B. Sc. (CBCS) (Sem. VI) Examination

April / May – 2015

Physics : Paper - 601

(Nuclear Physics & Space Physics)

Faculty Code : 003

Subject Code : 001601

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1) Write answers of Question - 1 (MCQs) in the main answer book.

(2) Symbols and notations have their usual meaning.

(3) Total marks of the question are indicated on the right side of the question.

(4) Attempt as many questions as instructed in the main question.

1   Select correct answer from the given options for the   **20**
following questions :

(1) Bevatron mainly refers to
(A) Electron synchrotron   (B) Proton synchrotron
(C) Linear accelerator   (D) None of these

(2) Betatron mainly refers to
(A) Electron acceleration   (B) Proton acceleration
(C) Linear accelerator   (D) None of these

(3) What distance must be passed by Gamma rays in water in order to lose 1% of their total intensity. (Linear attenuation factor of Gamma rays for water is $5m^{-1}$).
(A) 1.2 m   (B) 1.2 cm
(C) 0.92 m   (D) 0.92 cm

(4) In the intensity attenuation equation $I = I_0 e^{-\mu x}$, μ refers to

(A) Mass absorption coefficient

(B) Linear absorption coefficient

(C) Intensity of Radiation

(D) Width of the material

(5) For the detection of Neutrons in ionization chambers the following gas is more convenient.

(A) Krypton (B) Xenon

(C) Boron Trifluoride (D) Neon

(6) $^{11}_{3}Li + ^{1}_{1}H \rightarrow 2^{4}_{2}He$ is an example of transmutation by

(A) Protons (B) Alpha particles

(C) Neutrons (D) Deuterons

(7) When Beryllium target is bombarded with high energy electrons, _____ is ejected.

(A) Neutron (B) Electron

(C) Proton (D) Deuteron

(8) $^{2}_{1}H + \gamma \rightarrow ^{1}_{1}H + ^{1}_{0}n$ is an example of which type of nuclear process.

(A) Radiative capture (B) Elastic scattering

(C) Photodisintegration (D) Inelastic scattering

(9) In fission reaction of Uranium 232, the energy carried by emission of neutrons, Gamma rays, Beta rays and Neutrinos is approximately_____ of the total energy released.

(A) 80% (B) 50%

(C) 40% (D) 20%

(10) The theory of Liquid drop model of nuclear fission reaction was mainly developed by

    (A) Prof. Paul Dirac

    (B) Prof. Bohr and Prof. Wheeler

    (C) Madam Curie

    (D) Prof. Meghnad Saha

(11) The magnetic confinement of the PLASMA for fusion reactions to take place is known as

    (A) Fast breeder Reactor   (B) Thermal Nuclear reactor

    (C) Inertial confinement   (D) Tokamak

(12) The antiparticle of Electron is known as

    (A) Protons   (B) Positron

    (C) Neutron   (D) Antielectron

(13) Electrons are member of which of the following groups of particles ?

    (A) Leptons   (B) Mesons

    (C) Hyperons   (D) Baryons

(14) Pions are member of which of the following groups of particles ?

    (A) Leptons   (B) Mesons

    (C) Hyperons   (D) Baryons

(15) In HR diagram the term HR stands for

    (A) Hertz-Rontgen   (B) Hertzsprung-Russel

    (C) High-Radar   (D) Heavy-Remote

(16) If the colour of the star is Blue then its temperature is in the range of

(A) 30000-50000 K   (B) 3000-5000 K

(C) 300-500 K   (D) None of these

(17) The Sun is classified under which of the following spectral classes ?

(A) A   (B) B

(C) G   (D) K

(18) What is the least number of satellites required to determine the Geo-positioning of object is

(A) One   (B) Two

(C) Three   (D) Four

(19) Which one is the densest of the following :

(A) Neutron star   (B) White dwarf

(C) Red Giant   (D) Black Hole

(20) The Sun produces energy with which of the following reaction processes :

(A) Fission reactions   (B) Fusion reactions

(C) Atomic reactions   (D) Molecular reactions

2 (a) Write short answers to **any three** of the following : 6

   (1) Explain Transuranic elements.

   (2) Explain the interaction of heavy charged particles with matter.

   (3) State the major differences in the interaction of electrons with matter than interaction of heavy charged particles with matter.

   (4) Name different types of nuclear reactions.

   (5) State the different types of conservation laws followed in nuclear reactions.

   (6) Give definitions of Nuclear Fission and Fusion reactions.

(b) Write answers to **any three** of the following : 9

   (1) Explain the synchrocyclotron in brief.

   (2) Explain in brief the photoelectric effect.

   (3) Explain in brief the Compton effect.

   (4) Short note on Rutherford experiment.

   (5) Short note on Endoergic reaction.

   (6) Discuss in brief the energy released in fission of 1kg of $^{235}_{92}$U nuclei.

(c) Write answers to **any two** of the following : 10

   (1) Discuss in detail the construction and working of Proton synchrotron.

   (2) Explain the construction and working of GM counter.

(3) Explain the construction and working of IONIZATION chamber.

(4) Explain in detail the q-value equation for a nuclear reaction.

(5) Explain in detail the Nuclear Reactors with the elements they mainly consist.

3 (a) Write short answers to **any three** of the following :   **6**

(1) Explain breifly the Fusion reaction with example.

(2) Explain in brief the concept of antimatter.

(3) Give the names of different fundamental interactions with their range of action.

(4) Give the names of different types of Galaxies.

(5) Explain brightness of stars.

(6) Name the practical applications of Remote Sensing technology.

(b) Write answers to **any three** of the following :   **9**

(1) Discuss the various methods for PLASMA confinement.

(2) Discuss the conservation laws and symmetries in respect of particle physics.

(3) Discuss the concepts of Particles and Antiparticles with examples.

(4) Explain Neutron Stars.

(5) Explain Black holes in brief.

(6) Explain in brief the energy interaction of radiation with Earth's surface.

(c) Write answer to **any two** of the following : **10**

    (1) Explain the Pressurized Water reactor and Boiling Water reactor in brief.

    (2) Explain in detail the Quark Model with reference to particle physics.

    (3) Explain in detail the physics involved in the birth of Star.

    (4) Explain the HR diagram in detail.

    (5) Explain in detail the Global positioning system.

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