Q.P. Code :29456

[Time: 2:30 Hours] **[Marks:60]**

Please check whether you have got the right question paper.

N.B:
1. All questions are compulsory.
2. Figures to the right indicates full marks.
3. Use of logarithmic table/non programmable calculator is allowed.
4. At. Wts: H=1, C=12, N=14, O=16, Na=23, AI=27, S=32, CI=35.5, K=39, Ca=40, Ag=108. Ba=137, Pb=207, Mg=24.3, F=19, Cu=63.5, Cr=52, Br=79.8.

Q.1 A) Attempt **any two** of the following:

a) With respect to analytical methodology, explain the following terms with suitable examples. **4**
i) Technique ii) Methods iii) Procedures iv) Protocols

b) What is total quality management (TQM)? Discuss 5S principles of TQM in improving the quality of analytical laboratory. **4**

c) With respect to quantitative performance criteria of an analytical instrument, discuss the terms, 'Calibration sensitivity' and 'Analytical sensitivity'. What are the advantages of analytical sensitivity? **4**

d) Explain the term Good Laboratory Practice (GLP). Discuss the principles of GLP. **4**

Q.1 B) Attempt **any one** of the following:

a) Define the terms, 'Quality audit' and 'Quality review'. Explain the importance of Quality Audit in analytical laboratory. **4**

b) Discuss important methods to minimize determinate errors. **4**

Q.2 A) Attempt **any two** of the following:

a) i) How many milligrams / millimeter of potassium sulphate are present in 0.35 molar solution of potassium sulphate? **2**
ii) Assign oxidation number to each element in $V_2O_7^{-4}$ **2**

b) Chloroform reacts with chlorine, to form CCI_4 and hydrogen chloride. In an experiment 20g of chloroform and 10g of chlorine were allowed to react. Which is the limiting reagent? What is the maximum yield of CCI_4 in moles and grams? **4**

c) A 21.62 cm^3 sample of Ca $(OH)_2$ solution was titrated with 0.2545 M HC1.45.87 cm^3 of the acid was required to reach the endpoint of the titration. **4**
i) Write the reaction.
ii) What was the molarity of calcium hydroxide solution?

d) The solubility product of AgBr is 5.2 x 10^{-13} . Calculate its solubility in mol dm^{-3} and g dm^{-3} . **4**

Q.2 B) Attempt **any one** of the following:

a) Calculate the mass of anhydrous HCI in 5.0cm^3 of commercial HCl, containing 37.23% of HCI by weight (specific gravity 0.19 g cm^{-3}). **4**

b) Calculate the amount of $AgNO_3$ required to convert 1.75 grams of Na_2CO_3 to Ag_2CO_3. Calculate the mass of Ag_2CO_3 formed. **4**

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Q.3 A) Attempt **any two** of the following:

a) What are multichannel transducers? Discuss photodiode array in detail. **4**

b) What are the advantages of FTIR? Explain the finger print region with respect to FTIR with suitable examples. **4**

c) Derive Beer Lambert's equation. What are its limitations? **4**

d) Describe the following terms with respect to IR Spectroscopy. **4**

i) Pelleting ii) Mulls

Q.3 B) Attempt **any one** of the following:

a) Explain the use of Laser as a source of radiation. **4**

b) A solution containing two absorbing species X and Y was analyzed spectrophotometrically at two different wavelengths in a cell of path length 1.0 cm. The absorbance of mixture was 0.625 and 0.043 at 400 nm and 700nm respectively. The molar absorptivities of two species were given as below: **4**

Species	Molar Absorptivity (€)$dm^3\ mol^{-1}\ cm^{-1}$	
	At 400nm	At 700nm
X	3641	435.6
Y	3301	11.4

Calculate the molar concentration of X and Y.

Q.4 A) Attempt **any two** of the following:

a) Describe the instrumentation involved in flow injection analysis with suitable examples. **4**

b) Distinguish between discrete and continuous automated devices. **4**

c) Describe differences between power compensated and heat flux DSC instruments. **4**

d) Explain application of DSC for drug analysis and oxidative stability. **4**

Q.4 B) Attempt **any one** of the following:

a) Describe working of DSC with suitable diagram. **4**

b) Explain with suitable example, how the automation in instrumental analysis has overcome the limitation of conventional techniques. **4**

Q.5 Attempt **any four** of the following: **12**

a) Explain calibration curve method to quantify an analyte in a sample.

b) Discuss in brief 'Klimisch score'.

c) Calculate the number of hydrogen atoms present in 5.0 moles of Ethyl alcohol. (Given Avogadro number N_A = 6.02 X 10^{23})

d) Calculate the pH of 2 x 10^{-3}M solution of acetic acid. K_a for acetic acid is 1.8 x 10^{-5}.

e) Explain: Methane exhibits λ_{max} at 125nm while ethane exhibits λ_{max} at 135nm.

f) Describe the use of Nernst Glower source used in IR Spectroscopy.

g) Explain how sample size and sample shape affect DSC curves.

h) How does automation enhance the acceptability of the results?

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