

2021

Time : 3 hours

Full Marks : 60

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer any four questions in which  
Q. No. 1 is compulsory.

1. Select the correct option of the following :

$1\frac{1}{2} \times 10 = 15$

(a) Which of the following pairs of elements show diagonal relationship ?

- (i) Na and K
- (ii) Li and Mg
- (iii) F and Cl
- (iv) N and P

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(Turn over)

(b) Which of the following is an ionic hydride ?

- (i)  $\text{SiH}_4$
- (ii)  $\text{CH}_4$
- (iii)  $\text{CaH}_2$
- (iv)  $\text{NH}_3$

(c) Extraction of Zinc from Zinc blende is achieved by :

- (i) Electolytic reduction
- (ii) Roasting followed by reduction with carbon
- (iii) Roasting followed by reduction with another metal
- (iv) Roasting followed by self-reduction

(d) The compressibility factor for a real gas at high temperature is :

- (i)  $1 + \frac{RT}{pb}$
- (ii) 1

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(2)

(iii)  $1 + \frac{pb}{RT}$

(iv)  $1 - \frac{pb}{RT}$

(e) A gas will approach ideal behaviour at :

- (i) Low temperature and high pressure
- (ii) Low temperature and low pressure
- (iii) High temperature and high pressure
- ~~(iv) High temperature and low pressure~~

~~(f)~~ Which type of defect has the presence of cation in the interstitial site ?

- (i) Schottky defect
- (ii) Vacancy defect
- ~~(iii) Frenkel defect~~
- (iv) Metal deficiency defect

(g) In NaCl crystal the co-ordination number of  $\text{Na}^+$  and  $\text{Cl}^-$  are respectively :

- (i) 6 and 8

(ii) 6 and 6

(iii) 12 and 8

(iv) 8 and 6

(h)  $10^\circ\text{C}$  rise in temperature increases the rate of a reaction :

- (i) Four times
- (ii)  $10^2$  times
- ~~(iii) 2 to 3 times~~
- (iv) None of these

(i) Rate constant (K) of a reaction has least value at :

- (i) High T and high  $E_a$
- (ii) High T and low  $E_a$
- (iii) Low T and low  $E_a$
- (iv) Low T and high  $E_a$

(j) According to the collision theory of reaction rates, the rate of reaction increases with temperature due to :

- ~~(i) Greater number of collisions~~

- (ii) Higher velocity of reacting molecules
- (iii) Greater number of molecules having the activation energy
- (iv) Decrease in the activation energy

2. What do you mean by Electronegativity ? Describe Pauling and Mulliken scales to determine electronegativity.  $4+7+4 = 15$

3. (a) What do you mean by anomalous behaviour of the first members of each group of the Periodic Table ?

(b) Describe anomalous behaviour of Carbon Nitrogen and Oxygen ?  $6+3+3+3 = 15$

4. (a) What are Boranes ? Describe structure and bonding in  $B_2H_6$  (Diborane) ?

(b) How does diborane reacts with ?

(i)  $NH_3$

(ii)  $H_2O$

$2+9+4 = 15$

(Turn over)

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(5)

5. Explain the following

$3 \times 5 = 15$

- (a) Unit cells
- (b) Miller indices
- (c) Symmetry elements
- (d) Liquid Crystals
- (e) Bragg's equation

6. (a) Define order and molecularity of reaction ? Distinguish between them.

(b) What is a second order reaction ? Derive the expression of rate constant (K) for a second order reaction, both for equal and unequal concentration of reactants ?  $5+10 = 15$

7. (a) What are the postulates of Kinetic theory of gases ?

(b) What are the defects of Kinetic theory of gases ?

(c) Derive Van der Waal's equation ?

$5+3+7 = 15$

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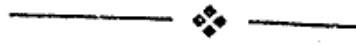
(6)

Contd.

6 Write notes on any three of the following :

5×3 = 15

- (a) Inter pair effect
- (b) Defect in solids
- (c) Collision theory
- (d) Energy of activation



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