



COOCH BEHAR PANCHANAN BARMA UNIVERSITY

B.Sc. Honours 2nd Semester Examination, 2021

PHYSICS

ELECTRICITY AND MAGNETISM

CORE-3

Time Allotted: 2 Hours

Full Marks: 25

The figures in the margin indicate full marks.

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

All symbols are of usual significance.

Answer any one question

25×1= 25

1. Find the expression for electric field intensity at any external point (P) due to an electric dipole. 25
2. An ac voltage is applied to a series LCR circuit. Find the expression for the instantaneous current in the circuit. 25

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MATHEMATICS

CORE-3

Time Allotted: 2 Hours

Full Marks: 40

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Answer any two questions

20×2 = 40

1. (a) State and prove Bolzano-Weierstrass theorem for sequence of real numbers. 10
(b) Test the convergence of the series $\sum \frac{n^3 - 1}{n^3 + 1} x^{n-1}$, $x > 0$. 10
2. (a) Let $A(\neq \phi) \subseteq \mathbb{R}$ be bounded above in \mathbb{R} . Let B be the set of upper bounds of A . 10
Show that B is bounded below and $\text{lub } A = \text{glb } B$.
(b) State and prove the Cauchy's general principle of convergence for sequence of real numbers. 10
3. (a) Let $\{a_n\}$ be a real sequence. Show that $\sum (a_n - a_{n+1})$ is convergent iff $\{a_n\}$ is convergent. If the series converges, what is its sum? 10
(b) Let $\sum u_n$ be a series of positive real numbers and let $\lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_n} = l$. Show that 10
 $\sum u_n$ is convergent if $l < 1$ and is divergent if $l > 1$. What happens if $l = 1$?
— Justify.

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B.Sc. Honours 2nd Semester Examination, 2021

CHEMISTRY

INORGANIC CHEMISTRY-I

CORE-3

Time Allotted: 2 Hours

Full Marks: 25

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All symbols are of usual significance.*

Answer any *one* question from the following

25×1 = 25

1. (a) What is node? What is the chemical significance of node? 1+3
- (b) For the half cell: 3

$$\text{C}_2\text{H}_2(\text{g}) + 2\text{H}^+(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{C}_2\text{H}_4(\text{g}), E^0 = 0.731 \text{ V}$$

What will be its formal potential at pH = 7?
- (c) Does the lone pairs present in Lead Chloride change the geometry of that molecule? — Explain. 3
- (d) CH₄ and GeH₄ are inert towards hydrolysis — Explain. 4
- (e) What is ionic potential? How does it differ from ionization potential? 1+2
- (f) Compare ionization energy of NO and N₂ molecule. 3
- (g) The dipole moment of water is 6.17×10^{-30} cm. The H-O-H angle is 104° and OH distance is 96 pm. Calculate the percent of ionic character of the O-H bond. 2
- (h) MgCO₃ is less stable than CaCO₃. — Explain. 2
- (i) What is successive electron affinity? 1
2. (a) The position of an electron is determined at a particular instant with the uncertainty of $\pm 1 \text{ \AA}$. Find out the uncertainty of its position after 2 second. 3
- (b) What is the difference between the ionization potential of an element and the oxidation potential of it? 2
- (c) Show that combination of two p(π) orbital leads to produce two nodal plane. 2
- (d) What is the nature of HOMO of O₂ molecule? What will be the change of bond order when dioxygen molecule is ionized? 2
- (e) How many radial and angular nodes are present in 3p orbital? 2
- (f) What is F-centre? How would you explain thermal reaction of ZnO? 1+2

- (g) Determine the ground state term symbol for d^8 configuration. 2
- (h) Do you expect the structure of PCl_3F_2 and PF_3Cl_2 to be different? If so why? 2
- (i) Suggesting reason rank the following in the order of decreasing bond angles: 3
- OF_2, OCl_2, OH_2ON_2
- (j) Provide a reason for high dipole moment in hydrazine. 2
- (k) HF forms stronger H bonds than water still ΔH_{vap} of HF is lower than that of H_2O . Explain. 2

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