

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, January 2023

Programme: M.Sc. Physics

Session: 2022-23

Semester : III

Max. Time: 3 Hours

Course Title: Nuclear Physics

Max. Marks: 70

Course Code: SBS PHY 01 302 CC 3104

Instructions:

1. Question no. 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.
2. Question no. 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.

Question No. 1.

(4X3.5=14)

- a) Write the configuration of protons for the nuclei $^{179}_{79}\text{Au}_{118}$ and $^{47}_{22}\text{Ti}_{25}$.
- b) Write a note on Gell-Mann-Okubo formula.
- c) List the assumptions of liquid drop model.
- d) Why Higgs particle is known as God particle?
- e) Positive scattering length mean nucleus is bounded. Comment
- f) Why nuclei have quadrupole moment?
- g) Calculate radius of $^{131}_{54}\text{Xe}$ nucleus using Ngo and LDM parameterizations.

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Question No. 2.

(2X7=14)

- a) Describe the internal conversion process in details
- b) How Wu's experiment was able to establish the beta decay process?
- c) Discuss one experimental method to determine the size of a nucleus.

Question No. 3.

(2X7=14)

- a) Show that nuclear forces are spin dependent.
- b) Describe the ground state properties of deuteron nucleus.
- c) How meson theory proved that nuclear forces are of short range?

Question No. 4.

(2X7=14)

- a) Describe the Fermi gas model for nuclei.
- b) Draw energy level diagram based on Shell model for nucleon configuration.
- c) What do you mean by nuclear fission? Describe the fragment distribution.

Question No. 5.

(2X7=14)

- a) Discuss the C and P operations. Show that CP operation violate in weak interactions.
- b) What do you mean by weak interactions? Describe the charged weak interactions.
- c) Discuss the conservation of isospin, strangeness and hypercharge with suitable examples.

CENTRAL UNIVERSITY OF HARYANA
Term End Examinations January 2023

Programme: M.Sc. Physics

Semester: III

Course Title: Research and Publication Ethics

Course Code: SBS PHY 01 306 CC 2002

Session: 2022-23

Max. Time: 1.5 Hours

Max. Marks: 35

Instructions:

1. Question no. 1 has nine parts and students are required to answer any seven. Each part carries One Marks.
2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries 3.5 marks.

Q 1.

(7X1=7)

- a) Illustrate the meaning of philosophy with a suitable example.
- b) What are moral judgments and its reaction?
- c) Explain the scientific misconduct and its types.
- d) Define citation index of a research paper.
- e) Explain the violation in publication ethics with and two examples.
- f) Distinguish between open access and predatory journals?
- g) Explain plagiarism and what tool is available to detect it?
- h) What is conflict of interest?
- i) Explain research gap with a suitable example.

Q 2.

(2X3.5=7)

- a) What are research ethics? Explain the importance with an example
- b) Discuss the Redundant publications: duplicate and overlapping publications, salami slicing.
- c) Summarize the best practice in research with an example.

Q 3.

(2X3.5=7)

- a) What is SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies? Discuss in brief.
- b) Briefly discuss two journal finder tools from reputed journals. Does it help the authors in finding the correct journal?
- c) What is SPPU? How to identify the predatory journal using UGC CARE?

(2X3.5=7)

Q 4.

- a) Discuss a case study on complaint and scientific research appeals from fraud in India and abroad.
- b) How to evaluate the nature of plagiarism for a scientific report.
- c) Interpret the subject specific ethical issues, FFP and authorship

(2X3.5=7)

Q 5.

- a) Discuss the research metrics; h index, g index, and i10 index.
- b) Summarize the indexing database and citation database with correct reference
- c) Interpret the meaning of the following terms SNIP, SJR, IIP, Cite Score and journal citation report.

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, January 2023

Programme: M.Sc. Physics
Semester: III
Course Title: Solid State Physics
Course Code: SBS PHY 01 303 CC 3104

Session: 2022-23
Max. Time: 3 Hours
Max. Marks: 70

Instructions:

1. Question number 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.
2. Question numbers 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.

Question Number 1.

(4X3.5=14)

- a) Copper has fcc structure and its atomic radius is 0.1278 nm. Calculate its density. Take the atomic weight of copper as 63.5.
- b) What is coordination number? What factors control the coordination number?
- c) Explain Wiedemann-Franz law.
- d) What is Fermi energy? Write down its relation with the concentration of conduction electrons in metals.
- e) What are Brillouin zones? What is the physical significance of the boundary of a Brillouin Zone? How are they related to the energy of an electron in a metal?
- f) How does superconducting transition temperature vary with magnetic field?
- g) Prove that the crystals cannot have five-fold symmetry.

Question Number 2.

(2X7=14)

- a) Consider the crystal structure of NaCl which is modeled as a set of touching spheres. Each Na atom has a radius r_1 and each Cl atom has a radius r_2 . The centres of the spheres form a simple cubic lattice. Determine the packing fraction of this crystal system.
- b) Obtain the vector form of Bragg's law using the concept of reciprocal lattice.
- c) Show (111) and (222) planes in a cubic unit cell of side a . Compute the distances of these planes from a parallel plane passing through the origin.

(2X7=14)

Question Number 3.

- a) What is Debye temperature? What is its significance? If a solid has Debye temperature of $2000\text{ }^{\circ}\text{C}$, what can you say about its room temperature specific heat?
- b) Describe inelastic scattering of photons by phonons. Obtain an expression for the frequency of phonons generated when a photon is scattered inelastically at an angle θ .
- c) The radii of Na^+ and Cl^- ions are 0.98 and 1.81 \AA respectively. The Young's modulus of NaCl in $[100]$ direction is $5 \times 10^{10}\text{ N/m}^2$. Assuming that the extension in $[100]$ direction produces negligible contraction in the perpendicular directions, calculate the wavelength at which the electromagnetic radiation is strongly reflected by NaCl crystal. Atomic masses of Na and Cl are 23 and 35.5 amu respectively.

Question Number 4.

(2X7=14)

- a) Discuss the motion of electrons in one-dimension according to the band theory and show the variation of energy, velocity and effective mass as a function of wave-vector.
- b) The energy of an electron in a band as a function of its wave vector k is given by $E(k) = E_0 - B(\cos k_x a + \cos k_y a + \cos k_z a)$, where E_0 , B and a are constants. Calculate the effective mass of the electron near the bottom of the band.
- c) The energy near the valence band edge of a crystal is given by $E = -Ak^2$, where $A = 10^{39}\text{ Jm}^2$. An electron with wave-vector $k = 10^{10}k_x\text{ m}^{-1}$ is removed from an orbital in the completely filled valence band. Determine the effective mass, velocity, momentum and energy of the hole.

Question Number 5.

(2X7=14)

- a) Perfect diamagnetism of a material is due to a certain electron arrangement. Do you think that this electron arrangement is compatible with zero resistance of superconductors. Why are not all diamagnetic material have zero resistance property?
- b) It is said that the phenomenon of superconductivity is analogous to the phenomenon of superfluidity in liquids. Comment.
- c) The London penetration depths for Pb at 3 K and 7.1 K are respectively 39.6 nm and 173 nm . Calculate the transition temperature as well as penetration depth at 0 K .

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations January 2023

Programme: M.Sc. Physics

Session: 2022-23

Semester: Third

Max. Time: 3 Hours

Course Title: Atomic, Molecular Physics & Lasers

Max. Marks: 70

Course Code: SBS PHY 01 301 CC 3104

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4 x 3.5 = 14)

- a) Explain the spatial and temporal coherence with examples.
- b) Define Q-switching and mode locking. What are the different techniques used for Q-switching?
- c) State and prove Bohr's quantization law of angular momentum.
- d) How many revolutions does an electron in the $n=2$ state of a Hydrogen atom make before dropping to the $n=1$ state? The average lifetime of an excited state is 10^{-8} s. Given that $R_{\infty} = 1.097 * 10^7 \text{ m}^{-1}$.
- e) The lithium atom has one 2s electron outside a filled inner shell. Its ground state is $^2S_{1/2}$. What are the term symbols of the other allowed states? Why would we think that the $^2S_{1/2}$ state is the ground state?
- f) What is the Paschen-Back effect?
- g) The fundamental mode of HCl occurs at 2886 cm^{-1} . Predict the frequency of the corresponding mode of DCl.

Q 2. (2 x 7 = 14)

- a) Explain Bohr's correspondence principle. Prove that for very large quantum numbers, the quantum theory frequency and the classical orbit frequency become equal.
- b) In a transition to a state of excitation energy 10.19 eV, an hydrogen-like atom emits a 4890 \AA photon. Find the binding energy of the initial state.
- c) What is the meaning of degeneracy of elliptic orbits in Sommerfeld theory of elliptic orbits? Discuss Hydrogen atom fine spectra with relativistic correction to energy levels of an atom using Sommerfeld theory.

(2 x 7 = 14)

Q3.

a) Determine the possible terms of one-electron atom corresponding to $n=3$ and compute the value of total electronic angular momentum for the state ${}^2D_{5/2}$ and angle between \vec{L}

and S -vectors for the term ${}^2D_{5/2}$.

b

b) Explain Born-Oppenheimer approximation in detail.

c) Discuss Anomalous Zeeman Effect. Describe the Zeeman splitting pattern of resonance lines of Sodium.

Q 4.

(2 x 7 = 14)

a) The OH-radical has a moment of inertia of $1.48 \times 10^{-47} \text{ kgm}^2$. Calculate its internuclear distance. Also, calculate its angular momentum and angular velocity for $J=5$. Determine the energy absorbed in the $J=5 \rightarrow J=6$ transition in cm^{-1} and in joule.

b) What is the Raman effect? Give its quantum theory. What light does it throw on the structure of molecules?

c) What are Stokes and anti-Stokes lines? Obtain expression for frequency shift of rotational Raman lines.

Q 5.

(2 x 7 = 14)

a) What are three level and four level laser systems? Discuss the principle, construction, and working of He-Ne Laser.

b) What do you understand by the Einstein Coefficients? Explain their physical significance.

c) What are transition probabilities? Obtain a relation between the transition probabilities

of spontaneous and induced emissions. Prove that $B^{A_{21}} = \frac{8\pi h^3 \nu^3}{c^3}$.

$$\frac{A_{21}}{B_{21}} = \frac{8\pi h^3 \nu^3}{c^3}$$

Central University of Haryana

Term End Examination January 2023

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Programme: Journalism and Mass Communication

Semester: III

Course Title: Film Appreciation

Course Code: SHSS DJMC 010324 GEC 3104

Session: 2022-2023

Maximum Time: 03 Hour

Maximum Marks: 70

Category: GEC

Please Note:

1. Section No. 1 has seven questions and students are required to answer any four. Each question carries three and half (3.5) Marks.
2. Section No. 2 to 5 have three Questions each and students are required to answer any two questions from each section. Each question carries Seven (7) Marks.

~~Section 1. Write short notes on:~~

~~Q. a. Film as a medium of expression?~~

~~Q. b. World Cinema.~~

~~Q. c. What do you mean by OTT?~~

~~Q. d. Write a short note on 'Mise-en-scene'.~~

~~Q. e. Film Festivals.~~

~~Q. f. Note on Regional cinema with example~~

~~Q. g. Define CBFC.~~

~~Section 2.~~

~~Q. a. Write a note on film genres?~~

~~Q. b. Write comprehensively about the Semiotics in films.~~

~~Q. c. Write an exclusive note on narrative forms of films?~~

~~Section 3.~~

~~Q. a. Write an extensive note on 'National Cinema'~~

~~Q. b. 'South Indian Cinema achieving a place in main stream cinema', comment.~~

~~Q. c. Write a note on 'Film Movement in India' and its relevance.~~

~~Section 4.~~

~~Q. a. What is 'Montage'? Explain in detail.~~

~~Q. b. Write a comprehensive note on Diegetic elements in films?~~

~~Q. c. Define different Camera shots in films?~~

~~Section 5.~~

~~Q. a. Write down the review on a Hindi feature film of your choice.~~

~~Q. b. What are the National Film Awards?~~

~~Q. c. Write down a note on National film festival of your choice.~~