

2B6A23060

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Physics Degree Examination, April 2023

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 is meant by thermodynamic system?
2. What is an indicator diagram?
3. Differentiate between intensive and extensive variables with examples.
4. What is a path function? Give examples.
5. Distinguish between C_p and C_v .
6. Compare the slopes of isotherm and adiabatic.
7. What do you mean by a throttling process?
8. Define absolute scale of thermodynamic scale.
9. Write the expression for coefficient of performance of refrigerator. Explain the symbols.
10. State Carnot's Theorem and write its corollary.
11. What is a first order phase transition?
12. What is the physical significance of thermodynamic potentials?

(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. For a perfect gas, the pressure, temperature and volume are related by $PV=RT$. What are the values of $\left(\frac{\partial P}{\partial V}\right)_T$, $\left(\frac{\partial P}{\partial T}\right)_V$ and $\left(\frac{\partial V}{\partial T}\right)_P$.
14. Establish the equivalence of Kelvin-Planck and Clausius statements.

15. Calculate the change in entropy when 10g of ice melts into water at the constant temperature. Latent heat of ice is 80 cal g^{-1} .
16. State First law of thermodynamics. Using First law of thermodynamics prove that $C_V = \left(\frac{\partial U}{\partial T}\right)_V$.
17. From Maxwell's relation deduce Clausius-Clapeyron's equation.
18. What is Gibbs free energy? Show that for isobaric -isothermal process Gibbs free energy of a system is minimum.
19. A reversible engine converts one sixth of heat in to work. When the temperature of the sink is reduced by 82°C it converts one third of the heat received into useful work. Compute temperature of source and sink.

(Ceiling-30)

Section C- Essay type

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

20. Obtain the equation of an ideal gas passes during a quasistatic adiabatic process in terms of temperature and pressure.
21. Discuss the concept of entropy. Explain the increase of entropy during an irreversible process.

(1 x 10=10 Marks)

2B6A23061

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2023

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. Distinguish between bosons and fermions.
2. Why Laser action is not possible in higher frequency ranges?
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 collision broadening?
6. What are prolate and oblate symmetric top molecules? Also give examples for both.
7. Draw the block diagram of an emission spectrometer.
8. Why the rotation of a diatomic molecule like H_2 didn't produce any spectrum?
9. What is the significance of zero-point energy?
10. What is Bravais lattice?
11. Distinguish between microstate and macro state of a system.
12. Write any two differences between Maxwell-Boltzmann statistics and Bose-Einstein statistics.

(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. Discuss briefly the structure of Sodium Chloride (NaCl).
16. Describe the working of YAG laser.
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 anharmonicity constant. (μ of HCl = $1.63 \times 10^{-27}\text{ kg}$).
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. 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.
21. Explain the rotational -vibrational spectra of diatomic molecules.

(1x10=10 marks)

2B6A23062

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Physics Degree Examination, April 2023
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. Explain the reason behind the relative abundance of Fe-56 in earth crust.
2. Calculate the radius of deuteron.
3. What is nuclear reaction cross section? What is its unit?
4. Why U^{238} is not suitable in nuclear reactor?
5. How can you produce electric power from Alpha particle sources?
6. What do you mean by enrichment of natural Uranium?
7. What are the principles of ionization chamber?
8. Draw the schematic diagram of bubble chamber and label it.
9. What is Cerenkov radiation?
10. What is the principle of Cockcroft – Walton accelerator?
11. How will you distinguish the weak force and strong force?
12. What are baryons?

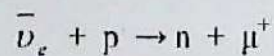
(Ceiling – 20)

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. How rock dating differ from Carbon dating ?
14. Explain the basic requirement of fusion reaction. What are the advantages of fusion reactor over fission reactor?

15. How does an over active thyroid is treated with radiation?
16. Explain briefly the neutron counting?
17. Explain the principle and construction of Linear accelerator. What are its merits and demerits ?
18. Alpha particles are accelerated in a cyclotron having dees of radius 65cm. Magnetic field across the pole pieces is 1.8 tesla. What would be the frequency of the oscillating potential applied across the dees? What is the maximum energy of alpha particle in this cyclotron?
19. Determine whether the following reactions are allowed or forbidden?



(Ceiling – 30)

SECTION C – Essay type

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

20. What are the main postulates of liquid drop model? Derive Weizsacker Semi empirical mass formula
21. Explain the quark hypothesis of hadrons. Discuss the different properties of quark with examples.

(1 x 10 = 10 marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Sixth Semester B.Sc Physics Degree Examination, April 2023

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. Obtain the Galilean transformation equations for acceleration of a particle in moving space.
2. Explain relativistic addition of velocities.
3. What is Lorentz length contraction in relativity?
4. Explain the negative result of Michelson –Morley experiment.
5. What is the concept of simultaneity in relativistic mechanics?
6. What is meant by Cosmic Microwave Background Radiation?
7. Write on the proton – proton chain reaction.
8. Distinguish between luminosity and apparent brightness.
9. Draw an H-R diagram and indicate stellar radius.
10. What is meant by the Chandrasekhar limit?
11. Write on the internal structure of the Sun.
12. Describe gravitation lensing.

(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 Einstein's mass energy relation
14. Find the fractional increase in mass of a jet plane flying at 1080 km/hr.
15. Find the velocity of the spaceship if every day spent on it may correspond to 2 days on the earth's surface.
16. Find the velocity and momentum of an electron of kinetic energy 10MeV.
17. What are binary stars? Classify and explain them.
18. How does a white dwarf evolve? Explain
19. State and explain Hubble's law.

(Ceiling –30)

SECTION C – Essay type

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

20. Obtain the Lorentz transformation equations.
21. Describe the various mechanisms possible in the death of a star.

(1x 10 = 10marks)

2B6A23064

(Pages : 2)

Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Sixth Semester B.Sc Physics Degree Examination, April 2023

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. What do you mean by a point defect? Give example.
2. What is atomic packing factor (APF)?
3. Explain Polymorphism.
4. Distinguish between screw dislocation and edge dislocation
5. Distinguish between homo polymers and copolymers?
6. What are grain boundaries?
7. What are secondary electrons?
8. Write the difference between mechanical and annealing twins.
9. Distinguish between hexagonal close packing and cubic close packing.
10. What is thermal tempering ?
11. What are refractories?
12. Distinguish between thermoplasts and thermo sets.

(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 composites? Explain its properties.
14. Distinguish between vacancy diffusion and interstitial diffusion.
15. Calculate the volume of an FCC unit cell in terms of atomic radius R .

16. In terms of bonding explain why silicate materials have relatively low densities?
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. Compute its theoretical density and compare the answer with its measured density

(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. With the help of a neat diagram explain steady state diffusion in detail.

(1×10 = 10marks)