

Answer key to QP 54790

S.Y. B.Sc. Chemistry - III

Date - 30/3/2019

- Q.1. A. (i) - (c) proximate (ii) - (b) optical
(iii) - (a) 0-10 (iv) - (b) operational
(v) - (c) sub sample (vi) - (a) solids
(vii) - (b) secondary (viii) - (c) hexa
(ix) - (a) 1 (x) - (b) oxidised
(xi) - (c) complexometric (xii) - (b) crystalline
(xiii) - (a) 400-750nm (xiv) - (c) quartz
(xv) - (a) colorimeters (xvi) - (c) Either shorter or longer
(xvii) - (c) electrons (xviii) - (a) absorbance

- Q.1. B (i) - False
(ii) - True
(iii) - True
(iv) - False
(v) - False
(vi) - False

- Q.1. C (i) Universe - Population
(ii) Voltammetry - Electroanalytical method
(iii) 6-electrons - Saturated bonds
(iv) Titrant - Solution in burette
(v) Iodometry - Redox titration
(vi) DTA - Thermal method

(@ 1 one mark each correct answer)

Q. 2. A Instrumental methods - Analysis done using a specific instrument, the response of the instrument is used for calculations. (1 mark)

1. Optical methods
2. Electro analytical methods
3. Thermal methods
4. Chromatographic methods
5. Radio analytical
5. Miscellaneous methods

(Any 4, 1 mark each)

Q. 2. B Sampling - definition (1 mark)
 Random sampling with example (2 marks)
 Systematic sampling with example (2 marks)

Q. 2. C. Determinate errors - source is known, (2 marks)
 small magnitude, no direction, not responding

Sources of determinate errors -

1. Instrumental errors - Uncertainty
 Improper response
2. Methodic error - Solubility
 additional quantity
 incomplete reaction

Q. 2. D.

Reading X_i	True Value T	Absolute error $(X_i - T)$	Relative error $RE = \frac{(X_i - T)}{T}$	Pph $RE \times 100$	PPT $RE \times 1000$
22.15	22.18	0.03	0.00135	0.135	1.35
22.21	22.18	0.03	0.00135	0.135	1.35
22.22	22.18	0.04	0.00180	0.180	1.80

(1 mark) (1 mark) (1 mark) (1 mark) (1 mark)

3

Q.2.E. (i) Constant errors - absolute error remains constant (1 mark)

Proportionate errors - absolute error changes with change in sample size (1 mark)

and one example each (1 mark)

- (ii) — easy availability of apparatus (2 marks)
- no need of special training
 - no need of standards
 - less time required
 - economical

Q.2.F. (i) Purpose of sampling -

- small quantity used / consumed for analysis
- preservation of samples is easy than bulk
- economy (3 marks)

(ii) Sensitivity - minimum concentration which gives proper response.

Selectivity - Response to particular species in presence of other material. (2 marks)

Q.3.A. Gravimetric Analysis - Measurement of weight of substance or sample / analyte is correlated with results

- Volatilization gravimetry - $\text{BaSO}_4 + \text{NH}_4\text{Cl}$
- Precipitation gravimetry - Ni - DMG
- Electrogravimetry - Cu/Zn deposition
- Thermogravimetry - $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

(1 mark each)

- Q.3.B.
1. Temperature
 2. Common ion effect
 3. Diverse ion effect
 4. pH
 5. Complexation
 6. Nature of solvent

(any 5
one mark each)

Q.3.C. (i) End point - definition

(1 mark)

Equivalence point - definition

(1 mark)

End point is obtained by no titration or classical method and equivalence point

is obtained by instrumental method. (1 mark)

Q.3.D. - Determination of end point

(1 mark)

- Acid-base neutralization titration

(1 mark)

- Graphical representation, nature of graph etc.

(3 marks)

Q.3.E.

Titration

Indicator

1. Acid-base titration
(Neutralization titration)

phenolphthalein
Methyl orange

2. Complexometric titration

EBT

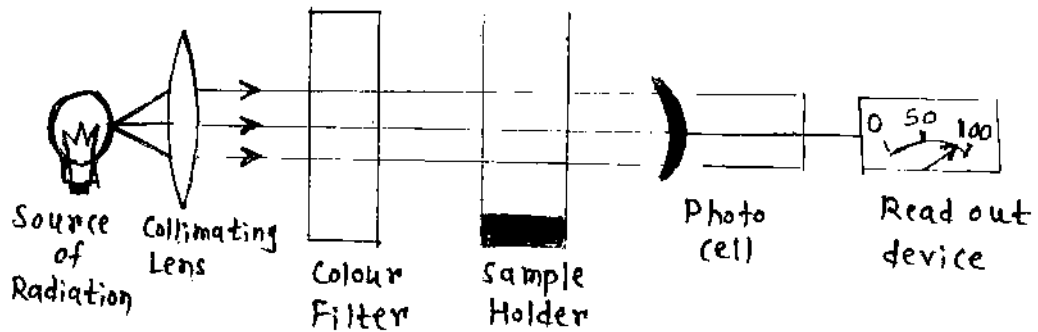
3. Precipitation titration

KBrO_3

4. Redox titration

KMnO_4 , starch etc

Q.4.B. Single beam spectrophotometer diagram (2 Marks)



- Source
- Collimating lens
- Colour filter
- Sample holder
- Photo cell
- Read out device

(any 3 - 1 mark each)

Q.4.C. Any two methods (2 1/2 mark each)

1. Potentiometry
2. Conductometry
3. Voltammetry - Polarography
Amperometry
Coulometry

Q.4.D. Photometric titrations (2 marks)

Measurement of change in absorbance as a function of added titrant.

Limitations -

1. Not applicable to cases where molecular changes takes place.
2. Not possible at high concentrations.
3. The solvent should not absorb the light of same wavelength.

- 6
- Q.4.E Applications of UV-Visible spectrophotometry (1 mark each)
- identification of structural groups.
 - identification of chromophores/Auxochromes
 - cis trans isomers
 - quantitative inorganic analysis
 - photometric titrations.

Q.4.F. Definitions (1 mark each)

Q.5.A.	<u>Precision</u>	<u>Accuracy</u>
	1. Agreement between two readings	1. closeness to true value
	2. shows reliability of method	2. shows reproducibility of the method
	3. need more than one reading	3. One reading can also be accurate
	4. need true value for calculation	4. no need of true value for calculation
	5. good accuracy is associated with precision	5. not necessary to have good precision.

(1 mark each)

Q.5.B Sampling of gases

(1 mark)

Diagram

(2 marks)

Explanation

(2 marks)

Q.5.C Digestion of precipitation
Co-precipitation

(2 1/2 marks)

(2 1/2 marks)