Code No. : S-353

Annual Examination - 2019

B.Sc. Part - III

PHYSICS

Paper - I

RELATIVITY, QUANTUM AND NUCLEAR PHYSICS

Max.Marks : 50

Time : 3 Hrs.   Min.Marks : 17

Vhi % [k.M ^v* eanl vfry?k¡kjh iz'u g¨a] ftlg¡gagy djuk vfuok;Z g¨A [k.M
^c* ea y?k¡kjh ç'u ,oa [k.M ^l * eank?k½mŸkjh ç'u g¨A [k.M ^v* dks
lcl igysgy djA

Note : Section 'A', containing 10 very short-answer-type questions, is compulsory.
Section 'B' consists of short-answer-type questions and Section 'C'
consists of long-answer-type questions. Section 'A' has to be solved first.

Section - 'A'

fuEukf¡dr vfry?k¡kjh ç'uka ds mŸkj ,d ;k nks okD;ka ea ¨nA

**Answer the following very short-answer-type questions in one or two
sentences.   (1x10=10)**

ç'u 1- ekbdyl u&ekysds iz;¨x ds __.kkRed ifj.kke D;k gSA

What is the negative result of Mickelson Morley Experiment?

ç'u 2- fnd&dky fun¶kkd dsfy, y¨Ut : i¡kUrj.k lehdj.k fyf[k, A

Write the Lorentz transformation relations for space-time co-ordinates.

ç'u 3- Dok.Ve ;kf=dh fdl idkj dsd.kka dsfy, ykxwgksrh gS\

Quantum Mechanics is valid for what type of particles?

ç'u 4- Mh&czxyh lehdj.k D;k gSA

What is De-Broglie's equation?

P.T.O.

प्रश्न 5- jkf'k $\int |\psi|^2$ D;k 0;Dr djrh gS\

What does the quantity $\int |\psi|^2$ represent?

प्रश्न 6- Dok.Ve ;k="dh dsvuqlkj ljy vkorZxfr dj jgsd.k dsmtkZLrj dSls gksrs gS\

What type of energy level does a simple harmonic oscillator have?

प्रश्न 7- bysDVªksu dk pØ.k dks<h; laox (p_s) fdruk gksrk gS\

What will be the spin angular momentum (p_s) of an electron?

प्रश्न 8- ,d v.kq dk dkEifud ÅtkZLrj dSlk gksrk gS\

What will be the type of spectra does the vibrational energy level has?

प्रश्न 9- ukfHkd dk n|;eku La[;k fdls dgrsgS\

Define mass number of the nucleus?

प्रश्न 10- β &d.k mRltZd dk vf/kdkak o.kØe dSlk gksrk gS\

What type of spectrum does the β -emmitter's mostly have?

Section - 'B'

fuEukafdr y?kq mÙkjh; ç'uksa ds mÙkj 150&200 'kCn lhek eas na
Answer the following short-answer-type questions with word limit 150-200   (3x5=15)

प्रश्न 1- vkis{kdh; ij yEckbZ ds ladqpu dk rkRi;Z D;k gS\ lw= LFkkfir dhft, A

What is meant by length contraction? Derive the expression?

OR

vkbULVhu dk nª;eku mtkZ lacak fuxfer dhft, A

Derive Einstein's mass energy relation.

प्रश्न 2- lykad dk Dok.Ve fl)kar D;k gS\ le>kb;sA

What is Planck's Quantum theory? Explain.

OR

ljy vkorZl nksy= ds fy, JksfMaxj lehdj.k fyf[k, rFkk bl gy dhft, A fl) dhft, fd nksy= dsÅtkZLrj fofo/r rFkk lenwjLr gksrs gS A

Write down the Schrodinger's equation for a simple harmonic oscillator and solve it. Show that the energy levels of the oscillator are discrete and equidistant.

प्रश्न 4- gkbMªkstu rFkk M+;wVªku ijek.kq dso.kØe eaD;k varj gS\ bl dh 0;k[;k dhft, A

How does the spectrum of deutron differ from that of hydrogen atom? Explain.

OR

jeu izHkko D;k gS\ jeu js{kkvksadh fo'ks"krk,¡ fyf[k, A jeu izHkko dh izdk'k ds Dok.Ve fl)kar }kjk 0;k[;k dhft, A

What is Raman Effect? What are the characteristics of Raman lines? Explain Raman Effect by Quantum theory of light.

प्रश्न 5- iLQqj.k x.kd dk fl)kar] lajpuk ,oa dk;Zfof/k l e>kb;, A

Describe the principle, construction and working of scintillation counter.

OR

jsM;ks,fDVo {k; lavki D;k l e>rsgksA jsM;ks,fDVo fo?kVu dk fu;e fyf[k, ,oa n'kkb, fd ;g fØ;k pj?kkrkadh gksrk gS A

What do you mean by radioactive decay? State the law of radioactive decay and show that this is exponential.

---x---

OR

nÒ; rjaxka dsfy, Mh&czXyh dh rjax ifjdYiuk D;k gS\ leerd dks fuxfer dhft,A

What is De-Broglie's Hypothesis for matter waves? Derive the expression.

ç'u 3- rjax Qyu dh ifjHkk"kk nrsgq] dky vkfJr JkfMaxj lehdj.k dh LFkkiuk dhft,A

Define wave function and derive Schrodinger's time independent wave function.

OR

iR;k'kh ekuka dk Hkkofrd vFkZ D;k gS\ fdlh xfrd pj ds iR;k'kh eku dsfy, lw= fyf[k, A

What is the physical meaning of expectation value? Write expression for expectation value of a dynamical variable.

ç'u 4- ikWyh dk viotZu fl)kar D;k gS\ la{ksi esa fyf[k, A

What is Pauli's exclusion principle? Write in brief.

OR

$L - S$;qXeu dh la{ksi esa 0;k[;k dhft, A

Explain $L - S$ coupling in brief.

ç'u 5- ;kSfxd ukfHkd vfHkfØ;k dh vo/kkj.kk dks ,d mnkgj.k nrsgq la{ksi esa fyf[k, A

Explain the concept of compound nucleus formation in brief giving one example.

OR

U;fÛVªuks rFkk ifr&U;fÛVªuks ifjdYiuk ds vk/kkj ij β &{k; dh 0;k[;k dhft, A

Explain β -decay on the basis of neutrino and anti-neutrino.

Section - 'C'

fuEukafdr nh?kZ mŸkjh; ç'uksa ds mŸkj 300&350 'Kn lhek eaa na

Answer the following long-answer-type questions with word limit 300-350 (5x5=25)

ç'u 1- ykWjsUtk : ikUrj.k lehdj.kka dk fuxeu dhft, A

Derive Lorentz transformation equation.

OR

¼v½ le{kf.kdrk dh vif{kdrk dh 0;k[;k dhft, A

Discuss the simultaneity of events.

¼c½ yEckbZ eal dpu Isvki D;k le>rs gaŇ isekf.kr dhft, A

What do you understand by length contraction? Prove it.

ç'u 2- DokUVe ;kaf=dh ds vfHkx`ghrka dks fyf[k, rFkk le>kb;A rjax Qyu dh ikf;d 0;k[;k dhft, A

Write down the postulates of quantum mechanics and explain them. Explain the probabilistic interpretation of wave function.

OR

nŇ; rjaxs D;k gaŇ Msfoluuu o xejd dsi z;ksx dk o.kiu dhft, A blls crk.k dh rjax iÑfr fdl izdkj fl) gksrh gSŇ

What are matter waves? Describe Davission and Germer's Experiment. How the wave nature of a particle is proved by this experiment?

ç'u 3- vk;rkdkj foHko Isksiku ij vkifrr d.k ds fy, JkfMaxj lehdj.k fyf[k, rFkk bllsgy dhft, A ;fn $E < V_0$ gksrks ikjxeu xqkkad dk 0;atd 0;aiUu dhft, A

Write down the Schrodinger wave equation for a particle incident on a rectangular potential step. If $E < V_0$ then find the expression for transmittance coefficient.