UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME	:	**FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR II**
COURSE CODE	:	**FSNT 202**
TITLE OF PAPER	:	**SENSORY EVALUATION**
TIME ALLOWED	:	**TWO (2) HOURS**
INSTRUCTIONS	:	**ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) QUESTIONS. STATISTICAL TABLES AND FORMULA ARE PROVIDED AT THE END OF THE QUESTION PAPER**

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

QUESTION 1 (COMPULSORY)

(a) What is sensory analysis?

(10 Marks)

(b) Most large consumer goods companies have departments dedicated to sensory analysis. Discuss **five (5)** points on the importance of sensory analysis.

(10 Marks)

(c) Explain **two (2)** environmental factors that could affect each of the following senses during sensory evaluation and how the effects of these factors can be minimized.

i) Sense of sight
ii) Sense of smell (8 marks)

(16 Marks)

(d) Give **four (4)** instructions that you would give to a panelist during sensory evaluation.

(4 Marks)

[TOTAL MARKS = 40]

QUESTION 2

(a) What is an expert panel? Give an example of an industry that requires an expert panel.

(6 Marks)

(b) Describe the sensory test protocol considerations with respect to the following:-

i. Palate cleansing
ii. Carriers
iii. Serving temperature
iv. Randomization and blind labeling

(12 Marks)

(c) Differentiate between the following sensory evaluation methods.

i. Unilateral paired comparison and bilateral paired comparison tests
ii. Discrimination ranking and preference raking tests

(12 Marks)

[TOTAL MARKS = 30]

QUESTION 3

(a) Discuss the following characteristics of food that can be evaluated by sensory analysis:-

i. Appearance
ii. Aroma
iii. Flavour
iv. Texture

(20 Marks)

(b) A paired comparison test was conducted to determine if there was a significant difference in 10°Brix and 12°Brix grape juice. Twenty three out of 32 judges gave correct judgment. Was there a significant difference between samples at ($p < 0.05$) and at ($p < 0.01$)? Justify your answer.

(10 Marks)

[TOTAL MARKS = 30]

QUESTION 4

(a) Describe how you would conduct the following discrimination and affective sensory evaluation methods. Show your sample order presentation assuming you are presenting not more than **three (3)** samples (A, B and C) :-

i. Paired comparison test
ii. Duo trio test, balance reference mode
iii. Rating preference test

(18 Marks)

(b) Three grape juice samples, "A", "B" and "C" were presented to 32 assessors who were asked to rank the samples in-order of the intensity of sweetness. The rank sums are shown in the Table below:-

	Apple juice samples		
	540	600	764
Rank sums	64	91	37

Was there any significant difference (at 0.05 probability level for two tailed test) in the intensity of sweetness between the three samples? Justify your answer. Show all your workings.

(12 Marks)

[TOTAL MARKS = 30]

Table 1. Minimum number for correct judgements to establish significance at various probability levels for paired comparison and Duo-trio tests (one-tailed, p = ½)

No of trials (N)	Probability levels						
	0.05	0.04	0.03	0.02	0.01	0.005	0.001
7	7	7	7	7	7		
8	7	7	8	8	8	8	
9	8	8	8	8	9	9	
10	9	9	9	9	10	10	10
11	9	9	10	10	10	11	11
12	10	10	10	10	11	11	12
13	10	11	11	11	12	12	13
14	11	11	11	12	12	13	13
15	12	12	12	12	13	13	14
16	12	12	13	13	14	14	15
17	13	13	13	14	14	15	16
18	13	14	14	14	15	15	16
19	14	14	15	15	15	16	17
20	15	15	15	16	16	17	18
21	15	15	16	16	17	17	18
22	16	16	16	17	17	15	19
23	16	17	17	17	18	19	20
24	17	17	18	18	19	19	20
25	18	15	18	19	19	20	21
26	18	18	19	19	20	20	22
27	19	19	19	20	20	21	22
28	19	20	20	20	21	22	23
29	20	20	21	21	22	22	24
30	20	21	21	22	22	23	24
31	21	21	22	22	23	24	25
32	22	22	22	23	24	24	26
33	22	23	23	23	24	25	26
34	23	23	23	24	25	25	27
35	23	24	24	25	25	26	27
36	24	24	25	25	26	27	28
37	24	25	25	26	26	27	29
38	25	25	26	26	27	28	29
39	26	26	26	27	28	28	30
40	26	27	27	27	28	29	30
41	27	27	27	28	29	30	31
42	27	28	28	29	29	30	32
43	28	28	29	29	30	31	32
44	28	29	29	30	31	31	33
45	29	29	30	30	31	32	34
46	30	30	30	31	32	33	34
47	30	30	31	31	32	33	35
48	31	31	31	32	33	34	36
49	31	32	32	33	34	34	36
50	32	32	33	33	34	35	37
60	37	38	38	39	40	41	43
70	43	43	44	45	46	47	49
80	48	49	49	50	51	52	55
90	54	54	55	56	57	58	61
100	59	60	60	61	63	64	66

Source : E.B .Roessler et al. Journal of Food Science, 1978, 43, 940-947

Table 2. Minimum numbers of agreeing judgements necessary to establish significance at various probability levels for the paired comparison and paired preference tests (two tailed, p = ½)

	Probability Levels						
No. of trials (n)	0.05	0.04	0.03	0.02	0.01	0.005	0.001
7	7	7	7	7			
8	8	8	8	8	8		
9	8	8	9	9	9	9	
10	9	9	9	10	10	10	
11	10	10	10	10	11	11	11
12	10	10	11	11	11	12	12
13	11	11	11	12	12	12	13
14	12	12	12	12	13	13	14
15	12	12	13	13	13	14	14
16	13	13	13	14	14	14	15
17	13	14	14	14	15	15	16
18	14	14	15	15	15	16	17
19	15	15	15	15	16	16	17
20	15	16	16	16	17	17	18
21	16	16	16	17	17	18	19
22	17	17	17	17	18	18	19
23	17	17	18	18	19	19	20
24	18	18	18	19	19	20	21
25	18	19	19	19	20	20	21
26	19	19	19	20	20	21	22
27	20	20	20	20	21	22	23
28	20	20	21	21	22	22	23
29	21	21	21	22	22	23	24
30	21	22	22	22	23	24	25
31	22	22	22	23	24	24	25
32	23	23	23	23	24	25	26
33	23	23	24	24	25	25	27
34	24	24	24	25	25	26	27
35	24	25	25	25	26	27	28
36	25	25	25	26	27	27	29
37	25	26	26	26	27	28	29
38	26	26	27	27	28	29	30
39	27	27	27	28	28	29	31
40	27	27	28	28	29	30	31
41	28	28	28	29	30	30	32
42	28	29	29	29	30	31	32
43	29	29	30	30	31	32	33
44	29	30	30	30	31	32	34
45	30	30	31	31	32	33	34
46	31	31	31	32	33	33	35
47	31	31	32	32	33	34	36
48	32	32	32	33	34	35	36
49	32	33	33	34	34	35	37
50	33	33	34	34	35	36	37
60	39	39	39	40	41	42	44
70	44	45	45	46	47	48	50
80	50	50	51	51	52	53	56
90	55	56	56	57	58	59	61
100	61	61	62	63	64	65	67

Source : .E.B .Roessler et al.. Journal of Food Science, 1978, 43, 940-947

Table 3. Critical values of Chi-square (χ^2)

	Level of significance for one-tailed test					
	0.10	0.05	0.025	0.01	0.005	0.0005
	Level of significance for two-tailed test					
df	0.2	0.1	0.05	0.02	0.01	0.001
1	1.64	2.71	3.84	5.41	6.64	10.83
2	3.22	4.6	5.99	7.82	9.21	13.82
3	4.64	6.25	7.82	9.84	11.34	16.27
4	5.99	7.78	9.49	11.67	13.28	18.46
5	7.29	9.24	11.07	13.39	15.09	20.52
6	8.56	10.64	12.59	15.03	16.81	22.46
7	9.8	12.02	14.07	16.62	18.48	24.32
8	11.03	13.36	15.51	18.17	20.09	26.12
9	12.24	14.68	16.92	19.68	21.67	27.88
10	13.44	15.99	18.31	21.16	23.21	29.59
11	14.63	17.28	19.68	22.62	24.72	31.26
12	15.81	18.55	21.03	24.05	26.22	32.91
13	16.98	19.81	22.36	25.47	27.69	34.53
14	18.15	21.06	23.68	26.87	29.14	36.12
15	19.31	22.31	25	28.26	30.58	37.7
16	20.46	23.54	26.3	29.63	32	39.29
17	21.62	24.77	27.59	31	33.41	40.75
18	22.76	25.99	28.87	32.35	34.8	42.31
19	23.9	27.2	30.14	33.69	36.19	43.82
20	25.04	28.41	31.41	35.02	37.57	45.32
21	26.17	29.62	32.67	36.34	38.93	46.8
22	27.3	30.81	33.92	37.66	40.29	48.27
23	28.43	32.01	35.17	38.97	41.64	49.73
24	29.55	33.2	36.42	40.27	42.98	51.18
25	30.68	34.38	37.65	41.57	44.31	62.62
26	31.8	35.56	38.88	42.86	45.64	54.05
27	32.91	36.74	40.11	44.14	46.96	55.48
28	34.03	37.92	41.34	45.42	48.28	56.89
29	35.14	39.09	42.69	46.69	49.59	58.3
30	36.25	40.26	43.77	47.96	50.89	59.7
32	38.47	42.59	46.19	50.49	53.49	62.49
34	40.68	44.9	48.6	53	56.06	65.25
36	42.88	47.21	51	55.49	58.62	67.99
38	45.08	49.51	53.38	57.97	61.16	70.7
40	47.27	51.81	55.76	60.44	63.69	73.4
44	51.64	56.37	60.48	65.34	68.71	78.75
48	55.99	60.91	65.17	70.2	73.68	84.04
52	60.33	65.42	69.83	75.02	78.62	89.27
56	64.66	69.92	74.47	79.82	83.51	94.46
60	68.97	74.4	79.08	84.58	88.38	99.61

*The table lists the critical values of chi square for the degrees of freedom shown at the left for tests corresponding to those significance levels heading each column. If the observed value of x_{obs}^2 is *greater than or equal* to the tabled value, reject H_o.

Source: Table IV of Fisher and Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd, London (previously published by Oliver and Boyd Ltd, Edinburgh) and by permission of the authors and publishers.

$$\chi^2 = \frac{12}{[NxK\,(K+1)]} \sum(T\kappa)^2 - [3 \times N\,(K+1)]$$

$$LSDR = 1.96\sqrt{\frac{NK(K+1)}{6}}$$

Where

K = number of samples
N = number of panellists
Tκ = rank totals