

2B3N21246

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Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2021

**BCH3C03 – Organic Chemistry**

(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

**Section A (Short answers)**

**(Answer questions up to 20 marks. Each question carries 2marks)**

1. What is meant by electromeric effect ?
2. Draw the resonance structures of aniline.
3. Mention a method to distinguish maleic acid and fumaric acid.
4. Draw the possible conformations of methyl cyclohexane.
5. Illustrate Friedel-Crafts alkylation reaction with a suitable example. Give equation and name the product.
6. Explain the term Williamson's synthesis with an example?
7. What is Fittig reaction ? Illustrate with an example.
8. What is meant by denaturation of alcohol?
9. How can fluorobenzene be obtained from benzene diazonium chloride ?
10. What are essential aminoacids ? Name two of them.
11. Draw the structure of nicotine.
12. What is meant by vulcanization ? Explain with example.

[Ceiling of marks: 20]

**Section B (Paragraph)**

**(Answer questions up to 30 marks. Each question carries 5 marks)**

13. Explain the different kinds of bond fission observed in organic reactions.
14. Explain the term hyper conjugation and its significance with illustrative examples.
15. Explain the relative stability of conformations of cyclohexane.
16. State and explain Hückel's rule.
17. Explain the Lucas test to distinguish between 1°, 2° and 3° alcohols.
18. Arrange aniline, N-methylaniline and N, N dimethylaniline in the increasing order of basicity and explain the variation.
19. State the important characteristics of enzyme action.

[Ceiling of marks: 30]

**Section C (Essay)**  
**(Answer any one. Each question carries 10 marks)**

- 20. Illustrate the different structural levels of protein.
- 21. Discuss the optical isomerism in tartaric acid.

**[1 x 10 = 10 Marks]**

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Third Semester B.Sc Degree Examination, November 2021  
BMT3C03 - Mathematics - 3  
(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A**

All questions can be attended.  
Each question carries 2 marks.

1. Find the vector function that describes the curve  $C$  of intersection of the plane  $y = 2x$  and the paraboloid  $z = 9 - x^2 - y^2$ .
2. Define Tangential and Normal Components of Acceleration.
3. If  $z = u^2v^3w^4$  and  $u = t^2, v = 5t - 8, w = t^3 - t$ . Find  $dz/dt$ .
4. Find the directional derivative of  $f(x, y) = 2x^2y^3 + 6xy$  at  $(1, 1)$  in the direction of a unit vector whose angle with the positive  $x$ -axis is  $\pi/6$ .
5. State Stoke's theorem.
6. Compute all the roots of  $8^{\frac{1}{3}}$  and sketch these roots on an appropriate circle centered at origin.
7. Find the circulation and net flux for the flow  $f(z) = 2z$  where  $C$  is the circle  $|z| = 1$ .
8. Show that the function  $f(z) = 4z - 6\bar{z} + 3$  is not analytic at any point.
9. Find the first partial derivatives of  $z = \frac{4\sqrt{x}}{3y^2+1}$ .
10. Compute  $\nabla f(x, y)$  for  $f(x, y) = 5y - x^3y^2$ .
11. Find the directional derivative of the function  $f(x, y) = 5x^3y^6$  at the point  $(1, 1)$  in the direction  $\theta = \frac{\pi}{6}$ .
12. Find the level curve of  $f(x, y) = -x^2 + y^2$  passing through  $(2, 3)$ . Graph the gradient at the point.

(Ceiling 20 Marks)

### Section B

All questions can be attended.  
Each question carries 5 marks

13. A projectile is launched from ground level with an initial speed  $V_0 = 768$  ft/s at an angle of elevation  $\theta = 30^\circ$ . Find
- the vector function and parametric equations of the projectile's trajectory,
  - the maximum altitude attained,
  - the range of the projectile, and
  - the impact speed.
14. Verify that the given function  $u = \cos at \cdot \sin x$  satisfies Wave equation,  $a^2 \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ .
15. Define length of a space curve. Find the length of the space curve traced by the vector function  $r(t) = a \cos t \mathbf{i} + a \sin t \mathbf{j} + at \mathbf{k}$ ,  $0 \leq t \leq 2\pi$ .
16. Determine whether the vector field  $F(x, y) = (x^2 - 2y^3)\mathbf{i} + (x + 5y)\mathbf{j}$  is conservative.
17. State and prove Cauchy's inequality.
18. Show that  $\cos\left(\frac{\pi}{2} + i \ln 2\right) = -\frac{3}{4}$
19. Show that  $f(z) = e^z$  is nowhere analytic.

(Ceiling 30 Marks)

### Section C

Answer any One question. Each question carries 10 marks

20. (a) Find parametric equations for the normal line to the surface  $z = \frac{1}{2}x^2 + \frac{1}{2}y^2 - z + 4$  at the point  $(1, -1, 5)$ .
- (b) Find the points on the surface  $x^2 + y^2 + z^2 = 7$  at which the gradient is parallel to the plane  $2x + 4y + 6z = 1$ .
21. (a) Show that the line integral  $\int_C (y + yz)dx + (x + 3z^3 + xz)dy + (9yz^2 + xy - 1)dz$  is independent of the path  $C$  between  $(1, 1, 1)$  to  $(2, 1, 4)$ .
- (b) Evaluate  $\int_{(1,1,2)}^{(2,1,4)} F \cdot dr$

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2021

BPH3B03 – Electrodynamics – I

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A**

**Answer all questions. Answer in two or three sentences. Each correct answer carries a maximum of two marks.**

1. State and explain the law of triangle of vector addition
2. State Helmholtz's theorem
3. State and explain divergence theorem
4. Field lines never cross each other. Why?
5. Derive an expression for the force experienced by a dielectric in an electric field
6. State Flemings right hand rule
7. State and prove Ampere's circuital theorem
8. Find the magnetic field inside a torroid using Ampere's law
9. What are ferromagnetic substances. Give three properties
10. Discuss B-H curve
11. What is Curie's temperature?
12. Show that force on a current loop in a non-uniform magnetic field is  $\vec{F} = (\vec{m} \cdot \nabla) \vec{B}$

**(Ceiling: 20 Marks)**

**Section B (Paragraph/Problem)**

(Answer all questions in a paragraph of about half a page to one page.  
Each correct answer carries a maximum five marks)

13. Compute the divergence of the function,  $\vec{A} = r\cos\theta\hat{r} + r\sin\theta\hat{\theta} + r\sin\theta\cos\phi\hat{\phi}$
14. A hollow spherical shell carries charge density  $\rho = \frac{k}{r^2}$  in the region  $a \leq r \leq b$ . Find the electric field in the three regions.
15. A dielectric slab is partially inserted between the plates of a parallel plate capacitor. Calculate the force on the slab.
16. Find the magnetic field inside a solenoid.
17. If  $\vec{B} = \frac{\hat{r}}{r^2}$ , find the vector potential.
18. Derive the expression for vector potential in terms of bound currents.
19. Find the capacitance per unit length of two coaxial metal cylindrical tube of radii a and b.

(Ceiling:30Marks)

**Section C (Essay)**

Answer anyone in about two pages .Each question carries ten marks)

20. Derive an expression for energy of a continuous charge distribution and hence find the energy of a uniformly charged spherical shell of total charge q and radius R.
21. Discuss the trajectory of the charged particle moving in transverse electric and magnetic field.

(1x10=10 Marks)