

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Fourth Semester B.Sc Degree Examination, March/April 2021  
BCH4C04 – Physical and Applied Chemistry  
(2019 Admission onwards)

Time: 2 hours

Max. Marks: 60

**Section A (Short answers)****(Answer questions up to 20 marks. Each question carries 2 marks)**

1. What is meant by Tyndall effect? Mention one of its applications.
2. List the applications of nanomaterials in optics.
3. Define percentage atom economy of a synthesis.
4. What is meant by coagulation of a colloidal solution? Among  $\text{Na}^+$ ,  $\text{Al}^{3+}$  and  $\text{Mg}^{2+}$ , which ion is having highest coagulating power.
5. What is greenhouse effect? Name two greenhouse gases.
6. What are the possible electronic transitions in molecules? Arrange them in the increasing order of energy.
7. How will you identify propanal and acetone from NMR spectra.
8. What are biodegradable polymers? Give examples.
9. Comment on the statement: Taj Mahal is losing its beauty due to atmospheric pollution.
10. What do you mean by bioaccumulation?
11. Define cetane number.
12. What are the different types of glasses?

**[Ceiling of marks: 20]****Section B (Paragraph)****(Answer questions up to 30 marks. Each question carries 5 marks)**

13. Explain the applications of colloids.
14. Explain the twelve principles of green chemistry.
15. State and explain Beer-Lamberts law. How is it used in the quantitative estimation of substances?
16. What is BOD? How is it determined? What does the BOD value of a sample of water signify?
17. Explain the principle of thin layer chromatography. Evaluate its merits.
18. What are drugs? Write the important classes of drugs with suitable examples.
19. Describe the manufacture and composition of cement.

**[Ceiling of marks: 30]**

Section C (Essay)

(Answer any one. Each question carries 10 marks)

20. (i) Explain the principle and applications of gas chromatography.  
(ii) Discuss the structure and applications of Buna-S, Nylon 6 and Nylon 66.
21. (i) Draw the high resolution NMR spectrum of ethanol and explain the splitting signals.  
(ii) Explain theories of colour and chemical constitution of dyes.

[1 x 10 = 10 marks]

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
**Fourth Semester B.Sc Degree Examination, March/April 2021**  
**BMT4C04 – Mathematics – 4**  
 (2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**PART A**

**Answer all questions. Each question carries 2 marks.**  
**Maximum mark from this section is 20.**

1. Find the order and degree of the differential equation  $\frac{d^3y}{dx^3} = \left(1 + \left(\frac{dy}{dx}\right)^2\right)^{3/2}$ .
2. Give an example for a linear and a non-linear differential equation.
3. Define an autonomous differential equation and give an example.
4. Find a solution to the differential equation  $x \frac{dy}{dx} = 4y$ .
5. Find the integrating factor in simplified form for the differential equation
6.  $\frac{dy}{dx} + y \tan x = \sin 2x$
7. Write the general form of Bernoulli's differential equation and explain how it can be solved
8. Define the Dirac Delta function and WRITE its Laplace transformation.
9. Find the inverse Laplace transformation of  $F(s) = \frac{s+1}{s^2+1}$ .
10. State the superposition principle for homogenous differential equations.
11. Verify whether the functions  $f_1(x) = 5$ ,  $f_2(x) = \cos^2 x$  and  $f_3(x) = \sin^2 x$  are linearly dependent or independent in the interval  $(-\infty, \infty)$
12. Find the wroskian of the two functions  $f_1(x) = e^x$ ,  $f_2(x) = e^{-x}$

**PART B**

**Answer all questions. Each question carries 5 marks.**  
**Maximum mark from this section is 30.**

13. Derive the formula for the Laplace transformation of  $f'''(t)$ , where  $L(f(t)) = F(s)$  is given.
14. Find the Fourier cosine series of the function  $f(x) = x$ .
15. Using the method of separation of variables, solve the partial differential equation  

$$\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$$
16. Solve the differential equation  $x^2 y'' + xy' - y = 0$
17. Show that the differential equation  $(e^{2y} - y \cos(xy))dx + (2xe^{2y} - x \cos(xy) + 2y)dy = 0$  is exact and hence solve the same.
18. Solve the initial value problem  $\cos x (e^{2y} - y) \frac{dy}{dx} = e^y \sin(2x)$ ,  $y(0) = 0$
19. Using the method of undetermined coefficients, solve  $y'' + 4y = 8x^2$ .

**PART C**

**Answer any ONE question. One question carries 10 marks.**

20. Using the Laplace transformation, solve the initial value problem  
 $y'' - y = t$ ,  $y(0) = 1$ ,  $y'(0) = -1$
21. Find the Fourier Series of the function  $f(x) = x$ ,  $-\pi < x < \pi$

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Degree Examination, March/April 2021

BPH4B04 - Electrodynamics – II

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Section A- Short Answer Type**

*(Answer all questions in two or three sentences,  
each correct answer carries a maximum of 2 marks)*

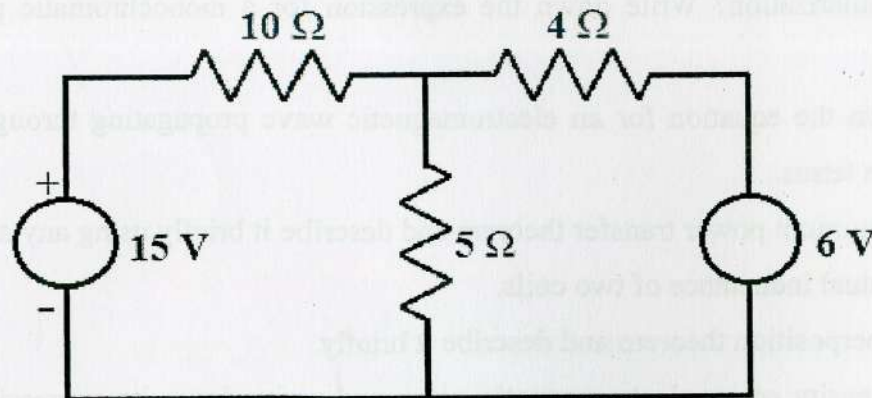
1. State laws of electromagnetic induction.
2. What is polarization? Write down the expression for a monochromatic plane polarized wave.
3. Write down the equation for an electromagnetic wave propagating through vacuum and explain the terms.
4. Define Maximum power transfer theorem and describe it briefly using any arbitrary circuit.
5. Define mutual inductance of two coils.
6. Define superposition theorem and describe it briefly.
7. Define intensity of an electromagnetic wave and write down its expression in terms of intensity of electric field.
8. Write down Maxwell's equations in free space.
9. Write down the expression for the instantaneous values of current and voltage in circuit containing pure inductance and discuss the phase relation between the two.
10. Define time constant in a series LR circuit and write down its expression.
11. Define Kirchoff's laws.
12. What is the condition for resonance in a series LCR circuit and write down the expression for resonance frequency?

**(Ceiling-20)****Section B- Paragraph/ Problem Type**

*(Answer all questions in a paragraph of about half a page to one page,  
each correct answer carries a maximum of 5 marks)*

13. Explain the phase relation between the instantaneous values of current and voltage in a circuit with pure inductor and capacitor connected in series. Also discuss about the impedance of the circuit.

14. Using Maxwell's equations obtain the expression for the decrease in energy of electromagnetic field per unit time and hence discuss Poynting vector.
15. Obtain the expression for the energy stored in a magnetic field.
16. A lamp having a hot resistance of 10 ohm is not allowed to pass more than 3A. Find the value of the inductance which must be connected in series with the lamp which is supplied by an a.c of maximum r.m.s 320V at 50Hz.
17. Discuss polarisation current density. Obtain the Maxwell's equations inside matter.
18. A parallel plate air capacitor has circular plates of radius 5cm. It is being charged so that the electric field changes at a rate of  $10^{12}$  V/m.second. Find the displacement current in it.
19. State Thevenin's theorem and using it find the current through the  $4\Omega$  resistor in the circuit given below,



(Ceiling- 30)

### Section C- Essay Type

(Answer any one question. Answer carries 10 marks)

20. Explain growth of charge in a series LCR circuit and explain the three different conditions in the circuit.
21. Explain the reflection and transmission of electromagnetic wave incident normally on a surface and show that it is in accordance with law of conservation of energy.

(1x10= 10 Marks)

1B4M21541

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Fourth Semester B.Sc Degree Examination, March/April 2021

BPH4C04 - Electricity, Magnetism and Nuclear Physics

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

*The symbols used in this question paper have their usual meanings*

**Section A – Short Answer type.**

**(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)**

1. What is electrostatic shielding?
2. Distinguish between primary and secondary cosmic rays.
3. Define Nuclear Magnetic Resonance.
4. Derive the relation between permeability and susceptibility.
5. Define temperature coefficient of resistance.
6. Electron cannot be accelerated using cyclotron. Why?
7. Explain the terms retentivity and coercivity.
8. What is Meissner effect?
9. What is Higg's Boson?
10. Show that the introduction of a dielectric slab into the capacitor can increase the capacitance.
11. Define reduction factor of TG.
12. What is drift velocity? Write down its expression. **(Ceiling – 20)**

**Section B – Paragraph / Problem type.**

**(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)**

13. The binding energy of  ${}_{12}^{24}\text{Mg}$  is 198.25 MeV. Find its atomic mass?  
(Mass of hydrogen atom = 1.00783u , mass of neutron = 1.0865u)
14. The activity of a radioactive sample is decreased to 75% of the initial value after 30 days. Calculate the half life of sample.
15. Describe the classification of elementary particle
16. With the help of neat diagram explain the working of linear accelerator
17. What capacitance is required to store an energy of 100 KWh at a potential difference of  $10^4$  V?
18. Explain cosmic ray shower
19. The force between two electrons when placed in air equal to 0.5 times weight of an electron. Find the distance between two electrons  
(Given mass of electron =  $9.1 \times 10^{-31}$  Kg). **(Ceiling – 30)**

**SECTION C – Essay type**

**(Essays - Answer in about two pages, any one question.**

**Answer carries 10 marks)**

20. Explain the principle of potentiometer. How can we determine the resistance using potentiometer?
21. Explain the theory of vibration magnetometer. With the help of Searle's Vibration magnetometer how can we find the moment of magnet?

**(1 x 10 = 10 marks)**