SYNOPTIC ANSWER KEY

Q.1		Marks
A		
i	Mechanical	1
ii	Partition	1
iii	Fractional distillation	1
iv	Electric charge	1
v	Partition	1
vi	Distribution ration	1
vii	Standard Hydrogen Electrode	1
viii	Galvanic Cell	1
ix	1 to 8	1
x	Membrane	1
xi	0.242 V	1
xii	Scm^{-1}	1
xiii	Bell shaped curve	1
xiv	Q-Test	1
xv	Obtaining best fitting line	1
xvi	Rejection of result	1
xvii	$\pm {ts}/{\sqrt{n}}$	1
xviii	Range	1
B		
i	False	1
ii	True	1
Iii	True	1
Iv	False	1
v	True	1
vi	True	1
C		
i	f	1
ii	d	1
iii	a	1
iv	b	1
v	c	1
vi	e	1

Q.2		
A	Principle	2
	Steps involved	3
B	Any five applications	5
C	Ascending Technique	
	diagram	1
	explanation	1 ½
	Two dimensional technique	
	diagram	1

	explanation	1 ½
D	Five steps	5
E	Correct derivation leading to $W_1 \gg W_2$	5
F	In the first case	
	Fraction un-extracted $= [\frac{Wn}{W}]$	
	$= [\frac{1}{DV+1}]^n$	
	$= [\frac{1}{20+1}]^2$	
	$= [\frac{1}{21}]^2$	
	$= 0.00227$	1 ½
	Fraction extracted = 0.9977	½
	% extraction = 99.77	½
	In the second case	
	X= 0.1	
	Fraction unextracted $= [\frac{1}{2+1}]^2$	
	$= 0.0011$	1 ½
	Fraction extracted = 0.9989	½
	% extraction = 99.89	½
Q.3		
A	Diagram	2
	Experimental Procedure	3
B	Curve and discussion	
	a) E vs Volume	2 ½
	b) $\frac{\Delta E}{\Delta V}$ vs Volume	2 ½
C	Titration Curve	2
	Description	3
D	Any five applications	5
E	Diagram	2
	Discussion	3
F	Any three advantages	3
	Any two limitations	2
Q.4		
A	Equation	1
	Any four salient features	4
B	Null Hypothesis	
	introduction	2
	outline procedure	3
C	Least square method for obtaining line of the type $y = mx$ or $y = mx + C$ (Any One)	5

D Mean = $\frac{0.164+0.175+0.172+0.176+0.152+0.155+0.157+0.166+0.168+0.167}{10} = 0.165$ 1

x_i	d = l x_i - $\bar{x}$ l	$(x_i - \bar{x})^2$
0.164	0.001	1×10^{-6}
0.175	0.010	1×10^{-4}
0.172	0.007	4.9×10^{-5}
0.176	0.011	12.1×10^{-5}
0.152	0.013	16.9×10^{-5}
0.155	0.010	10.0×10^{-5}
0.157	0.008	6.4×10^{-5}
0.166	0.001	1×10^{-6}
0.168	0.003	9×10^{-6}
0.167	0.002	4×10^{-6}

2

$\Sigma = 6.18 \times 10^{-4}$

Standard deviation $= \sqrt{\Sigma \frac{(xi - \bar{x})2}{n-1}}$ 1

$= \sqrt{\Sigma \frac{0.000618}{10-1}}$

$= 8.28 \times 10^{-3}$

For 95% confidence interval

$= \bar{x} \pm \frac{ts}{\sqrt{n}}$

$= 0.165 \pm \frac{2.26\ x\ 0.00828}{\sqrt{10}}$ 1

$= 0.165 \pm 0.0059$

E Mean $\bar{x} = \frac{0.575}{8} = 0.0718 \approx 0.072$ 1

Median = 0.072 1

Standard deviation

x_i	d = l x_i - $\bar{x}$ l	$(x_i - \bar{x})^2$
0.069	0.003	9×10^{-6}
0.070	0.002	4×10^{-6}
0.071	0.001	1×10^{-6}
0.072	0.00	0×10^{-6}
0.072	0.00	0×10^{-6}
0.072	0.00	0×10^{-6}
0.073	0.001	1×10^{-6}
0.076	0.004	16×10^{-6}

$\Sigma = 31 \times 10^{-6}$ 2

Standard deviation $= \sqrt{\Sigma \frac{(xi - \bar{x})2}{n-1}}$

$= 2.1 \times 10^{-3}$

Range $= 0.076 - 0.069 = 0.007$ 1

F

Obs. No.	x	y	x^2	xy
1	0.1	1.2	1×10^{-2}	0.12
2	0.2	2.6	4×10^{-2}	0.52
3	0.4	4.4	16×10^{-2}	1.76
4	0.7	7.6	49×10^{-2}	5.32
5	1.0	10.8	100×10^{-2}	10.8
6	1.5	15.6	225×10^{-2}	23.4
	$\Sigma x = 3.9$	$\Sigma y = 42.2$	$\Sigma x^2 = 3.95$	$\Sigma xy = 41.92$

2

3.95m + 3.9c = 41.92 Eqn. No.1
3.9m + 6c = 42.2 Eqn. No.2

Dividing Eqn. No.1 by 3.9 and Eqn. No.2 by 6
1.012 m + c = 10.7 Eqn. No.3
0.65 m + c = 7.03 Eqn. No.4 2
Solving Eqn. No.3 & 4
m = 10.1 ≈ 10
On substituting in Eqn. No.4
C= 0.53 ≈ ½
Equation is 1
(Intensity) = 10(concentration) + ½

Q.5

A Principle 2
Any three applications 3

B Diagram 2
Explaination 3

C Indicator electrode – definition 1
construction 2
working 2

D Any three advantages 3
Any two limitations 2

E $\bar{x}_1 = \frac{1.22+1.25+1.26}{3} = 1.243$ 1

$\bar{x}_2 = \frac{1.31+1.34+1.35}{3} = 1.333$ 1

$t_{cal} = [(\bar{x}_1 - \bar{x}_2)/ s] \sqrt{n_1 n_2 / n_1+n_2}$

$= [(1.333-1.243)/0.021] \sqrt{9/6}$

$= 5.25$ 2

$t_{tab} = 2.78$

$t_{cal} > t_{tab}$ ½

Null hypothesis is invalid, the two means differ not only numerically but also statistically ½

F On the basis of 2.5d rule

New Mean = 4.52 1

x_i	$d = \| x_i - \bar{x} \|$
4.3	0.22
4.5	0.02
4.5	0.02
4.6	0.08
4.7	0.18

1 ½

$\Sigma d = 0.52$

$d_{avg} = 0.52/5 = 0.104$

$d_{questionable} = x_i - \bar{x}$

$= 0.48$ ½

$2.5d_{avg} = 2.5 \times 0.104$

$= 0.26$

$2.5d_{avg} < d_{questionable}$ Hence the doubtful(last) value should be rejected 1

On the basis of 2.5d rule

$4.0d_{avg} = 4 \times 0.104$

$= 0.416$

$4.0d_{avg} < d_{questionable}$ Hence the doubtful(last) value should be rejected 1

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