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Sl.No. 02893

Total No. of Pages : 2



II Semester B.Sc. Examination, April/May - 2018
(Scheme Semester) (2014-15 Onwards)
PHYSICS (Paper - II)
Heat and Thermodynamics

Time : 3 Hours

Max. Marks : 60

Instruction: Answer any three questions from parts A and B, Three questions from Part - C and six questions from Part - D.

Part - A

1. a) Derive an expression for critical constants using vander waals equation for a gas. [7]
b) Derive an equation for the flow of heat through a solid bar. [5]
2. a) Derive planck's law of radiation using Einstein's A and B coefficients. [7]
b) With a neat diagram explain porus plug experiment. [5]

Part - B

3. a) State and prove carnot's theorem. [5]
b) Define gibb's function and Helmholtz function. Derive gibbs. helmholtz equation. [7]
4. a) Derive general expression for maxwell's thermodynamic relation. [6]
b) Explain the principle of increase of entropy. [3]
c) What is clausius inequality? Explain. [3]

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Part - C

5. Calculate RMS velocity of CO_2 at 27°C , given density of CO_2 at NTP equals 1.96kg/m^3 [4]
6. Calculate the critical temperature and boyle's temperature for a gas, given vander waals constants. [4]
- $a = 6.4 \times 10^{-2} \text{ Jm}^3 \text{ mole}^{-1}$
- $b = 3.3 \times 10^{-5} \text{ m}^3 \text{ mole}^{-1}$
- Universal gas constant
- $R = 8.31 \text{ J/Mole /K.}$
7. Calculate the change in entropy when 1kg of water at 27°C is heated to 100°C , assuming specific heat capacity of water to be 4200 J/kg/k. [4]
8. Assuming the specific volumes of water and steam to be $10^{-3}\text{m}^3 \text{ kg}^{-1}$ and $1601 \times 10^{-3} \text{ m}^3 \text{ kg}^{-1}$ respectively at 373k , find the change in boiling point of water when the pressure is increased by 0.25 atmospheres, given latent heat of vaporization of water to be $22.6 \times 10^5 \text{ J/k}$ [4]

Part - D

9. a) What is meant by degrees of freedom? How many degrees of freedom for a diatomic gas molecule? [2]
- b) What is induced emission of radiation? Explain. [2]
- c) Explain adiabotic demagnetization. [2]
- d) State the principle of equi- partition of energy. [2]
- e) Write down boltz mann's entropy relation and explain the symbols [2]
- f) Draw TS diagram for a carnot's cycle. [2]
- g) State second law of thermodynamics. [2]
- h) What happens to temperature of gas when it undergoes adiabotic expansion and compression? [2]



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II Semester I B.Sc. Examination, April/May - 2018
(Semester Scheme) (Nov/Dec-2017 onwards)

CHEMISTRY

Chemistry Paper - II (New Syllabus)

Time : 3 Hours

Max. Marks : 60

Instruction : Write equations and neat diagram wherever necessary.

PART - A



Answer all questions:

[6 × 1 = 6]

1. a) How many π bonds are present in nitrogen molecule?
- b) Name the type of hybridization in PCl_5 .
- c) Boat form of cyclohexane is less stable than chair form. Why?
- d) Give an example for electron withdrawing group.
- e) Define ebullioscopic constant.
- f) What is azeotropic mixture?

PART - B

(Inorganic Chemistry)

Answer any three questions.

[3 × 6 = 18]

2. a) Construct the Born-Haber cycle for the formation of NaCl molecule.
How do you calculate lattice energy? [4]
- b) How is accuracy different from precision? [2]

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3. a) Explain the valence bond approach for the formation of fluorine molecule. [2]
b) Give the molecular orbital diagram of oxygen molecule. Calculate its bond order and magnetic property. [4]
4. a) What is hybridisation? Explain hybridisation in SF_6 . [3]
b) Discuss the factors favouring the formation of ionic bond. [3]
5. a) What are the differences between bonding and antibonding molecular orbitals. [3]
b) Explain running blank titration and method of minimising errors with a suitable example. [3]

PART - C

(Organic Chemistry)

Answer any three questions:

[3 × 6 = 18]

6. a) What are the postulates of Baeyer's strain theory? [3]
b) Write the resonance structures of anthracene. [3]
7. a) Explain the orientating influence of $-\text{COOH}$ group during electrophilic substitution reaction. [4]
b) How is acetic anhydride synthesised? Mention its application. [2]
8. a) How is stilbene prepared? Draw the structure of cis and trans stilbene. [4]
b) Explain Ullmann reaction with an example. [2]

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9. a) Explain Huckel's rule of aromaticity in [3]
i) Benzene
ii) Cyclopentadienyl cation
b) Give the general mechanism of electrophilic aromatic substitution reaction. [3]

PART - D

(Physical Chemistry)

Answer any three questions:

[3 × 6 = 18]

10. a) How are binary liquid mixtures classified? Give an example for each. [3]
b) How is osmotic pressure determined by Berkely-Hartley's method? [3]
11. a) A solution containing 12.5g of non-electrolyte substance in 17.5g. Water gave elevation of b.p as 0.7k. Calculate the molar mass of substance [K_b = 0.52k kg/mol] [2]
b) Explain laws of osmotic pressure? [2]
c) What is the effect of non-volatile solute on CST? [2]
12. a) Explain Beckmann method for the determination of molar mass of non-volatile solute. [4]
b) What is cryoscopic constant? How is it related with molar mass? [2]
13. a) Derive an expression for the relation between molar mass and osmotic pressure. [3]
b) Explain MST verses composition curve of nicotine water system? [3]



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II Semester B.Sc. Examination, April/May - 2018

(Semester Scheme)

MATHEMATICS (Paper - II)

(2015-16 onwards)

Differential Calculus II and Integral Calculus I



Time : 3 Hours

Max. Marks : 60

Instructions : Answer all the sections

SECTION - A

I. Answer any six questions. Each question carry two marks.

a) Discuss the continuity of the function $f(x) = \begin{cases} 1+x, & \text{for } x \leq 2 \\ 5-x, & \text{for } x > 2 \end{cases}$ at $x=2$

b) Prove that every differentiable function is continuous.

c) Verify Lagrange's mean value theorem for $f(x) = x^3 - 4x$ in $[-2,2]$

d) Evaluate : $\lim_{x \rightarrow 0} (x \cdot \log \sin x)$.

e) If $U = \sin^{-1}\left(\frac{y}{x}\right)$ find $\frac{\partial^2 u}{\partial x \partial y}$

f) If $u = x^2y + xy^2$, where $x = 3t^2$, $y = 3t$, find $\frac{du}{dt}$ at $t = 1$.

g) Evaluate : $\int_0^{\frac{\pi}{4}} \sin^4(2x) dx$.

h) Evaluate : $\int_0^{\frac{\pi}{2}} \sin^6 x \cdot \cos^4 x dx$.

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SECTION - B

(Differential Calculus - II)

II. Answer any six questions. Each question carries four marks.a) If $\lim_{x \rightarrow a} f(x) = l$ and $\lim_{x \rightarrow a} g(x) = m$ then prove the $\lim_{x \rightarrow a} [f(x).g(x)] = l.m.$ b) Examine the differentiability of $f(x) = \begin{cases} 1 + \sin x & \text{for } 0 < x < \frac{\pi}{2} \\ 2 + \left(x - \frac{\pi}{2}\right)^2 & \text{for } x \geq \frac{\pi}{2} \end{cases}$ at $x = \frac{\pi}{2}$.

c) State and prove Rolles theorem.

d) Verify the cauchy's mean value theorem for the functions $f(x) = x^4$ and $g(x) = x^3$ in $[1,2]$ e) Find the fifth taylor's polynomial of $f(x) = \cos x$ at $x = 0$.f) Expand the function $\log(1 + \sin x)$ upto the term containing x^5 by Maclourin's expansion.g) Evaluate: $\lim_{x \rightarrow 0} \left[\frac{e^x - e^{-x} - 2x}{x^2 \sin x} \right]$.h) Evaluate: $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{\frac{1}{x^2}}$.**SECTION - C**

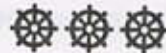
(Integral Calculus - I)

III. Answer any six questions. Each question carry four marks.a) If $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$ show that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$.b) If $u = (x - y)^4 + (y - z)^4 + (z - x)^4$ then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$

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- c) If $u = \sin^{-1} \left[\frac{x^2 + y^2}{x + y} \right]$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$
- d) If $x = r \cos \theta, y = r \sin \theta$, Find the Jacobians J and J' and also verify $J \cdot J' = 1$
- e) Obtain the reduction formula for $\int \sec^n x \, dx$ and hence evaluate $\int_0^{\frac{\pi}{4}} \sec^3 x \, dx$.
- f) Evaluate $\int_0^a x^4 \sqrt{a^2 - x^2} \, dx$.
- g) If $I_n = \int_0^{\frac{\pi}{2}} x^n \sin x \, dx$, then prove that $I_n + n(n-1)I_{n-2} = n \left[\frac{\pi}{2} \right]^{n-1}$
- h) Evaluate $\int_0^{\pi} x \sin^8 x \, dx$



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II Semester B.Sc. Examination, April/May - 2018
(Scheme:Semester) (2013-14 Batch onwards)
COMPUTER SCIENCE (Paper - II)
Data Structure Applications With C

Time : 3 Hours

Max. Marks : 60

Instruction: Answer any two full questions from each part, each question carries 10 marks.



Part - A

1. a) Explain the steps involved in problem solving technique. [6]
b) What is a pointer? Explain the advantages of pointers. [4]
2. a) What is a pre processor? List any three pre processor directives. [4]
b) Explain Malloc, Realloc and free function in 'C'. [6]
3. a) Explain any three functions to write data on to a file. [6]
b) Write a note on algorithm and flow chart. [4]

Part - B

4. a) Describe the storage structure of 2D array. [4]
b) Write an algorithm to insert and delete an element in an array at the given position. [6]
5. a) What is a stack? Explain applications of stack. [5]
b) What is a linked list? explain the types of linked list. [5]

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6. a) Write an algorithm to search an element in singly linked list. [5]
b) Write a 'C' program to insert an element into linear queue. [5]

Part - C

7. a) What do you mean by non-linear data structure? Define sibling, depth of tree & skew tree. [6]
b) Explain the memory representation of tree. [4]
8. a) Define the following with an example. [6]
i) Graph ii) Weighted graph
iii) Path
- b) What is directed graph? Explain the memory representation of graph. [4]
9. Write an algorithm for pre - order, in -order and post - order traversal of binary tree. [10]

