



UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig.

Roll No. in Words.

PAPER: Nuclear Physics-I

MAX. TIME: 15 Min.

Course Code: PHY-403 Part-I (Compulsory)

MAX. MARKS: 10

Signature of Supdt.:

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

(i)- Each nucleon in a nucleus interacts chiefly with the general force field produced by all other nucleons. This is assumption of:

(a) liquid drop model

(b) shell model

(c) collective model

(d) all of above

(ii)- The ionization energy of an atom as compared to binding energy of its nucleus is:

(a) greater

(b) same

(c) less

(d) none of above

(iii)- The existence of neutrino was postulated to explain the contradictions in law / laws of conservation of:

(a) energy

(b) momentum

(c) mass

(d) both a and b

(iv)- If a radioactive nuclide ${}_Z^A X$ decays by emitting a gamma ray, then the resulting nuclide has:

(a) a different Z value

(b) the same Z and A values

(c) a different A value

(d) none of these

(v)- If electric dipole field has odd parity then magnetic dipole field will have ---- parity.

(a) even

(b) odd

(c) mixed

(d) zero

(vi)- In scintillation counter, electrons are accelerated by:

(a) electric field

(b) magnetic field

(c) oscillating field

(d) both a and b

(vii)- Number of protons in a nucleus is called its:

(a) mass number

(b) atomic number

(c) quantum number

(d) none of above

(viii)- For spherically symmetric charge distribution, electric quadrupole moment is:

(a) positive

(b) negative

(c) zero

(d) not predicted yet

(ix)- Nuclear forces are:

(a) charge independent

(b) spin dependent

(c) short range

(d) all of above

(x)- In cyclotron, the frequency of rotation of charged particle decreases as the velocity:

(a) increases

(b) decreases

(c) remains constant

(d) none of above



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PAPER: Nuclear Physics-I

Course Code: PHY-403 Part – II

MAX. TIME: 2 Hrs. 45 Min.

MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q. 2: Write short answers of following questions. (10 x 2 = 20)

(i)- The nucleons constantly emit and absorb pions. Why the neutrons and protons are never found with other than their usual masses?

(ii)- Explain why the sum of masses of two protons and two neutrons is not equal to the mass of alpha particle.

(iii)- Give a comparison of proportional and ionization chambers.

(iv)- What are the limitations of nuclear emulsion technique?

(v)- Why neutron number tends to exceed proton number in stable nuclei?

(vi)- The observed spin of ${}^7\text{N}^{14}$ is \hbar . Show that it cannot be explained on electron-proton model of nucleus.

(vii)- What are achievements and failures of shell nuclear model?

(viii)- What is meant by range of alpha particles? On what factors it depend upon?

(ix)- Electrons as such do not exist in the nucleus. What then is the cause of beta decay?

(x)- Can a cyclotron be used to accelerate electrons? If not, why?

Q. 3: (a)- What is meant by magnetic dipole moment? By giving an example show that magnetic moments are not additive. 01 + 02

(b)- Give principle, construction and working of synchro-cyclotron. 01 + 03 + 03

Q. 4: (a)- Discuss Fermi theory of beta decay and calculate momentum and energy distributions of emitted electrons. Draw the expected shape of these distributions and also draw Fermi-Kurie plot. 06

(b)- Highlight the achievements and failures of liquid drop model. Also give similarities between nucleus and liquid drop model. 04

Q. 5: (a)- How Gamow-Gurney-Condon theory explains the problems of alpha decay raised by classical theory? 05

(b)- What is proton-proton scattering? What does information it give about nuclear forces? Also differentiate between proton-proton and neutron-proton scattering. 05