XE (G): Q. 1 – Q. 9 carry one mark each & Q. 10 – Q. 22 carry two marks each.

Q.1 Which of the following is oil soluble pigment present in fruits and vegetables?

(A) Flavonoids (B) Carotenoids (C) Anthocyanins (D) Tannins

Q.2 Which of the following represent the group of saturated fatty acids?

(A) Lauric, Myristic, Arachidic
(B) Palmitic, Linoleic, Linolenic
(C) Capric, Stearic & Oleic
(D) Behenic, Caprylic, Arachidonic

Q.3 The anti-nutritional factor present in fava bean is

(A) Gossypol
(B) Curcine
(C) Vicine
(D) Cyanogen

Q.4 Irradiation carried out to reduce viable non-spore forming pathogenic bacteria using a dose between 3 to 10 kGy is called

(A) Radurization
(B) Thermoradiation
(C) Radappertization
(D) Radicidation

Q.5 Identify the correct statement related to the viscosity of Newtonian fluids from the following

(A) It is not influenced by temperature
(B) It increases with shearing rate
(C) It decreases with shearing rate
(D) It is not influenced by shearing rate

Q.6 Adult male Wistar rats were fed with a protein based diet. Total 150 g of protein was ingested per animal. If the average weight increased from 110 g to 350 g after the end of the experiment, the Protein efficiency ratio of the given protein would be _____. (up to two decimal points)

Q.7 The initial moisture content of a food on wet basis is 50.76%. Its moisture content (%) on dry basis is _____.(up to two decimal points)

Q.8 The oxygen transmission rate through a 2.54 x 10^{-3} cm thick low density polyethylene film with air on one side and inert gas on the other side is 3.5 x 10^{-6} mL cm^{-2} s^{-1}. Oxygen partial pressure difference across the film is 0.21 atm. The permeability coefficient of the film to oxygen is _____ x 10^{-11} mL (STP) cm cm^{-2} s^{-1} $(cm\ Hg)^{-1}$.

Q.9 Ambient air at 30°C dry bulb temperature and 80% relative humidity was heated to a dry bulb temperature of 80°C in a heat exchanger by indirect heating. The amount of moisture gain (g kg^{-1} dry air) during the process would be _____.

Q.10 Match the commodity in **Group I** with the bioactive constituent in **Group II**

Group I	**Group II**
P. Ginger	1. Lutein
Q. Green tea	2. Gingerol
R. Spinach	3. Curcumin
S. Turmeric	4. Epigallocatechin gallate

(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-4, R-1, S-3
(C) P-4, Q-1, R-3, S-2
(D) P-2, Q-3, R-1, S-4

Q.11 Match the process operation in **Group I** with the separated constituent in **Group II**

Group I	**Group II**
P. Extraction	1. Phospholipids
Q. Degumming	2. Free fatty acids
R. Neutralization	3. Pigments
S. Bleaching	4. Crude oil

(A) P-3, Q-2, R-4, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-4, Q-1, R-2, S-3
(D) P-4, Q-1, R-3, S-2

Q.12 Match the spoilage symptom in **Group I** with the causative microorganism in **Group II**

Group I	**Group II**
P. Green rot of eggs	1. *Micrococcus* spp.
Q. Putrid swell in canned fish	2. *Serratia marcescens*
R. Red bread	3. *Pseudomonas fluorescens*
S. Yellow discoloration of meat	4. *Clostridium sporogenes*

(A) P-4, Q-3, R-2, S-1
(B) P-2, Q-1, R-4, S-3
(C) P-3, Q-4, R-2, S-1
(D) P-1, Q-4, R-3, S-2

Q.13 Match the fermented product in **Group I** with the base material in **Group II**

Group I	**Group II**
P. Sake	1. Milk
Q. Chhurpi	2. Cabbage
R. Natto	3. Rice
S. Sauerkraut	4. Soybean

(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-3, R-4, S-2
(C) P-4, Q-1, R-3, S-2
(D) P-3, Q-2, R-1, S-4

Q.14 Match the operation in **Group I** with the process in **Group II**

Group I	**Group II**
P. Cleaning	1. Quality separation
Q. Grading	2. Clarification
R. Size reduction	3. Screening
S. Filtration	4. Comminution

(A) P-1, Q-3, R-4, S-2
(B) P-4, Q-1, R-3, S-2
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-1, R-4, S-2

Q.15 Out of 7 principles of HACCP system, 4 are listed below. Arrange these principles in the order in which they are applied.

(P) Conduct a hazard analysis
(Q) Establish monitoring process
(R) Establish critical limit
(S) Establish record keeping and documentation process

(A) P, R, Q, S (B) Q, R, P, S (C) P, Q, R, S (D) R, S, P, Q

Q.16 Apple juice of 10% total solids (TS) is being concentrated in a single effect evaporator working with a surface condenser to 40% TS under a vacuum of 20 kPa. After some time the vacuum pump stops but the evaporation process continued. Choose the combination of possible implications from the following.

(P) Product quality is affected

(Q) Substantial increase in thermal energy requirement

(R) Decrease in the rate of evaporation

(A) P & Q (B) Q & R (C) R & P (D) P,Q & R

Q.17 Identify an example of a classical diffusional mass transfer process without involving heat, among the following.

(A) Drying of food grains
(B) Carbonation of beverages
(C) Distillation of alcohol
(D) Concentration of fruit juice

Q.18 For an enzyme catalyzed reaction $S \rightarrow P$, the kinetic parameters are:
$[S] = 40\ \mu M$, $V_0 = 9.6\ \mu M\ s^{-1}$ and $V_{max} = 12.0\ \mu M\ s^{-1}$.
The K_m of the enzyme in µM will be _____.(up to one decimal points)

Q.19 A microbial sample taken at 10 AM contained $1x10^5$ CFU/mL. The count reached to $1x10^{10}$ CFU/mL at 8 PM of the same day. The growth rate (h^{-1}) of the microorganism would be _____.(up to two decimal points)

Q.20 Black pepper is ground from an equivalent particle size of 6 mm to 0.12 mm using a 10 hp motor. Assuming Rittinger's equation and that 1 hp = 745.7 W, the power (hp) of motor required to fine grind black pepper to 0.08 mm would be _____.(up to two decimal points)

Q.21 Green pea (average diameter 0.8 cm) is frozen in a blast freezer operating at -40°C and with a surface heat transfer coefficient of 30 W m^{-2} K^{-1}. The thermal conductivity of pea is 2.5 W $m^{-1}K^{-1}$, and latent heat of crystallization is 2.74 x 10^2 kJ kg^{-1}. If the freezing point of pea is -1°C and the density is 1160 kg m^{-3}, the freezing time in minutes will be _____.(up to two decimal points)

Q.22 The rate of heat transfer from a metal plate is 1000 W m^{-2}. The surface temperature of the plate is 120°C and ambient temperature is 20°C. The convective heat transfer coefficient (W m^{-2} °C^{-1}) using the Newton's law of cooling will be _____.

END OF THE QUESTION PAPER

Q.No.	Type	Section	Key/Range	Marks
1	MCQ	GA	A	1
2	MCQ	GA	C	1
3	MCQ	GA	B	1
4	MCQ	GA	B	1
5	MCQ	GA	B	1
6	MCQ	GA	A	2
7	MCQ	GA	D	2
8	MCQ	GA	D	2
9	MCQ	GA	B	2
10	MCQ	GA	C	2
1	MCQ	XE-A	D	1
2	MCQ	XE-A	A	1
3	NAT	XE-A	0.01 to 0.01	1
4	NAT	XE-A	5 to 5	1
5	NAT	XE-A	0.29 to 0.32	1
6	NAT	XE-A	250 to 250	1
7	NAT	XE-A	108 to 108	1
8	MCQ	XE-A	B	2
9	MCQ	XE-A	C	2
10	NAT	XE-A	3 to 3	2
11	NAT	XE-A	0.04 to 0.04	2
1	MCQ	XE-B	B	1
2	MCQ	XE-B	A	1

Q.No.	Type	Section	Key/Range	Marks
3	MCQ	XE-B	D	1
4	MCQ	XE-B	A	1
5	MCQ	XE-B	C	1
6	MCQ	XE-B	B	1
7	MCQ	XE-B	A	1
8	NAT	XE-B	4 to 4	1
9	NAT	XE-B	39 to 42	1
10	MCQ	XE-B	B	2
11	MCQ	XE-B	C	2
12	MCQ	XE-B	C	2
13	MCQ	XE-B	A	2
14	NAT	XE-B	900 to 990	2
15	NAT	XE-B	40 to 42	2
16	NAT	XE-B	2.9 to 3.1	2
17	NAT	XE-B	107 to 127	2
18	NAT	XE-B	440000 to 442000	2
19	NAT	XE-B	0.001 to 0.002	2
20	NAT	XE-B	30 to 45	2
21	NAT	XE-B	4800 to 4800	2
22	NAT	XE-B	1200 to 1350	2
1	MCQ	XE-C	C	1
2	MCQ	XE-C	A	1
3	MCQ	XE-C	B	1

Q.No.	Type	Section	Key/Range	Marks
4	MCQ	XE-C	C	1
5	MCQ	XE-C	A	1
6	MCQ	XE-C	D	1
7	MCQ	XE-C	C	1
8	NAT	XE-C	2 to 2	1
9	NAT	XE-C	6 to 6	1
10	MCQ	XE-C	B	2
11	MCQ	XE-C	A	2
12	MCQ	XE-C	B	2
13	NAT	XE-C	430 to 500	2
14	NAT	XE-C	124 to 124	2
15	NAT	XE-C	2.60 to 2.70	2
16	NAT	XE-C	59.00 to 60.00	2
17	NAT	XE-C	1.85 to 2.00	2
18	NAT	XE-C	132 to 132	2
19	NAT	XE-C	5.01 to 5.17	2
20	NAT	XE-C	5 to 5	2
21	NAT	XE-C	15.5 to 18.5	2
22	NAT	XE-C	1420 to 1480	2
1	MCQ	XE-D	D	1
2	MCQ	XE-D	A	1
3	MCQ	XE-D	D	1
4	MCQ	XE-D	B	1

Q.No.	Type	Section	Key/Range	Marks
5	MCQ	XE-D	B	1
6	NAT	XE-D	52.50 to 53.50	1
7	NAT	XE-D	27.00 to 28.00	1
8	NAT	XE-D	80 to 80	1
9	NAT	XE-D	220.00 to 222.00	1
10	MCQ	XE-D	B	2
11	MCQ	XE-D	B	2
12	MCQ	XE-D	D	2
13	MCQ	XE-D	C	2
14	MCQ	XE-D	C	2
15	MCQ	XE-D	A	2
16	MCQ	XE-D	D	2
17	NAT	XE-D	195.00 to 197.00	2
18	NAT	XE-D	0.01 to 0.02	2
19	NAT	XE-D	14.5 to 15.5	2
20	NAT	XE-D	26.00 to 27.00	2
21	NAT	XE-D	3.10 to 3.20	2
22	NAT	XE-D	13.5 to 14.5	2
1	MCQ	XE-E	B	1
2	MCQ	XE-E	A	1
3	MCQ	XE-E	C	1
4	MCQ	XE-E	A	1
5	MCQ	XE-E	C	1

Q.No.	Type	Section	Key/Range	Marks
6	MCQ	XE-E	D	1
7	NAT	XE-E	160.0 to 161.0	1
8	NAT	XE-E	14.5 to 15.0	1
9	NAT	XE-E	0.30 to 0.32	1
10	MCQ	XE-E	C	2
11	MCQ	XE-E	C	2
12	MCQ	XE-E	D	2
13	MCQ	XE-E	B	2
14	MCQ	XE-E	A	2
15	MCQ	XE-E	D	2
16	NAT	XE-E	332.5 to 336.5	2
17	NAT	XE-E	3.01 to 3.07	2
18	NAT	XE-E	838.0 to 844.0	2
19	NAT	XE-E	961.0 to 962.0	2
20	NAT	XE-E	5.7 to 6.1	2
21	NAT	XE-E	12950.0 to 13000.0	2
22	NAT	XE-E	513.0 to 517.0	2
1	MCQ	XE-F	C	1
2	MCQ	XE-F	A	1
3	MCQ	XE-F	D	1
4	MCQ	XE-F	B	1
5	MCQ	XE-F	D	1
6	MCQ	XE-F	B	1

Q.No.	Type	Section	Key/Range	Marks
7	MCQ	XE-F	A	1
8	NAT	XE-F	1500.00 to 1500.00	1
9	NAT	XE-F	48.52 to 48.72	1
10	MCQ	XE-F	D	2
11	MCQ	XE-F	A	2
12	MCQ	XE-F	B	2
13	MCQ	XE-F	D	2
14	MCQ	XE-F	B	2
15	MCQ	XE-F	D	2
16	MCQ	XE-F	C	2
17	MCQ	XE-F	C	2
18	NAT	XE-F	-25.00 to -24.50	2
19	NAT	XE-F	98.80 to 99.10	2
20	NAT	XE-F	0.90 to 0.93	2
21	NAT	XE-F	17.91 to 18.00	2
22	NAT	XE-F	2600 to 2600	2
1	MCQ	XE-G	B	1
2	MCQ	XE-G	A	1
3	MCQ	XE-G	C	1
4	MCQ	XE-G	D	1
5	MCQ	XE-G	D	1
6	NAT	XE-G	1.55 to 1.65	1
7	NAT	XE-G	103.0 to 103.2	1

Q.No.	Type	Section	Key/Range	Marks
8	NAT	XE-G	54 to 56	1
9	NAT	XE-G	0 to 0	1
10	MCQ	XE-G	B	2
11	MCQ	XE-G	C	2
12	MCQ	XE-G	C	2
13	MCQ	XE-G	A	2
14	MCQ	XE-G	D	2
15	MCQ	XE-G	A	2
16	MCQ	XE-G	C	2
17	MCQ	XE-G	B	2
18	NAT	XE-G	9.8 to 10.2	2
19	NAT	XE-G	1.1 to 1.8	2
20	NAT	XE-G	14.5 to 15.5	2
21	NAT	XE-G	6.0 to 6.4	2
22	NAT	XE-G	10 to 10	2
1	MCQ	XE-H	B	1
2	MCQ	XE-H	C	1
3	MCQ	XE-H	A	1
4	MCQ	XE-H	B	1
5	MCQ	XE-H	B	1
6	MCQ	XE-H	C	1
7	MCQ	XE-H	D	1
8	MCQ	XE-H	D	1

Q.No.	Type	Section	Key/Range	Marks
9	MCQ	XE-H	B	1
10	MCQ	XE-H	A	2
11	MCQ	XE-H	B	2
12	MCQ	XE-H	A	2
13	MCQ	XE-H	B	2
14	NAT	XE-H	1254 to 1256	2
15	NAT	XE-H	19.42 to 19.44	2
16	NAT	XE-H	734.8 to 735.0	2
17	NAT	XE-H	9.16 to 9.18	2
18	NAT	XE-H	12.8 to 13.2	2
19	NAT	XE-H	92.4 to 92.8	2
20	NAT	XE-H	1.3 to 1.4	2
21	NAT	XE-H	0.11 to 0.12	2
22	NAT	XE-H	9.99 to 10.01	2