Coaching Report

Participant	roby SEl	**Student detail**	User_58
Group	ntc.it ats.perugia.it	**Status**	Ended normally
Assessment name	Analyical Chemistry 3 - EN V4	**Final Score**	10
Time Used	00:01:33	**Time limit (min)**	90
Date taken	15-09-2016 18:01:40		

Questions - presented: 30, answered: 30

1 **Which one of the following potential waveforms is applied to the working electrode for obtaining a cyclic voltammogram?**

Question type	Multiple Choice
Topic	Electrochemical Methods

Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	Waveform A.
Answer	0) Waveform A.
	1) Waveform B.
	2) Waveform C.
	3) Waveform D.

2 **Sulfate is determined gravimetrically by precipitation with an excess of BaCl2 solution to form BaSO4 which is finally weighed. Then, the amount of sulfate (expressed as SO3) is given by the equation:(mass of SO3) = k (mass of BaSO4).Calculate the factor k. k =**

Question type	Numeric
Text	
Topic	Classical Analysis
Difficulty	1/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.3431

3 **Which one of the following equations must be applied for the exact calculation of [H+] in an aqueous solution of HCl at any analytical concentration CHCl?**

(Kw = 1x10-14 M2)

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) [H+] = CHCl + Kw / [H+]
	1) [H+] = CHCl
	2) [H+] = CHCl - Kw / [H+]
	3) [H+] = CHCl + Kw

4 **Which one of the following acids is more appropriate for preparing an aqueous buffer solution of pH in the range 7-8, by adding a strong base?**

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	HCl (pK1
Answer	0) H3PO4 (pK1=2.1, pK2=7.2, pK3=12.0)
	1) Tartaric acid (pK1=3.0, pK2=4.2)
	2) CH3COOH (pK1=4.7)
	3) HCl (pK1
	4) H2CO3 (pK1=6.4, pK2=10.3)

5 **Which one of the following quantities can only be estimated from a finite number of analytical measurements on the same sample?**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	The median of measurements.
Answer	0) The range of measurements. 1) The mean of measurements. 2) The precision of the method used. 3) The median of measurements.

6 **Calculate the median of the following set of measurements:**

3.41, 3.55, 3.22, 3.26, 3.33, 3.45Median =

Question type	Numeric
Text	
Topic	Data Analysis
Difficulty	1/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 3.37

7 **A sample of nickel ore was analysed for Ni by a gravimetric method. The following results for %Ni were obtained:**

14.11%, 14.01%, 14.23%, 14.17%.

The mean value of the results is 14.13%. Calculate the confidence

interval:(14.13 x) % (in terms of x) within which the true value of Ni% can be found with a probability of 95%.

x =

Question type	Numeric
Text	
Topic	Data Analysis
Difficulty	1/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.149

8 In order to improve the lower limit of determination of an instrumental analytical method for a specific analyte, which one of the following must best be adjusted or optimized?

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) Increasing the analytical signal as much as

possible.

1) Improvement of the signal-to-noise ratio.

2) Achievement of a linear relation between the analytical signal and the concentration of the analyte.

3) Reduction of the measurement time.

9 **Three gas chromatograms were obtained after injecting 1, 2 and 3 microliters of n-hexane. All other experimental parameters were kept the same. Which of the four chromatograms (sets of three peaks A-D) shown in the figure is most likely to be obtained?**

Question type	Multiple Choice
Topic	Separation Chromatographic Methods
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	Set D
Answer	0) Set A
	1) Set B
	2) Set C
	3) Set D

10 **The determination of inorganic species by UV/Vis spectrophotometry is generally done by one of the following procedures:**

Question type	Multiple Choice
Topic	Spectrochemical Methods

Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) Directly, since all inorganic ions and molecules show strong absorbance in the UV/Vis region. 1) Indirectly but always after its complexation with inorganic ligands. 2) Indirectly, and most often after derivatization or complexation with chromogenic organic compounds. 3) Directly, but only after very careful adjustment of the pH of the solution.

11 **The pH of an aqueous solution is reported as 10.25 0.04, where 0.04 is the standard deviation of pH measurement. The activity of H3O+ and its standard deviation can therefore be reported as:**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	(5.6 1.8) x 10-11
Answer	0) (5.6 0.5) x 10-11 1) (5.62 0.11) x 10-11

2) (5.6 0.2) x 10-11

3) (5.62 0.03) x 10-11

4) (5.6 1.8) x 10-11

12 **The salt bridge of a reference electrode (used in conjunction with an indicator electrode for direct potentiometric measurements) contains a NaCl solution instead of a KCl solution. Which one of the following problems is expected?**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) Potential readings will have precision. 1) No problem is expected. 2) Potential readings will be more pH dependent. 3) The activity of sodium might affect potential readings

13 **The concentration of Pb(II) in a sample of polluted water is determined by anodic stripping voltammetry (ASV) using the standard addition method. The voltammograms shown in the figure were obtained under identical analytical conditions. Calculate the concentration of Pb(II) in ppm.**

[Pb(II)], ppm =

Question type	Numeric
Text	
Topic	Electrochemical Methods
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.104

14 **Why is it essential in spectrofluorometric measurements the absorbance of the sample solution to be less than about 0.05 at the wavelength of the excitation light beam?**

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	2/3
Score	3.30
Score max	1
Answer choosen	The excitation light beam is partly absorbed by the analyte itself.
Answer	0) The excitation light beam is partly absorbed

by the analyte itself.

1) The emission is partly absorbed by the analyte itself.

2) The measured fluorescence is inversely proportional to the absorbance of the fluorescent compound.

3) At higher concentrations the quantum yield of the fluorescent compound decreases.

15 **Which one of the following detectors cannot be used in high-performance liquid chromatography (HPLC) systems?**

Question type	Multiple Choice
Topic	Separation Chromatographic Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The thermal conductivity detector. 1) The ultraviolet absorbance detector. 2) The electrochemical (amperometric) detector. 3) The refractive-index detector. 4) The light scattering detector.

16 **Which one of the following detectors can be used in both gas chromatography (GC) and high-performance liquid chromatography (HPLC)?**

Question type	Multiple Choice
Topic	Separation Chromatographic Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	The electric conductivity detector.
Answer	0) The mass-spectrometer detector. 1) The electric conductivity detector. 2) The electron capture detector. 3) The thermal conductivity detector. 4) The fluorometric detector.

17 **Ethanol in a blood sample is determined by gas chromatography using n-propanol as the internal standard. An alcohol-free blood sample is spiked with ethanol and n-propanol each at a concentration of 1.00 mg/mL (sample S). A blood sample containing an unknown concentration of ethanol is spiked with n-propanol to a concentration of 1.00 mg/mL (sample X). The gas chromatograms of S and X are shown below. Calculate the concentration of ethanol in sample X.**

Ethanol (mg/mL) =

Question type	Numeric
Text	
Topic	Separation Chromatographic Methods
Difficulty	2/3
Score	0.0
Score max	1

Answer choosen	not ok
Answer	0) 1.18

18 **A sample of polluted air is reported, as containing 6 ppm of CO. Which of the following statements is correct?**

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	1 kg of air contains 6 mg of CO.
Answer	0) 1 liter of air contains 6 microliters of CO. 1) 1 kg of air contains 6 mg of CO. 2) 1 liter of air contains 6 mg of CO. 3) 1 cubic meter of air contains 6 mL of CO under normal conditions of pressure and temperature.

19 **Carbonic acid (H2CO3) in aqueous solutions is traditionally considered as a weak acid when the calculation of its dissociation constants is based on the total dissolved CO2. Recent research showed that only a small percentage (ca. 0.2%) of the CO2 is actually hydrated as H2CO3.**
Which one of the following statements is correct?

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	2/3

Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) Carbonic acid is a stronger acid than was initially thought. 1) Carbonic acid is a weaker acid than was initially thought. 2) The strength of carbonic acid depends heavily on the external pressure. 3) There is no reason to change our views about the strength of carbonic acid.

20 **How is the buffer capacity index of a pH buffer defined?(CHA, CA: analytical concentrations of the acid HA and the conjugate base A)**

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	2/3
Score	3.30
Score max	1
Answer choosen	As the negative derivative: -dX/dpH, X: moles of a strong monoprotic acid.
Answer	0) As the negative derivative: -dX/dpH, X: moles of a strong monoprotic acid. 1) As the mean concentration: (CHA + CA)/2 . 2) As the experimentally determined change of pH after the addition of 1 mole of H+ to 1 litre

of the buffer solution.

3) As the ratio: 1 / (|log(CHA/CA)| + 1).

21	**Background correction in AAS is performed in order to:**

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	Measure the absorbance caused solely by the matrix constituents.
Answer	0) Eliminate electronic radiation generated in the cuvette. 1) Measure the electronic radiation generated in the cuvette. 2) Measure the absorbance caused solely by the matrix constituents. 3) Measure the decrease in the intensity of the selected line of the hollow cathode lamp due only to the presence of the analyte compensating for all other interfering parameters.

22	**An electrically heated tungsten wire is a common source of continuous radiation. Its radiation spectrum approximates that of the ideal blackbody and it is shown in the figure as curve X. Upon increasing its temperature (e.g. by increasing the electric current passing through it), which one of the following**

changes of its emission spectrum takes place?

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The relative radiation energy increases. The wavelength of the peak maximum does not change, being exclusively dependent on the wire material (curve 3). 1) The relative radiation energy increases. The wavelength of the peak maximum is shifted toward smaller wavelengths (curve 2). 2) The peak relative energy remains almost the same but the peak is getting wider spreading toward both directions, so that an almost perfect white light spectrum is obtained (curve 1). 3) The relative radiation energy increases. The wavelength of the peak maximum is shifted towards higher wavelengths (curve 4), a phenomenon known as 'red shift'.

23 **The infrared spectrum of 12C16O shows a vibrational absorption peak at 2170 cm-1. At which wavenumber is expected the corresponding peak of 14C16O?**

Wavenumber (cm-1) =

Question type	Numeric
Text	
Topic	Spectrochemical Methods
Difficulty	3/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 2080.0

24 **Which one of the following is true for a Fourier Transform (FT) spectrometer?**

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	3/3
Score	3.30
Score max	1
Answer choosen	No monochromator is needed in a FT-spectrometer.
Answer	0) No monochromator is needed in a FT-spectrometer. 1) FT-spectrometers require the use of a solid-state type radiation detector. 2) FT- spectrometers use only a pulsed-type light source (e.g. laser). 3) The wavelength resolving power of an

FT-spectrometer is much higher than that of a conventional-type spectrometer.

4) Spectra obtained with an FT-spectrometer cover a much wider range of wavelengths compared to those obtained with conventional spectrometers.

25 **Which one of the titration curves (A-D) shown in figure is expected during the biamperometric titration of Fe(II) with a Ce(IV) solution?**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	Curve C.
Answer	0) Curve A. 1) Curve B. 2) Curve C. 3) Curve D.

26 **The mean diffusion limited current of a polarographic wave is given by the Ilkovic equation:**

id(mean) =607nD1/2 m2/3 t1/6 C*

where n is the number of electrons participating in the electrode reaction, D is the diffusion coefficient of the electroactive species (in cm2/s), m is the flow rate of Hg (in mg/s), t is the Hg drop time (in s), and C* is the bulk concentration of the electroactive species (in mmol/L).

If the Hg drop size remains the same and the Hg drop time is reduced to half its previous value, the average current will be:

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	(22/3)id(mean)
Answer	0) (21/2)id(mean) 1) (2-1/6)id(mean) 2) (22/3)id(mean) 3) (2-1/2)id(mean) 4) (2-1/3)id(mean)

27 **Which one of the following block diagrams indicates accurately the function of the potentiostat and the correct flow of the cell current with a 3-electrode voltammetric cell arrangement?**
WE: Working ElectrodeRE: Reference ElectrodeAE: Auxiliary ElectrodeE(t): Scanning potential waveform.

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	B

Answer	0) A 1) B 2) C 3) D

28 **In which one of the following cases is it generally recommended to use the median of the results of measurements instead of the mean to express the real value of a measured quantity?**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) When we are not certain that the results follow a normal (Gaussian) distribution. 1) When a limited number (3 or 4) of results is available. 2) When we are interested in the trend (drift) of the results. 3) Under any circumstances, the use of the median is not recommended.

29 **The smallest diffraction angle of a monochromatic beam of X-rays in a certain experiment is 11.5. Based on these experimental data we must expect a 2nd order diffraction from the same crystal at:**

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 23.0 1) 23.5 2) 24.0 3) 24.5 4) 25.0

30	**A gamma-ray spectrometer is based on:**

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The dispersion of gamma rays of various energies by diffraction using appropriate inorganic crystals. 1) The separation of gamma rays of various energies using specific detectors and sophisticated electronic circuits (anticoincidence circuits).

2) Measurement of the total emitted energy of the gamma rays by placing devices absorbing alpha and beta particles between the sample and the detector.

3) The fact that the total energy of the emitted gamma rays is proportional to the amount of isotope emitting the gamma rays.