

2020/TDC/ODD/SEM/
CHMH-103/281

(2)

TDC Odd Semester Exam., 2020
held in July, 2021

CHEMISTRY

(Honours)

(1st Semester)

Course No. : CHMH-103

(Physical Chemistry—I)

Full Marks : 35

Pass Marks : 12

Time : 2 hours

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

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Establish a relation between van der Waals' constant and critical constant. 3
- (b) Define Boyle's temperature. How is it related to van der Waals' constants a and b ? 2

10-21/659

(Turn Over)

- (c) Why do the gases at low temperature and high pressure show large deviations from ideal behaviour? 2
2. (a) Derive Boyle's law and Graham's law of diffusion from kinetic equation. $1\frac{1}{2}+1\frac{1}{2}=3$
- (b) Write Berthelet and Dieterici equations, explaining the terms involved. 1+1=2
- (c) Calculate the critical temperature of a van der Waals' gas for which P_C is 100 atm and b is $50 \text{ cm}^3 \text{ mol}^{-1}$. 2

UNIT—II

3. (a) What is unit cell? Explain Bravais lattice. 1+1=2
- (b) What are F-centres? Why are the solids containing the F-centres paramagnetic? 1+1=2
- (c) Discuss Born-Haber cycle with suitable example. 3
4. (a) Write notes on Frenkel and Schottky defects. 3
- (b) Deduce Bragg's equation. 2

10-21/659

(Continued)

(3)

- (c) What are primitive and non-primitive unit cells? Give examples. 2

UNIT—III

5. (a) What are meant by—
(i) reversible processes; 1+1=2
(ii) irreversible processes? 2
- (b) State and explain the mathematical expression of first law of thermodynamics. 2
- (c) Show that the internal energy as a state function and work done as a path function. $1\frac{1}{2}+1\frac{1}{2}=3$
6. (a) Show that the work done in a reversible process is greater than the work done in an irreversible process. 4
- (b) Show that the inversion temperature is given by
- $$T_i = \frac{2a}{Rb} \quad 2$$
- (c) What are meant by state variables? 1

(4)

UNIT—IV

7. (a) Derive Gibbs' phase rule. 3
(b) Applying Gibbs' phase rule, discuss the phase diagram of sulphur system. 4
8. (a) What is meant by 'desilverization of lead'? 2
(b) By taking the example of ferric-chloride-water phase diagram system, discuss the congruent melting points. 3
(c) What do you mean by eutectic mixture and eutectic temperature? 1+1=2

UNIT—V

9. (a) State and explain Euler's reciprocity relations. Hence, show that internal energy, U is an exact differential. 2+2=4
(b) An equation of state can be represented as $f(P, V, T) = 0$. Show that

$$\frac{P}{T} \left(\frac{\partial V}{\partial T} \right)_P = \frac{V}{P} \left(\frac{\partial P}{\partial T} \right)_V \quad 1 \quad 3$$

(5)

10. (a) Draw an S vs. W graph, when $S = k \ln W$,
where k Boltzmann constant. 2
- (b) How many words can be formed with
the letters of the word 'HAILAKANDI'?
How many of these will begin with 'H'?
 $1\frac{1}{2} + 1\frac{1}{2} = 3$
- (c) Applying Euler's reciprocity relation,
show that $PdV - VdP$ is not an exact
differential. 2
