Atomic and Nuclear physics 50 Important 1 Marks Questions With Answers (Book Back and Creative)
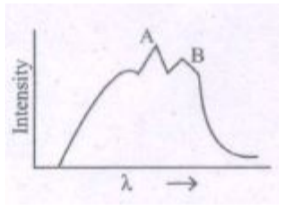
12th Standard

Physics

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) 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) $14.4\frac{Z}{V}\mathring{A}$ (b) $14.4\frac{V}{Z}\mathring{A}$ (c) $1.44\frac{Z}{V}\mathring{A}$ (d) $1.44\frac{V}{Z}\mathring{A}$

2) 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)** $\frac{2h}{\pi}$

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

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

4) The ratio between the radius of first three orbits of hydrogen atom is _____.

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

5) The charge of cathode rays particle is _____.

   (a) Positive   **(b) negative**   (c) neutral   (d) not defined

6) In J.J. Thomson e/m experiment, electrons are accelerated through 2.6 kV enter the region of crossed electric field and magnetic field of strength 3.0×10^4 Vm^{-1} and 1.0×10^{-3} T, respectively, and pass through it and undeflected, then the specific charge is _____.

   (a) 1.6×10^{10} C kg^{-1} (b) 1.7×10^{11} Ckg^{-1} **(c) 1.5×10^{11} Ckg^{-1}**   (d) 1.8×10^{11} Ckg^{-1}

7) 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**

8) The electric potential of an electron is given by $V = V_0 \, In\left(\frac{r}{r_0}\right)$, where r_0 is a constant. If Bohr atom model is valid, then variation of radius of nth orbit r_n with the principal quantum number n is _____.

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

9) If the nuclear radius of ^{27}Al is 3.6 fermi, the approximate nuclear radius of ^{64}Cu, in femi is _____.

   (a) 2:4   (b) 1.2   **(c) 4.8**   (d) 3.6

10) 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$^{5/3}$

11) The mass of a $_3^7$Li nucleus is 0.042 u less than the sum of the masses of all its nucleons. The binding energy per nucleon of $_3^7$Li nucleus is nearly _____.

    (a) 46 MeV   **(b) 5.6 MeV**   (c) 3.9 MeV   (d) 23 MeV

12) M$_p$ denotes the mass of the proton and M$_n$ denotes mass of a neutron. A given nucleus of binding energy B, contains Z protons and N neutrons. The mass M(N, Z) of the nucleus is given by _____.(where c is the speed of light)

    (a) M (N,Z) = NM$_n$ + ZM$_p$ - Bc^2 (b) M (N,Z) = NM$_n$ + ZM$_p$ + Bc^2 **(c) M (N,Z) = NM$_n$ + ZM$_p$ - B/c^2**

    (d) M (N,Z) = NM$_n$ + ZM$_p$ + B/c^2

13) A radioactive nucleus (initial mass number A and atomic number Z) emits two α-particles and 2 positons. The ratio of number of neutrons to that of proton in the final nucleus will be _____.

(a) $\frac{A-Z-4}{Z-2}$ **(b)** $\frac{A-Z-2}{Z-6}$ (c) $\frac{A-Z-4}{Z-6}$ (d) $\frac{A-Z-12}{Z-4}$

14) 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

15) A radiative element has N_0 number of nuclei at t = 0. The number of nuclei remaining after half of a half-life _____.(that is, at time t = $\frac{1}{2}T_{\frac{1}{2}}$)

(a) $\frac{N_0}{2}$ **(b)** $\frac{N_0}{\sqrt{2}}$ (c) $\frac{N_0}{4}$ (d) $\frac{N_0}{8}$

16) The ionization energy of hydrogen atom is -13.6e V. The energy corresponding to a transition between 3rd and 4th orbit is _____.

(a) 3.40 eV   (b) 1.51 eV   (c) 0.85 eV   **(d) 0.66 eV**

17) An alpha nucleus of energy $\frac{1}{2}mv^2$ bombards a heavy nuclear target of charge Ze. Then the distance of the closest approach for the alpha nucleus will be proportional to _____.

(a) v^2 **(b)** $\frac{1}{m}$ (c) $\frac{1}{v^{\$}}$ (d) $\frac{1}{Ze}$

18) An a-particle of energy 10 meV is scattered through 180º by a fixed uranium nucleus. The distance of the closest approach is of the order of _____.

(a) 1Å   (b) 10^{-10} cm   **(c) 10^{-12} cm**   (d) 10^{-15} cm

19) The fig. represents the observed intensity of X-rays emitted by an X-ray tube as a function of wavelength. The sharp peaks A and B denote _____.

(a) continuous spectrum   (b) band spectrum   **(c) characteristic spectrum**   (d) white radiations

20) Which of the following is not the property of cathode rays?

(a) It produces heating effect   **(b) It does not deflect in electric field**   (c) It travels in straight lines

(d) It produces fluorescence

21) If R is Rydberg's constant, the minimum wavelength of hydrogen spectrum is _____.

(a) 1/R   (b) R/4   (c) 4/R   (d) R

22) In a discharge tube, the source of positive rays is _____.

(a) cathode   (b) anode   **(c) gas atoms present in the discharge tube**   (d) fluorescent screen

23) If R is Rydberg constant, the shortest wavelength of paschen series is _____.

(a) R/9   **(b) 9/R**   (c) 16/R   (d) 25/R

24) The direction of deflection shows that cathode rays are _____ in charge

(a) negative   (b) positive   (c) neutral   (d) oscillatory

25) In Millikan's experiment an oil drop of mass 4.9 x 10^{-14} kg is balanced by applying potential difference of 2 kV between the two plates which are 2 mm apart. The charge of the drop is _____

(a) 1.96 x 10^{-18}C   (b) 1.602 x 10^{-19}C   (c) 12 C   **(d) 4.9 x 10^{-19}C**

26) The series obtained by the transition of the electron from n_2 = 5, 6,... to n_1 = 4 is called _____ series.

(a) Balmer   (b) Lyman   **(c) Brackett**   (d) Pfund

27) Pfund series lies in _____ region.

(a) UV   **(b) IR**   (c) X-ray   (d) visible

28) The process of giving extra energy to an electron in an orbit is called _____ of the atom

(a) grounding   **(b) excitation**   (c) sinking   (d) induction

29) α - rays consist of α - particles which are _____ nuclei.

(a) hydrogen   **(b) helium**   (c) heavy water   (d) boron

30) In the nuclear reaction $_4Be^9 + X \rightarrow {_6}C^{12} + {_0}n^1$ X stands for _____.

(a) proton   **(b) α particle**   (c) electron   (d) deutron

31) The fuel used in kamini reactor is _____.

(a) $_{92}U^{23}$ **(b) $_{92}U^{233}$**   (c) $_{92}U^{239}$ (d) low enriched Uranium

32) _____ is fissionable by neutrons of all energies.

(a) U^{235}   (b) U^{238} (c) U^{239} (d) all the above

33) To convert fertile material into fissile material, we make use of _____ reactors.

(a) research   **(b) production**   (c) power   (d) generator

34) Pressurised heavy-water reactors in our country generally use _____ as fuel.

(a) natural uranium oxide   (b) radioactive phosphorous   (c) titanium dioxide   (d) plutonium

35) Oxides of Plutonium and Uranium are used as fuel for _____ reactors.

(a) production   (b) research   (c) light water   **(d) prototype fast breeder**

36) _____ are used to control the chain reaction.

(a) Control rods   (b) Moderators   (c) Coolants   (d) Neutron source

37) Arrange electron (e), proton(p) and deuteron nucleus (d) in the increasing order of their specific charge: _____.

(a) e, p, d   **(b) d, p, e**   (c) p, e, d   (d) d, e, p

38) A narrow u electron beam passes un-deviated through an electric field E = 3 x 10^4 V /m and an overlapping magnetic field B = 2x10^{-3} Wb/m^2. The electron motion, electric field, and magnetic field are mutually perpendicular. The speed of the electron is _____.

(a) 60 ms^{-1} (b) 10.3 x 10^7 ms^{-1} **(c) 1.5 x 10^7 ms^{-1}**   (d) 0.67 x 10^{-7} ms^{-1}

39) In Millikan's oil drop experiment, charged oil drop is balanced between the two plates. Now the viscous force _____.

(a) acts downwards   (b) acts upwards   **(c) is zero**   (d) acts either upwards or downwards

40) The wavelength of radiation emitted when an electron jumps from third orbit to second orbit in hydrogen atom is _____.

(a) $\frac{36}{5R}$ (b) $\frac{5R}{36}$ (c) $\frac{6}{R}$ (d) $\frac{R}{6}$

41) Which of the following are isotones?

(a) $_{92}U^{238}$ & $_{92}U^{235}$ (b) $_8O^{16}$ & $_7N^{14}$ (c) $_6C$ 14 & $_7N$ ^{14} **(d) $_6C$ ^{13} & $_7N$ ^{14}**

42) The mass defect of $_2He^4$ is 0.03 amu. What is its binding energy per nucleon?

(a) 1 MeV   (b) 4 MeV   **(c) 7 MeV**   (d) 27 MeV

43) According to the law of disintegration $N = N_0 e^{-\lambda t}$, the number of radioactive atoms that have been decayed during a time of t is _____.

(a) N_0 (b) N   **(c) N_0-N**   (d) $N_0/2$

44) In β^- - dcay _____.

(a) atomic number decreases by one   (b) mass number decreases by one   (c) proton number remains the same

(d) neuron number decreases by one

45) Isotopes have _____.

(a) same mass number but different atomic number   (b) same proton number and neutron number

(c) same proton number but different neutron number   (d) same neutron number but different proton number

46) The mean life (τ) and half-life $(T_{1/2})$ radioactive elements are related as _____.

(a) $\tau = T_{1/2}$ (b) $\tau = 2\,T_{1/2}$ **(c) $T_{1/2} = 0.6931\tau$**   (d) $\tau = 0.6931\,T_{1/2}$

47) The unit of disintegration constant is _____.

(a) No unit   (b) Second   **(c) Second^{-1}**   (d) Curie

48) The decay constant of a free neutron is _____.

(a) 0.013 minute^{-1} **(b) 0.053 minute^{-1}**   (c) 3 minute   (d) 0.069 minute^{-1}

49) If in nuclear fusion process, the masses of the fusing nuclei be m_1 and m_2 and the mass of the resultant is m_3 then _____.

(a) $m_3 = m_1 + m_2$ (b) $m_3 = (m_1 - m_2)$ **(c) $m_3 < (m_1 + m_2)$**   (d) $m_3 > (m_1 + m_2)$

50) In Bohr Atom Model when the principal quantum number (n) increases the velocity of electron _____.

(a) increases and then decreases   (b) increases   **(c) decreases**   (d) remains constant