UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UCTATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BCE 4043
COURSE	: WASTEWATER ENGINEERING
SEMESTER/SESSION	: SEM 1-2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 5 questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 4 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Describe the processes needed to supply a modern city with clean drinking water from river or well with clean drinking water and processes needed to treat water after use. (Clarify your answer with sketches if needed). (10 marks)

b) A 25 ml water sample was placed in in a dish that wt. 50g, after evaporation and drying at 103° C, and cooling in desiccator, the dish wt. 50.02g. Then the dish is fired at 550° C for one hour, after which it weighs 50.005g.

Determine the followings:

i. The residue in mg (4 marks)
ii. Total solids (TS) in mg/L (4 marks)
iii. Volatile solids (VS) in mg/L (4 marks)
iv. Fixed solids (FS) in mg/L (3 marks)

QUESTION 2

a) Define the followings:

i. COD (1 mark)
ii. BOD (1 mark)
iii. TN (1 mark)
iv. Toxicity (1 mark)
v. TSS (1 mark)
vi. Aerobic (1 mark)
vii. Anaerobic (1 mark)
viii. Nitrification (1 mark)
ix. Denitrification (1 mark)

b) The results of a water analysis are shown in Table (2) below:

Table (2)

Cations	Mg/L	Anions	Mg/L
Ca	58.0	HCO_3	342
Mg	32.8	SO_4	72
Na	46.0	Cl	48
K	35.0	-	-

i. Convert miligrams per liter concentration to miliequivalents per liter (4 marks)

ii. Draw the milliequivalence per liter bar graph (4 marks)

iii. List hypothetical combinations (4 marks)

iv. Calculate hardness as mg/L of $CaCO_3$ for this water analysis (4 marks)

QUESTION 3

a) If The Dissolved oxygen (DO) in water is 100 g/L.
Determine the mole fraction of dissolved oxygen (DO) (5 marks)

b) Determine the carbonaceous 5-day BOD and k-rate for an un-chlorinated effluent after treatment by activated sludge aeration. Nine identical test bottles were prepared, with 60 ml of wastewater added to each bottle followed by 240 ml of dilution water. Three bottles were titrated after setup to determine the initial DO of 8.1 mg/l. The remaining 6 bottles were incubated and tested for time-residual DO data with the following results: 1.3 days, DO = 7.2 mg/l; 3.3 days, DO = 6.4 mg/l; 4.3 days, DO = 6.2 mg/l; 5.3 days, DO = 5.8 mg/l; 8.3 days, DO = 4.5 mg/l; and 11.3 days, DO = 3.5 mg/l.

i. Draw the BOD-time curve (10 marks)

ii. Draw the graph for determination k-rate (10 marks)

QUESTION 4

a) Define the followings:

i. Multiple- tube fermentation technique (5 marks)

ii. Most Probable Number (MPN) (4 marks)

b) Table (3) shows collects from domestic wastewater plant every 2 hours for complete period of 24 hrs. Compute the flow-weighted BOD and TSS concentration for the flow rate below:

Table (3)

Time, h	BOD, mg/L	TSS, mg/L	Flowrate, m^3/d
0200	130	150	8000
0400	110	135	6000
0600	160	150	9400
0800	220	205	12800
1000	230	210	13000
1200	245	220	14400
1400	225	210	12000
1600	220	200	9600
1800	210	205	11000
2000	200	210	8000
2200	180	185	9000
2400	160	175	8400

Compute the followings:

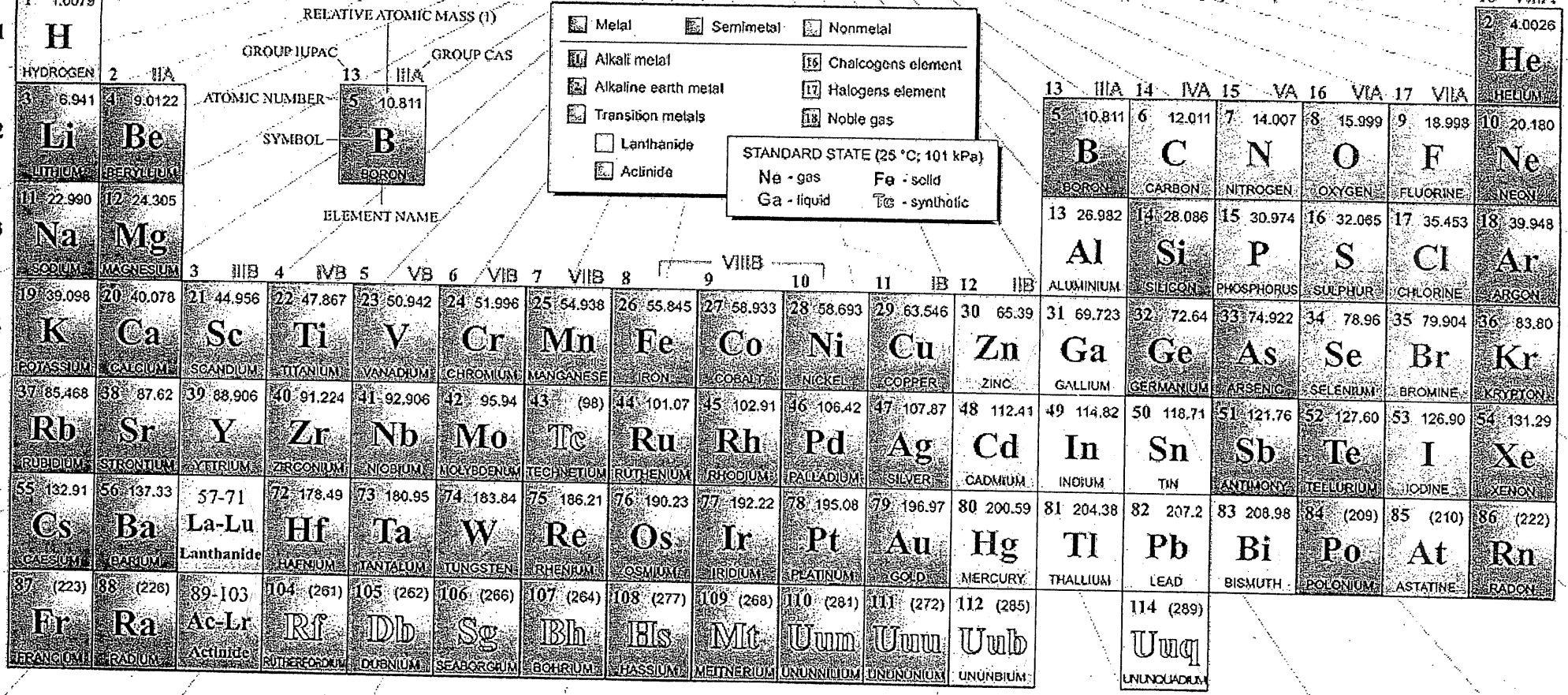
i. Weighted total BOD in g/m^3 (8 marks)

ii. Weighted total TSS in g/m^3 (8 marks)

----------End of questions ----------

PERIODIC TABLE OF THE ELEMENTS

http://www.ktf-split.hr/periodni/en/



Pure Appl. Chem., 73, No. 4, 667-683 (2001)

Relative atomic mass is shown with five significant figures. For elements have no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.

However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

Editor: Aditya Vardhan (adivar@netlinx.com)