SWAMI VIVEKANADA MATRIC HR SEC SCHOOL ARUMBAVUR.

STD : XII **MARKS: 70**

SUB: PHYSICS **TIME: 3.00 HRS**

UNIT TEST -9 (2022- 2023)

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PART - A

CHOOSE THE BEST ANSWER: **10 X 1 = 10**

1. Atomic number of H-like atom with ionization potential 122.4 V for *n* = 1 is

(a) 1 (b) 2 (c) 3 (d) 4

2. The charge of cathode rays particle is (a) positive (b) negative (c) neutral (d) not defined

3. In J.J. Thomson e/m experiment, a beam of electron is replaced by that of muons (particle with same charge as that of electrons but mass 208 times that of electrons). No deflection condition is achieved only if

(a) B is increased by 208 times (b) B is decreased by 208 times

(c) B is increased by 14.4 times (d) B is decreased by 14.4 times

4. The half-life period of a radioactive element A is same as the mean life time of another radioactive element B. Initially both have the same number of atoms. Then

(a) A and B have the same decay rate initially (b) A and B decay at the same rate always

(c) B will decay at faster rate than A (d) A will decay at faster rate than B.

5. The nucleus is approximately spherical in shape. Then the surface area of nucleus having mass number A varies as (a) $A^{2/3}$ (b) $A^{4/3}$ (c) $A^{1/3}$ (d) $A^{5/3}$

6. Suppose an alpha particle accelerated by a potential of *V* volt is allowed to collide with a nucleus of atomic number *Z*, then the distance of closest approach of alpha particle to the nucleus is

(a) 14.4 $\frac{Z}{V}$Å (b) 14.4 $\frac{V}{Z}$Å (c) 1.44 .$\frac{Z}{V}$Å (d) 1.44 $\frac{Z}{V}$Å

7. In a hydrogen atom, the electron revolving in the fourth orbit, has angular momentum equal to

(a) h (b) $\frac{h}{\pi}$ (c) $\frac{4h}{\pi}$ (d) $\frac{2h}{\pi}$

8. The ratio between the first three orbits of hydrogen atom is

(a) 1:2:3 (b) 2:4:6 (c) 1:4:9 (d) 1:3:5

9. The ratio of the wavelengths radiation emitted for the transition from *n* =2 to *n* = 1 in *Li*++, *He*+ and *H* is (a)1: 2: 3 (b) 1: 4: 9 (c) 3:2:1 (d) 4: 9: 36

10. The electric potential of an electron is given by $V = V_0 \ln\frac{r}{r_0}$, where *r*0 is a constant. If Bohr atom model is valid, then variation of radius of *n*th orbit *r*nwith the principal quantum number *n* is

(a) $r_n \alpha \frac{1}{n}$ (b) $rn\alpha \frac{1}{n^2}$ (c) $r_n \alpha n^2$ (d) $r_n \alpha n$

11. If the nuclear radius of 27 Al is 3.6 fermi, the approximate nuclear radius of 64Cu in fermi is

(a) 2.4 (b) 1.2 (c) 4.8 (d)3.6

12. A radiative element has *N0* number of nuclei at t=0. The number of nuclei remaining after half of a half-life (that is, at time *t*= 1/ 2 $T_{1/2}$) (a) $N_0/2$ (b)$N_0/\sqrt{2}$ (c) $N_0/4$ (d) $N_0/8$

13. Which of the following transition will have highest emission wavelength -------?

a) n = 2 to n = 1 b) n = 5 to n = 2 c) n = 6 to n = 2 d) n = 4 to n = 1

14. Wave number is defined as number of wave -----?

a) produced in second b) in a distance of 1 m c) in a distance 3 x 10^8 m d) in a distance of λ meter

15. An alpha particle of energy 10 meV is scattered through 180^0 fixed uranium nucleus. The distance of the closet approach is the order of -----? (a) 1 Å (b) 10^{-10} m (c) 10^{-12} c m (d) 10^{-15}c m

PART - B

ANSWER ANY SIX QUESTIONS.Q.NO 22 IS COMPULSORY 6 x 2 = 12

16. What are the constituent particles of neutron and proton?
17. What is meant by activity? Give it's unit?
18. What is mass defect?
19. List out the properties of Neutrino?
20. Show that nuclear density is almost constant for nuclei with Z >10.
21. The radius of the 5th orbit of hydrogen atom is 13.25A. Calculate the de Broglie wavelength of the electron orbiting in the 5th orbit.
22. Calculate the number of nuclei of carbon - 14 un decayed after 22,920 years if the initial number of carbon - 14 atoms is 10000. The half life of carbon - 14 is 5730 years.
23. Give the results of Rutherford alpha scattering ?
24. What is binding energy?

PART - C

ANSWER ANY SIX QUESTIONS.Q.NO 32 IS COMPULSORY. 6X 3 = 18

25. Discuss alpha decay process with example?
26. What are cathode rays? Write the properties?
27. Discuss the spectral series of hydrogen atom.
28. Write down the postulates of Bohr atom model?
29. What is mean life of nucleus? Give the expression?
30. Define impact parameter?
31. Explain about energy generation in stars?
32. Find the (I) angular momentum (ii) velocity of the electron revolving in the 5 th orbit of hydrogen atom.
33. Explain the variation of average binding energy with the mass number using graph and discuss about its features?

PART - D

ANSWER ALL THE QUESTIONS. 5X 5= 25

34. Obtain the law of radioactivity (OR)
    Describe the working of nuclear reactor with a block diagram.
35. Explain the J.J.Thomson experiment to determine the specific charge of electron. (OR)
    Explain the idea of carbon dating?
36. Derive the expression for radius of n^{th} orbit of a hydrogen atom using Bohr atom model? (OR)
    Discuss the Millikan's oil drop experiment to determine the charge of an electron.
37. Briefly explain the elementary particles present in nature (OR)
    (a) Discuss the Beta decay process with example? (b) Define Curie?
38. (a) What is half life of a radioactive nucleus? Give the expression?
    (b) Define Ionization energy and potential (OR)
    (a) Explain in detail the nuclear force? (b) Write down the drawbacks of Bohr atom model