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END SEMESTER EXAMINATION – 2022

Semester : 4th

Branch : Chemical Engineering

Subject Code : Ch-404

**STOICHIOMETRY, THERMODYNAMICS
AND KINETICS**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Instructions :

1. All questions of PART – A are compulsory.
2. Answer any five questions from PART – B.

PART – A

Marks – 25

1. Fill in the blanks :

- (a) Law of conservation of mass was formulated
by _____ in _____. 2
- (b) Gram molecular volume of any gas at NTP
is equal to _____. 1

[Turn over

(c) According to Boyle's law at constant _____, volume of a certain mass of gas varies inversely with its _____. 2

(d) Isothermal processes take place at constant _____. 1

(e) Third law of Thermodynamics is about _____. 1

(f) Compressor is a device for _____ the pressure of a gas by _____ its volume. 2

(g) Processes in which catalyst are used to retard reactions are called _____ catalysis. 1

2. Write True or False : 1×10=10

(a) Concentration of a substance in gaseous state increases with the increase in pressure.

(b) Promoters improve catalyst activity.

(c) CV stands for Specific Gravity at constant volume.

(d) Law of multiple proportions was formulated by John Dalton.

(e) No symbol contains more than three letters.

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(f) Single-stage compressors are more efficient than multi-stage compressors.

(g) Valency of an element denotes the number of electrons in its outermost shell.

(h) According to Avogadro, Molecules can exist in free state.

(i) At -273°C all gases occupy zero volume.

(j) Value of universal gas constant R is $0.072 \text{ atm L mol}^{-1} \text{ K}^{-1}$.

3. Select the correct answer from the choices given below : 1×5=5

(a) Avogadro's number is equal to _____

(i) 6.022×10^{23} (ii) 6.022×10^{22}

(iii) 6.22×10^{22} (iv) 6.22×10^{23}

(b) Isotopes are atoms having the same _____

(i) Mass number

(ii) Number of neutrons

(iii) Atomic mass

(iv) None of these

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(c) Molecular weight of SO_2 is _____.

- (i) 62 (ii) 63
(iii) 64 (iv) 65

(d) In a cyclic process the change in internal energy is _____.

- (i) -1
(ii) 0
(iii) 1
(iv) Cannot be determined

(e) $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$ is an example of _____ reaction.

- (i) Unimolecular (ii) Bimolecular
(iii) Trimolecular (iv) Tetramolecular

PART - B

Marks - 45

4. (a) What do you mean by Unit Operation? Explain with example. 5

(b) State Charles's Law. 2

(c) What do you mean by Stoichiometry? 2

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32 + 16 x 2
32 + 32
5. (a) What are the Laws of Chemical Combination? 4

(b) Explain the law of Reciprocal Proportions with example. 5

6. (a) A gas occupies 1.5L at 1 atm. What will be the volume of this gas if pressure is increased to 3 atm? 2

(b) Neon sample occupies 4L at a pressure of 5×10^4 Pa and 273 K temperature. Calculate the volume of the sample at STP. 3

(c) Find the percentage composition of each element in $\text{C}_{12}\text{H}_{22}\text{O}_{11}$. 4

7. (a) Calculate the quantity of H_2 produced from 325 gm of Zn on reaction with H_2SO_4 ? 4

(b) Write a short note on Half Life Period. 5

8. (a) State and explain the First law of thermodynamics. 5

(b) Mention some applications of Second Law of Thermodynamics. 4

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9. (a) Explain any one type of Refrigeration Cycle with diagram. 7
- (b) Distinguish between Elementary and Non-Elementary reaction. 2
10. (a) Define Molecularity of a reaction. 2
- (b) What is Catalytic poisoning? 2
- (c) Explain the factors affecting the rate of a reaction. 5