What is the total number of neutrons?

Atomic Models Atomic Number & Mass Number

1. The e/m ratio of cathode rays is x unit, when hydrogen is filled in the discharge tube. What will be its value when deuterium (D_2) is filled in it?
   1) x unit 2) x/2 unit 3) 2x unit 4) x/4 unit
2. α–particles are projected towards the following metals, with the same kinetic energy. Towards which metal, the distance of closest approach is minimum?
   1) $Cu(Z=29)$ 2) $Ag(Z=47)$
   3) $Au(Z=79)$ 4) $Ca(Z=20)$
3. Which of the following nuclear reactions will generate an isotope
   1)Neutron particle emission 2) Positron emission
   3) α – particle emission 4) β – particle emission
4. Chlorine exists in two forms, *Cl – 37* and *Cl – 35* but its atomic mass is 35.5. This indicates the ratio of *Cl – 37* and *Cl – 35* is approximately.
   1) 1:2 2) 1:1 3) 1:3 4) 3:1
5. The mass numbers of three isotopes of an element are 10,12,14 units.Thier percentage abundance is 80,15, and5 respectively.What is the atomic weight of the element?
   1)10.5 2)11.5 3)12.5 4)13.5
6. An ion with mass number 56 contains 3 units of positive charge and 30.4% more neutrons than electrons. Assign the symbol to this ion
   1) $^{55}_{26}Fe^{3+}$ 2) $^{57}_{26}Fe^{3+}$ 3) $^{59}_{26}Fe^{3+}$ 4) $^{56}_{26}Fe^{3+}$

Electromagnetic Radiation

7. The frequency of a wave light is $1.0\times10^{6}\,sec^{-1}$. The wave length for this wave is
   1) 3×10^{4} cm 2) 3×10^{-4} cm
   3) 6×10^{4} cm 4) 6×10^{6} cm
8. The energy per quantum associated with light of wave length 250×10^{-9} m is
   1) 7.95×10^{-19} J 2) 7.95×10^{-26} J
   3) 3.93×10^{-26} J 4) 3.93×10^{-19} J
9. What is the energy of photons that corresponds to a wave number of $2.5\times10^{-5}\,cm^{-1}$
   1) 2.5×10^{-20} erg 2) 5.1×10^{-23} erg
   3) 4.97×10^{-21} erg 4) 8.5×10^{-2} erg

Planck's Quantum Theory & Photo Electric Effect

10. Nitrogen laser produces a radiation at a wavelength of 337.1 nm. If the number of photons emitted is 5.6×10^{24}. Calculate the power of this laser
    1) $3.33\times10^{6}\,J$ 2) $3.33\times10^{5}\,J$
    3) $1.56\times10^{6}\,J$ 4) $15.6\times10^{8}\,J$
11. The ratio of energies of photons with wavelengths $2000A^0$ and $4000A^0$ is
    1) 1/4 2) 4 3) 1/2 4) 2
12. An Electro magnetic radiation of wavelength 242nm is just sufficient to ionise a sodium atom. Calculate the ionisation energy of sodium in kJ/mol?
    1) 494.5 2) 594.5 3) 694.5 4) 794.5
13. When a metal is irradiated with light of frequency $4.0\times10^{16}s^{-1}$ the photo electrons emitted had six times the K.E as the K.E of photo electron emitted when the metal was irradiated with light of frequency $2.0\times10^{16}s^{-1}$. The calculate the critical frequency of the metal.
    1) $2.0\times10^{16}s^{-1}$ 2) $1.6\times10^{16}s^{-1}$
    3) $3.0\times10^{16}s^{-1}$ 4) $4.2\times10^{16}s^{-1}$
14. In photo electric effect,if the energy required to over come the attractive forces on the electron(work function) of *Li, Na* and *Rb* are 2.41eV, 2.3eV and 2.09eV respectively, the work function of "*K*" could approximately be in eV (EAM 2012)
    1) 2.52 2) 2.2 3) 2.35 4) 2.01

H-Spectrum

15. The ratio of highest possible wavelength to lowest possible wavelength of Lyman series is
    1) 4/3 2) 9/8 3) 27/5 4) 16/5
16. If the wave number of the first line in the Balmer series of hydrogen atom is 15000 cm^{-1}, the wave number of the first line of the Balmer series of Li^{2+} is
    1) $1.35\times10^{5}\,cm^{-1}$ 2) $1.66\times10^{9}\,cm^{-1}$
    3) $13.5\times10^{5}\,cm^{-1}$ 4) $1.43\times10^{4}\,cm^{-1}$
17. What is the lowest energy of the spectral line emitted by the hydrogen atom in the Lyman series? (h=Planck's constant; C=Velocity of light; R=Rydberg constant).
    1) $\frac{5hcR}{36}$ 2) $\frac{4hcR}{3}$ 3) $\frac{3hcR}{4}$ 4) $\frac{7hcR}{144}$
18. The ionization energy of H atom is x kJ. The energy required for the electron to jump from n = 2 to n =3 will be :
    1) *5x* 2) *36x/5* 3) *5x/36* 4) *9x/4*
19. When the electron of 5th orbit jumps into the first orbit, the number of spectral lines produced in hydrogen spectrum is
    1) 5 2) 10 3) 20 4) 1
20. The Ratio of m^{th} to n^{th} wavelength of Lyman series in H-spectrum is equal to
    1) $\frac{\lambda_m}{\lambda_n}=\frac{(m^2-1)\times n^2}{(n^2-1)\times m^2}$ 2) $\frac{\lambda_m}{\lambda_n}=\frac{(n^2-1)\times m^2}{(m^2-1)\times n^2}$
    3) $\frac{\lambda_m}{\lambda_n}=\frac{(m+1)^2}{(n+1)^2}\times\frac{(n+1)^2-1}{(m+1)^2-1}$
    4) $\frac{\lambda_m}{\lambda_n}=\frac{(n+1)^2}{(m+1)^2}\times\frac{(m+1)^2-1}{(n+1)^2-1}$
21. Which of the following relationship is correct
    1) E_1 of $H=\frac{1}{2}E_2$ of $He^{+}=\frac{1}{3}E_3$ of $Li^{+2}=\frac{1}{4}$ of E_4 of Be^{+3}
    2) E_1 of $H=E_2$ of $He^{+}=E_3$ of $Li^{+2}=E_4$ of Be^{+3}
    3) E_1 of $H=2E_2$ of $He^{+}=3E_3$ of $Li^{+2}=4E_4$ of Be^{+3}
    4) E_1 of $H=\frac{2}{3}E_2$ of $He^{+}=\frac{4}{3}E_3$ of $Li^{+2}=\frac{5}{4}E_4$ of Be^{+3}
22. What is the wavelength of a photon emitted during a transition from n = 5 state to the *n* = 2 state in the hydrogen atom
    1) 434nm 2) 234nm 3) 476nm 4) 244nm
23. Which one of the following transitions of an electrons in hydrogen atom emits radiation of the lowest wavelength (EAM 2010)
    1) $n_2=\alpha\,to\,n_1=2$ 2) $n_2=4\,to\,n_1=3$
    3) $n_2=2\,to\,n_1=1$ 4) $n_2=5\,to\,n_1=3$

Bohr's Atomic Model

24. The velocity of electron in first orbit of H-atom as compared to the velocity of light is :
    1) $\frac{1}{10}th$ 2) $\frac{1}{100}th$ 3) $\frac{1}{1000}th$ 4) *Same*
25. In a collection of H-atoms, all the electrons jump from n=5 to ground level finally (directly or indirectly), without emitting any line in Balmer series. The number of possible different radiations is
    1) 10 2) 8 3) 7 4) 6
26. What is likely to be principal quantum number for a circular orbit of diameter 20.6 nm of the hydrogen atom. If we assume Bohr orbit to be the same as that represented by the principal quantum number?
    1) 10 2) 14 3) 12 4)16
27. If the radius of the first Bohr orbit of Hydrogen atom is 'x', then the de-Broglie wavelength of electron in third orbit is nearly.
    1) $2\pi x$ 2) $6\pi x$ 3) $9x$ 4) $x/3$
28. A single electron in an ion has ionization energy equal to 217.6eV. What is the total number of neutrons present in one ion of it?
    1) 2 2) 4 3) 5 4) 9
29. The ionisation energy for the Hydrogen atom in the ground state is $2.18\times10^{-18}\,Jatom^{-1}$. The energy required for the following process $He^{+}(g)\rightarrow He^{2+}(g)+e^{-}$ is
    1) $8.72\times10^{-18}\,Jatom^{-1}$ 2) $8.72\times10^{-19}\,Jatom^{-1}$
    3) $4.35\times10^{-18}\,Jatom^{-1}$ 4) $2.62\times10^{-19}\,Jatom^{-1}$
30. If the diameter of carbon atom is $0.15nm$, the number of carbon atoms which can be placed side by side is a straight line across length of 20 cm is
    1) 13.3×10^{9} 2) 1.33×10^{9}
    3) 6.2×10^{9} 4) 1.33×10^{7}

JEE MAIN Special

31. An electronic transition in hydrogen atom results in the formation of H_α line of hydrogen in lyman series the energies associated with the electrons in each of the orbits involved in the transition(in kal/mol) are (EAM 08)
    1) –313.6, –34.84 2) –313.6, –78.4
    3) –78.4, –34.84 4) –78.4, –19.6
32. The wavelength of a spectral line emitted by hydrogen atom in the lyman series is 16/5R cm. What is the value of n_2
    1) 2 2) 3 3) 4 4)1

de-Broglie's & Heisenberg's

33. If E_e, E_α, and E_p represents the kinetic energies of an electron alpha particle and a proton respectively, each moving with same deBroglie wavelength then :
    1) $E_e=E_\alpha=E_p$ 2) $E_e>E_\alpha>E_p$
    3) $E_\alpha<E_p<E_e$ 4) $E_e=E_p<E_n$
34. Calculate the wavelength (in nm) associated with a proton moving at $1.0\times10^{3}\,m/s$. The mass of proton is $1.67\times10^{-27}\,kg$ and h is $6.63\times10^{-34}\,Js$ (Aieee2009)
    1)0.032 nm 2) 2.5 nm 3) 14.0 nm 4) 0.4 nm
35. The de-Broglie wavelength for a proton with a velocity 15% of the speed of light is :
    1) $8.8\times10^{-12}\,m$ 2) $8.8\times10^{-15}\,cm$
    3) $8.8\times10^{-15}\,m$ 4) $4.4\times10^{-15}\,cm$
36. The velocities of two particles A and B are 0.05 and 0.02m/s respectively. The mass of B is five times the mass of A. The ratio of their de-Broglies wavelength is (EAM 2008)
    1) 2 : 1 2) 1 : 4 3) 1 : 1 4) 4 : 1
37. The mass of an electron is m, its charge e and it is accelerated from rest through a potential difference V. The velocity of electron will be calculated by formula :
    1) $\sqrt{V/m}$ 2) $\sqrt{eV/m}$
    3) $\sqrt{(2eV/m)}$ 4) None of these
38. The uncertainity in the positions of an electron and proton is equal, the ratio of the uncertainities in the velocity of an electron and proton is
    1) 10^{3}:1 2) 1:1836 3) 3672:1 4) 1836:1

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39. A ball of mass 200 gm is moving with velocity of 10 $m.s^{-1}$. If the error in measurement of velocity is 0.1%, the uncertainity in its position is
    1) $3.3.\times10^{-31}$ m 2) 3.3×10^{-27} m
    3) 5.3×10^{-25} m 4) 2.64×10^{-32} m
40. The kinetic energy of an electron accelerated from rest through a potential difference of 5V will be
    1) 5J 2) 5erg
    3)5eV 4) 8×10^{-10} eV

Quantum Mechanics & Numbues

41. Which one of the following conditions is incorrect for a well behaved wave function (ψ) (EAM 2010)
    1) ψ must be finite 2) ψ must be single valued
    3) ψ must be infinite 4) ψ must be continuous
42. The spin magnetic momentum of electrons in an ion is 4.84 BM. Its total spin will be
    1) ±1 2) ±2 3) $\geq\sqrt{\frac{h}{4\pi}}$ 4) ±2.5
43. The maximum number of sub levels,orbitals and electrons in N shell of an atom are respectively
    1) 4, 12, 32 2) 4, 16, 30
    3) 4, 16, 32 4) 4, 32, 64
44. In multi electron atom, which of the following orbitals described by the three quantum numbers will have the same energy in the absence of magnetic and electric fields.
    a) n = 1, *l* = 0, m = 0 b) n = 2, *l* = 0, m = 0
    c) n = 2, *l* = 1, m = 1 d) n = 3, *l* = 2, m = 1
    e) n = 3, *l* = 2, m = 0
    1) a & c 2) b & c 3) c & d 4) d & e
45. The values of four quantum numbers of valence electron of an element X is *n* = 4, *l* = 0, *m* = 0, s = 1/2 The element is
    1) *K* 2) *Ti* 3) *Na* 4) *Sc*
46. Given

K	L	M	N
2	8	11	2

    The number of electrons present in $l=2$ is
    1) 3 2) 6 3) 5 4) 4
47. Sum of electronic spins of all electrons with the configuration $3d^7$ is
    1) + 3/2 2) + 5/2 3) + 7/2 4) 9/2
48. Which one of the following pairs of ions have the same electronic configuration?
    1) Cr^{+3}, Fe^{+3} 2) Fe^{+3}, Mn^{+2}
    3) Fe^{+3}, CO^{+3} 4) Sc^{+3}, Cr^{+3}

KEY

01) 1	02) 4	03) 1	04) 3	05) 1	06) 4
07) 1	08) 1	09) 3	10) 1	11) 4	12) 1
13) 2	14) 2	15) 1	16) 1	17) 3	18) 3
19) 2	20) 2	21) 2	22) 1	23) 3	24) 2
25) 4	26) 2	27) 2	28) 3	29) 1	30) 2
31) 2	32) 3	33) 3	34) 4	35) 3	36) 1
37) 3	38) 4	39) 4	40) 3	41) 3	42) 2
43) 3	44) 4	45) 1	46) 1	47) 1	48) 2