Electronic Supplementary Information

Inkjet-Printed Paper-Based Electrochemical Sensor with Gold Nano-Ink for Detection of Glucose in Blood Serum

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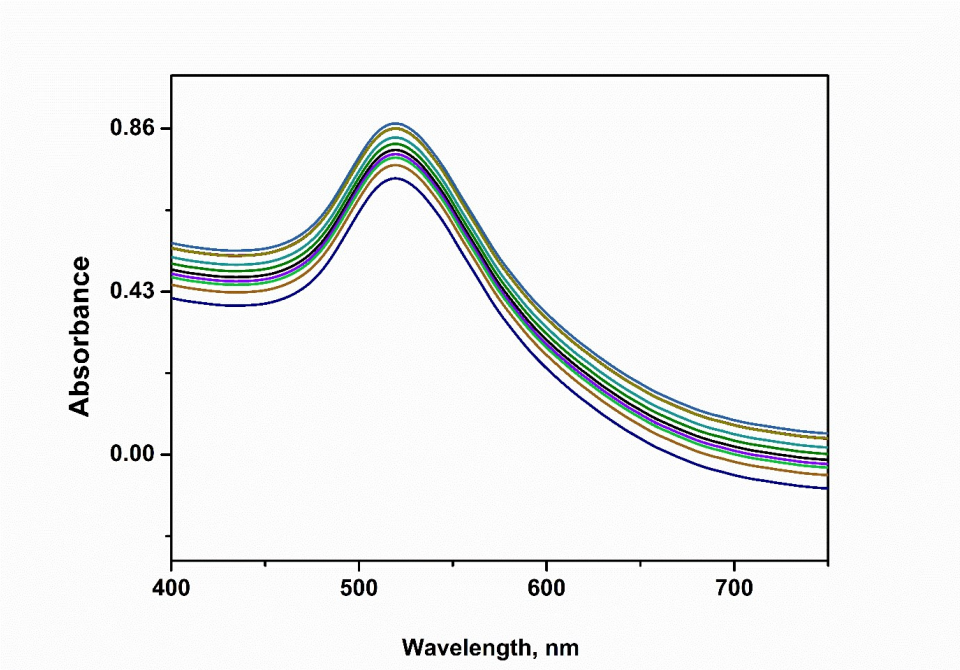


Fig. S1. UV-Vis spectra of AuNPs/starch analyzed for50 consecutive days.

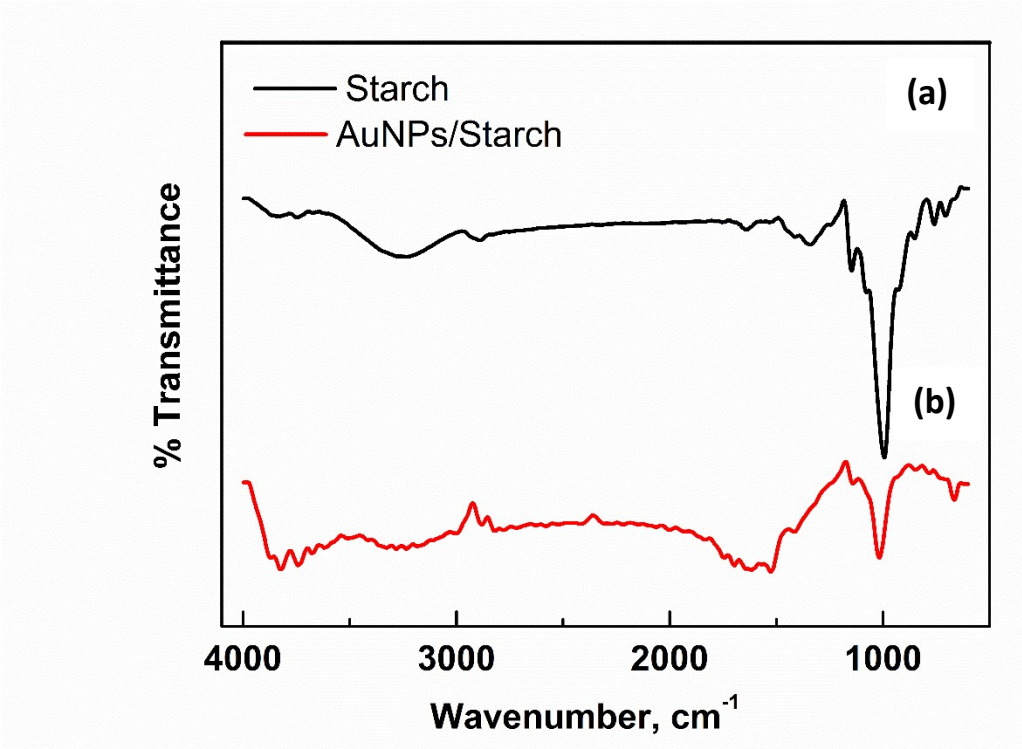
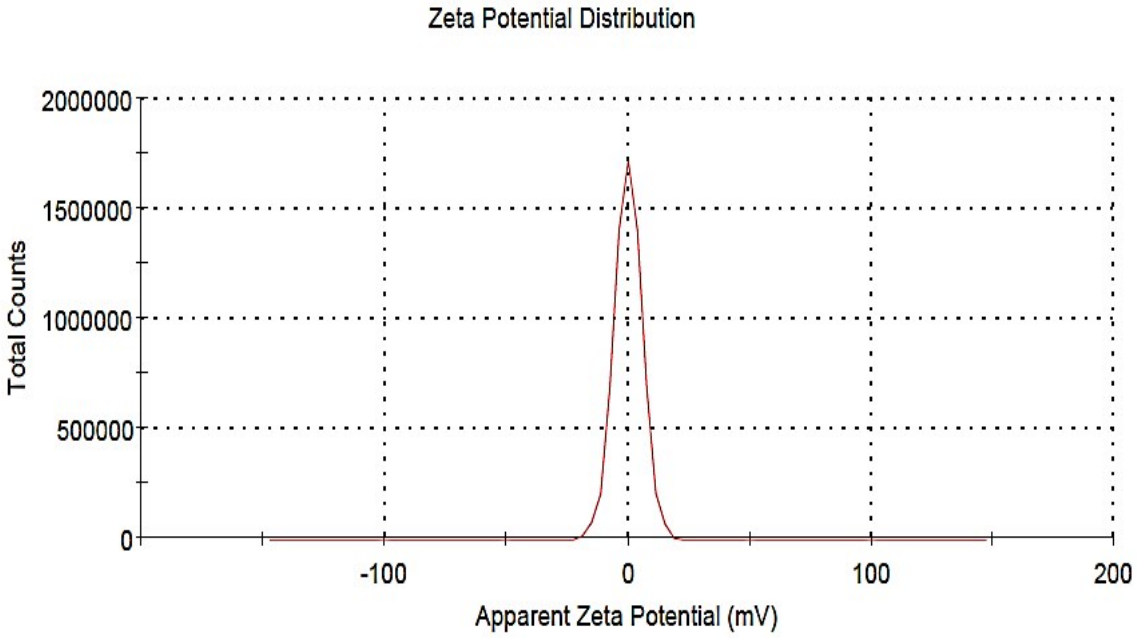


Fig. S2. FTIR spectra of (a) pure starch and (b) AuNPs/starch.



S3. Zeta potential measurement of AuNPs/starch

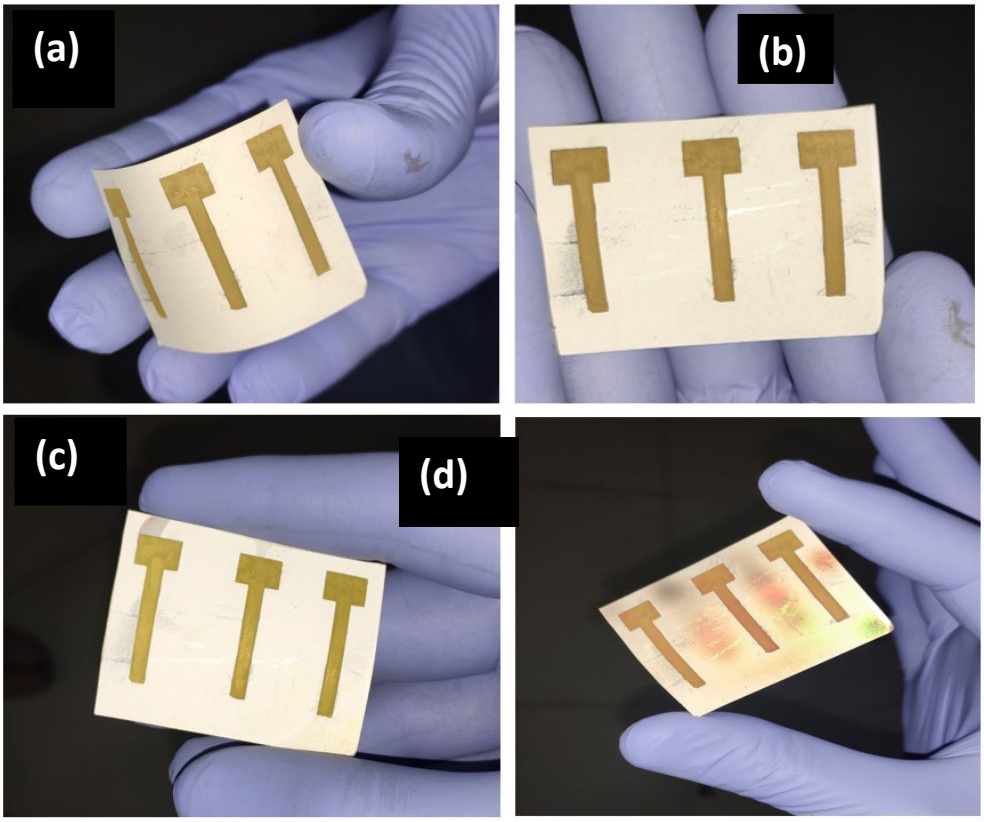


Fig. S4. Inkjet-printed (with nano-ink) on different paper substrates(a) photopaper (b) normal printing paper (c) Whatman filter paper No.1and (d) bond paper

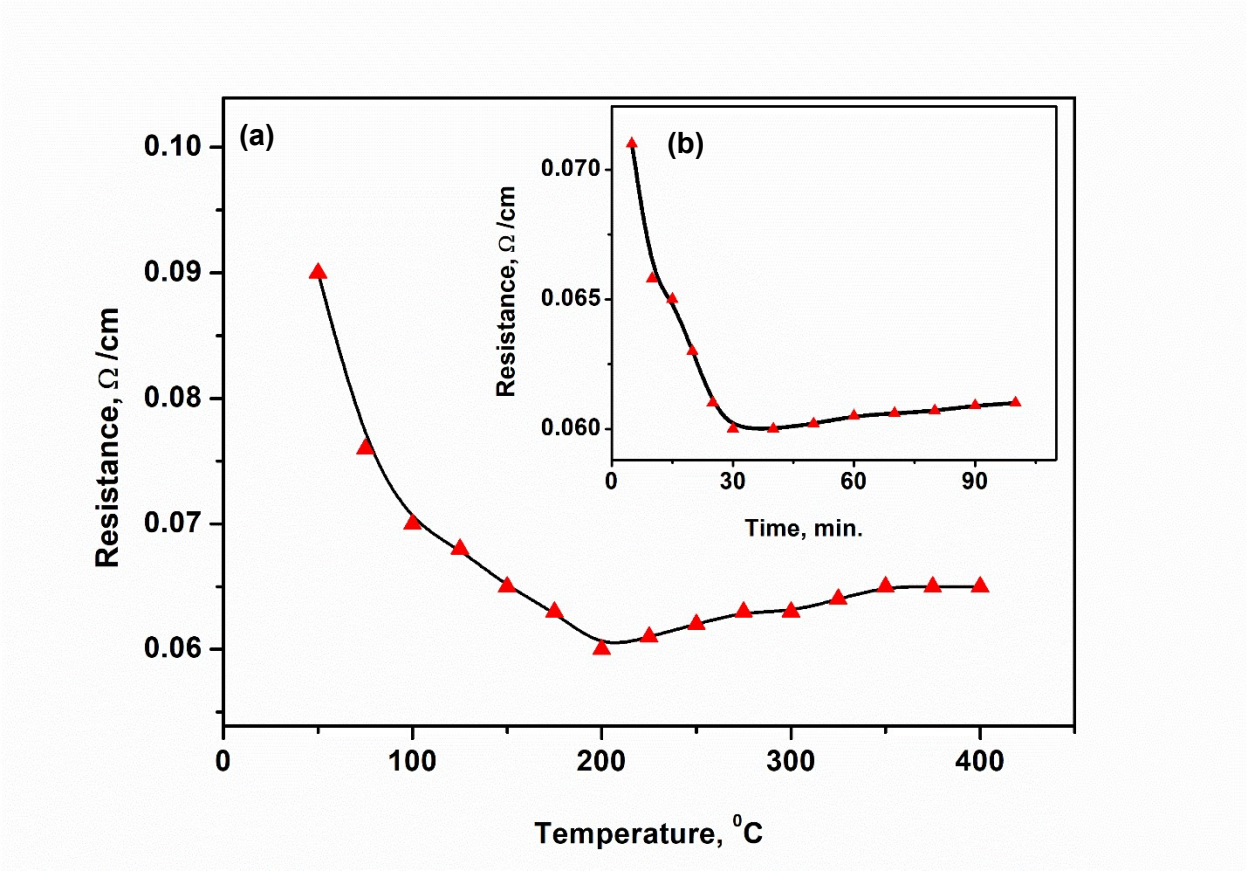


Fig. S5. Effect of sintering temperature on fabricated AuNPs-PPE from 50 to 110^{o}C. (b) Effect of sintering time from 5 to 35 min on resistance value in ohm/cm

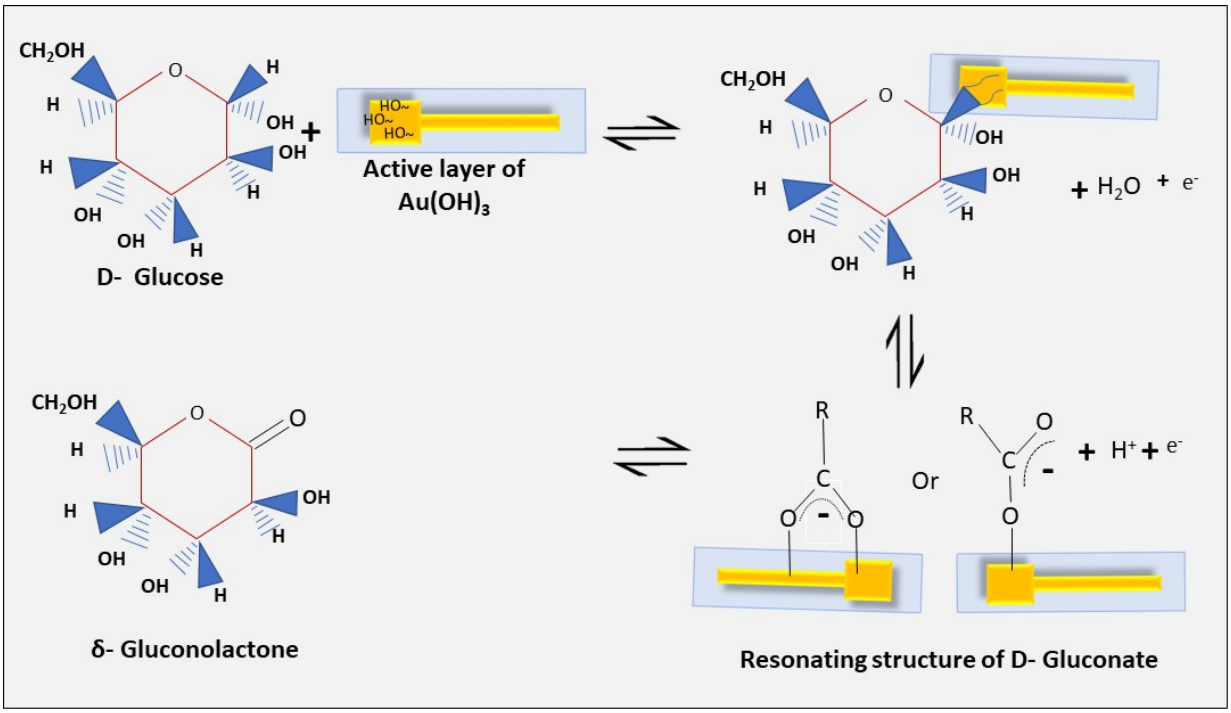


Fig. S6. Proposed mechanism for the detection of glucose through the electrochemical oxidation glucose on AuNPs-PPE.

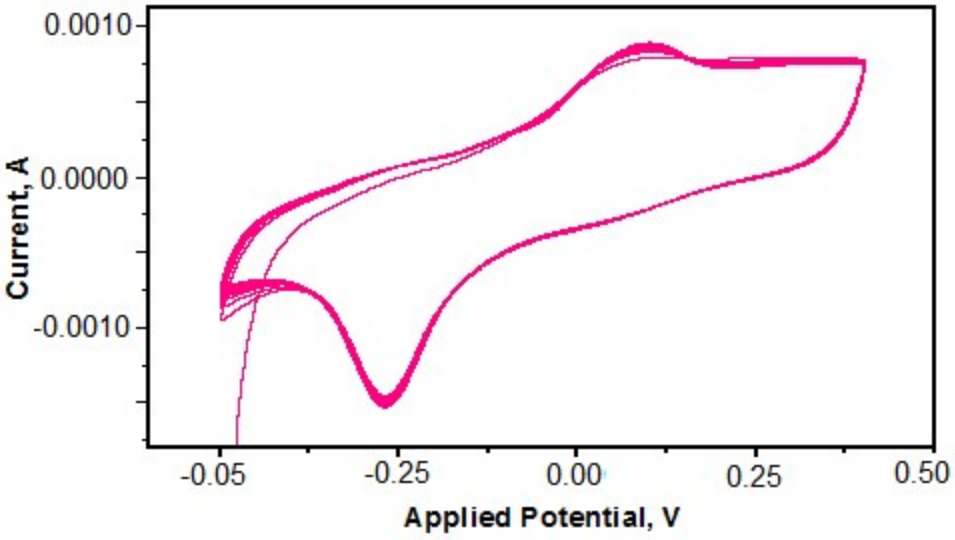


Fig. S7. Ccontinuous 50 CV cycles of 5 mM glucose in PBS (0.1 M, pH 9.2) with a scan rate of 10 mV s^{-1} when AuNPs-PPE is used as a working electrode.

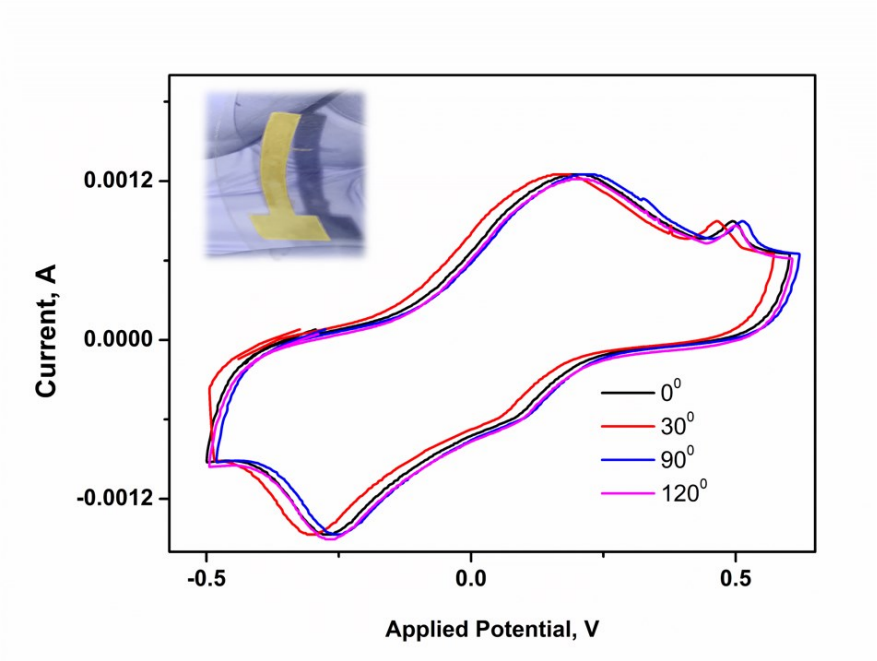


Fig S. 8. CV response observed for 10 mM glucose at 10 mV s^{-1} scan rate in PBS (0.1 mM, 9.2 pH) when AuNPs-PPE bended at different angles (30, 90, and 120 degree)

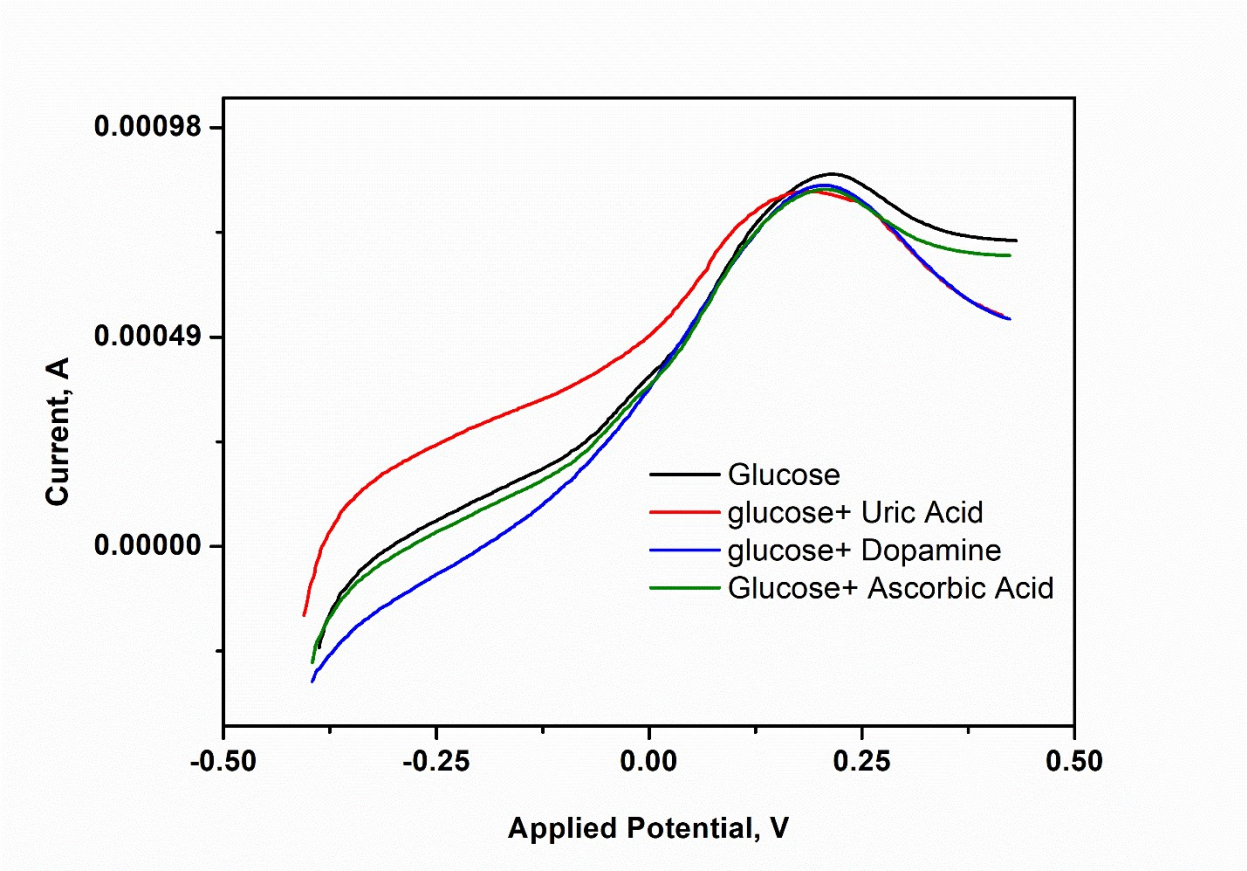


Fig. S9. Effects of uric acid (10 mM), dopamine (10 mM)and ascorbic acid (10 mM) toward the electrocatalytic oxidation of glucose (5 mM) using AuNPs-PPE in PBS (0.1 M,) at ascan rate of 10 mVs^{-1}

Table S1. Determination of glucose in blood serum sample					
Glucose found, mM using AuNPs-PPE as an electrochemical sensor (n=6)			Glucose found, mM using Glucometer (n=5)		
x_{i1}	$x_{i1-}\bar{x}_1$	$(x_{i1-}\bar{x}_{1)}{}^2$	x_{i2}	$(x_{i2-}\bar{x}_{2)}$	$(x_{i2-}\bar{x}_{2)}{}^2$
5.33	0.02	0.0004	5.34	0.04	0.0016
5.30	-0.01	0.0001	5.29	-0.01	0.0001
5.28	-0.03	0.0009	5.30	0.00	0.0000
5.35	0.04	0.0016	5.28	-0.02	0.0004
5.29	-0.02	0.0004	5.32	-0.03	0.0009
5.31	0.00	0.0000	5.33	0.03	0.0009
$\bar{x}_1$= 5.31		$\Sigma(x_{i1-}\bar{x}_{1)}{}^2$=0.0034	$\bar{x}_2$=5.30		$\Sigma(x_{i2-}\bar{x}_{2)}{}^2$=0.0039

F-test: It is the ratio of square of the standard deviation of two analytical methods

$$\mathbf{F}=\frac{S_1^2}{S_2^2}$$

Where S1 and S2 standard deviations of two methods respectively, F is variance

$$S_1^2=\Sigma\frac{(xi_1 - \bar{x}_1)^2}{N1 - 1} = \frac{0.0034}{6 - 1} = 6.8\text{x}10^{-4}$$

$$S_2^2=\Sigma\frac{(xi_2 - \bar{x}_2)^2}{N2 - 1} = \frac{0.0039}{5 - 1} = 9.7\text{x}10^{-4}$$

$$F = \frac{6.8x10 - 4}{9.7x10 - 4}$$

F= 0.70

- **At 95%, the tabulated F value for v_1=5 and v_2= 4 is 6.26**

- The calculated F value less than tabulated F value at 95% confidence level, then there is no significant different between the variance of the two methods, so the two methods have comparable standard deviation and t test can be applied:

t-test

$$\pm t = \frac{(\bar{x}_1 - \bar{x}_2)}{S_p}\frac{\sqrt{N1N2}}{N1+N2}$$

$$\mathbf{S_p} = \sqrt{\frac{\sum((x_{i1} - \bar{x}_1)^2 + \Sigma(x_{i2} - \bar{x}_2)^2}{N1+N2-2}}$$

$$= \sqrt{\frac{0.0034 + 0.0039}{6+5-2}}$$

$S_p = 0.028$

$$\pm t = \frac{(\bar{x}_1 - \bar{x}_2)}{S_p}\frac{\sqrt{N1N2}}{N1+N2}$$

$$= \frac{(5.31 - 5.30)}{0.028}\sqrt{\frac{6\times 5}{6+5}}$$

$\pm t = 0.35 \times 1.64$

$\pm t = 0.58$

* The tabulated t value for nine degrees of freedom (N_1+N_2-2) at the 95% confidence level is 2.262 and the thus calculated value is less than tabulated value and thus there is no statistical difference in the results by two methods.