



BBF-003-001601 Seat No. _____

B. Sc. (Sem. VI) Examination

July - 2021

Physics : Paper-601

(Nuclear Physics and Space Physics)

(Old Course)

Faculty Code : 003

Subject Code : 001601

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Symbols have their usual meanings.
- (3) Figures to the right indicate marks.

1 Answer in short : 20

- (1) Which particle is accelerated to high energies through betatron ?
- (2) Synchrocyclotron consists of _____ dee placed in a vacuum chamber.
- (3) Cosmotron is a machine which can produce a particle of energy _____.
- (4) In a case of β -particle, range is less than actual travel distance. (True/False)
- (5) In a process of pair production, the γ -rays disappears and is converted to _____ and _____ pair.
- (6) Platean curve of G.M. counter is a plot between _____ and counting potential.
- (7) In photo multiplier electrode is called _____.
- (8) In Rutherford's artificial transmutation, the range of α -particle is about _____ cm.
- (9) ${}_6C^{12} + \times \rightarrow {}_0n^1 + {}_7N^{13}$ what is \times ?

- (10) In elastic scattering there is increases in energy of incident particle. (True/False)
- (11) If Q -value of reaction is positive then the reaction is _____.
- (12) Bohr and wheeler's theory of nuclear fission is based on _____ model.
- (13) 1 amu = _____ MeV.
- (14) If multiplication factor $K < 1$, then reactor is in sub critical state. (True/False)
- (15) Atom bomb is the example of _____ chain reaction.
- (16) Larger the size of the body smaller is the escape rate. (True/False)
- (17) Natural uranium contain _____ % U^{235} .
- (18) Basically how many types of quarks ?
- (19) Parsec is a unit of which quantity ?
- (20) Red dwarf has luminosity _____ than our sun.

2 (A) Attempt any **three** in brief :

6

- (1) What is photo electric effect ?
- (2) What is plauto in voltage characteristics of G.M. counter ?
- (3) What is artificial transmutation ?
- (4) State a (p, d) reaction.
- (5) What is nuclear fission ?
- (6) What is threshold energy ?

(B) Attempt any **three** : **9**

- (1) Obtain the condition of Betatron.
- (2) Describe Compton effect.
- (3) Determine the product nuclei and Q -value of reaction $\Delta 1^{27}(d, \alpha)$, masses of $\Delta 1^{27}Mg^{25}$, α and d are 26.9901, 24.9936, 4.0039 and 2.0147 amu respectively.
- (4) Classify the reaction on the basis of energy balance.
- (5) What are the causes of neutron loss in nuclear reactor ?
- (6) Why do quarks in hadrons have different colours ?

(C) Attempt any **two** in detail : **10**

- (1) Describe with typical examples, the types of nuclear reactions.
- (2) Explain the alternating gradient accelerator.
- (3) Write note on elementary particle quantum numbers.
- (4) Give brief description of main elements of nuclear reactors.
- (5) Explain tokamak.

3 (A) Attempt any **three** in brief : **6**

- (1) What is the fusion reaction ?
- (2) What is multiplication factor ?

- (3) Which are the main two groups of elementary particles ?
- (4) What are the estimated masses of white dwarfs ?
- (5) Which noticeable event occur in red giant ?
- (6) Which of the following are called hadrons ? Leptons, Baryons, hyperons, mesons.

(B) Answer any **three** : **9**

- (1) Which three processes occurs due to absorption of γ -ray by matter.
- (2) Draw voltage characteristics of G.M. counter and analyze it.
- (3) Explain magnetic bottle.
- (4) Give classification of supernovae.
- (5) Describe the elementary particle Baryons.
- (6) Give uses of nuclear reaction.

(C) Attempt any **two** in detail : **10**

- (1) Explain particle and anti particle.
 - (2) What is black hole ? Classify them.
 - (3) What is stellar spectra ? Explain in detail.
 - (4) What is Hertzsprung Russell diagram ? Explain various sequences of stars.
 - (5) Explain in detail the physics involved in the birth of star.
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