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	00:15:30	**Time limit (min)**	60
Date taken	16-09-2016 09:54:13		

Questions - presented: 30, answered: 30

1 **The most common electroanalytical determination of the fluoride anion (F-) is based on which one of the following:**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	1/3
Score	3.30
Score max	1
Answer choosen	the use of an ion-selective electrode with a LaF3 - crystal membrane.
Answer	0) the use of an ion-selective electrode with a LaF3 - crystal membrane. 1) the use of an ion-selective electrode with a membrane based on a multi-crystalline mixture

of various insoluble fluoride salts.

2) the amperometric titration of fluoride with a standard Pb(II) solution.

3) the voltammetric oxidation of fluoride anion.

2	**Polarograms (P1-P3) of a Cu(II) solution in a composite KCl-EDTA carrier electrolyte are shown in the figure below. Which experimental parameter has been changed during the measurements from P1 to P3?**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) The EDTA concentration has been increased. 1) The concentration of Cu(II) has been decreased. 2) The potential scanning rate has been decreased. 3) The mercury drop time has been increased. 4) The KCl concentration has been increased.

3	**Phenol (C6H5OH) can be determined by coulometric titration with in situ generated bromine according the reaction scheme: How many coulombs (C) correspond to 1 mole of phenol? (1 Faraday = 96485 C/eq)**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) 96485 C
	1) 2 x 96485 C
	2) 96485 / 3 C
	3) 3 x 96485 C
	4) 6 x 96485 C

4 **Which one of the titration curves shown in the figure better describes the expected titration curve obtained when 50.0mL of a solution 0.10M in HCl and 0.20M in acetic acid is titrated with a 1.0M NaOH solution?**

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

5 **The equilibrium constant of the reaction:**

2AgCl + CrO42-Ag2CrO4 + 2Cl-

is given by the equation:

Question type	Multiple Choice
Topic	Classical Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) K = (Ksp(AgCl))2 / Ksp(Ag2CrO4)
	1) K = Ksp(Ag2CrO4)/Ksp(AgCl)2
	2) K = Ksp(Ag2CrO4) Ksp(AgCl)2
	3) K = Ksp(AgCl) / Ksp(Ag2CrO4)
	4) K = Ksp(Ag2CrO4) / Ksp(AgCl)

6 **Which one of the following statistical tests is used to compare the reproducibility of measurements obtained by two methods?**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	Dixon's Q-test.
Answer	0) F-test.
	1) Student's t-test.
	2) Dixon's Q-test.

3) Chi-squared test, (2-test).

7 **The following expression:**

when applied to a normal (Gaussian) distribution of n measurements of magnitudes x1, x2, ..., xn and mean value gives a value of the:

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	The Standard deviation.
Answer	0) The Standard deviation.
	1) The Relative standard deviation.
	2) The Variance.
	3) The Coefficient of variation.

8 **If the standard deviations of the measured quantities A and B are sA and sB, it follows that the standard deviation of A+B, (sA+B), is equal to:**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	sA x sB
Answer	0) sA + sB

1) sA2 + sB2

2) sA x sB

3) (sA2 + sB2)1/2

9 **The true mean of a series of normally distributed measurements is 20.0 and the relative standard deviation is known to be 1.0%. Which one of the following ranges is expected to embrace about 95% of the measurements?**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	1/3
Score	0.00
Score max	1
Answer choosen	19.8 to 20.2
Answer	0) 19.8 to 20.2
	1) 19.6 to 20.4
	2) 19.4 to 20.6
	3) 19.2 to 20.8

10 **The real (theoretical) spectrum of an absorbing solution is shown in figure A. The spectrum obtained experimentally is shown in figure B. In order to obtain a spectrum more similar to the real one the following experimental conditions must be applied:**

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	1/3
Score	0.00

Score max	1
Answer choosen	Increase the intensity of the light source.
Answer	0) Decrease the exit slit width of the monochromator. 1) Increase the intensity of the light source. 2) Increase the voltage applied to the photomultiplier tube. 3) Use a cell of better quality glass (e.g. quartz). 4) Use a less absorbing solvent.

11 **The mean iron content in a sample of a tap water was determined by a spectrophotometric method and was found 1.25 mg/L. The standard deviation of this determination is known to be 0.10 mg/L. Calculate the percent probability (P%) that a single measurement will give a result within the 1.20-1.30 mg/L range.**

P% =

Question type	Numeric

Text

Topic	Data Analysis
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 37.3

12	**An analytical method is considered as rugged if:**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	It is relatively free from interferences.
Answer	0) It is relatively insensitive to changes in experimental conditions. 1) It is relatively free from interferences. 2) It is appropriate for in-field analytical measurements. 3) It uses portable devices of rugged design. 4) It can easily be carried by unskilled personnel.

13	**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	(5.62 0.03) 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

14 **Measurements of pH with a glass electrode in relatively strong alkaline solutions usually yield lower pH values than the actual values. This problem, known as alkaline error, is due to:**

Question type	Multiple Choice
Topic	Electrochemical Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	The strong absorption of carbon dioxide from the air by the alkaline solutions.
Answer	0) The partial response of the glass electrode to other single-charged cations. 1) The corrosive action of alkaline solutions on

the glass membrane.

2) The strong absorption of carbon dioxide from the air by the alkaline solutions.

3) The erratic response of most reference electrodes in alkaline solutions.

15 **The transmittance of solution A is 20.0%, whereas the transmittance of solution B (measured under the same conditions) is 60.0%. What is the transmittance of a mixture of equal volumes of solutions A and B?**

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	40.0%
Answer	0) 34.6%
	1) 30.0%
	2) 41.2%
	3) 40.0%

16 **An equimolar mixture of Bi3+ and Cu2+ is subjected to photometric titration with EDTA(at 745 nm). EDTA and the Bi-EDTA complex do not absorb, whereas the Cu-EDTA complex absorbs. Given that Kform(Bi-EDTA) Kform(Cu-EDTA), which one of the titration curves shown in the figure will be be recorded?**

Question type	Multiple Choice

Topic	Spectrochemical Methods
Difficulty	2/3
Score	3.30
Score max	1
Answer choosen	Curve B
Answer	0) Curve A
	1) Curve B
	2) Curve C
	3) Curve D
	4) Curve E

17 **A 1 M NaCl solution is passed through a strong cation-exchanger cartridge containing 2.40 g of resin in the H+ form until the eluant becomes neutral. If the total volume of the eluant is neutralised by titration with 28.79 mL of 0.0500 M KOH, what is the ion-exchange capacity of the resin in mmol/g?Ion-exchange capacity (mmol/g) =**

Question type	Numeric
Text	
Topic	Separation Chromatographic Methods
Difficulty	2/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 0.6

18 **Molecular iodine (I2) can easily be extracted from an aqueous solution by a water immiscible solvent such as n-hexane. The efficiency of this extraction is**

influenced by the presence of iodide ions (I-) in the aqueous phase. The equilibria involved are shown below:

Which one of the following expressions describes the distribution ratio (D) of I2 in the system n-hexane:water?KD is the distribution constant of I2 in this system and [I-]w is the concentration of free iodide in the aqueous phase.

Question type	Multiple Choice
Topic	Separation Chromatographic Methods
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	D = Kf / (KD + Kf [I-]w)
Answer	0) D = KD / (1 + Kf [I-]w)
	1) D = (KD + 1) / Kf [I-]w
	2) D = Kf / (KD + Kf [I-]w)
	3) D = KD (1 + Kf) / [I-]w

19 **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

20 **10.0 mL of HCl 0.50 M and 10.0 mL of NaOH 0.50 solutions, both at the same temperature, are mixed in a calorimeter where an increase of ToC of temperature is recorded.**

Estimate the temperature increase if 5.0 mL of NaOH 0.50 M was used instead of 10.0 mL.Consider thermal losses are negligible and the specific heats of both solutions are taken as equal.

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	2/3
Score	0.00
Score max	1
Answer choosen	T / 2
Answer	0) 2 x T/ 3
	1) T / 2
	2) 3 x T / 4
	3) T

21 **Synchronous scanning fluorometry is a technique sometimes used when**

analysing complex sample solutions. On which one of the following working protocols relies this technique?

Question type	Multiple Choice
Topic	Spectrochemical Methods
Difficulty	3/3
Score	3.30
Score max	1
Answer choosen	A constant difference between the excitation and emission wavelengths is maintained while the two wavelengths are continuously increased/decreased.
Answer	0) The excitation wavelength is maintained at a fixed value while the emission wavelength is continuously changed and monitored. 1) The emission wavelength is maintained at a fixed value while the excitation wavelength is continuously changed and monitored. 2) A constant difference between the excitation and emission wavelengths is maintained while the two wavelengths are continuously increased/decreased. 3) The excitation wavelength and the emission wavelength are both fixed and the signal is monitored as the power of the light source is continuously increased/decreased.

22 **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)

23 **A 2-tailed Students t-test was applied to compare two means A and B calculated from two sets of analytical results (where AB). It was found that the null hypothesis could be rejected at the 95% confidence level. Which one of the following statements is correct?**

Question type	Multiple Choice
Topic	Data Analysis
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	The probability that A is significantly different from B is 95% or more.
Answer	0) The probability that A is significantly larger than B is 95% or more. 1) The probability that A is significantly different from B is 95% or more. 2) The probability that A and B do not differ significantly is less than 95%. 3) The probability that A is significantly larger than B is 95%.

24 **The mean measured values of three analytical parameters A, B and C are: A = 12.0, B = 10.0, C = 1.3 and their respective values of standard deviation are: sA = 1.2, sB = 1.5, sC = 0.11 Calculate the % relative standard deviation of the quantity: X = (A/B) + C. %RSD of X =**

Question type	Numeric
Text	
Topic	Data Analysis
Difficulty	3/3
Score	0.0
Score max	1

Answer choosen	not ok
Answer	0) 9.71

25 **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.

26 **A volume of 100 mL of a 0.0519 M Zn(II) aqueous solution was subjected to four consecutive extractions with 25 mL of toluene each time (containing 10% v/v tributylphosphate). At the end it was found that the aqueous phase contained 0.0060 M zinc. Calculate the distribution ratio, D, of Zn(II) between the two solvents.**

D =

Question type	Numeric
Text	
Topic	Separation Chromatographic Methods
Difficulty	3/3
Score	0.0
Score max	1
Answer choosen	not ok
Answer	0) 2.86

27 **Braggs law states that the sine of the reflection angle of an X-ray beam of a given wavelength is:**

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	not ok
Answer	0) related reciprocally to the planar distance between the atoms in the crystal lattice. 1) related reciprocally to the interplanar distance of atoms in the crystal lattice. 2) proportional to the planar distance between the atoms in the crystal lattice. 3) proportional to the interplanar distance of atoms in the crystal lattice.

28	A gamma-ray spectrometer is based on:

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	The fact that the total energy of the emitted gamma rays is proportional to the amount of isotope emitting the gamma rays.
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.

29	In mass spectrometry, ionisation of the analyte molecules frequently results in breakdown of the molecules to give a number of smaller fragments that are

characteristic of the structure of the molecule.

What type of compound would result a series of peaks at m/z values 15, 29, 43, 57, 71, 85, 99 and 113?

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	An aromatic compound.
Answer	0) An aromatic compound. 1) A long chain alkyl compound. 2) An aliphatic chloro compound. 3) A carbohydrate.

30 Which one of the following acid-base titration techniques provides precise and accurate results regardless of the strength of the acid (or base), when it is titrated with a strong base (or acid)?

Question type	Multiple Choice
Topic	Miscelleanous
Difficulty	3/3
Score	0.00
Score max	1
Answer choosen	Potentiometric titration.
Answer	0) Thermometric titration. 1) Conductimetric titration.

2) Photometric titration.

3) Potentiometric titration.

4) Coulometric titration.