy, controlling the flow of both fuel and oxidizer is:

A. Required B. Irrelevant

11. "Memory" effects are most pronounced in:

A. A flame atomizer B. An electrothermal atomizer (graphite furnace)

12. An increase of the applied potential in the HCL (hollow cathode lamp) causes

A. More intense and wider lines B. More intense and narrower lines

13. The self-absorption phenomenon in HCL is associated with:

A. High currents
B. Low currents
C. Multielement composition of the HCL

14. La corrección Smith-Hieftje en espectroscopía de Absorción Atómica

A. Se basa el fénomeno de autoinversión con autoabsorción
B. Está relacionada con la aplicación de un campo magnético externo
C. Usa una segunda fuente de deuterio

15. The signals obtained in flame atomic absorption spectroscopy are:

A. Transient B. Continuous, as far as sample is being aspired to the flame

1. Cr was determined in an aqueous sample by introducing 10.0 mL aliquots of sample in five 50.0 mL volumetric flasks. Different volumes of a 12.2 ppm standard of Cr were added to each flask before making them up to volume with H_2O.

Unknown Sample (mL)	10.0	10.0	10.0	10.0	10.0
Cr standard (mL)	0	10.0	20.0	30.0	40.0
Emission intensity (a.u.)	20.1	29.2	37.8	46.7	55.4

Calculate the ppm of Cr in the sample.

Answer: 28 ppm Cr

2. We used the internal standard method for the analysis of Sr by flame emission spectrophotometry. The standard solution of $Sr(NO_3)_2$ was prepared by dissolving 0.2415 g of $Sr(NO_3)_2$ (211.63 g / mol) in water and making up to 1 L. Varying volumes of this solution were transferred by pipette to different 100.00 mL flasks, to which flasks -before making up to volume- 10.00 mL of a 160.0 μg $VOSO_4$ /mL were added. On the other hand, another 100.00 mL flask was prepared, which was labeled as **"sample"**, in which 10.00 mL of the $VOSO_4$ solution were placed together with 50.00 mL of the unknown sample, and afterwards it was made up to volume with distilled H_2O. Then, emission measurements for Sr and V were made at 460.7 and 237.9 nm, respectively. Readings are given in the table below. **Find the concentration of Sr in the unknown sample.**

Volume of the Sr standard solution (mL)	Intensidades	
	460.7 nm	437.9 nm
2.00	16.9	35.7
4.00	29.9	33.1
6.00	54.7	38.5
8.00	74.7	39.3
10.00	81.2	34.1
sample	**36.1**	**35.4**

Answer: $9.96 \cdot 10^{-5}$ M Sr