1. In the data below, four reagents are used with a blood sample from each patient. The three variables measured for each reagent are y_1 = white blood count, y_2 = red blood count, and y_3 = hemoglobin count.

	Reagent 1			Reagent 2			Reagent 3			Reagent 4		
Subject	y_1	y_2	y_3	y_1	y_2	y_3	y_1	y_2	y_3	y_1	y_2	y_3
1	8.0	3.96	12.5	8.0	3.93	12.7	7.9	3.86	13.0	7.9	3.87	13.2
2	4.0	5.37	16.9	4.2	5.35	17.2	4.1	5.39	17.2	4.0	5.35	17.3
3	6.3	5.47	17.1	6.3	5.39	17.5	6.0	5.39	17.2	6.1	5.41	17.4
4	9.4	5.16	16.2	9.4	5.16	16.7	9.4	5.17	16.7	9.1	5.16	16.7
5	8.2	5.16	17.0	8.0	5.13	17.5	8.1	5.10	17.4	7.8	5.12	17.5
6	11.0	4.67	14.3	10.7	4.60	14.7	10.6	4.52	14.6	10.5	4.58	14.7
7	6.8	5.20	16.2	6.8	5.16	16.7	6.9	5.13	16.8	6.7	5.19	16.8
8	9.0	4.65	14.7	9.0	4.57	15.0	8.9	4.58	15.0	8.6	4.55	15.1
9	6.1	5.22	16.3	6.0	5.16	16.9	6.1	5.14	16.9	6.0	5.21	16.9
10	6.4	5.13	15.9	6.4	5.11	16.4	6.4	5.11	16.4	6.3	5.07	16.3
11	5.6	4.47	13.3	5.5	4.45	13.6	5.3	4.46	13.6	5.3	4.44	13.7
12	8.2	5.22	16.0	8.2	5.14	16.5	8.0	5.14	16.5	7.8	5.16	16.5
13	5.7	5.10	14.9	5.6	5.05	15.3	5.5	5.02	15.4	5.4	5.05	15.5
14	9.8	5.25	16.1	9.8	5.15	16.6	8.1	5.10	13.8	9.4	5.16	16.6
15	5.9	5.28	15.8	5.8	5.25	16.4	5.7	5.26	16.4	5.6	5.29	16.2
16	6.6	4.65	12.8	6.4	4.59	13.2	6.3	4.58	13.1	6.4	4.57	13.2
17	5.7	4.42	14.5	5.5	4.31	14.9	5.5	4.30	14.9	5.4	4.32	14.8
18	6.7	4.38	13.1	6.5	4.32	13.4	6.5	4.32	13.6	6.5	4.31	13.5
19	6.8	4.67	15.6	6.6	4.57	15.8	6.5	4.55	16.0	6.5	4.56	15.9
20	9.6	5.64	17.0	9.5	5.58	17.5	9.3	5.50	17.4	9.2	5.46	17.5

a) Carry out one-way MANOVA on reagents at 5% level of significance and write down the MANOVA table.
b) Ignoring reagents, carry out Principal Component Analysis and discuss if the objective of the analysis is achieved in three ways, comment on the correlation between the principal components with original variables and write down the Principal components.
c) Assuming homogeneity assumption and using the linear score function, linear discriminant function and the logistic approach and given that the prior probabilities are 0.2 for reagent 1, 0.3 for reagent 2, 0.1 for reagent 3 and 0.4 for reagent 4. Classify a new measurement (7.0, 5.0, 15.0) in one of the four reagents. (refer to special notes on Discriminant Analysis)

2. In a medical research, five variables in a comparison of normal patients and diabetics was observed. The table below gives partial data for normal patients only. The three variables of major interest were: x_1 = glucose intolerance, x_2 = insulin response to oral glucose, x_3 = insulin resistance.
The two additional variables of minor interest were: y_1 = relative weight, y_2 = fasting plasma glucose.

(a) Find the canonical correlations between (y_1, y_2) and (x_1, x_2, x_3).
(b) Find the standardized coefficients for the canonical variates.
(c) Test the significance of each canonical correlation.
(d) Comment on significance of correlation between the raw canonical variates and the original variables

(e) Explain how this analysis can be used as a variable reduction technique.

Patient Number	y_1	y_2	x_1	x_2	x_3
1	.81	80	356	124	55
2	.95	97	289	117	76
3	.94	105	319	143	105
4	1.04	90	356	199	108
5	1.00	90	323	240	143
6	.76	86	381	157	165
7	.91	100	350	221	119
8	1.10	85	301	186	105
9	.99	97	379	142	98
10	.78	97	296	131	94
11	.90	91	353	221	53
12	.73	87	306	178	66
13	.96	78	290	136	142
14	.84	90	371	200	93
15	.74	86	312	208	68
16	.98	80	393	202	102
17	1.10	90	364	152	76
18	.85	99	359	185	37
19	.83	85	296	116	60
20	.93	90	345	123	50
21	.95	90	378	136	47
22	.74	88	304	134	50
23	.95	95	347	184	91
24	.97	90	327	192	124
25	.72	92	386	279	74
26	1.11	74	365	228	235
27	1.20	98	365	145	158
28	1.13	100	352	172	140
29	1.00	86	325	179	145
30	.78	98	321	222	99
31	1.00	70	360	134	90
32	1.00	99	336	143	105
33	.71	75	352	169	32
34	.76	90	353	263	165
35	.89	85	373	174	78
36	.88	99	376	134	80
37	1.17	100	367	182	54
38	.85	78	335	241	175
39	.97	106	396	128	80
40	1.00	98	277	222	186
41	1.00	102	378	165	117
42	.89	90	360	282	160
43	.98	94	291	94	71
44	.78	80	269	121	29
45	.74	93	318	73	42
46	.91	86	328	106	56