D 140853 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER (CBCSS—U.G.) DEGREE EXAMINATION
APRIL 2026

Physics

PHY4C04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

(2019 Syllabus)

Time : Two Hours Maximum : 60 Marks

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. Explain the stability of nucleus and binding energy.
2. What do you mean by angle of dip ? What is the angle of dip at the magnetic equator ?
3. Discuss any *four* properties of paramagnetic materials.
4. State and Explain Gauss's law in electrostatics.
5. Differentiate between nuclear fission and fusion with example.
6. Explain critical magnetic field Hc in superconductivity. How it is related Tc?
7. Explain the principle of ^{14}C dating.
8. What is azimuth effect of cosmic rays ?
9. Explain current density and drift velocity. Write down the expression connecting current density and drift velocity.?
10. Distinguish between primary and secondary cosmic rays ?
11. Write an expression for the capacitance of a cylindrical capacitor and explain the terms.
12. Why the potentiometer is superior to voltmeter in measuring the e.m.f of a cell ?

(Ceiling 20 marks)

Turn over

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. How many kilowatts energy will be released by complete fission of 1kg of U^{235}. Given that the energy released per fission is 200 MeV ?

14. Helium nucleus has +2e charge and neon nucleus + 10e charge. Calculate the force of repulsion between them if they are separated by a distance of 10^{-6}m. ($e = 1.6 \times 10^{-19}$ C).

15. A cyclotron in which the flux density is 1.4 weber/m^2 is employed to accelerate protons. How rapidly should the electric field between the Dees be reversed ? Mass of the proton = 1.67×10^{-27} kg. and charge= 1.6×10^{-19}.

16. With the help of suitable diagram, explain the conversion of a galyanometer to a ammeter.

17. Explain the classification of Elementary particles and mention their properties.

18. Derive an expression for finding the moment of a bar magnet using deflection magnetometer in T and C position.

19. What is the principle of a potentiometer ? How the internal resistance is determined by potentiometer ?

(Ceiling 30 marks)

Section C (Essay type)

Essays - Answer in about **two pages**, *any* **one** *question. Answer carries* 10 *marks.*

20. Derive an expression for the capacitance of a parallel plate capacitor. What will be the capacitance if the space between the plates is partially filled with a slab of thickness d and relative permittivity ε_r ?

21. Discuss the working principle of a Carey Foster bridge. How will you determine the temperature co-efficient of resistance of a material using a Carey Foster bridge.

(1 × 10 = 10 mark)

D 120582 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2025

Physics/Applied Physics

PHY4C04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

(2019—2023 Admissions)

Time : Two Hours Maximum : 60 Marks

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 question carries a maximum of 2 *marks.*

1. State and explain Coulomb's law between charges.
2. Distinguish between electric potential and potential difference.
3. What is Superconductivity ?
4. Explain current density and drift velocity. Write down the expression connecting current density and drift velocity ?
5. Distinguish between Para and ferromagnetic materials with examples.
6. What do you mean by a Capacitor ? What are the factors on which the capacity of a capacitor depends on ?
7. What do you mean by angle of dip ? What is the angle of dip at the magnetic equator ?
8. Distinguish between nuclear fission and fusion.
9. What do you mean by binding energy of a nucleus ? Write the equation of binding energy.
10. What is latitude effect if cosmic rays ?
11. What is the working principle of a Tangent Galvanometer ?
12. How can the sensitivity of potentiometer be increased ?

(Ceiling 20 marks)

Turn over

Section B (Paragraph/Problem Type)

Answer all questions in a paragraph of about half a page to one page
Each question carries a maximum of 5 *marks.*

13. The plate of a parallel plate capacitor has an area of $100cm^2$ each and are separated by $2mm$. The capacitor is charged by connecting is to 500 V supply. Find the energy of the charged capacitor.

14. In a chamber a uniform magnetic field 2×10^{-4} is maintained. An electron with a speed of 4×10^6m/s enters the chamber normal to the field. Find the radius of the path and the frequency of revolution of electron.

15. The half-life of a radioactive substance is 4 days. What fraction of 1 gm substance remains after 20 days.

16. What do you mean by a hysteresis loop ? Plot a typical hystersis loop and indicate retentivity and coercivity.

17. Find the binding energy of $^{56}Fe_{26}$ in MeV. Given m_p = 1.007825 *amu*. m_n = 1.008665 *amu* and m_{Fe} = 55.934939 *amu*.

18. With the help of suitable diagram. Explain the conversion of a galvanometer to a voltimeter.

19. Explain the classification of Elementary particles and mention their properties.

(Ceiling 30 marks)

Section C (Essay Type)

Essays-Answer in about **two** *pages, any one question.*
Each question carries 10 *marks.*

20. State and prove Gauss's law in electrostatics. Find the electric field due to a plane sheet of charge and explain Electrostatic shielding.

21. Give an account of the theory, construction and working of a cyclotron Point out its limitations.

(1 × 10 = 10 marks)

D 103070 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2024

Physics/Applied Physics

PHY4C04—ELECTRICITY, MAGNETISM AND NUCLEAR PHYSICS

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

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 are baryons and leptons ?
2. Mention some of the uses of a nuclear reactor.
3. State and explain the law of radioactive disintegration.
4. What is electrostatic shielding ?
5. What is latitude effect if cosmic rays ?
6. What is superconductivity ?
7. Explain nuclear waste disposal
8. Explain current density and drift velocity. Write down the expression connecting current density and drift velocity ?
9. Distinguish between dia and ferromagnetic materials with examples
10. State and explain Gauss's law in electrostatics.
11. What is the purpose of large hadron collider ?
12. Explain the principle of hydrogen bomb.

(Ceiling = 20 marks)

Turn over

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. What is the principle of a potentiometer ? How the internal resistance is determined by potentiometer ?

14. The plate of a parallel plate capacitor have an area of 50 cm^2 each and are separated by 2 mm. The capacitor is charged by connecting is to 200 V supply. Find the energy of the charged capacitor.

15. A reactor js developing energy at the rate of 3000 kW. How many atoms of U^{235} undergo fission per second ?

16. Describe the theory, construction and working of a tangent galvanometer

17. The disintegration constant λ of a radioactive element is 0.00231 per day. Calculate its half-life and average life.

18. Explain the classification of Elementary particles and mention their properties.

19. What do you mean by energy of a charged capacitor ? Derive an expression for it.

(Ceiling = 30 marks)

Section C (Essay Type)

(*Essays - Answer in about* **two pages**, *any one question.*
Answer carries 10 *marks.*

20. Explain the construction and working of a Searle's vibration magnetometer

21. Discuss the construction and working of a nuclear reactor.

(1 × 10 = 10 mark)

C 41239 **(Pages : 2)** **Name.....**

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2023

Physics/Applied Physics

PHY 4C 04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

The symbols used in 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 do you mean by electrostatic shielding ?
2. Define the term current density. What is its unit ?
3. Write down the equation of continuity in electricity. What does it mean ?
4. What is the use of a potentiometer ?
5. What do you mean by the term angle of declination ? How is it expressed ?
6. Give any four properties of diamagnetic materials.
7. What is the use of a deflection magnetometer ? How will you arrange a deflection magnetometer in tan A position ?
8. What is the principle of C_{14} dating ?
9. What are primary cosmic rays ? What is its content ?
10. What are elementary particles ? Give an example.
11. What do you mean by hadron ? Give an example.
12. Give the features of Higg's boson.

(Ceiling - 20)

Turn over

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. It is required to construct a parallel plate capacitor of capacitance 0.5 μF using paper sheets of thickness 4×10^{-5} m as the dielectric. How many circular metal foils of radius 2×10^{-1} m are required ? Given, the relative permittivity of paper is 5 and $\varepsilon_0 = 8.9 \times 10^{-12}$ F/m.

14. The resistance of a galvanometer is 100 ohms. It gives full scale deflection for a current of 1 milli ampere. How will you convert it to a voltmeter of range 50 volts ?

15. In an experiment with Carey Foster bridge, the shift in the balance point is 5.4 cm when the thick copper strip and the one ohm resistance are interchanged. The one ohm resistance is then replaced by an unknown resistance. Now the balancing point shifts by 10 cm on interchanging. Determine the unknown resistance.

16. Draw a typical hysteresis curve and indicate the magnetic saturation, retentivity and coercivity of a ferromagnetic material.

17. Using a suitable figure, explain the arrangement of a Searle's vibration magnetometer. Give an application of a Searle's vibration magnetometer.

18. Estimate the binding energy of $^{12}_{6}C$ nucleus. Also determine its density.

19. Discuss briefly the fundamental interactions in nature indicating the exchange particles.

(Ceiling - 30)

Section C (Essay Type)

Answer in about **two pages**, *any* **one** *question.*
Answer carries 10 *marks.*

20. Explain Gauss's law in electrostatics. Obtain an expression for the electric field due to an infinite plane sheet of charge.

21. What do you mean by radioactivity ? Explain the properties of alpha, beta and gamma radiations.

(1 × 10 = 10 marks)

C 21552 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2022

Physics/Applied Physics

PHY 4C 04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

(2019 Admission onwards)

Time : Two Hours Maximum : 60 Marks

Section A

Answer at least **eight** *questions.*

Each question carries 3 *marks.*

All questions can be attended.

Overall Ceiling 24.

1. Explain Gauss's law in electrostatics.
2. How will you define the potential difference between two points in an electric field ? What is its unit ?
3. What do you mean by a capacitor ? What are the factors on which the capacity of a capacitor depends on ?
4. Write down the expression connecting current density and drift velocity. What are the terms involved ?
5. What do you mean by angle of dip ? What is the angle of dip at the magnetic equator ?
6. Give any *four* properties of paramagnetic materials.
7. What is the use of a deflection magnetometer ? How will you arrange a deflection magnetometer in tan B position ?
8. What is the working principle of a tangent galvanometer ?
9. What do you mean by nuclear fission ? Give an example.
10. What are secondary cosmic rays ? What is its content ?
11. Give the quark composition of a proton and a neutron.
12. What is the purpose of large hadron collider ?

(8 × 3 = 24 marks)

Turn over

Section B

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. If 1 coulomb charge is placed at the centre of a cube of side 10 cm, estimate the flux coming out of any face of the cube.

14. A sphere of 10 cm. diameter is suspended within a hollow sphere of 12 cm. diameter. If the inner sphere be charged to a potential of 15,000 volt and the outer sphere be earthed, determine the charge on the inner sphere.

15. A galvanometer of resistance 15 ohms gives full scale deflection for a current of 2 milli ampere. Calculate the shunt resistance needed to convert it to an ammeter of range 5 A.

16. What do you mean by a hysteresis loop ? Plot a typical hysteresis loop and indicate retentivity and coercivity.

17. Discuss the arrangement of a Searle's vibration magnetometer using a suitable figure. Give an application of a Searle's vibration magnetometer.

18. The half life of a radioactive substance is 15 years. Calculate the period in which 2.5 % of the initial quantity will be left over.

19. Discuss the lepton and baryon number conservation laws giving an example for each.

(5 × 5 = 25 marks)

Section C

Answer any **one** *question.*
The question carries 11 *marks.*

20. Using a suitable figure, discuss the working principle of a Carey Foster bridge. How will you determine the temperature co-efficient of resistance of a material using a Carey Foster bridge.

21. Using a suitable figure, explain the working principle of a cyclotron.

(1 × 11 = 11 marks)

C 3562 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
APRIL 2021

Physics/Applied Physics

PHY 4C 04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

Time : Two Hours Maximum : 60 Marks

The symbols used in question paper have their usual meanings.

Section A (Short Answers)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Give the differential form of Gauss's law in electrostatics. What are the terms involved in the expression ?
2. What are the properties of equipotential surfaces ?
3. What do you mean by the capacitance of a capacitor ? Give the basic expression for the same.
4. Give the vector statement of Ohm's law. What are the terms involved ?
5. Give the value of the angle of dip at the magnetic pole and magnetic equator.
6. Give any *four* properties of ferromagnetic materials.
7. What is the use of a deflection magnetometer ? How will you arrange a deflection magnetometer in tan C position ?
8. What is nuclear fusion ? Give an example.
9. What are cosmic ray showers ?
10. What are the fundamental interactions in nature ?
11. What do you mean by hypercharge ? What is the hypercharge of π^+ particle ?
12. Name the different leptons.

(8 × 3 = 24 marks)

Turn over

Section B (Paragraph/Problem Type)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

13. How much electric flux will come out through a surface S = 10 j kept in an electrostatic field E = $2i + 4j + 7k$?

14. Determine the capacitance of a sphere of 20 cm diameter inside which there is an earth-connected sphere of 10 cm diameter, the medium between the spheres being air.

15. A galvanometer of resistance 15 ohms gives full scale deflection for a current of 2 milli-ampere. Calculate the shunt resistance needed to convert it to an ammeter of range 5 A.

16. What is the origin for a hysteresis loop in ferromagnetic materials ? Use a typical hysteresis loop indicating retentivity and coercivity.

17. Discuss the working principle of a tangent galvanometer. What do you mean by the reduction factor of a tangent galvanometer ?

18. How long will it take for 60 % of a sample of radon to decay ? Given, the half-life of radon = 3.82 days.

19. Explain the distinction between particles and antiparticles. Illustrate using two examples.

(5 × 5 = 25 marks)

Section C (Essay Type)

Answer any **one** *question.*
The question carries 11 *marks.*

20. Explain the working principle of a potentiometer. How will you determine the resistance of a wire using a potentiometer ?

21. Using a suitable figure, explain the working principle of a linear accelerator.

(1 × 11 = 11 marks)