28/11/19

VCD F.Y.B.Sc SEM-I Regular+ATKT PHYSICS-II 2019-20 100 MARKS 3 HRS

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Note: (1) All questions are compulsory.

(2) Figures to the right indicate maximum marks.

(3) Use of non-programmable calculators is permitted.

(4) Symbols used have their usual meaning.

Q.1 (A) Select the Correct Option (12)

1) The rate of disintegration of a given sample of radio nuclides of 10^{17} atoms/s and half-life is 1445 years. Then number of atoms is_____ .

(a) 1.44×10^{17} (b) 1.4×10^{17} (c) 6.57×10^{27} (d) none of these

2) The inverse of pair production processes is called _____.

(a) pair formation (b) pair annihilation (c) both (a) and (b) (d) none of these

3) In the following reaction, X-_____ ${}^{16}_{8}O + {}^{2}_{1}H \longrightarrow X + {}^{3}_{1}H$.

(a) ${}^{16}_{8}O$ (b) ${}^{15}_{8}O$ (c) ${}^{15}_{7}N$ (d) none of these

4) For an exothermic nuclear reaction, Q_____0.

(a) $\leq$ (b) $\geq$ (c) = (d) none of these

5) In Davisson and Germer experiment, $\theta = 50$ and lattice constant d = 2.15 A°, then λ is

(a) 2.30 A° (b) 1.65 A° (c) 1.1 A° (d) none of these

6) In stars like the sun,_____reaction occurs.

(a) nuclear fission (b) nuclear fusion (c) elastic scattering (d) pickup reaction

Q.1) (B) Answer in one statement: (03)

1) What is the ratio of nuclear densities of two nuclei having mass number in the ratio1:4?

2) Define nuclear fusion.

3) State Bragg's law?

Q.1) (C) Fill in the blanks: (05)

1) Beta particles originate in the _____of an atom.

2) The missing radioactive series has mass number _____.

3) For perfectly_____, the coefficient of absorption is 1.

4) The simultaneous error in measurement of energy and _____of the particle will be the order of plank's constant.

5) The Compton shift is independent of the _____of the incident radiation.

Q.2) A) Attempt any one: (08)

1) Describe Rutherford's alpha particle scattering experiment to give an idea about the size and density of the nucleus.

2) In radioactive series consisting of parent daughters table nuclides (A-B-C) , write the number of nuclei at given time of each nuclide and discuss the following cases : a) parent is very much longer lived the daughter b) parent is longer lived than daughter.

Q.2) B) Attempt any one: (08)

1) Explain the process of carbon dating. How can the age of geological sample be determined?

2) Draw a graph showing the variation of the binding energy per nucleon with the mass number. What are the main inferences from the graph? Explain, with the help of this plot, the release of energy in the process of nuclear fission and fusion.

Q.2) C) Attempt any one: (04)

1) What activity in dis. /min gm. would be expected for carbon sample from bones that are said to be 2000 years old? Activity of C^{14} in living plant = 15 dis. /min gm; T = 5570 years.

2) A piece of wood weighs 50 gms and shows C^{14} activity of 320 dis./min. estimate the length of time which has elapsed since this piece of wood was part of living tree, assuming that living plants show an activity of 12 dis./min gm . T = 5730 years.

Q.3) A) Attempt any one: (08)

1) With the help of neat diagram, explain the construction and working of proportional counter.

2) Define Q- value of the nuclear reaction. Obtain an expression for Q – equation.

Q.3) B) Attempt any one: (08)

1) Explain the interaction between particles and matters.

2) State and explain the various laws of conservation on which the balancing of nuclear reaction occurs.

Q.3) C) Attempt any one: (04)

1) Find the quantity of energy released in KWhr by 1 gram of uranium, if one atom of ^{235}U releases the energy of 200 MeV in nuclear fission reaction.

2) Find the energy release when two deuterium nuclei is fuse to form a particle.

Given: atomic mass of deuterium = 2.014102 a.m.u., mass of helium = 4.002603 a.m.u.

Q.4) A) Attempt any one: (08)

1) Derive an expression for shift in wavelength in Compton Effect.

2) Explain how X-ray are produced used Coolidge tube.

Q.4) B) Attempt any one: (08)

1) Define gravitational red shift and find expression for it.

2) Explain Bragg's spectrometer and how it is used for verification of Bragg's law.

Q.4) C) Attempt any one: (04)

1) Calculate the critical voltage required to stimulate emission of characteristics lines of K- series in tungsten, if K absorption edge is 1 A°.

2) Calculate the wavelength of scattered photon at 45° by X- ray of wavelength 6×10^{-7} m in carbon atom.

Q.5) Attempt any four: (20)

1) Explain the terms: a) disintegration constant b) half- life c) mean life of a radioactive element and write relation between them.

2) Write short note on radioactive series.

3) Write short note on bremsstrahlung process.

4) Write short note on nuclear fission

5) Explain de- Broglie concept of matter waves.

6) Describe G.P. Thomson experiment to verify dual nature of particle.