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R – 3118

Reg. No. : .....

Name : .....



Second Semester B.Sc. Degree Examination, September 2023

First Degree Programme under CBCSS

Chemistry

Complementary Course for Physics and Geology

CH 1231.1/CH 1231.2 : PHYSICAL CHEMISTRY I

(2017 – 2019 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

(Answer all questions. Each question carries 1 mark)

1. Write Gibbs Helmholtz equation.
2. What is the value of free energy change at equilibrium?
3. What do you mean by Intrinsic energy?
4. What are exothermic reactions?
5. Name the law which helps to calculate the bond dissociation energy.
6. What are reversible reactions?
7. Is the dissociation of  $PCl_5$  endothermic or exothermic reaction?
8. Write an example each for lewis acid and lewis base.
9. What do you mean by degree of hydrolysis of salt?
10. Give an example for neutral buffer.

(10 × 1 = 10 Marks)

P.T.O.



## SECTION - B

(Answer any **eight** questions. Each question carries **2** marks)

11. One mole of an ideal gas at 25°C is allowed to expand isothermally and reversibly from a volume of 20 L to 40 L. Calculate the work done by the gas.
12. What are intrinsic and extrinsic properties?
13. The enthalpy change for the conversion of a liquid to its vapour is 75.8 kJ/mol. calculate the entropy change if the boiling point of the liquid is 150°C.
14. Calculate the enthalpy change for the combustion of methane given the formation of methane, carbondioxide and water are -74.8 kJ/mol, -393.5kJ/mol and -286.2kJ/mol respectively.
15. What is Kirchoff equation? What are the terms involved in it?
16. Calculate the difference between heat of reaction at constant pressure and constant volume for the combustion of ethane at 25°C in kJ/mol.
17. Explain Lechatelier principle.
18. What is isochoric process?
19. Calculate the equilibrium constant of a reaction at 25°C whose free energy change is 50kcal.
20. Calculate the pH of 0.02 M  $H_2SO_4$  at 25°C.
21. Write the Henderson equation and what are the terms involved in it.
22. Explain the determination of pH by potentiometry method.

(8 × 2 = 16 Marks)

## SECTION - C

(Answer any **six** questions. Each question carries **4** mark)

23. Explain the spontaneous process on the basis of free energy change.
24. Define enthalpy and entropy. Write down their unit.
25. State and explain second law of thermodynamics.
26. Explain (a) enthalpy of neutralisation and (b) enthalpy of hydration.

27. Discuss on the variation of heat of reaction with temperature.
28. Discuss the effect of temperature on the formation of ammonia.
29. Explain how the dissociation of  $\text{PCl}_5$  is related with pressure.
30. Explain in detail levelling effect.
31. Discuss the mechanism of action of acidic buffer.

(6 × 4 = 24 Marks)

SECTION – D

(Answer any two questions. Each question carries 15 marks)

32. (a) State and explain first law of thermodynamics. Write its mathematical form. What are its limitations? 8
- (b) Derive  $C_p - C_v = R$  7
33. (a) State and explain Hess's law. What are its applications? 10
- (b) Explain (i) Enthalpy of formation and (ii) Enthalpy of combustion 5
34. (a) Define  $K_p$  and  $K_c$ . Derive the relation between  $K_p$  and  $K_c$ . 8
- (b) Discuss the relation between free energy change and equilibrium constant. 7
35. (a) Explain in detail the different concepts of acids and bases. 10
- (b) Derive the relation between  $K_w$  and  $K_h$  for the salt of strong acid and weak base. 5

(2 × 15 = 30 Marks)

