ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)
path to success

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PRE-MEDICAL

PHYSICS

ENTHUSIAST | LEADER | ACHIEVER

EXERCISE

Modern Physics-III

ENGLISH MEDIUM

EXERCISE-I (Conceptual Questions)

Build Up Your Understanding

X-RAYS

1. If the K_α radiation of Mo has a wavelength of 0.71 Å. The wavelength of the corresponding radiation of Cu :– [Z_{Mo} = 42, Z_{Cu} = 29]

(1) 0.52 Å (2) 1.52 Å

(3) 2.52 Å (4) 3.52 Å

MP0343

2. In coolidge tube the potential difference between cathode and anticathode is 120 kV. The maximum energy of emitted X-rays will be :–

(1) 1.2×10^5 eV (2) 10^{10} eV

(3) 10^{15} eV (4) 10^{20} eV

MP0344

3. If the X–ray tube is working at 25 kV then the minimum wavelength of X–rays will be :–

(1) 0.49 Å (2) 0.29 Å

(3) 0.19 Å (4)0.39 Å

MP0345

4. The distance between interatomic lattice planes is 10Å. The maximum wavelength of X–rays which are diffracted by this crystal will be :–

(1) 10Å (2) 20Å (3) 30Å (4) 40Å

MP0346

5. The structure of solids is studied by :–

(1) X–rays (2) γ–rays

(3) Cosmic rays (4) Infrared rays

MP0347

6. 50% of X–rays obtained from a Coolidge tube pass through 0.3 mm. thick aluminium foil. If the potential difference between the target and the cathode is increased, then the fraction of X–rays passing through the same foil will be :–

(1) 50% (2) > 50% (3) < 50% (4) 0%

MP0348

7. When 50 keV electrons are made incident on a target material, the wavelength of K_α X–ray line was found to be 0.5Å. When the accelerating potential is increased to 100 kV, then the wavelength of K_α–line from the same target will be

(1) 0.25 Å (2) 0.5 Å

(3) 0.75 Å (4) 1.0 Å

MP0349

8. On increasing the filament current in X-ray tube :–

(1) wavelength of X-rays increases

(2) penetration power of X-ray increases

(3) intensity of X-rays decreases

(4) intensity of X-rays increases

MP0350

9. Which of the following is not affected by electro-magnetic fields :–

(1) α-rays (2) β-rays

(3) X-rays (4) cathode-rays

MP0351

10. Minimum wavelength of X-ray is 2 Å, then potential difference between anode and cathode is:–

(1) 62 kV (2) 6.2 kV

(3) 24.8 kV (4) 2.48 kV

MP0352

11. X-rays obtained by coolidge tube are :–

(1) mono-chromatic

(2) of all wavelength below a maximum wavelength

(3) of all wavelength above a minimum wave length

(4) of all wavelength between a maximum and a minimum wave length

MP0353

12. X-ray is an electromagnetic radiation, so X-ray photons carry :–

(1) an electric charge

(2) a magnetic moment

(3)both the electric charge and magnetic moment

(4) neither electric charge nor magnetic moment

MP0354

13. Characteristic X-rays are not obtained in the spectrum of H-atom because :–

(1) hydrogen is a gas

(2) hydrogen is very light

(3) energy difference in energy levels of hydrogen is much less

(4) energy difference in energy levels of hydrogen is much high

MP0355

14. Which of the following is related with characteristic emission of X-ray :–

(1) α-particle emission

(2) electron emission

(3) positron emission

(4) K-electron capturing

MP0356

15. Penetration power of X-rays depend on :–

(1) current flowing in filament

(2) applied potential difference

(3) nature of target

(4) all of the above

MP0357

16. Which of the following have velocity equal to light

(1) cathode rays (2) anode rays

(3) X-rays (4) positive rays

MP0358

17. The energy of characteristic X-rays photon obtained from coolidge tube comes from :—

(1) kinetic energy of incident electron.

(2) kinetic energy of free electrons of target material

(3) kinetic energy of ions of target material

(4) electron transition in target material

MP0359

18. Absorption of X-ray is maximum in which of the following sheets :–

(1) copper (2) gold

(3) beryllium (4) lead

MP0360

19. In X-ray spectrum wave length λ of line K_α depends on atomic number Z as :–

(1) $\lambda \propto Z^2$ (2) $\lambda \propto (Z-1)^2$

(3) $\lambda \propto \frac{1}{(Z-1)}$ (4) $\lambda \propto \frac{1}{(Z-1)^2}$

MP0361

20. If potential difference applied to an X-ray tube is V volt, then minimum wavelength of X-rays produced is about (in Å) :–

(1) 1240/V (2) 12400/V

(3) 24000/V (4) 12.27/V

MP0362

21. The minimum wavelength of X-rays produced by electrons accelerated by a potential difference of V volts is equal to :–

(1) $\frac{eV}{hc}$ (2) $\frac{eh}{cV}$ (3) $\frac{hc}{eV}$ (4) $\frac{h}{V}$

MP0363

22. In E.M. waves spectrum X-rays region lies between

(1) short radio waves and visible region

(2) visible and ultraviolet region

(3) gamma rays and ultra-violet region

(4) short radio waves and long radio waves

MP0364

23. If V be the accelerating voltage, then the maximum frequency of continuous X-rays is given by :–

(1) $\frac{eh}{V}$ (2) $\frac{hV}{e}$ (3) $\frac{eV}{h}$ (4) $\frac{h}{eV}$

MP0365

24. The shortest wave length emitted from an X-ray tube depends upon :–

(1) the voltage applied to the tube

(2) the nature of the gas in the tube

(3) the current in the tube

(4) the nature of target material

MP0366

25. In an X-ray tube, the intensity of the emitted X-ray beam is increased by :–

(1) increasing the filament current

(2) decreasing the filament current

(3) increasing the target potential

(4) decreasing the target potential

MP0367

26. In an X-ray tube, electrons accelerated through a potential difference of 15000 V strike a copper target. The speed of the emitted X-rays from the tube is :–

[e=charge on electron, m=mass of electron, Z=atomic number of target]

(1) $\frac{\sqrt{2\times 2e\times 1500}}{m}$ (2) $\frac{\sqrt{2\times e\times 1500}}{m}$

(3) $\frac{\sqrt{2Ze\times 1500}}{m}$ (4) 3×10^8 m/s

MP0368

27. The momentum of a photon in an X-ray beam of 10^{-10} metre wavelength is :–

(1) 1.5×10^{-23} kg–m/sec

(2) 6.6×10^{-24} kg–m/sec

(3) 6.6×10^{-44} kg–m/sec

(4) 2.2×10^{-52} kg–m/sec

MP0369

28. The energy of a photon of light with wavelength 5000Å is approximately x eV. This way the energy of an X-ray photon with wavelength 1Å would be:–

(1) $\frac{x}{5000}$eV (2) $\frac{x}{(5000)^2}$eV

(3) $x \times 5000$ eV (4) $x \times (5000)^2$eV

MP0370

29. The kinetic energy of an electron which is accelerated through a potential of 100 volts is :–

(1) 1.602×10^{-17} joules

(2) 418.6 calories

(3) 1.16×10^{4} eV

(4) 6.626×10^{-34} watt-second

MP0371

30. The wavelength of the most energetic X-ray emitted when a metal target is bombarded by electrons having kinetic energy 100 keV is approximately :

(1) 12 Å (2) 4 Å

(3) 0.31 Å (4) 0.124 Å

MP0372

31. For harder X-rays :–

(1) the wavelength is higher

(2) the intensity is higher

(3) the frequency is higher

(4) the photon energy is lower

MP0373

32. When cathode rays strike a metal target of high melting point with very high velocity, then :–

(1) X-rays are produced

(2) α-rays are produced

(3) β-rays are produced

(4) ultrasonic waves are produced

MP0374

33. Penetrating power of X-rays can be increased by

(1) increasing the potential difference between anode and cathode

(2) decreasing the potential difference between anode and cathode

(3) increasing the cathode filament current

(4) decreasing the cathode filament current

MP0375

34. K_α characteristic X-ray refers to the transition :–

(1) n = 2 to n = 1 (2) n = 3 to n = 2

(3) n = 3 to n = 1 (4) n = 4 to n = 2

MP0376

35. The production of characteristic X-rays is due to:-

(1) transfer of momentum in collision of electrons with the target atom

(2) transfer of energy in collision of electrons with the target atom

(3) the transition of electrons in heavy target atoms from high to low energy level

(4) none of these

MP0377

36. X-rays are produced in X-ray tube operating at a given accelerating voltage. The wavelength of the continuous X-rays has values from :–

(1) 0 to ∞

(2) λ_{min} to ∞, where $\lambda_{min} > 0$

(3) 0 to $\lambda_{max.}$, where $\lambda_{max.} < \infty$

(4) λ_{min} to $\lambda_{max.}$, where $0 < \lambda_{min} < \lambda_{max.} < \infty$

MP0378

37. The ratio of the energy of an X-ray photon of wavelength 1 Å to that of visible light of wavelength 5000 Å is :–

(1) 1 : 5000 (2) 5000 : 1

(3) $1 : 25 \times 10^{6}$ (4) 25×10^{6}

MP0379

38. According to Mosley's law, the frequency of a characteristic spectral line in X-ray spectrum varies as :–

(1) atomic number of the element

(2) square of the atomic number of the element

(3) square root of the atomic number of the element

(4) fourth power of the atomic number of the element

MP0380

39. For the structural analysis of crystals, X-rays are used because :–
(1) X-rays have wavelength of the order of interatomic spacing
(2) X-rays are highly penetrating radiations
(3) wavelength of X-rays is of the order of nuclear size
(4) X-rays are coherent radiations
MP0381

40. What determines the hardness of the X-rays obtained from the Coolidge tube :–
(1) current in the filament
(2) pressure of air in the tube
(3) nature of target
(4) potential difference between cathode and target
MP0382

41. The most penetrating radiation out of the following is
(1) X-rays (2) β-rays
(3) α-particles (4) γ-rays
MP0383

42. On increasing the number of electrons striking the anode of an X-ray tube, which one of the following parameters of the resulting X-rays would increase
(1) penetration power
(2) frequency
(3) wavelength
(4) intensity
MP0384

43. For production of characteristics K_β X-ray, the electron transition will be :–
(1) n = 2 to n = 1 (2) n = 3 to n = 2
(3) n = 3 to n = 1 (4) n = 4 to n = 2
MP0385

44. If X-rays is passed through from strong magnetic field, then X-rays :–
(1) will deviate maximum
(2) will deviate minimum
(3) undeviated
(4) none of these
MP0386

45. Which of the following wavelength is not possible for an X-ray tube which is operated at 40 kV:–
(1) 0.25 Å (2) 0.5 Å
(3) 0.52 Å (4) 0.34 Å
MP0387

46. If the operating voltage of X–ray tube is 50 kV then velocity of X–ray :–
(1) 4×10^4 m/sec (2) 3×10^8 m/sec
(3) 10^8 m/sec (4) 3 m/sec
MP0388

47. When X–rays are projected in strong magnetic field it will :–
(1) deflect right.
(2) deflect left.
(3) move in opposite direction to magnetic field
(4) not deflect
MP0389

48. If voltage of X–ray tube is doubled then intensity of X–rays will :–
(1) halved (2) remains constant
(3) doubled (4) quadrupled
MP0390

49. If minimum wavelength obtained in a X–ray tube is 2.5×10^{-10} m. For this minimum wavelength the minimum operating voltage of the tube should be–
(1) 2 kV (2) 3 kV (3) 4 kV (4) 5 kV
MP0391

50. In X-ray tube, wavelength of X-ray is the characteristic of :–
(1) tube voltage (2) target material
(3) filament current (4) none of these
MP0392

51. 5000V is applied on an electronic X-ray tube. Then minimum wavelength of X-ray will be :–
(1) 1.24×10^{-11} m (2) 2.48×10^{-10} m
(3) 3.72×10^{-11} m (4) 4.96×10^{-11} m
MP0393

52. Pressure inside the X-ray tube is :–
(1) equal to 740 mm of Hg
(2) equal to 76 mm of Hg
(3) equal to 10^{-3} mm of Hg
(4) equal to 10^{3} mm of Hg
MP0394

53. 20 kV potential is applied across X-ray tube, the minimum wavelength of X-ray emitted will be :–
(1) 0.62 Å (2) 0.37 Å
(3) 1.62 Å (4) 1.31 Å
MP0395

54. What is the minimum wavelength of X–rays :–

(1) $\frac{eV}{hc}$ (2) $\frac{hc}{eV}$

(3) $\frac{hc}{e}$ (4) $\frac{hc}{V}$

MP0396

55. To increase the hardness of X–rays in coolidge tube we should :–

(1) increase filament current

(2) increase filament voltage

(3) increase the voltage applied between cathode and anticathode

(4) none of these

MP0397

56. For X–ray diffraction, order of size of obstacle is :

(1) 1 Å (2) 10 Å

(3) 20 Å (4) 30 Å

MP0398

57. Voltage applied across the X-ray tube is

(1) 1000 V (2) 100 V

(3) 10 V (4) 10^6 V

MP0399

58. Which of the following is the wave length of X-ray:

(1) 10,000 Å (2) 1000 Å

(3) 1 Å (4) 10^{-4} Å

MP0400

59. Lattice constant of a crystal is 3×10^{-8} cm and glance angle of X-ray is 30° for first order diffraction, then the value of λ will be :–

(1) 6×10^{-8} cm (2) 3×10^{-8} cm

(3) 1.5×10^{-8} cm (4) 10^{-8} cm

MP0401

60. λ_{min} of X-rays depends on :-

(1) Atomic number of target

(2) Energy of electron

(3) Both (1) & (2)

(4) None of these

MP0402

61. The order of energy of X-ray photon is :-

(1) MeV (2) keV

(3) eV (4) GeV

MP0403

62. If vacuum tube is operated at 6.4 kV, what is the wavelength of X-ray produced :-

(1) 1.93Å (2) 1.53Å

(3) 2.67Å (4) 0.78Å

MP0404

63. When electron is incident on molyblednum then by changing energy of electron :-

(1) λ_{min} changes

(2) λ_{min} remains constant

(3) λ_{K_α} , λ_{K_β} changes

(4) λ_{min}, λ_{K_α} and λ_{K_β} all changes

MP0405

64. In Coolige tube the relation between used voltage V and minimum wavelength λ_{min} is-

(1) $\lambda_{min} \propto V$ (2) $\lambda_{min} \propto \sqrt{V}$

(3) $\lambda_{min} \propto \frac{1}{\sqrt{V}}$ (4) $\lambda_{min} \propto \frac{1}{V}$

MP0406

65. In an X–ray tube accelerating potential is 60 kV. What is the maximum frequency of emitted X-ray ?

(1) 1.45×10^{19} Hz (2) 1.45×10^{15} Hz

(3) 1.25×10^{15} Hz (4) 1.25×10^{13} Hz

MP0407

ATOMIC STRUCTURE

66. What is the wavelength of the least energetic photon emitted in the Lyman series of the hydrogen atom spectrum ?

(1) 150 nm (2) 122 nm

(3) 102 nm (4) 82 nm

MP0408

67. What is the ratio of the shortest wavelength of the Balmer series to the shortest wavelength of the Lyman series ?

(1) 4 : 1 (2) 4 : 3

(3) 4 : 9 (4) 5 : 9

MP0409

68. Kinetic energy for Hydrogen atom in first Bohr's orbit is–

(1) – 13.6 eV (2) 13.6 eV

(3) –27.2 eV (4) –6.5 eV

MP0410

69. According to Bohr Model for Hydrogen, energy is proportional to :

(1) $-Z^2 / n$ (2) $-n/Z^2$ (3) $-Z^2/n^2$ (4) $-n^2/Z$

MP0411

70. In above question radius is related as :-

(1) n^2 / Z (2) $\frac{n}{Z}$ (3) $\frac{n}{Z^2}$ (4) $\frac{n^2}{Z^2}$

MP0412

71. If ionization potential of Hydrogen atom is 13.6 V then what is ionization potential of He atom ?

(1) 27.6 V (2) 13.6 V

(3) 54.2 V (4) None of these

MP0413

72. Which of the following statements is correct ?

(1) Lyman series is continuous

(2) Balmer series lies in ultraviolet region

(3) Paschen series lies in infrared region

(4) Brackett series lies in visible region

MP0414

73. According to the Bohr theory of Hydrogen atom, the speed of the electron, its energy and the radius of its orbit varies with the principal quantum number n, respectively, as

(1) $\frac{1}{n}, \frac{1}{n^2}, n^2$ (2) $\frac{1}{n}, n^2, \frac{1}{n^2}$

(3) $n^2, \frac{1}{n^2}, n^2$ (4) $n, \frac{1}{n^2}, \frac{1}{n^2}$

MP0415

74. If the ionization potential of hydrogen atom is 13.6 eV, its energy in the n = 3 is approximately

(1) – 1.14 eV (2) – 1.51 eV

(3) –3.4 eV (4) – 4.53 eV

MP0416

EXERCISE-I (Conceptual Questions) Build Up Your Understanding

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	1	1	2	1	2	2	4	3	2	3	4	3	4	2
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	4	4	4	2	3	3	3	1	1	4	2	3	1	4
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	3	1	1	1	3	2	2	2	1	4	4	4	3	3	1
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	2	4	2	4	2	2	3	1	2	3	1	1	3	2	2
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	
Ans.	2	1	1	4	1	2	1	2	3	1	3	3	1	2	

EXERCISE-II (Previous Year Questions) AIPMT/NEET

AIPMT 2008

1. The ground state energy of hydrogen atom is –13.6eV. When its electron is in the first excited state, its excitation energy is:-

(1) 10.2 eV (2) 0
(3) 3.4 eV (4) 6.8 eV

MP0417

AIPMT 2009

2. The ionization energy of the electron in the hydrogen atom in its ground state is 13.6 eV. The atoms are excited to higher energy levels to emit radiations of 6 wavelengths. Maximum wavelength of emitted radiation corresponds to the transition between :-

(1) n = 4 to n = 3 states
(2) n = 3 to n = 2 states
(3) n = 3 to n = 1 states
(4) n = 2 to n = 1 states

MP0418

3. In a Rutherford scattering experiment when a projectile of charge z_1 and mass M_1 approaches a target nucleus of charge z_2 and mass M_2, the distance of closest approach is r_0. The energy of the projectile is :-

(1) directly proportional to mass M_1
(2) directly proportional to M_1M_2
(3) directly proportional to z_1z_2
(4) inversely proportional to z_1

MP0419

AIPMT 2010

4. The energy of a hydrogen atom in the ground state is –13.6 eV. The energy of a He^+ ion in the first excited state will be :-

(1) –6.8 eV (2) –13.6eV
(3) –27.2 eV (4) –54.4 eV

MP0420

AIPMT (Pre) 2011

5. The wavelength of the first line of Lyman series for hydrogen atom is equal to that of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is :-

(1) 3 (2) 4
(3) 1 (4) 2

MP0421

AIPMT (Mains) 2011

6. Out of the following which one is not a possible energy for a photon to be emitted by hydrogen atom according to Bohr's atomic model ?

(1) 0.65 eV
(2) 1.9 eV
(3) 11.1 eV
(4) 13.6 eV

MP0422

AIPMT (Mains) 2012

7. The transition from the state n = 3 to n = 1 in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from :

(1) $4 \to 2$ (2) $4 \to 3$
(3) $2 \to 1$ (4) $3 \to 2$

MP0424

NEET-UG 2013

8. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is:-

(1) $\frac{9}{31}$ (2) $\frac{5}{27}$
(3) $\frac{3}{23}$ (4) $\frac{7}{29}$

MP0425

AIPMT 2014

9. Hydrogen atom is ground state is excited by a monochromatic radiation of λ = 975 Å. Number of spectral lines in the resulting spectrum emitted will be :-

(1) 3 (2) 2

(3) 6 (4) 10

MP0426

AIPMT 2015

10. Consider 3^{rd} orbit of He^+ (Helium), using non-relativistic approach, the speed of electron in this orbit will be [given K = 9×10^9 constant, Z = 2 and h (Planck's Constant) = 6.6×10^{-34} J s]

(1) 1.46×10^6 m/s

(2) 0.73×10^6 m/s

(3) 3.0×10^8 m/s

(4) 2.92×10^6 m/s

MP0427

RE-AIPMT 2015

11. In the spectrum of hydrogen, the ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series is :

(1) $\frac{5}{27}$ (2) $\frac{4}{9}$

(3) $\frac{9}{4}$ (4) $\frac{27}{5}$

MP0428

NEET-I 2016

12. When an α-particle of mass 'm' moving with velocity 'v' bombards on a heavy nucleus of charge 'Ze', its distance of closest approach from the nucleus depends on m as :

(1) $\frac{1}{m}$ (2) $\frac{1}{\sqrt{m}}$

(3) $\frac{1}{m^2}$ (4) m

MP0430

13. Given the value of Rydberg constant is $10^7 m^{-1}$, the wave number of the last line of the Balmer series in hydrogen spectrum will be :-

(1) $0.025 \times 10^4\ m^{-1}$ (2) $0.5 \times 10^7\ m^{-1}$

(3) $0.25 \times 10^7\ m^{-1}$ (4) $2.5 \times 10^7\ m^{-1}$

MP0431

NEET-II 2016

14. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength (λ_0) of the emitted X-ray is :-

(1) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$ (2) $\lambda_0 = \lambda$

(3) $\lambda_0 = \frac{2mc\lambda^2}{h}$ (4) $\lambda_0 = \frac{2h}{mc}$

MP0432

15. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ. When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be :-

(1) $\frac{20}{7}\lambda$ (2) $\frac{20}{13}\lambda$

(3) $\frac{16}{25}\lambda$ (4) $\frac{9}{16}\lambda$

MP0433

NEET(UG) 2017

16. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is:-

(1) 1 (2) 4 (3) 0.5 (4) 2

MP0434

NEET(UG) 2018

17. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is :-

(1) 1 : 1 (2) 1 : –1 (3) 2 : –1 (4) 1 : –2

MP0436

NEET(UG) 2019

18. The total energy of an electron in an atom in an orbit is –3.4 eV. Its kinetic and potential energies are, respectively:

(1) –3.4 eV, –3.4 eV (2) –3.4 eV, –6.8 eV

(3) 3.4 eV, –6.8 eV (4) 3.4 eV, 3.4 eV

MP0469

NEET(UG) 2019 (Odisha)

19. The radius of the first permitted Bohr orbit for the electron, in a hydrogen atom equals 0.51 Å and its ground state energy equals –13.6 eV. If the electron in the hyrogen atom is replaced by muon(μ^-) [charge same as electron and mass 207 m_e], the first Bohr radius and ground state energy will be :

(1) 0.53×10^{-13} m, –3.6 eV

(2) 25.6×10^{-13} m, –2.8 eV

(3) 2.56×10^{-13} m, –2.8 keV

(4) 2.56×10^{-13} m, –13.6 eV

MP0470

NEET(UG) 2020

20. For which one of the following, Bohr model in **not** valid ?

(1) Singly ionised neon atom (Ne^+)

(2) Hydrogen atom

(3) Singly ionised helium atom (He^+)

(4) Deuteron atom

MP0481

NEET(UG) 2020 (COVID-19)

21. The total energy of an electron in the n^{th} stationary orbit of the hydrogen atom can be obtained by

(1) $E_n = \frac{13.6}{n^2}$ eV (2) $E_n = -\frac{13.6}{n^2}$ eV

(3) $E_n = -\frac{1.36}{n^2}$ eV (4) $E_n = -13.6 \times n^2$ eV

MP0482

NEET(UG) 2021 (Paper-2)

22. A helium ion is in excited state of quantum number 4n, a photon of energy 10.2 eV is emitted. The value of n is

(1) 1 (2) 2 (3) 3 (4) 4

MP0502

NEET(UG) 2022 (Overseas)

23. Let L_1 and L_2 be the orbital angular momentum of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model, the ratio $L_1 : L_2$ is:

(1) 2 : 1 (2) 3 : 2

(3) 2 : 3 (4) 1 : 2

MP0503

Re-NEET(UG) 2022

24. Given below are two statements :

Statement I :

The law of radioactive decay states that the number of nuclei undergoing the decay per unit time is inversely proportional to the total number of nuclei in the sample.

Statement II :

The half life of a radionuclide is the sum of the life time of all nuclei, divided by the initial concentration of the nuclei at time t = 0.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both **Statement I** and **Statement II** are correct

(2) Both **Statement I** and **Statement II** are incorrect

(3) **Statement I** is correct but **Statement II** is incorrect

(4) **Statement I** is incorrect but **Statement II** is correct

MP0504

EXERCISE-II (Previous Years Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	1	3	2	4	3	2	2	3	1	1	1	3	3	1
Que.	16	17	18	19	20	21	22	23	24						
Ans.	2	2	3	3	1	2	1	3	2						

EXERCISE-III (Analytical Questions) Master Your Understanding

1. The energy of a K- electron in tungsten is –20 keV and of an L– electrons is –2 keV. The wave length of X-rays emitted when there is electron jump from L to K shell :–

(1) 0.3443 Å (2) 0.6887 Å
(3) 1.3982 Å (4) 2.78 Å

MP0445

2. An X-ray tube when operated at 60 kV, then reading of tube current is 50 mA. Assuming that the total energy of electron is converted into heat, the rate of heat produced at the anode in calories/sec is about :–

(1) 100 (2) 300
(3) 500 (4) 714

MP0446

3. The wavelength of K_α–line characteristic X–rays emitted by an element is 0.32Å. The wavelength of K_β–line emitted by the same element will be :–

(1) 0.27Å (2) 0.32Å (3) 0.39Å (4) 0.2Å

MP0447

4. The ionisation energies of K–shell for cobalt, copper, and molebdenum are 7.8, 9.0 and 20.1 keV respectively. If any metal out of these is used as target in an X–ray tube operated at 15KV, then:–

(1) the K–series of characteristic X-ray will be emitted by Co only
(2) the K–series of characteristic X–rays will be emitted by Cu and Co only
(3) the K–series of characteristic X–rays will be emitted by Cu, Co and Mo
(4) the minimum wavelength of continuous X–rays emitted by the three metals will not be same

MP0448

5. The intensity of light pulse travelling in an optical fibre decrease according to the relation

$I = I_0 e^{-\alpha x}$

The intensity of light is reduced to 20 % of its initial value after a distance x equal to

(1) $\log(1/\alpha)$ (2) $\log\alpha$
(3) $(\log 5)/\alpha$ (4) $\log(5/\alpha)$

MP0449

6. The potential difference applied to an X-ray tube is increased. As a result, in the emitted radiation-

(a) the intensity increases
(b) the minimum wavelength increases
(c) the intensity remains unchanged
(d) the minimum wavelength decreases

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

MP0450

7. In producing X-rays a beam of electrons accelerated by a potential difference V is made to strike a metal target. For what value of V of the following X-rays have the lowest wavelength:-

(1) 10 kV (2) 20 kV (3) 30 kV (4) 40 kV

MP0451

8. The wavelength of K_α X-rays produced by an X-ray tube is 0.76 Å. The atomic number of the anode material of the tube is :–

(1) 20 (2) 60 (3) 41 (4) 80

MP0452

9. Energy levels A,B and C of a certain atom correspond to increasing values of energy i.e. $E_A < E_B < E_C$. If λ_1, λ_2 and λ_3 are wave lengths of radiations corresponding to transitions C to B, B to A and C to A respetively, which of the following relations is correct :–

(1) $\lambda_3 = \lambda_1 + \lambda_2$ (2) $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

(3) $\lambda_1 + \lambda_2 + \lambda_3 = 0$ (4) $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

MP0453

10. What is the approximate ratio of wavelength of radiation and when atomic number of first target is $Z_1 = 64$ and atomic number of second target is $Z_2 = 80$:–

(1) $\frac{1}{4}$ (2) $\frac{1}{16}$ (3) $\frac{2}{\sqrt{5}}$ (4) $\frac{25}{16}$

MP0454

11. The ionization potential of the hydrogen atom is 13.6 V. The energy needed to ionize a hydrogen atom which is in its first excited state is about

(1) 13.6 eV (2) 10.2 eV
(3) 3.4 eV (4) 1.5 eV

MP0455

12. Ionization potential of hydrogen is 13.6 volt. If it is excited by a photon of energy 12.1 eV, then the number of lines in the emission spectrum will be

(1) 2 (2) 3
(3) 4 (4) 5

MP0456

13. If electron in a hydrogen atom has moved from n = 1 to n = 10 orbit, the potential energy of the system has

(1) increased (2) decreased
(3) remained unchanged (4) become zero

MP0457

14. The electron of a hydrogen atom revolves round the proton in a circular n^{th} orbit of radius $r_n = \frac{\varepsilon_0 n^2 h^2}{(\pi m e^2)}$ with a speed $\upsilon_n = \frac{e^2}{2\varepsilon_0 nh}$. The current due to the circulating charge is proportional to

(1) e^2 (2) e^3 (3) e^5 (4) e^6

MP0458

EXERCISE-III (Analytical Questions) ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.	**2**	**4**	**1**	**2**	**3**	**2**	**4**	**3**	**2**	**4**	**3**	**2**	**1**	**3**