

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 3

**P373**

**[5115]-5**

**F.Y.B.Sc.**

**CHEMISTRY - I**

**Physical and Inorganic Chemistry**

**(2013 Pattern) (Theory) (Paper - I)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Use of logtable and calculator is allowed.*

**Q1)** Answer the following questions:

**[16]**

- a) What is meant by negative catalysis? Give one example of it.
- b) Give the rule of differentiation of a quotient of two functions.
- c) Define the terms:
  - i) Wavelength.
  - ii) Wavenumber.
- d) State the first law of thermodynamics and give its mathematical equation.
- e) What is the effect of temperature on viscosity?
- f) Define: i) Oxidation number ii) Valency.
- g) How many atoms are present in 142 grams of chlorine?
- h) Explain in brief formation of covalent bond with suitable example.

**Q2)** Attempt any Four of the following:

**[16]**

- a) Explain the causes for deviation of real gases from ideal behaviour.
- b) What is adsorption isotherm? Give postulates of Langmuir's adsorption isotherm.
- c) Draw the graph of linear function and find the expression for the following.
  - i) Linear function passing through (1,3) and (2,3).
  - ii) Linear function when slope is 2 and passing through point (2,2).

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- d) State de-Broglie's Hypothesis. Derive the expression for de-Broglie's wavelength in terms of kinetic energy of a particle.
- e) Explain spontaneous and Non-spontaneous process with help of suitable examples.
- f) Derive van der Waals equation of state for real gases.

**Q3)** Answer any Four of the following:

**[16]**

- a) i) If  $Y=(3x+2)(x+5)$ , find  $\frac{dy}{dx}$ .
- ii) Solve the integral  $\int (x^2 + 4)^2 dx$ .
- b) Write down Schrodinger equation and explain the term in it.
- c) Obtain the expression for entropy change of an ideal gas when its pressure and temperature are changed simultaneously.
- d) What is gel. Distinguish between Emulsion and Gel.
- e) Define efficiency of heat engine. Derive the expression for efficiency of heat engine.
- f) What is vapour pressure of liquid? Describe isoteniscope method for measurement of vapour pressure.

**Q4)** Attempt any Four of the following:

**[16]**

- a) Calculate the oxidation number of the following:
  - i) S in  $\text{Na}_2\text{S}_2\text{O}_3$
  - ii) Cr in  $\text{K}_2\text{Cr}_2\text{O}_7$
  - iii) Mn in  $\text{MnO}_2$
  - iv) P in  $\text{H}_3\text{PO}_4$
- b) What is  $\text{SP}^2$  hybridisation? Explain the formation of  $\text{BF}_3$  molecule.
- c) Explain the primary and secondary standard substance with suitable example.
- d) Define atomic orbital overlap? Give factors affecting it.

e) Draw the structures of



f) Define the terms

i) Co-ordinate bond.

ii) Sigma bond.

iii) Octet rule.

iv) Metallic bond.

**Q5) Solve any Four of the following:**

**[16]**

- a) What volume of nitric acid solution having specific gravity 1.31 and 50% by weight will be required to neutralise 20ml 1.05 N solution of NaOH?
- b) In an experiment, 500 mL of a gas at 27°C and 655 mm pressure weighed 0.560 gms. Calculate molecular weight of the gas.
- c) Calculate the entropy change, when 10 moles of an ideal gas expand so that its temperature and volume change from 27°C and 8 litre to 65°C and 80 litre. [Given  $R=8.314\text{J}(\text{mole.k})^{-1}$ ,  $C_v=\frac{3}{2}\times R \text{ J.mole}^{-1}$ ].
- d) Calculate the wavelength and momentum of a  $\alpha$ -particle moving with a speed of  $10^5\text{cm.s}^{-1}$ .
- e) The densities of toluene and water are 860 and 992  $\text{gm.dm}^{-3}$  at 20°C respectively. The time of flow of toluene and water through Ostwald's viscometer are 70 and 100 seconds respectively. Calculate the viscosity of toluene. [Given: Viscosity of water 0.010 poise]
- f) Calculate the wavenumber and wavelength of the first line in the Lyman series. [Given  $R=109677.6 \text{ cm}^{-1}$ ]

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