55

1B6A22064

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2022

BPH6B14 - Material Science

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

The symbols used 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. Distinguish between material science and materials engineering.
2. Write down Fick's first law of diffusion and explain the terms involved
3. What are ceramics ? Give examples.
4. What are amorphous solids?
5. What are piezoelectric materials?
6. Write a note on grain boundary.
7. What is coordination number ?
8. What are nano materials?
9. Distinguish between polymorphism and allotropy.
10. What is isomerism in polymers ?
11. What are refractories?
12. What are solid solutions?

(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. State and explain Pauli's exclusion principle.
14. Distinguish between vacancy diffusion and interstitial diffusion.
15. Show that the atomic packing factor the FCC crystal is 0.74.
16. Derive composition conversion equation.
17. Distinguish between Frenkel and Schottky defects in solids.

18. Explain the principle of X-ray powder diffraction method of structural analysis.

19. Copper has an atomic radius of 0.128 nm, an FCC crystal structure, and an atomic weight of 63.5 g/mol. Calculate its theoretical density and compare the answer with its measured value.

(Ceiling -30)

SECTION C- Essay type

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

20. Describe the defects in solids.

21. Draw Mg-Al_2O_3 phase diagram and explain it in detail.

(1×10 =10marks)

96

1B6A22063

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2022

BPH6B13 - Relativistic Mechanics and Astrophysics

(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. Write down and explain the Lorentz transformation equations.
2. What is time dilation?
3. State the postulates of special relativity
4. How does mass vary with velocity?
5. What is meant by radiation pressure of light?
6. What is meant by principle of equivalence?
7. State Hubble's law
8. What is dark matter?
9. Explain the terms (a) apparent magnitude (b) absolute magnitude
10. Distinguish between type I and type II supernovae.
11. What is Schwarzschild radius?
12. What is a quasar?

(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. Obtain the relation between relativistic momentum and energy
14. A rod of proper length 3m moves with a velocity of 0.8c in a direction making an angle 60° with its length. Find the apparent length.
15. Two space ships A and B are moving in opposite directions each with a speed 0.9c.Calculate the relative velocity of B with respect to A.

16. Describe Cepheid variables and their period – luminosity relation

17. Briefly describe (a) globular clusters (b) planetary nebulae.

18. Explain the ageing of twins quantitatively.

19. Explain gravitational red shift and blue shift.

(Ceiling –30)

SECTION C – Essay type

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

20. Describe the Michelson – Morley experiment and explain the null result obtained

21. Sketch an H-R diagram and write down all informations that we obtain from it.

(1 x 10 = 10 marks)

47

1B6A22062

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2022

BPH6B12 - Nuclear Physics & Particle 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 do you meant by Q value of a nuclear reaction?
2. What is Mossbauer Effect?
3. How can you utilize cadmium in nuclear reactor?
4. Short note on PET scanning
5. What is tokomak?
6. What are Lawson's criteria?
7. What are the disadvantages of cloud chamber?
8. Draw the schematic diagram of spark chamber and label it?
9. Why the scintillation counter is so called?
10. What is the difference between electron and proton synchrotron?
11. State CPT theorem?
12. How do you differentiate between Leptons and Hadrons?

(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. What are magic numbers? What are the merits and demerits of shell model ?
14. Explain proton - proton reaction cycle with an example.
15. How does alpha emission is used in smoke detectors?

16. Briefly explain a Geiger – Muller counter. What is its main draw back?

17. Explain with neat diagram the working of a cyclotron?

18. In a drift tube portion of a linear accelerator, protons are accelerated from 0.75 MeV to 100MeV. AC Voltage applied has a frequency of 200MHz. Find the length of the first and last drift tube.

19. Determine whether the following reactions are allowed or forbidden?

$$p + p \rightarrow K^+ + \Sigma^+$$

$$p + p \rightarrow p + p + p + \bar{p}$$

$$\pi + n \rightarrow \Lambda^0 + K^+$$

(Ceiling – 30)

SECTION C – Essay type

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

20. Explain the Gamow theory of Alpha decay.

21. Explain the classifications of elementary particles. Discuss the conservation laws in particle interaction.

(1 x 10 = 10 marks)

98

1B6A22061

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2022

BPH6B11 - Statistical Physics, Solid State Physics, Spectroscopy & Photonics

(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. What is induced emission?
2. Write any two differences between laser beam and ordinary light beam.
3. Among stoke lines and anti-stoke lines, which lines are more intense? why?
4. Draw (3 2 1) plane in a cubic cell.
5. What is Doppler broadening?
6. What are prolate and oblate symmetric top molecules? Also give examples for both.
7. Draw the block diagram of an absorption spectrometer suitable for the microwave and radiofrequency regions.
8. Why does the rotation of a diatomic molecule like H_2does not produce any spectrum?
9. What is the significance of zero-point energy?
10. What are hot bands?
11. Explain the term primitive cell?
12. Distinguish between microstate and macro state of a system.

(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. Discuss the rotational spectrum of a rigid diatomic molecule.
14. Prove that crystals cannot have fivefold symmetry.
15. Describe the working of semiconductor laser.
16. Discuss briefly the structure of diamond.
17. Explain Raman effect using Quantum theory.

18. The spectrum of HCl shows a very intense absorption at 3668 cm^{-1}, a weaker one at 5886 cm^{-1} and a very weak one at 7843 cm^{-1}. Find the equilibrium frequency of the molecule and the an harmonicity constant. (μ of HCl= 1.63×10^{-27} kg).
19. Prove that the RMS speed(v_{rms}) is greater than the most probable speed (v_p) starting from Maxwell-Boltzmann speed distribution law.

(Ceiling-30)

Section C-Essay type

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

20. Explain the rotational - vibrational spectra of diatomic molecules.
21. Write an expression for distribution function of particles that obey Fermi-Dirac statistics, and obtain an expression for Fermi energy of a free electron gas.

(1x10=10 marks)

1B6A22060

(Pages : 2)

Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2022

BPH6B10 - Thermodynamics

(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 are the conditions for thermodynamic equilibrium?
2. Identify the type of each thermodynamic process where P, V, and T are the pressure, volume, and temperature respectively.

   a) A gas is expanded from the initial state P_1,V_1,T_1 to a final state P_2,V_2,T_2 such that there is no exchange of heat $\Delta Q = 0$.

   b) A gas is expanded from a state P_1,V_1,T_1 to another state P_2,V_2,T_1.
3. What is a path function? Give two examples.
4. Obtain the expression of work for quasistatic isothermal process.
5. What is Clausius inequality?
6. Define heat capacity of a system.
7. What is meant by Joule-Thomson coefficient?
8. Why is it impossible to create an engine with 100% efficiency?
9. What is an isentropic process? Show isentropic process on a TS diagram.
10. Write the equation for the entropy changes during an isobaric process. Explain the symbols.
11. Show that in a natural isothermal change at constant volume Helmholtz free energy decreases.
12. What are the conditions required for a change of first order?

(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. Write the differential form of First law of thermodynamics. Using First law of thermodynamics prove that $C_V = \left(\frac{\partial U}{\partial T}\right)_V$.
14. Write a short note on quasistatic flow of heat.
15. A quantity of Oxygen is compressed until its pressure is doubled. It is then allowed to expand adiabatically until its original volume is restored. Its pressure was then found to be 0.75 of the initial value. Calculate γ.
16. Explain briefly the kinetic theory of ideal gas.
17. State and explain principle of increase of entropy.
18. Derive Maxwell's second relation and give its importance.
19. An ideal heat pump is being considered for use in heating an environment with a temperature of 22^0C. What is the cold reservoir temperature if the pump is to have a coefficient of performance of 12.0?

(Ceiling-30)

Section C- Essay type

(Essays-Answer in about two pages, anyone question, Answer carries 10 marks)

20. State and prove Carnot's Theorem.
21. Derive the TdS equations and discuss the application of second TdS equation.

(1 x 10=10 marks)