



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIO-ENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE : CQB 10603
COURSE TITLE : FOOD ANALYSIS AND SENSORY EVALUATION
PROGRAMME NAME : BACHELOR OF FOOD SAFETY AND QUALITY TECHNOLOGY WITH
HONOURS
DATE : 30 JANUARY 2026
TIME : 9:00AM - 12:00PM
DURATION : 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Answer ALL questions for Section A.
5. Section B consist of four questions. Answer THREE (3) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Please answer MCQ/EMQ questions using OMR sheet. ☐ *Tick if applicable*
9. Refer to the attached Formula/ Appendies. ☐ *Tick if applicable*

SECTION A (Total: 40 marks)

Answer ALL questions.

Please use the answer booklet provided.

1. Which nutrient is not usually listed on a nutritional facts label?
 - A. Total fat
 - B. Dietary fiber
 - C. Vitamin C
 - D. Moisture

2. To calculate the % of ash content the dry coal is heated in _____.
 - A. electric furnace
 - B. muffle furnace
 - C. reverberatory furnace
 - D. blast furnace

3. Following are macronutrients EXCEPT
 - A. Proteins
 - B. Carbohydrates
 - C. Vitamins
 - D. Fats

4. Select the materials required for crude fat determination.
 - A. Drying oven and aluminium pan
 - B. Petroleum ether, Soxhlet apparatus and thimble
 - C. Digestion, distillation unit and retort stand
 - D. Muffle furnace and crucible

5. Select the method that is **NOT** used in the moisture determination of food samples.
- A. Vacuum oven
 - B. Combustion
 - C. Distillation
 - D. Evaporation
6. The crude protein content of a food sample containing 1.60% nitrogen, using a conversion factor of 6.25, is
- A. 10.0%
 - B. 6.25%
 - C. 0.26%
 - D. 16.0%
7. According to the nutrition labelling format, energy content on the label should be declared
- A. With two decimal places
 - B. In percentage only
 - C. With one decimal place
 - D. Without decimal places
8. The crude protein content in animal feed is often calculated by multiplying the percentage of nitrogen by a specific factor. Select the **CORRECT** protein conversion factor.
- A. 6.25
 - B. 5.35
 - C. 4.25
 - D. 5.75

9. Select the method that is **NOT** used for the determination of vitamins in food.
- A. Bioassays
 - B. Microbiological assays
 - C. Extraction
 - D. Techno-functional analysis
10. The L^* value in the CIELAB color space represents
- A. Lightness
 - B. Blueness to Yellowness
 - C. Greenness to Redness
 - D. Saturation (chroma)
11. Select the method for vitamin C extraction.
- A. Organic solvent extraction
 - B. Enzyme extraction
 - C. Saponification
 - D. Cold extraction
12. The range of values describes the L^* component in the $L^*a^*b^*$ color space represents
- A. -100 to +100
 - B. -120 to +120
 - C. 0 to 100
 - D. 0 to 120

13. Presence of a functional group in a compound can be established by using
- A. X-ray diffraction
 - B. Chromatography
 - C. Mass spectroscopy
 - D. IR Spectroscopy
14. _____ is used for detection and quantification of heavy metals in food.
- A. Gas Chromatography
 - B. Electrophoresis
 - C. Atomic Absorption Spectroscopy
 - D. High Performance Liquid Chromatography
15. Select the method that is **NOT** used for the determination of vitamins in food.
- A. Extraction
 - B. Microbiological assays
 - C. Techno-functional analysis
 - D. Bioassays
16. Select the component extracted by the Soxhlet technique.
- A. Minerals
 - B. Lipids
 - C. Carbohydrate
 - D. Protein

17. Select the common food color used to create a vibrant red hue.
- A. Cochineal
 - B. Carmine
 - C. Turmeric
 - D. Annatto
18. Sensory evaluation can best be described as a scientific discipline that:
- A. uses human senses to measure product quality and acceptability
 - B. relies only on chemical and instrumental analysis
 - C. studies consumer psychology without product testing
 - D. focuses on marketing strategies for food products
19. One of the following senses is **NOT** involved in sensory evaluation:
- A. Sight
 - B. Smell
 - C. Balance
 - D. Taste
20. An important role of sensory evaluation in the food industry includes:
- A. increasing manufacturing costs
 - B. replacing quality control systems
 - C. eliminating the need for market testing
 - D. determining consumer preferences

21. In product development, sensory evaluation is mainly applied to:
- A. determine whether consumers can detect product changes
 - B. conduct chemical shelf-life testing
 - C. replace advertising and promotion activities
 - D. reduce ingredient usage
22. From a physiological and psychological perspective, sensory responses:
- A. occur independently for each sense
 - B. are unaffected by perception and experience
 - C. may be influenced by multiple sensory stimuli simultaneously
 - D. involve only one sensory stimulus at a time
23. The recommended panelist viewing angle during visual colour measurement is _____.
- A. 60°
 - B. 45°
 - C. 30°
 - D. 90°
24. Dark-coloured sugar solutions are perceived as _____ than lighter coloured solutions.
- A. Bitter
 - B. Less sweet
 - C. Equally sweet
 - D. More sweet

25. Color is perceived when light _____ with an object.
- A. Reflects
 - B. Breaks
 - C. Interacts
 - D. Absorbs
26. Mouthfeel characteristics such as slimy, sticky and pasty belong to _____ texture.
- A. Auditory
 - B. Visual
 - C. Hand tactile
 - D. Oral tactile
27. Visual moistness of a cake is an example of _____ texture evaluation.
- A. Chemical
 - B. Visual
 - C. Tactile
 - D. Auditory
28. Exposure of dry crisp foods to moisture will _____ perceived crispness.
- A. Stabilize
 - B. Improve
 - C. Increase
 - D. Decrease

29. Crisp and crunchy characteristics are mainly evaluated under _____ texture.
- A. Auditory
 - B. Tactile
 - C. Chemical
 - D. Visual
30. Select the ideal temperature for serving hot food samples during sensory evaluation.
- A. 50°F (10°C)
 - B. 212°F (100°C)
 - C. Room temperature
 - D. 140°F (60°C)
31. The halo effect occurs when panelists _____.
- A. Evaluate too many factors at once
 - B. Compare two products
 - C. Are given no information
 - D. Are untrained
32. Giving too much information to panelists may cause _____ error.
- A. Leniency
 - B. Stimulus
 - C. Expectation
 - D. Halo

33. Hot foods are usually served at _____.
A. 40–50°C
B. 60–66°C
C. 70–75°C
D. 50–55°C
34. Three-digit random numbers are used in coding samples to _____.
A. Improve taste
B. Increase accuracy
C. Avoid bias
D. Reduce cost
35. Discrimination tests are primarily used to determine whether:
A. two products are different from one another
B. a product is liked by consumers
C. sensory attributes can be quantified
D. a product meets legal requirements
36. One of the following tests is classified as a discrimination test:
A. Ranking test
B. Triangle test
C. Consumer acceptance test
D. Scoring test

37. In a triangle test, the panelist is required to:
- A. choose the sample that matches the reference
 - B. rate the intensity of a specific attribute
 - C. identify the odd sample among three coded samples
 - D. rank samples based on preference
38. The ranking test is best described as a method that:
- A. measures the size of differences between samples
 - B. evaluates only one sample at a time
 - C. ranks samples relative to each other for a specific attribute
 - D. determines consumer liking using a hedonic scale
39. The paired comparison test is mainly used to:
- A. rank samples based on preference
 - B. identify whether two samples differ in a specific attribute
 - C. evaluate overall liking of a product
 - D. determine the size of sensory differences
40. Descriptive tests typically involve panelists who are:
- A. randomly selected customers
 - B. trained to evaluate sensory attributes like an instrument
 - C. untrained consumers
 - D. selected based on product preference

SECTION B (Total: 60 marks)

Answer THREE (3) questions only.

Please use the answer booklet provided.

Question 1

A cereal-based food sample was analysed for proximate composition using standard laboratory methods. The following data were obtained.

Moisture Content (Oven Drying Method)

Weight of empty moisture pan = 35.60 g

Weight of pan + sample before drying = 37.62 g

Weight of pan + sample after drying = 37.42 g

Ash Content (Muffle Furnace Method)

Weight of empty crucible = 29.80 g

Weight of crucible + sample before ashing = 31.82 g

Weight of crucible + ash = 29.83 g

Crude Fat Content (Soxhlet Extraction)

Sample weight = 2.00 g

Weight of empty extraction flask = 98.40 g

Weight of flask + extracted oil = 98.70 g

Crude Protein Content (Kjeldahl Method)

Sample weight = 2.05 g

Volume of standard acid used = 9.80 mL

Volume of blank used = 0.05 mL

Normality of acid = 0.10 N

Nitrogen conversion factor = 6.25

- (a) Calculate the percentage moisture, ash, crude fat and crude protein content of the cereal.

(4 marks)

- (b) Calculate the percentage carbohydrate content by difference and total energy value (kcal per 100 g) of the cereal.

(2 marks)

- (c) The weight of the cereals is 30 gram per serving. Determine the calories (kcal), carbohydrate, crude fat and protein content per serving.

(4 marks)

- (d) The following Table shows the *Nutrition Information Panel* of a chocolate-filled bun as provided by the manufacturer.

Refer Below - Table 1 : Nutrition Facts of Chocolate-Filled Bun .

Table 1: Nutrition Facts of Chocolate-Filled Bun

FAKTA NUTRISI / NUTRITION FACTS		
	Per 100 g	Per Serving (80 g)
Tenaga / Energy	450 kcal	520 kcal
Lemak / Fat	22.0 g	18.0 g
Karbohidrat / Carbohydrate	55.0 g	60.0 g
Jumlah Gula / Total Sugar	12.0 g	15.0 g
Protein	6.0 g	4.0 g
Sodium	120 mg	90 mg

- i. Identify and explain **FIVE (5)** incorrect or misleading pieces of information presented in the Nutrition Information Panel above, with reference to the Guide to Nutrition Labelling and Claims.

(5 marks)

- ii. Based on your answer in (i), reconstruct a corrected Nutrition Information Panel that complies with the nutrition labelling requirements, including appropriate format and nutrient presentation.

(5 marks)

Question 2

A food laboratory is analysing the concentration of a permitted food colour (e.g. Tartrazine) in a beverage sample using UV-Visible spectrophotometry at a wavelength of 430 nm. A series of standard solutions were prepared, and their absorbance values were measured using a UV-Vis spectrophotometer.

The absorbance of the unknown beverage sample was measured as 0.410 at the same wavelength using a 1 cm cuvette.

Refer Below - Table2 : Standard Solutions of Tartrazine .

Table 2: Standard Solutions of Tartrazine

Standard concentration (mg/L)	Absorbance
0.0	0.000
2.0	0.120
4.0	0.245
6.0	0.365
8.0	0.490
10.0	0.610

- (a) State the principle of UV-Visible spectrophotometry and describe the relationship between absorbance and concentration.

(4 marks)

- (b) Using the data in Table:

- i. Plot a calibration curve of absorbance versus concentration.

(4 marks)

- ii. Determine the equation of the calibration curve using the straight-line equation.

(4 marks)

- (c) Using the calibration curve or equation obtained in part (b), calculate the concentration of the unknown sample. Show the calculations clearly.

(6 marks)

- (d) State **TWO (2)** factors that may affect the accuracy of the calibration curve in UV-Vis analysis.

(2 marks)

Question 3

A sensory evaluation was conducted to compare the texture acceptability of four yogurt formulations (Sample W, X, Y and Z). Five trained panelists evaluated the samples using a 9-point hedonic scale. The data were analysed using one-way ANOVA at a 5% significance level.

Refer Below - Table3 : Texture acceptability score .

Refer Appendix Attachment - F-table of Critical Values for Significance Level = 0.05 .

Table 3: Texture acceptability score

Panelist	W	X	Y	Z
1	6	7	8	8
2	5	6	7	8
3	6	7	7	8
4	5	6	7	7
5	6	7	8	8

- (a) State the null hypothesis (H_0) and alternative hypothesis (H_1).

(4 marks)

- (b) Complete the ANOVA table.

Refer Below - Table4 : ANOVA Table .

(10 marks)

Table 4: ANOVA Table

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-value
Between samples				
Within samples (Error)				
Total				

- (c) State the decision and conclusion of the ANOVA test.

(6 marks)

Question 4

A food manufacturer has developed a new baked whole-grain bread with reduced salt content. Before launching the product, the company wants to evaluate whether the reduced salt level affects product quality and consumer acceptance.

- (a) Define sensory evaluation and distinguish between analytical and affective sensory tests.

(6 marks)

- (b) Identify and explain **THREE (3)** sensory attributes that are critical for evaluating the reduced-salt bread.

(6 marks)

- (c) Suggest an appropriate sensory test to determine whether consumers can detect a difference between the reduced-salt bread and the regular bread, and justify your answer.

(4 marks)

- (d) State **FOUR (4)** precautions that should be taken when selecting panelists for this sensory evaluation.

(4 marks)

END OF EXAMINATION PAPER

APPENDIX

Appendix for Section B Question 3 : F-table of Critical Values for Significance Level = 0.05

		F-table of Critical Values of $\alpha = 0.05$ for F(df1, df2)																		
		DF1=1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
DF2=1		161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.95	248.01	249.05	250.10	251.14	252.20	253.25	254.31
2		18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3		10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4		7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5		6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6		5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7		5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8		5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9		5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10		4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11		4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12		4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13		4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14		4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15		4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16		4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17		4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18		4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19		4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20		4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21		4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22		4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23		4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24		4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25		4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26		4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27		4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28		4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29		4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30		4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40		4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60		4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120		3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞		3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

APPENDIX

$$\% \text{ Moisture} = \frac{\text{Moisture weight}}{\text{Sample weight}}$$

$$\% \text{ Ash} = \frac{\text{Ash weight}}{\text{Sample weight}}$$

$$\% \text{ Fat} = \frac{\text{Oil weight}}{\text{Sample weight}}$$

$$\% \text{ Protein} = \frac{(\text{Volume of titrant} - \text{Volume of blank}) \times 0.014 \times N_{\text{HCl}}}{\text{Weight of sample}} \times 100$$

$$CF = \frac{(T_n)^2}{n_s \times n_p}$$

$$Ss, \text{ samples} = \frac{(T_1)^2 + (T_2)^2 + \dots + (T_n)^2}{n_p} - CF$$

$$Ss, \text{ panelist} = \frac{(R_1)^2 + (R_2)^2 + \dots + (R_n)^2}{n_s} - CF$$

$$SS, \text{ total} = (X_1^2 + X_2^2 + \dots + X_n^2) - CF$$

$$SS, \text{ error} = SS(\text{total}) - SS(\text{sample}) - SS(\text{panelist})$$

$$Df, \text{ sample} = n_s - 1$$

$$Df, \text{ panelist} = n_p - 1$$

$$Df, \text{ total} = X_n - 1$$

$$Df, \text{ error} = dftotal - dfpanelist - dfsamples$$

$$Ms \text{ sample} = \frac{Sssamples}{dfsamples}$$

$$Ms \text{ panelist} = \frac{Sspanelist}{dfpanelist}$$

$$Ms \text{ error} = \frac{Sserror}{dferror}$$

$$F \text{ sample} = \frac{mssamples}{mserror}$$

