PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

ATOMS, MOLECULES AND NUCLEI

Classical Thinking

1. Which particles were used in Geiger-Marsdon experiment?

A. β- particles

B. α- particles

C. γ-particles

D. positrons.

Answer: B

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2. Detector used in Marsdon experiment is

A. zinc sulphide screen and microscope.

B. Iron oxide screen and telescope

C. Zinc oxide screen and telescope

D. Aluminium chloride screen and microscope

Answer: A

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3. α- particles deflected at more than 90° in Marsdon experiment were

A. 1 in 1000

B. 1 in 10000

C. 1 in 100000

D. 1 in 8000

Answer: D

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4. Accordingly to classical theory, the Rutherford atom was

A. stable

B. unstable

C. semisable

D. meta-stable

Answer: B

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5. α-particles is scattering is a consequence of

A. nuclear force.

B. coulomb force

C. gravitational force

D. magnetic force.

Answer: B

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6. An α -particle moving with a constant energy is scattered by the nuclues. The scattering angle will be maximum when the α- particles.

A. approaches the nucleus head on

B. just passes the nucleus.

C. passes at large distance from the nucleus

D. is attracted by the nucleus.

Answer: A

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7. The problem of unstability of Rutherford's atomic model was solved by

A. Thomson's atomic model.

B. Sommerfield's atomic model.

C. Bohr's atomic model.

D. Quantum atomic model.

Answer: C

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8. Rutherford proposed his model of the atom in order to explain the scattering of

A. cathode rays

B. X-rays

C. alpha rays

D. neutrons

Answer: C

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9. According to the Rutherford's atomic model, the electrons inside the atom are

A. Stationary

B. not stationary

C. centralized

D. none of these

Answer: B

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10. The Rutherford α-particle experiment shown that most of the α-particles pass through almost unscattered while some are scattered through large angles. What infromation does it given about the structure of the atom ?

A. Atom is hollow.

B. The whole mass of the atom is concentrated in a small center called nucleus .

C. Nucleus is positively charged

D. All the above

Answer: D

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11. According to Bohr's atomic model, the electrons revolve round the nucleus in

A. stationary circular orbits

B. stationary elliptic orbits

C. arbitrary circular orbits

D. radiating circular orbits.

Answer: A

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12. In Bohr model of the hydrogen atom, the lowest orbit corresponds to

A. zero energy

B. minimum energy

C. maximum energy

D. infinite energy

Answer: B

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13. In Bohr's atomic model, the electrons do not fall into the nucleus because

A. The space between the nucleus and the atomic boundary is filled with ether.

B. electrostatic attraction is balanced by mechanical forces.

C. quantum rules do not permit it.

D. centripetal force is equal to gravitational force.

Answer: C

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14. According to Bohr's theory, discrete quantity is

A. Kinetic energy

B. Angular momentum

C. Potential energy

D. Linear momentum

Answer: B

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15. The repulsive force between the positively charged protons does not throw them apart because

A. Coulomb force does not act at small distances.

B. nuclear forces are stronger

C. neutrons sit in between the protons.

D. electron revolves around nucleus.

Answer: B

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16. The orbital frequency of an electron in the hydrogen atom is proportional to

A. n^2

B. n^{-3}

C. n^2

D. n^{-2}

Answer: B

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17. Assertion: In outermost stationary orbit, energy of electrons is maximum

Reason: In such an orbit, electron is at minimum distance from the nucleus

A. Assertion is True, Reason is true, Reason is a correct explanation for Assertion

B. Assertion is true, Reason is True, Reason is not a correct explnation for Assertion

C. Assertion is True, Reason is false.

D. Assertion is False, but, Reason is True

Answer: C

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18. The radius of hydrogen atom , when it is in its second excited state, becomes:

A. half

B. double

C. 4 times

D. nine times

Answer: D

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19. The ratio of the radius of the first orbit to that of the second orbit of the orbital electron is

A. $4 : 1$

B. $2 : 1$

C. $0.5 : 1$

D. $1 : 4$

Answer: D

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20. The linear speed of an electron in Bohr's orbit is inversely proportional to

A. principle quantum number.

B. square of principal quantum number.

C. cube of principle quantum number,

D. number of electrons.

Answer: A

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21. The ratio of the velocity of the electron in the first orbit to that in the second orbit is

A. $8:1$

B. $4:1$

C. $2:1$

D. $1:4$

Answer: C

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22. The ratio between area of Bohr's first three orbits of the hydrogen atom are

A. $1:2:3$

B. $1:4:9$

C. $1:8:27$

D. $1:16:81$

Answer: D

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23. When an electron in hydrogen atom jumps from orbit of quantum number n_2 to orbit of quantum number n_1, the shortest wavelength is obtained for following condition.

A. $n_2 = n_1 + 1$

B. $n_2 < n_1$

C. $n_2 > n_1$

D. $n_2 = \infty$

Answer: D

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24. The first member of any series in hydrogen atom is (electron jumps from quantum no. p to n)

A. $p = n + 2$

B. $p = n + 1$

C. $p = n - 2$

D. $p = n - 1$

Answer: B

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25. Quantum condition is expressed as

A. $mvr = \frac{nh}{2\pi}$

B. $E_1 - E_r = hv$

C. $F = \left(\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r^2}\right)$

D. $F = \frac{mv^2}{r}$

Answer: A

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26. Which particles were used in Geiger-Marsdon experiment?

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Answer: B

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27. Detector used in Marsdon experiment is

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Answer: A

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28. α- particles deflected at more than 90° in Marsdon experiment were

A. 2 in 1000

B. 2 in 10000

C. 2 in 100000

D. 2 in 8000

Answer: D

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29. Accordingly to classical theory, the Rutherford atom was

A. stable

B. unstable

C. semisable

D. meta-stable

Answer: D

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30. α-particles is scattering is a consequence of

A. nuclear force.

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C. gravitational force

D. magnetic force.

Answer: D

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31. An α -particle moving with a constant energy is scattered by the nuclues. The scattering angle will be maximum when the α-particles.

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C. passes at large distance from the nucleus

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Answer: D

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32. The problem of unstability of Rutherford's atomic model was solved by

A. Thomson's atomic model.

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C. Bohr's atomic model.

D. Quantum atomic model.

Answer: C

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33. Rutherford proposed his model of the atom in order to explain the scattering of

A. cathode rays

B. X-rays

C. alpha rays

D. neutrons

Answer: B

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34. According to the Rutherford's atomic model, the electrons inside the atom are

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B. not stationary

C. centralized

D. none of these

Answer: B

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35. Which particles were used in Geiger-Marsdon experiment?

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Answer: C

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36. Detector used in Marsdon experiment is

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Answer: B

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B. 2 in 10000

C. 2 in 100000

D. 2 in 8000

Answer: B

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D. meta-stable

Answer: A

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39. α-particles is scattering is a consequence of

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D. magnetic force.

Answer: A

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40. An α -particle moving with a constant energy is scattered by the nuclues. The scattering angle will be maximum when the α-particles.

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41. The problem of unstability of Rutherford's atomic model was solved by

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C. Nucleus is positively charged

D. All the above

Answer: B

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45. According to Bohr's atomic model, the electrons revolve round the nucleus in

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B. stationary elliptic orbits

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D. radiating circular orbits.

Answer: D

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46. In Bohr model of the hydrogen atom, the lowest orbit corresponds to

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47. In Bohr's atomic model, the electrons do not fall into the nucleus because

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C. quantum rules do not permit it.

D. centripetal force is equal to gravitational force.

Answer: D

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48. According to Bohr's postulates, which of the following quantities takes discrete values?

A. Kinetic energy

B. Angular momentum

C. Potential energy

D. Linear momentum

Answer: A

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49. The repulsive force between the positively charged protons does not throw them apart because

A. Coulomb force does not act at small distances.

B. nuclear forces are stronger

C. neutrons sit in between the protons.

D. electron revolves around nucleus.

Answer: B

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50. The orbital frequency of an electron in the hydrogen atom is proportional to

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D. Assertion is False, but, Reason is True

Answer: D

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52. When hydrogen atom is in its second excited level, then its radius becomes

A. half

B. double

C. 5 times

D. nine times

Answer: A

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53. The ratio of the radius of the first orbit to that of the second orbit of the orbital electron is

A. $4:1$

B. $2:1$

C. $0.5:1$

D. $1:4$

Answer: C

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54. The linear speed of an electron in Bohr's orbit is inversely proportional to

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C. cube of principle quantum number,

D. number of electrons.

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55. The ratio of the velocity of the electron in the first orbit to that in the second orbit is

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57. When an electron in hydrogen atom jumps from orbit of quantum number n_2 to orbit of quantum number n_1, the shortest wavelength is obtained for following condition.

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Answer: D

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58. The first member of any series in hydrogen atom is (electron jumps from quantum no. p to n)

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C. $F = \left(\frac{1}{4\pi\varepsilon_0}\frac{e^2}{r^2}\right)$

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B. 3 in 10000

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Answer: D

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Answer: D

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Answer: D

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B. Sommerfield's atomic model.

C. Bohr's atomic model.

D. Quantum atomic model.

Answer: B

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76. Rutherford proposed his model of the atom in order to explain the scattering of

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B. X-rays

C. alpha rays

D. neutrons

Answer: C

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77. Consider an eelctron in the nth orbit of a hydrogen atom in the Bohr model. The circumference of the orbit can be expressed in terms of the de Broglie wavelength λ o fthat electron as

A. $(0.259)n\lambda$

B. $\sqrt{n}\lambda$

C. $(13.6)\lambda$

D. $n\lambda$

Answer: D

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78. A $200g$ cricket ball is thrown with a speed of $3.0 \times 10^3 cm\sec^{-1}$. What will be its de

Broglie's wavelength ?

$$[h = 6.6 \times 10^{-27} gcm^2 \sec^{-1}].$$

A. 1.1×10^{-22} cm

B. 2.2×10^{-32} cm

C. 0.55×10^{-32} cm

D. 3.2×10^{-32} cm

Answer: A

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79. The de-Broglie wavelength of a particle with mass $1g$ and velocity $100m/\sec$ is.

A. 6.63×10^{-35} m

B. 6.63×10^{-34} m

C. 6.63×10^{-33} m

D. 6.63×10^{-32} m

Answer: C

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80. A dust particle of mass 2 mg is carried by wind with a velocity of 100 cm/s. What is the de-Broglie wavelength associated with the dust particle? ($h = 6.63 \times 10^{-34} J - s$)

A. 3.32×10^{-31} m

B. 6.64×10^{-30} m

C. 3.32×10^{-34} m

D. 3.32×10^{-28} m

Answer: D

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81. The de-Broglie equation suggests that an electron orbit in hydrogen atom is related to de-Brogile wavelength of the electron in the same orbit as

A. $2\pi r = n\lambda$

B. $2\pi r = \frac{2n}{\lambda}$

C. $2\pi r = \frac{n\lambda}{2}$

D. $2\pi r = \frac{2\lambda}{n}$

Answer: C

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82. The circumference of an electron orbit in hydrogen atom is related to de-Brogile wavelength of the electron in the same orbit as

A. $2\pi r = n\lambda$

B. $2\pi r = \frac{2n}{\lambda}$

C. $2\pi r = \frac{n\lambda}{2}$

D. $2\pi r = \frac{2\lambda}{n}$

Answer: A

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83. The de-Broglie wavelength of an electron, an α -particle and a proton are $\lambda_e, \lambda_\alpha, \lambda_p$. Which is wrong from the following:

A. $\lambda_e > \lambda_p$

B. $\lambda_e < \lambda_p$

C. $\lambda_p > \lambda_\alpha$

D. $\lambda_e > \lambda_p > \lambda_\alpha$

Answer: B

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84. Bragg's equation for diffraction is

A. $2d - \lambda = n \sin \phi$

B. $2d \sin \phi = n\lambda$

C. $\lambda = \sin \phi$

D. $2\lambda \sin \phi = nd$

Answer: B

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85. In Davisson-Germer experiment, which particles are scattered by the Ni-crystal?

A. neutron

B. proton

C. Electron

D. photon

Answer: C

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86. In Davosson-Germer experiment, the filament emits

A. photons

B. protons

C. X-rays

D. electrons

Answer: D

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87. Select wrong statement about the Davisson Germer experiment:

A. The inter-atomic distance in nickel crystal is of the order of the de-Broglie wavelength.

B. Electron of constant energy are obtained by the electrons gun.

C. Nickel crystal acts as three dimensional diffracting grating.

D. Davisson-Germer experiment is an interference experiment.

Answer: D

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88. Tungsten filament in the Germer experiment s coated with a material called

A. potassium iodide

B. silver chloride

C. barium chloride

D. barium oxide

Answer: D

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89. Which crystal is used to scatter electrons in the Davission and Germer experiment?

A. cobalt

B. Nickel

C. Calcite

D. Silver

Answer: B

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90. Approximate value of wavelength of electron waves in Davission experiment at maximum diffraction is

A. 1.67Å

B. 1.75Å

C. 1.22Å

D. 1.81Å

Answer: A

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91. In Davisson and Germer experiment, accelerating potential is kept constant at 54 V. As detector is rotated, the first intensity maximum is obtained at an angle of

A. 50°

B. 54°

C. 65°

D. 45°

Answer: A

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92. The solution of Bragg's equation will not exist if

A. $\lambda > 2D$

B. $\lambda < 2D$

C. $\lambda < D$

D. $\lambda = D$

Answer: A

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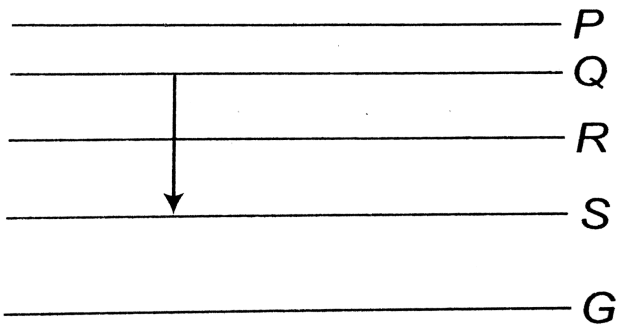
93. Figure shows the enegry levels P, Q, R, S and G of an atom where G is the ground state. A red line in the emission spectrum of the atom can be obtaned by an energy level change from Q so S. A blue line can be obtained by following energy level change



A. P to Q

B. Q to R

C. R to S

D. R to G

Answer: D

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94. What will be the ratio of radii of Li^7 nucleus to Fe^{56} nucleus?

A. $1:3$

B. $1:2$

C. $1:8$

D. $1:6$

Answer: B

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95. The minimum enegry required to excite a hydrogen atom from its ground state is

A. 13.6 eV

B. -13.6 eV

C. $3.4eV$

D. $10.2eV$

Answer: D

Watch Video Solution

96. The ratio of areas within the elctron orbits for the first excited state to the ground sate for hydrogen atom is

A. $16:1$

B. $18:1$

C. $4:1$

D. $2:1$

Answer: A

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97. Assertion: Plutonium is a transuranic element.

Reason: The materials which can undergo fission easily are called transuranic element.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False, but, Reason is True.

Answer: C

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Critical Thinking

1. The product of linear momentum and angular momentum of an electron of the hydrogen atom is proportional to n^x, where x is

A. 0

B. 1

C. -2

D. 2

Answer: A

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2. The ratio of the angular momentum of the orbital electron in the first orbit to that in the 2nd orbital is

A. $2:1$

B. $1:1$

C. $1:2$

D. $2:3$

Answer: C

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3. If the radius of the innermost Bohr orbit is 0.53Å, the radius of the 4th orbit is

A. 8.48 Å

B. 16 Å

C. 81 Å

D. 4 Å

Answer: A

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4. The area of the electron orbit for the ground state of hydrogen atom is A. What will be the area of the electron orbit corresponding to the second excited state?

A. 27A

B. 9A

C. 81A

D. 3A

Answer: C

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5. Speed of electron in 1st Bohr orbit is approximately

A. $2 \times 10^7 m/s$

B. 2.25×10^6 m/s

C. 2.23×10^7 m/s

D. 2.25×10^5 m/s

Answer: B

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6. In an atom, two electrons move around nucleus in circular orbits of radii (R) and (4R) . The ratio of the time taken by them to complete one revolution is :

A. $\frac{1}{64}$

B. $\frac{1}{8}$

C. $\frac{4}{1}$

D. $\frac{2}{1}$

Answer: B

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7. A particle of charge q and mass m is moving with constant speed v and perpendicular to a constant magnetic field B follows circular path. If the angular momentum about the center of this circle is quantized so that mvr =n, $\frac{h}{2\pi}$,then the allowed radii forthe particle are given by

A. $r_s^2 = \frac{nh}{2\pi qB}$

B. $r_n^2 = \frac{nhq}{2\pi B}$

C. $r_s^2 = \frac{nhB}{2\pi q}$

D. $r_s^2 = \frac{2\pi nh}{Bq}$

Answer: A

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8. The radius of hydrogen atom in its ground state is $5.3 \times 10^{-11} m$. After collision with an electron it is found to have a radius of $21.2 \times 10^{-11} m$. What is the principle quantum number of n of the final state of the atom ?

A. n=4

B. n=5

C. n=16

D. n=3

Answer: B

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9. When an electron in hydrogen atom is excited, from its 4th to $5$the stationary orbit, the change in angular momentum of electron is (Planck's constant: $h = 6.6 \times 10^{-34} J - s$)

A. 4.16×10^{-34}

B. 3.32×10^{-34}

C. 1.05×10^{-34}

D. 2.08×10^{-34}

Answer: C

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10. A ground state hydrogen atom has an energy of $-13.6eV$. If the electron is excited to the energy state n=3, its energy becomes

A. $-12.09eV$

B. $-13.6eV$

C. $-4.5eV$

D. $-1.51eV$

Answer: D

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11. The orbital velocity of the electron in the ground state of hydrogen atom is v. What will be its orbital velocity when excited to the energy state= $-0.544eV$?

A. $\frac{v}{9}$

B. $\frac{v}{4}$

C. $\frac{v}{5}$

D. $\frac{v}{2}$

Answer: C

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12. Energy in a Bohr's orbit is given to be equal to $\frac{B}{n^2}$ with $B = -16 \times 10^{-18}$ J. The wavelength of the radiation, when the electron jumps from fourth orbit to second orbit, is $(e = 3 \times 10^8 m/s)$

A. 10^8 j

B. 10^{26} h

C. $\frac{3 \times 10^{16}}{16}$ h

D. 3×10^{18} h

Answer: B

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13. The series limit wavelength of the Lyman series for the hydrogen atom is given by

A. $\frac{1}{R}$

B. $\frac{4}{R}$

C. $\frac{9}{R}$

D. $\frac{16}{R}$

Answer: A

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14. The longest wavelength limit of Lyman series is

A. $\frac{4}{3 \times 109670}$ cm

B. $\frac{3}{4 \times 109670}$ cm

C. $\frac{4 \times 109670}{3}$ cm

D. $\frac{3 \times 109670}{4}$ cm

Answer: A

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15. An electron jumps from the 4th orbit to the 1st orbit of hydrogen atom. Given the Rydberg's constant $R = 10^5 cm^{-1}$. The frequency in Hz of the emitted radiation will be

A. 3.2×10^5

B. 3.2×10^{25}

C. 2.81×10^{15}

D. 2.81×10^{25}

Answer: C

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16. A monochromatic beam of light is absorbed by a collector of ground state hydrogen atom in such a way that six different wavelengths are observed when hydrogen relaxes back to the ground state. The wavelength of the incident beam is

A. 97 nm

B. 91 nm

C. 68 nm

D. 85 nm

Answer: A

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17. The shortest wavelength in H sopecitrum of lyman series when $R_H = 109678 cm^{-1}$ is

A. $1002.7 Å$

B. $1215.67 Å$

C. $1127.30 Å$

D. $911.7 Å$

Answer: D

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18. The ratio of the frequencies of the long wavelength limits of the Brackett and Pfund series of hydrogen is

A. $44 : 81$

B. $4 : 11$

C. $11:4$

D. $81:44$

Answer: D

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19. The first line of Balmer series has wvaelength 6563Å. What will be the wavelength of the ifrst member of Lyman series?

A. 1215Å

B. 2500Å

C. 7500Å

D. 600Å

Answer: A

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20. If series limit of Balmer series is 6400Å, then series limit of Paschen series will be

A. 64000Å

B. 18680Å

C. 14400Å

D. 2400Å

Answer: C

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21. An electron jumps from 3rd to 2nd orbit of hydrogen atom. Taking the Rydberg constant as $10^7 m^{-1}$, what will be the frequency of the radiation emitted?

A. $6 \times 10^{14} Hz$

B. $4 \times 10^{14} Hz$

C. $6.75 \times 10^{12} Hz$

D. $8 \times 10^{14} Hz$

Answer: B

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22. The wavelength of emitted radiation in terms of R (the Rydberg constant) is $\lambda = 36/5R$. The electron jumps from

A. 4th orbit to 3rd orbit

B. 4th orbit to 2nd orbit

C. 3rd orbit to 1st orbit

D. 3rd orbit to 2nd orbit

Answer: D

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23. Shortest wavelength in the Lymann series is 912 Å. The longest wavelength in this series will be:

A. 3648Å

B. 2100Å

C. 1800Å

D. 1216Å

Answer: D

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24. The wavelength of the first lime of the Lyman series of hydrogen is 121.6 nm. The wavelength of the second member of the Balmer series is

A. 30.4 nm

B. 60.8 nm

C. 243.2 nm

D. 486.4 nm

Answer: D

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25. Wavelength of radiation emitted when an electron jumps from a state A to state C is 2000 Å and it is 6000 Å when the electron jumps from state B to State C, wavelength of the radiation emitted when an electron jumps from state A to B will be

A. 2000Å

B. 3000Å

C. 4000Å

D. 6000Å

Answer: B

Watch Video Solution

26. Let X and Z bethe frequencies of series limit of Lyman series and Balmer series respectively. If Y is the frequency of first line of Lyman series, then

A. X-Y=Z

B. Y-X =Z

C. $Z = \frac{X+Y}{2}$

D. $(X + Y = Z)$

Answer: A

Watch Video Solution

27. Assertion: The density of the nuclei of all the atoms is same.

Reason: It is because, density of nuclei is independent of mass number.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False but, Reason is True.

Answer: A

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28. When a $._4 Be^9$ atom is bombarded with $\propto -$ particle, one of the product of nuclear transmutation is $._6 C^{12}$. The other is.

A. $_{-1}e^{0}$

B. $_{1}H^{1}$

C. $_{1}D^{2}$

D. $_{0}n^{1}$

Answer: D

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29. Highly energetic electrons are bombarded on a target of an element containing 30 neutrons. The ratio of radii of nucleus to that of Helium nucleus is $141/3$. The atomic number of nucleus will be.

A. 25

B. 26

C. 56

D. 30

Answer: B

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30. The radius of a nucleus having 10 nucleons is 3×10^{-15}m. The nuclear radius of a nucleus will nucleon number 80 is

A. 3×10^{-15}m

B. 1.5×10^{-15} m

C. 6×10^{-15}m

D. 4.5×10^{-15}m

Answer: C

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31. The binding energy per nucleon of O^{16} is $7.97 MeV$ and that of O^{17} is $7.75 MeV$. The energy (in MeV) required to remove a neutron from O^{17} is.

A. 3.52

B. 3.64

C. 4.23

D. 7.86

Answer: C

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32. Atomic mass number of an element is 232 and its atomic number is 90. The end product of this radiaoctive element is an isotope of lead (atomic mass 208 and atomic number 82.) The number of α-and β -particles emitted are.

A. $\alpha = 3, \beta = 3$

B. $\alpha = 6, \beta = 4$

C. $\alpha = 6, \beta = 0$

D. $\alpha = 4, \beta = 6$

Answer: B

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33. The average life T and the decay constant λ of a radioactive nucleus are related as

A. $T\lambda = 1$

B. $T = \frac{0.693}{\lambda}$

C. $\frac{T}{\lambda} = 1$

D. $T = \frac{c}{\lambda}$

Answer: A

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34. If T is the half-life of a radioactive material, then the fraction that would remain after a time $\frac{T}{2}$ is

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{\sqrt{2}-1}{\sqrt{2}}$

Answer: C

Watch Video Solution

35. The half-life of a radioactive substance against $\alpha-$ decay is $1.2 \times 10^7 s$. What is the decay rate for 4×10^{15} atoms of the substance ?

A. 4.6×10^{12} atoms/s

B. 2.3×10^{11} m/s

C. 4.6×10^{10} m/s

D. 2.3×10^8 atoms/s

Answer: D

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36. The life-life of Bi^{210} is 5 days. What time is taken by $(7/8)^t h$ part of the sample of decay ?

A. 3.4 days

B. 10 days

C. 15 days

D. 20 days

Answer: C

Watch Video Solution

37. N atoms of a radioactive element emit n alpha particles per second. The half-life of tge element is.

A. $\frac{n}{N}$ s

B. $\frac{N}{n}$ s

C. $\frac{0.693N}{n}$s

D. $\frac{0.693n}{N}$s

Answer: C

Watch Video Solution

38. The half-life (T) and the disintegration constant (λ) of a radioactive substance are related as

A. $\lambda T = 1$

B. $\lambda T = 0.693$

C. $\frac{T}{\lambda} = 0.693$

D. $\frac{\lambda}{T} = 0.693$

Answer: B

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39. The activity of a radioactive sample is measured as 9750 counts per minute at $t = 0$ and as 975 counts per minute at $t = 5$ minutes. The decay constant is approximately

A. 0.230 per minute.

B. 0.461 minute

C. 0.691 minute

D. 0.922 per minute

Answer: B

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40. For the de-Broglie wavelength of 10^{-17} metre, momentum of a particle will be

A. $13.25 \times 10^{-17} kgm / s$

B. 26.5×10^{-17} kg m/s

C. 6.625×10^{-17} kgm/s

D. 3.3125×10^{-17} kgm/s

Answer: C

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41. The de-Broglie wavelength of an electron is 66 nm. The velocity of the electron is

$\left[h = 6.6 \times 10^{-34} kgm^2 s^{-1}, m = 9.0 \times 10^{-31} kg\right]$

A. $1.84 \times 10^{-4} ms^{-1}$

B. $1.1 \times 10^{4} ms^{-1}$

C. $5.4 \times 10^{3} ms^{-1}$

D. $1.1 \times 10^{3} ms^{-1}$

Answer: B

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42. A helium atom at 300 K is moving with a velocity of $2.40 \times 10^{2} ms^{-1}$. The de-Broglie wavelength is about [At. Wt. of He=4.0]

A. 0.416 nm

B. 0.83 nm

C. 803 Å

D. 8000Å

Answer: A

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43. The de-Broglie wavelength of an electron revolving in the ground state orbit is

A. πr

B. πr^2

C. $2\pi r$

D. $\sqrt{2\pi r}$

Answer: C

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44. A particle X moving with a certain velocity has a debroglie wave length of $1A^{\circ}$. If particle Y has a mass of 25% that of X and velocity

75% that of X, debroglies wave length of Y will

be :-

(a). $3A^{\circ}$

(b). $5.33A^{\circ}$

(c). $6.88A^{\circ}$

(d). $48A^{\circ}$

A. 1Å

B. 5.3Å

C. 3Å

D. 0.2Å

Answer: B

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45. An electron is having a kinetic energy of 50 eV. Its de-Broglie wavelength is

A. 1.737Å

B. 2.5Å

C. 4.414Å

D. 6.5Å

Answer: A

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46. An electron and a proton are accelerated through the same potential difference. The ratio of their de-Broglie wavelengths will be

A. $\left(\frac{m_p}{m_e}\right)^{1/2}$

B. m_e / m_p

C. m_p / m_e

D. 1

Answer: A

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47. In the Bohr model of a hydrogen atom, the centripetal force is furnished by the coulomb attraction between the proton and the electron. If a_0 is the radius of the ground state orbit, m is the mass and e is the chargeon the electron and ε_0 is the vacuum permittivity,the speed of the electron is

A. 0

B. $\dfrac{e}{\sqrt{\varepsilon_0 a_0 m}}$

C. $\frac{e}{\sqrt{4\pi\varepsilon_0 a_0 m}}$

D. $\frac{\sqrt{4\pi\varepsilon_0 a_0 m}}{e}$

Answer: C

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48. The wavelength of the energy emitted when electron come from fourth orbit to second orbit in hydrogen is $20.397 cm$. The wavelength of energy for the same transition in He^{+} is

A. $5.099 cm^{-1}$

B. $20.497 cm^{-1}$

C. $40.994 cm^{-1}$

D. $81.988 cm^{-1}$

Answer: A

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49. The time of revolution of an electron around a nucleus of charge Ze in nth Bohr orbit is directly proportional to

A. n

B. $\frac{n^3}{Z^2}$

C. $\frac{n^2}{Z}$

D. $\frac{Z}{n}$

Answer: B

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50. If the binding energy of the electron in a hydrogen atom is $13.6eV$ the energy required to remove the electron from the

first excited state of Li^{++} is

A. 122.4 eV

B. 30.6 eV

C. 13.6 eV

D. 3.4 eV

Answer: B

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51. A difference of 2.3 eV separates two energy levels in an atom. What is the frequency of radiation emitted when the atom transits form the upper level to the lower level.

A. $6.95 \times 10^{14} Hz$

B. 3.68×10^{15} Hz

C. 5.6×10^{14} Hz

D. 7.28×10^{14} Hz

Answer: C

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52. The half-life a radioacitve substance is 40 yeard. How long will it take to reduce to one fourth of its original amount and what is the value of decay constant ?

A. 40 year, 0.9173 /year

B. 90 year, 9.017/ year

C. 80 year, 0.0173 year

D. None of these

Answer: C

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53. The rest mass of an electron as well as that of positron is 0.51 MeV. When an electron and positron are annihilate, they produce gamma-rays of wavelength(s)

A. 0.012Å

B. 0.024Å

C. 0.012Å to ∞

D. 0.024Å to ∞

Answer: A

Watch Video Solution

54. In Bohr's model of hydrogen atom, the period of revolution of the electron in any orbit is proportional to

A. the quantum number

B. square root of the quantum number

C. square of the quantum number.

D. cube of the quantum number.

Answer: D

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55. Energy of the lowest level of hydrogen atom is $-13.6eV$. The energy of the photon emitted in the transition from n=3 to n=1 is

A. 27 eV

B. 9 eV

C. 3 eV

D. 12.09 eV

Answer: D

Watch Video Solution

56. Ionization potential of hydrogen atom is $13.6V$. Hydrogen atoms in the ground state are excited by monochromatic radiation of photon energy $12.1eV$. The spectral lines emitted by hydrogen atoms according to Bohr's theory will be

A. 1

B. 3

C. 3

D. 4

Answer: C

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57. If in nature they may not be an element for which the principle quantum number $n > 4$, then the total possible number of elements will be

A. 60

B. 32

C. 4

D. 64

Answer: A

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58. If the binding energy per nucleon of deuterium is 1.115 MeV, its mass defect in atomic mass unit is

A. 0.0048

B. 0.0024

C. 0.0012

D. 0.0006

Answer: B

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59. Two samples X and Y contain equal amounts of radioactive substances. If $\frac{1}{16}th$ of a sample X and $\frac{1}{256}th$ of sample Y remain after 8h, then the ratio of half periods of X and Y is

A. $2:1$

B. $1:2$

C. $1:4$

D. $1:16$

Answer: A

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60. Assertion: Balmer series lies in visible region of electromagnetic spectrum.

Reason: Balmer means visible, hence series lies in visible region.

A. Assertion is True, Reason is true, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is true, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False but, Reason is True.

Answer: C

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61. Assertion: Natural radioactive nuclei are nuclei of high mass number.

Reason: The B.E. per nucleon of heavy nuclei is large as compared to that of the stable nuclei.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False, but, Reason is true.

Answer: C

Watch Video Solution

62. Assertion: The density of nucleus is maximum at the center and falls to zero as we move redically ourwards.

Reason: Matter is uniformly distributed inside the nucleus.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False, but, Reason is true.

Answer: C

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Competitive Thinking

1. Rutherford assumed in his atomic model that

A. the mass is concentrated at the center.

B. charge is concentrated at the center.

C. both the mass and charge are concentrated at the center.

D. electrons are positively charged particles.

Answer: A

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2. Rutherford's a particle experiment showed that the atoms have

A. proton

B. nucleus

C. neutron

D. electrons

Answer: B

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3. When an electron in hydrogen atom revolves in stationary orbit, it

A. does not radiate light thought its velocity changes

B. does not radiate light and velocity remains unchanged

C. radiates light but its velocity is unchanged

D. radiates light with the change of energy

Answer: A

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4. According to Bohr's theory, there can be an infinite numbner of electron orbits around the nucleus, however, only those orbits are possible for which

A. kinetic energy of electron is integral multiple of $h / 2\pi$

B. angular momentum is constant

C. angular momentum of electron is integral multiple of $h/2\pi$

D. none of these

Answer: C

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5. In the Bohr's hydrogen atom model, the radius of the stationary orbit varies with principle quantum number as

A. $r \propto n^{-1}$

B. $r \propto n$

C. $r \propto n^{-2}$

D. $r \propto n^{2}$

Answer: D

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6. An electron revolve round the nucleous with the radius of the circular orbit is 'r' . To double the kinetic energy of the electron its orbital radius will be

A. $\frac{r}{\sqrt{2}}$

B. $\sqrt{2}r$

C. 2r

D. $\frac{r}{2}$

Answer: D

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7. The radius of hydrogen atom, in its ground state, is of the order of

A. 10^{-8} cm

B. 10^{-6} cm

C. 10^{-5} cm

D. 10^{-4} cm

Answer: A

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8. The fact that photons carry energy was established by

A. Doppler's effect.

B. Compton effect.

C. Bohr's theory

D. Diffraction of light.

Answer: C

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9. In an atom, an electron moves in an orbit of radius r with a speed v, the equivalent current is.

A. $\frac{ev}{2\pi r}$

B. $\frac{2\pi ev}{r}$

C. 3 ev

D. evr

Answer: A

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10. The electron in first orbit of hydrogen with velocity $2.18 \times 10^6 m / s$. If the radius of first orbit is 0.53 Å, then orbital current is

A. 0.41 mA

B. 1.04 mA

C. 1.84 mA

D. 2.4 mA

Answer: B

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11. Ratio of velocity in first orbit of H_2 to speed of light is

A. $2e^2 / \varepsilon_0 hn^2 c$

B. $2e^2 / \varepsilon_0 hc$

C. $e^2 / \varepsilon_0 hc$

D. $e^2 / 2\varepsilon_0 hc$

Answer: D

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12. The period of revolution of an electron in the ground state of hydrogen atom is T. The period of revolution of the electron in the first excited state is

A. 2T

B. 4T

C. 6T

D. 8T

Answer: D

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13. When electron jumps from n=4 level to n=1 level,the angular momentum of electron changes by

A. $\frac{h}{2\pi}$

B. $\frac{2h}{2\pi}$

C. $\frac{3h}{2\pi}$

D. $\frac{4h}{2\pi}$

Answer: C

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14. First orbit velocity of electron is $2.1 \times 10^6 m/s$ then the velocity of 3rd orbit electron is

A. $7 \times 10^6 m/s$

B. $6 \times 10^6 m/s$

C. $7 \times 10^7 m/s$

D. $0.7 \times 10^6 m/s$

Answer: D

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15. The ionization potential of a hydrogen atom is 13.6 eV. What will be the energy of the atom corresponding to n=2?

A. $-6.8eV$

B. $-3.4eV$

C. $-27.2eV$

D. $-4.4eV$

Answer: B

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16. Energy E of a hydrogen atom with principle quantum number n is given by $E = \frac{-13.6}{n^2} eV$. The energy of a photon ejected when the electron jumps from $n = 3$ state to $n = 2$ state of hydrogen is approximately

A. 1.5 eV

B. 0.85 eV

C. 3.4 eV

D. 1.9 eV

Answer: D

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17. For the hydrogen atom the energy of radiation emitted in the transitation from 4th excited state

to 2nd exicited state according to Bohr 's theory is

A. 0.567 eV

B. 0.667 eV

C. 0.967 eV

D. 1.267 eV

Answer: C

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18. Energy required for the electron excitation in Li^{++} from the first to the third Bohr orbit is

A. 12.1 eV

B. 36.3 eV

C. 108.8 eV

D. 122.4 eV

Answer: C

Watch Video Solution

19. The ionisation potential of hydrogen atom is $13.6eV$. The energy required to remove an electron in the $n=2$ state of the hydrogen atom is

A. $27.2eV$

B. 13.6 eV

C. 6.8 eV

D. 3.4 eV

Answer: D

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20. An electron collides with a hydrogen atom in its ground state and excites it to $n = 3$,. The energy gives to hydrogen aton n this inclastic collision is [Neglect the recoiling of hydrogen atom]

A. 10.2 eV

B. 12.1 eV

C. 12.5 eV

D. 13.6 eV

Answer: B

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21. The ground state energy of hydrogen atom is $-13.6eV$. What is the potential energy of the electron in this state

A. 0 eV

B. $-27.2eV$

C. 1 eV

D. 2 eV

Answer: B

Watch Video Solution

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

A. $1:1$

B. $1: \ -1$

C. $2:1$

D. $1: \ -2$

Answer: D

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23. The electron in a hydrogen atom makes a transition from an excited state to the ground state. Which of the following statements is true?

A. Its kinetic energy increases and its potential and total energies decrease.

B. Its kinetic energy decreases, potential energy increases and its total energy remains the same.

C. Its kinetic and total energies decreases and its potential energy increases.

D. Its kinetic, potential and total energies decreases.

Answer: A

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24. The values of potential energy, kinetic energy and the total energy of the electron in the fourth orbit of hydrogen atom are respectively.

A. $-1.7eV, +1.7eV, 0$

B. $-1.7eV, -1.7eV, -3.4eV$

C. $+1.7eV, +1.7eV, -3.4eV$

D. $-1.7eV, +0.85eV, -0.85eV$

Answer: D

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25. Total energy of electron in an excited state of hydrogen atom is $-3.4eV$. The kinetic and potential energy of electron in this state.

A. $K = -3.4eV, U = -6.8eV$

B. $K = 3.4eV, U = -6.8eV$

C. $K = -6.8eV, U = +3.4eV$

D. $K = +10.2eV, U = -13.6eV$

Answer: B

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26. The transition of an electron from $n_2 = 5, 6$ ..... To $n_1 = 4$ gives rise to

A. Pfund series.

B. Lyman series.

C. Paschen series

D. Brackett series.

Answer: D

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27. The lines of Lyman sereis are present in which region of the spectrum?

A. Far ultraviolet

B. visible

C. Infrared

D. Far infrared

Answer: A

Watch Video Solution

28. Balmer series lies in which spectrum?

A. Visible

B. Ultraviolet

C. Infrared

D. Partially visible, partially infrared.

Answer: A

Watch Video Solution

29. Which one of the series of hydrogen spectrum is in the visible region ?

A. Lyman series

B. Balmer series

C. Paschen series

D. Bracket series.

Answer: B

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30. In Bohr's theory of hydrogen atom, the electron jumps from higher orbit n to lower orbit p. The wavelength will be minimum for the transition

A. n=5 to p=4

B. n=4 to p=3

C. n=3 to p=2

D. n=2 to p=1

Answer: D

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31. If λ_1 and λ_2 are the wavelength of the first members of the Lyman and Paschen series, respectively, then $\lambda_1 \lambda_2$ is

A. $1:3$

B. $1:30$

C. $7:50$

D. $7:108$

Answer: D

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

A. $0.25 \times 10^7 m^{-1}$

B. $2.5 \times 10^7 m^{-1}$

C. $0.025 \times 10^4 m^{-1}$

D. $0.5 \times 10^7 m^{-1}$

Answer: A

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33. The least energetic wave number in the Paschen series is

A. $\frac{5R}{16}$

B. $\frac{R}{4}$

C. $\frac{R}{9}$

D. $\frac{7R}{144}$

Answer: D

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34. 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?

A. 13.6 eV

B. 0.65 eV

C. 1.9 eV

D. 11.1 eV

Answer: D

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35. The ionisation potential of H-atom is $13.6 eV$. When it is excited from ground state by monochromatic radiations of $970.6 \mathrm{Å}$, the number of emission lines will be (according to Bohr's theory)

A. 10

B. 8

C. 6

D. 4

Answer: C

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36. Hydrogen $\left(._1 H^1\right)$, Deuterum $\left(._1 H^2\right)$, singly ionised Hellium $\left(._2 He^4\right)^+$ and doubly ionised lithium $\left(._3 Li^6\right)^{++}$ all have one electron around the nucleus. Consider an electron tranition from $n = 2$ to $n = 1$. If the wave lengths of emitted radiation are $\lambda_1, \lambda_2, \lambda_3$ and λ_4 respectively then approximately which one of the follwing is correct ?

A. $4\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

B. $\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

C. $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$

D. $\lambda_1 = 2\lambda_2 = 3\lambda_3 = 4\lambda_4$

Answer: C

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37. An electron jumps from the $4th$ orbit to the $2nd$ orbit of hydrogen atom. Given the Rydberg's constant $R = 10^5 cm^{-1}$. The frequency in Hz of the emitted radiation will be

A. $\frac{3}{16} \times 10^5$

B. $\frac{3}{16} \times 10^{15}$

C. $\frac{9}{16} \times 10^{15}$

D. $\frac{3}{4} \times 10^{15}$

Answer: C

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38. The ratio of the largest to shortest wavelength in Lyman series of hydrogen spectra is

A. $\frac{25}{9}$

B. $\frac{17}{6}$

C. $\frac{9}{5}$

D. $\frac{4}{3}$

Answer: D

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39. If the wavelength of the first line of the Balmer series of hydrogen is 6561Å, the wavelngth of the second line of the series should be

A. 13122 Å

B. 3280Å

C. 4860Å

D. 2187Å

Answer: C

Watch Video Solution

40. The first member of the paschen series in hydrogen spectrum is of wavelength $18, 800 \text{Å}$. The short wavelength limit of Paschen series is

A. 1215 Å

B. 6560 Å

C. 8225 Å

D. 12850 Å

Answer: C

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

A. $\frac{5}{27}$

B. $\frac{4}{9}$

C. $\frac{9}{4}$

D. $\frac{27}{5}$

Answer: A

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42. The ratio of wavelength of the lest line of Balmer series and the last line Lyman series is:

A. 2

B. 1

C. 4

D. 0.5

Answer: C

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43. If $\lambda_{\max}$ is $6563 Å$, then wave length of second line of Balmer series will be

A. $\lambda = \frac{16}{3R}$

B. $\lambda = \frac{36}{5R}$

C. $\lambda = \frac{4}{3R}$

D. $\lambda = \frac{9}{5R}$

Answer: A

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44. $\frac{\lambda_{\alpha}}{\lambda_{\beta}}$ in Balmer series is

A. $27 : 20$

B. $20 : 27$

C. $5 : 36$

D. $12 : 64$

Answer: A

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45. The frequencies for series limit of Balmer and Paschen series respectively are v_1 and v_3. If frequency of first line of Balmer series is v_2 then the relation between v_1, v_2 and v_3 is

A. $v_1 - v_2 = v_3$

B. $v_1 + v_3 = v_2$

C. $v_1 + v_2 = v_3$

D. $v_1 - v_3 = 2v_1$

Answer: A

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46. If the series limit frequency of the Lyman series is v_L, then the series limit frequency of the Pfund seriesis :

A. $v_L / 16$

B. $v_L / 25$

C. $25 v_L$

D. $16 v_L$

Answer: B

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47. For Balmer series , wavelength of first line is 1 λ and for Brackett series, wavelength of first line is 2λ then their ratio is

A. 0.081

B. 0.162

C. 0.198

D. 0.238

Answer: B

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48. The ratio of the longest to shortest wavelength in Brackett series of hydrogen spectra is

A. $\frac{25}{9}$

B. $\frac{17}{6}$

C. $\frac{9}{5}$

D. $\frac{4}{3}$

Answer: A

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49. The shortest wavelength for Lyman series is 912 Å. What will be the longest wavelength in Paschen series?

A. 1216Å

B. 3646Å

C. 18761Å

D. 8208Å

Answer: C

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50. If, an electron in hydrogen atom jumps from an orbit of lelvel n=3 to an orbit of level n=2, emitted radiation has a freqwuency (R= Rydbertg's contant ,c = velocity of light)

A. $\frac{3Rc}{27}$

B. $\frac{Rc}{25}$

C. $\frac{8Rc}{9}$

D. $\frac{5Rc}{36}$

Answer: D

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51. 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 form the $4th$ orbit to the $3dr$ orbit, the corresponding wavelength of the photon will be

A. $\frac{20}{13}\lambda$

B. $\frac{16}{25}\lambda$

C. $\frac{9}{16}\lambda$

D. $\frac{20}{7}\lambda$

Answer: D

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52. An electron in an atom jumping from 3rd orbit to 2nd orbit emits radiation of wavelength λ_1 and when it jumps from 2nd orbit to 1st orbit emits radiation of wavelength

λ_2. The wavelength of radiation emitted when it jumps from 3rd orbit to 1st orbit is

A. $\sqrt{\lambda_1\lambda_2}$

B. $\dfrac{\lambda_1 + \lambda_2}{2}$

C. $\dfrac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

D. $(\lambda_1 + \lambda_2)$

Answer: C

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53. As an electron makes a transition from an excited state to the ground state of hydrogen-like atom / ion:

A. its kinetic energy increases but potential energy and total energy decreases

B. kinetic energy, potential energy and total energy decreases

C. kinetic energy decreases, potential energy increases but total energy remains same

D. kinetic energy and total energy decreases but potential energy increases

Answer: A

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54. Wavelength of characteristic X-ray depends on which property of target?

A. A

B. Z

C. Melting point

D. All of these

Answer: B

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55. The radius of an atomic nucleus is of the order of

A. 10^{-10} cm

B. 10^{-15} cm

C. 10^{-13} cm

D. 10^{-8} cm

Answer: C

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56. Binding energy of a nucleus is equivalent to

A. mass of the proton

B. mass of the neutron

C. mass of the nucleus

D. mass defect of the nucleus

Answer: D

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57. In helium nucleus, there are.

A. one proton + 1 neutron

B. one proton + 2 neutrons

C. 1 proton + 3 neutrons

D. 1 proton + 4 neutrons

Answer: B

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58. In nuclear reaction $._{4}Be^{9}+._{2}He^{4}\rightarrow ._{6}C^{12}+X, X$ will be

A. Neutron

B. Proton

C. Positron

D. Electron

Answer: A

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59. The ratio of nuclear volume to the atomic volume is

A. 10

B. 10^{-5}

C. 10^{-10}

D. 10^{-15}

Answer: D

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60. Two nuclei have their mass numbers in the ratio of $1:3$. The ratio of their nuclear densities would be

A. $3^{1/3}:1$

B. $1:1$

C. $1:3$

D. $3:1$

Answer: B

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61. The size of atomic nucleus is

A. 10 fermi

B. 5 fermi

C. 1.2 fermi

D. 0.1 fermi

Answer: C

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62. An element X decays into element Z by two - steps process

$X \rightarrow Y + He_2^4$

$Y \rightarrow Z + 2e$ then

A. X and Z are isobars.

B. X and Y are isotopes

C. X and Z are isotopes

D. X and Z are isotopes.

Answer: D

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63. Mp depends the mass of a proton and Mn that 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 (c is the velocity of light)

A. $M(N, Z) = NMn + ZMp - Bc^2$

B. $M(N, Z) = NMn + ZMp + Bc^2$

C. $M(N, Z) = NMn + ZMp - B/c^2$

D. $M(N, Z) = NMn + ZMp + B/c^2$

Answer: C

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64. The radius of nucleus is:

A. directly proportional to its mass number.

B. inversely proportional to its atomic weight.

C. directly proportional to the cube root of its mass number.

D. none of these

Answer: C

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65. If radius of the $._{13}^{27}Al$ nucleus is taken to be R_{AI}, then the radius of $._{53}^{125}Te$ nucleus is nearly

A. $\left(\frac{53}{13}\right)^{1/3} R_{Al}$

B. $\frac{5}{3} R_{Al}$

C. $\frac{3}{5} R_{Al}$

D. $\left(\frac{13}{53}\right)^{\frac{1}{3}} R_{Al}$

Answer: B

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66. If the nucleus of $._{13} Al^{27}$ has a nuclear radius of about 3.6 fm, then $._{52} Te^{125}$ would have its radius approximately as

A. 3.6 Fermi

B. 6.0 fermi

C. 8.9 fermi

D. 16.7 fermi

Answer: B

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67. The radius of germanium (Ge) nuclide is measured to be twice the radius of $\_(4)^{9}Be$. The number of nucleons in Ge

A. 72

B. 73

C. 74

D. 75

Answer: A

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68. If the nuclear radius of $.^{27} A1$ 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

Answer: C

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69. A nucleus ruptures into two nuclear parts, which have their velocity ratio equal to $2:1$.

What will be the ratio of their nuclear size (nuclear radius)?

A. $2^{1/3} : 1$

B. $1 : 2^{1/3}$

C. $3^{1/2} : 1$

D. $1 : 3^{1/2}$

Answer: B

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70. The average binding energy per nucleon is maximum for the nucleus

A. ${}_2He^4$

B. ${}_8O^{16}$

C. ${}_{26}Fe^{36}$

D. ${}_{92}U^{238}$

Answer: C

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71. Which of the following is stable?

A. Proton

B. Positron

C. Neutron

D. Electron

Answer: C

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72. For uranium nucleus how does its mass vary with volume?

A. $m \propto V$

B. $m \propto I/V$

C. $m \propto \sqrt{V}$

D. $m \propto V^2$

Answer: A

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73. What is the amount of energy released, when 3 kg mass is annihilated?

A. $22 \times 10^{16} J$

B. 18×10^{16}J

C. 27×10^{16} J

D. 9×10^{16} J

Answer: C

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74. 1.5 kg mass is annihilated. Energy liberated in this process is

A. 1.35×10^{16} J

B. 13.5×10^{16} J

C. 13.5×10^{8} J

D. 135 J

Answer: B

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75. A certain mass of hydrogen is changes to helium by the process of fusion. The mass defect in fusion reaction is $0.02866u$. The energy liberated per u is (given $1u = 931 MeV$)

A. 2.67 MeV

B. 26.7 MeV

C. 6.67 MeV

D. 13.3 MeV

Answer: C

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76. The mass defect of He_2^4 He is 0.03 u. The binding energy per nucleon of helium (in MeV) is

A. 6.9825

B. 27.93

C. 2.793

D. 69.825

Answer: A

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77. The masses of neutron and proton are 1.0087 a.m.u. and 1.0073 a.m.u. respectively. If the neutrons and protons combine to form a helium nucleus (alpha particle) of mass 4.0015 a.m.u. The binding energy of the helium nucleus will be $(1a.m.u. = 931MeV)$.

A. 28.4 MeV

B. 20.8 MeV

C. 27.3 MeV

D. 14.2 MeV

Answer: A

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78. $1g$ of hydrogen is converted into $0.993g$ of helium in a thermonuclear reaction. The energy released is.

A. 63×10^7J

B. 63×10^{10} J

C. 63×10^{14} J

D. 63×10^{20} J

Answer: B

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79. The binding energy per nucleus of $_8O^{17}$ is 7.75 MeV. The energy required to remove one neutron from $_8O^{17}$ is............... MeV.

A. 3.52

B. 3.62

C. 4.23

D. 7.86

Answer: C

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80. In the reaction $._1^2 H + ._1^3 H \rightarrow ._2^4 He + ._0^1 n$, if the binding energies of $._1^2 H, ._1^3 H$ and $._2^4 He$ are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is.

A. c+a-b

B. c-a-b

C. a+b+c

D. a+b-c

Answer: B

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81. The binding energy per nucleon of $._3^7 Li$ and $._2^4 He$ nuclei are 5.60 MeV and 7.06 MeV, respectively. In the nuclear reaction

$._3^7 Li + ._1^1 H \to ._2^4 He + ._2^4 He + Q$, the value of energy Q released is

A. 19.6 MeV

B. -2.4 MeV

C. 8.4 MeV

D. 17.3 MeV

Answer: D

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82. Unit of radioactivity is rutherford. Its value is

A. 3.7×10^{10} disintegrations/s.

B. 3.7×10^{6} disintegrations/s.

C. 1.0×10^{10} disintegrations/s.

D. 1.0×10^{6} disintegrations/s.

Answer: D

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83. Which of the following is in the increasing order for penetrating power ?

A. α, β, γ

B. β, α, γ

C. γ, α, β

D. γ, β, α

Answer: A

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84. A radioactive decay can form an isotope of the original nucleus with the emission of particles

A. one α and one β

B. one α and four β

C. four α and one β

D. one α and two β

Answer: D

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85. For the radioactive nuclei that undergo either α or β decay, which one of the following cannot occur?

A. Isobar of original nucleus is produced.

B. Isotope of the original nucleus is produced.

C. Nuclei with higher atomic number than that of the original nucleus is produced.

D. Nuclei with lower atomic number than that of the original nucleus is produced.

Answer: B

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86. Which of the following is emitted when $_{94}Pu^{239}$ decays into $_{92}U^{235}$?

A. Gamma Ray

B. Neutron

C. Electron

D. Alpha particle.

Answer: D

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87. In the nuclear decay given below :

$$\underset{Z}{\overset{A}{.}}X \rightarrow \underset{Z+1}{\overset{A}{.}}Y \rightarrow \underset{z-1}{\overset{A-4}{.}}B^{\star} \rightarrow \underset{z-1}{\overset{A-4}{.}}B$$

The particles emitted in the sequence are :

A. $\beta^{-1}, \beta^{-1}, \beta^{-1}, \alpha^{-1}$

B. $\beta^{-1}, \beta^{-1}, \beta^{+}, \alpha$

C. $\beta^{-}, \beta^{-1}, \alpha, \alpha$

D. $\beta^{-1}, \beta^{-1}, \alpha, \beta^{-1}$

Answer: D

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88. Age of a tree is determined by using radio-isotope of

A. carbon

B. cobalt

C. iodine

D. phosphorus

Answer: A

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89. The decay constant of radio isotope is λ. If A_1 and A_2 are its activities at times t_1 and t_2 respectively, the number of nuclei which have decayed during the time $(t_1 - t_2)$

A. $A_1 t_1 - A_2 t_2$

B. $A_1 - A_2$

C. $(A_1 - A_2)/\lambda$

D. $\lambda(A_1 - A_2)$

Answer: C

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90. The half life of a radioactive substance is 20 days. If $\frac{2}{3}$ part of the substance has decayed in time t_2 and $\frac{1}{3}$ part of it has decayed in time t_1 then the time interval between t_2 and t_1 is $(t_2 - t_1)$=...............

A. 5 days

B. 10 days

C. 20 days

D. 40 days

Answer: C

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91. The half-life of a radioactive element which has only $\frac{1}{32}$ of its original mass left after a lapse of 60 days is

A. 12 days

B. 32 days

C. 60 days

D. 64 days

Answer: A

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92. The half-life of a radioactive isotope X is $20yr$. It decays to another element Y which is stable. The two elements X and Y were found to be in the ratio $1:7$ in a sample of given rock.

The age of the rock is estimated to be

A. 40 years

B. 60 years

C. 80 years

D. 100 years

Answer: B

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93. The half-life of a radioactive sample is 6.93 days. After how many days will only $\frac{1}{20}$ of the sample be left over? [Take $\log_e(20) = 3.0$]

A. 20 days

B. 27 days

C. 30 days

D. 35 days

Answer: C

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94. A radio isotope X with a half-life 1.4×10^9 years decays of Y which is stable. A sample of the rock from a cave was found to contain X and Y in the ratio $1:7$. The age of the rock is.

A. 1.96×10^9 years

B. 3.92×10^9 years

C. 4.20×10^9 years

D. 8.40×10^9 years

Answer: C

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95. Radioactive material 'A' has decay constant $'8\lambda'$ and material 'B' has decay constant 'lamda'. Initial they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$?

A. $\frac{1}{\lambda}$

B. $\frac{1}{7\lambda}$

C. $\frac{1}{8\lambda}$

D. $\frac{1}{9\lambda}$

Answer: B

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96. The half-life period of a radioactive substance is 5 min . The amount of substance decayed in 20 min will be

A. 6.25

B. 75

C. 25

D. 93.75

Answer: D

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97. For a radioactive material, half-life is 10 minutes. If initially there are 600 number of nuclei, the time taken (in minutes) for the disintegration of 450 nuclei is.

A. 20

B. 10

C. 30

D. 15

Answer: A

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98. Two radioactive materials have decay constant $5\lambda \& \lambda$. If initially they have same no. of nuclei. Find time when ratio of nuclei become $\left(\frac{1}{e}\right)^2$:

A. $\frac{1}{4\lambda}$

B. 4λ

C. 2λ

D. $\frac{1}{2\lambda}$

Answer: D

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99. A radioactive material decays by simulataneous emission of two particle from the with respective half - lives 1620 and 810

year . The time , in year , after which one - fourth of the material remains is

A. 1080

B. 2430

C. 3240

D. 4860

Answer: A

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100. A radioactive nucleus can decay by two different processes. The half lives of the first and second decay processes are 5×10^3 and 10^5 years respectively. Then the effective half - life of the nucleus is

A. 105×10^5 years

B. 4762 years

C. 10^4 years

D. 47.6 yrs

Answer: B

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101. If the half-life of a radioactive sample is 10 hours its mean life is

A. 1.44

B. 6.93

C. 14.4

D. 0.693

Answer: C

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102. A radioactive nucleus A with a half life T, decays into nucleus B. At t=0, there is no nucleus B. At somewhat t, the ratio of the number of B to that of A is 0.3 . Then, t is given by

A. $t = T\log(1.3)$

B. $t = \frac{T}{\log 1.3}$

C. $t = \frac{T}{2}\frac{\log 2}{\log 1.3}$

D. $t = T\frac{\log 1.3}{\log 2}$

Answer: D

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103. The half-life of a radioactive element is 100 minutes . The time interval between the stage to 50% and 87.5% decay will be:

A. 25 minutes

B. 30 minutes

C. 10 minutes

D. 40 minutes

Answer: D

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104. The half-life of a radioactive substance is 30 minutes, The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is.

A. 60

B. 15

C. 30

D. 45

Answer: A

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105. Half life of a radio-active substance is 20 minutes. The time between 20% and 80% decay will be

A. 20 minutes

B. 30 minutes

C. 40 minutes

D. 60 minutes

Answer: C

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106. Half-life of a radioactive substance A and B are, respectively, 20 min and 40 min. Initially, the samples of A and B have equal number of nuclei. After 80 min, the ratio of the ramaining number of A and B nuclei is

A. $4:1$

B. $1:4$

C. $5:4$

D. $1:16$

Answer: C

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107. A sample contains $16gm$ of radioactive material, the half-life of which is two days. After

32 days, the amount of radioactive material left in the sample is

A. less than 1 mg

B. $\frac{1}{4}$ g

C. $\frac{1}{2}$ g

D. 1g

Answer: A

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108. The half-life of tritium is 12.5 years. What mass of tritium of initial mass 64 mg will remain undecayed after 50 years?

A. 32 mg

B. 8 mg

C. 16 mg

D. 4 mg

Answer: D

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109. A radioactive sample of half life 10 days contains 1000X nuclei. Number of original nuclei present after 5 days is

A. 707 X

B. 750 X

C. 500 X

D. 250 X

Answer: A

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110. A radioactive element has rate of disintegration $10,000$ disintegrations per minute at a particular instant. After four minutes it becomes 2500 disintegrations per minute. The decay constant per minute is

A. $0.2 \log_e 2$

B. $0.5 \log_e 2$

C. $0.6 \log_e 2$

D. $0.8 \log_e 2$

Answer: B

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111. A certain radioactive element disintegration with a decay constant of 7.9×10^{-10} sec. At a given instant of time, if the activity of the sample is equal to 55.3×10^{11} disintegration/sec, then number of nuclei at that instant of time.

A. 7.0×10^{21}

B. 4.27×10^{13}

C. 4.27×10^{3}

D. 6×10^{23}

Answer: A

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112. A sample of a radioactive element has a mass of $10g$ at an instant $t = 0$. The approxiamte mass of this element in the sample after two mean lives is .

A. 2.50 g

B. 3.70 g

C. 6.30 g

D. 1.35 g

Answer: D

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113. If the half life of a radioactive nucleus is 3 days nearly, what fractions of the initial number of nuclei will decay on the 3rd day? (Given that $\sqrt{0.25} = 0.63$)

A. 0.63

B. 0.5

C. 0.37

D. 0.13

Answer: D

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114. In the given nuclear reaction A, B, C, D, E represents

$\cdot_{92} U^{238} \rightarrow^{\alpha} \cdot_{B} Th^{A} \rightarrow^{\beta} \cdot_{D} Pa^{C} \rightarrow^{E} \cdot_{92} U^{234}$.

A.

$$A = 234, B = 90, C = 234, D = 91, E - \beta$$

B.

$$A = 234, B = 90, C = 234, D = 94, E = \alpha$$

C.

$$A = 238, B = 93, C = 234, D = 91, E = \beta$$

D.

$$A = 234, B = 90, C = 234, D = 93, E = \alpha$$

Answer: A

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115. A radioactive element X disintegrates successively

$$X \xrightarrow{\beta^-} X_1 \xrightarrow{\alpha} X_2 \xrightarrow{\beta_-} X_3 \xrightarrow{\alpha} X_4$$

If atomic number and atomic mass number of X are respectively, 72 and 180, then what are the corresponding values for X_4 ?

A. 69176

B. 69172

C. 71176

D. 70172

Answer: D

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116. A radiaoactive nucleus (initial mass number A and atomic number Z emits 3α- particles and 2 positrons The ratio of number of neutrons to that of proton in the final nucleus will be

A. $\dfrac{A-Z-4}{Z-2}$

B. $\dfrac{A-Z-8}{Z-4}$

C. $\dfrac{A - Z - 4}{Z - 8}$

D. $\dfrac{A - Z - 12}{Z - 4}$

Answer: C

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117. In the decay series $._{92}U^{238}$ to $._{82}Pb^{206}$, how many α-paritcles and how many $\beta^{\ominus}$-particles are emitted?

A. 8 and 6

B. 6 and 8

C. 12 and 6

D. 8 and 12

Answer: A

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118. A radioactive element $._{90}X^{238}$ decay into $._{83}Y^{222}$. The number of $\beta -$ particles emitted are.

A. 4

B. 6

C. 2

D. 1

Answer: D

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119. Two radioactive substances X and Y initially contain an equal number of atoms. Their half-lives are 1 hour and 2 hours respectively. Then the ratio of their rates of disintergration after two hours is

A. $1:4$

B. $1:2$

C. $3:4$

D. $2:3$

Answer: A

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120. The de Broglie wavelength λ of a particle

A. is proportional to mass.

B. is proportional to impulse.

C. is inversely proportional to impulse.

D. does not depend on impulse.

Answer: C

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121. The de-Broglie wavelength of an electron in 4th orbit is (where, r=radius of 1st orbit)

A. $2\pi r$

B. $4\pi r$

C. $8\pi r$

D. $16\pi r$

Answer: C

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122. A body of mass 100g moves at the speed of 36 km/hr. The de Broglie wavelength related to it is of the order..........m $(h = 6.626 \times 10^{-34}$ Js)

A. 10^{-14}

B. 10^{-24}

C. 10^{-34}

D. 10^{-44}

Answer: C

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123. The de - Broglie wavelength of a neutron at $27^\circ C$ is λ. What will be its wavelength at $927^\circ C$?

A. $\frac{\lambda}{2}$

B. $\frac{\lambda}{2}$

C. $\frac{\lambda}{4}$

D. $\frac{3\lambda}{2}$

Answer: A

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124. A charged particle is associated from rest through a certain potential difference. The de-Broglie wavelength is λ_1 when it is accelerated through V_1 and is λ_2 when accelerated through V_2. The ratio λ_1 / λ_2 is

A. $V_1^{3/2} : V_2^{3/2}$

B. $V_2^{1/2} : V_1^{1/2}$

C. $V_1^{1/2} : V_2^{1/2}$

D. $V_1^2 : V_2^2$

Answer: B

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125. The energy of an electron having de-Brogilie wavelength λ is

(hwere, h=Plank's constant, m = mass of electron)

A. $\frac{h}{2m\lambda}$

B. $\frac{h^2}{2m\lambda p^2}$

C. $\frac{h^2}{2m^2\lambda^2}$

D. $\frac{h^2}{2m^2\lambda}$

Answer: B

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126. The energy that should be added to an electron to reduce its de - Broglie wavelength from one $nm \rightarrow 0.5nm$ is

A. four-times the initial energy

B. equal to the initial energy

C. two-times the initial energy

D. three-times the initial energy

Answer: D

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127. The de-Broglie wavelength of an electron is 0.4×10^{-10} m when its kinetic energy is 1.0 keV. Its wavelength will be 1.0×10^{-10}m, When its kinetic energy is

A. 0.2 keV

B. 0.8 keV

C. 0.63 keV

D. 0.16 keV

Answer: D

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128. The de-Broglie wavelength of an electron is the same as that of a 50 ke X-ray photon. The ratio of the energy of the photon to the kinetic energy of the electron is (the energy equivalent of electron mass of 0.5 MeV)

A. $1:50$

B. $1:20$

C. $20:1$

D. $50:1$

Answer: C

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129. An electron of mass m and a photon have same energy E. The ratio of de - Broglie wavelengths associated with them is :

A. $c(2mE)^{1/2}$

B. $\frac{1}{c}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$

C. $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

D. $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

Answer: C

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130. A photon sensitive metallic surface emits electrons when X-rays of wavelength λ fal on it.

The de-Broglie wavelength of the emitted electrons is (Neglect the work function of the surface, m is mass of the electron. H=Planck's constant. C= velocity of light)

A. $\sqrt{\frac{2mc}{h\lambda}}$

B. $\sqrt{\frac{h\lambda}{2mc}}$

C. $\sqrt{\frac{mc}{h\lambda}}$

D. $\sqrt{\frac{h\lambda}{mc}}$

Answer: B

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131. If the kinetic energy of a free electron doubles , its de - Broglie wavelength changes by the factor

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. 2

D. $\frac{1}{2}$

Answer: B

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132. If the kinetic energy of the particle is increased to 16 times its previous value , the percentage change in the de - Broglie wavelength of the particle is

A. 25

B. 75

C. 60

D. 50

Answer: B

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133. If an electron has an energy such that its de Broglie wavelength is 5500Å, then the energy value of that electron is $\left(h = 6.6 \times 10^{-34}\right)$ Js, $m_c = 9.1 \times 10^{-31}$ kg

A. 8×10^{-20} J

B. 8×10^{-10} J

C. 8 J

D. 8×10^{-25} J

Answer: D

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134. If the momentum of an electron is changed by Δp , then the de - Broglie wavelength associated with it changes by 0.50% . The initial momentum of the electron will be

A. $100Pm$

B. $\frac{P_m}{100}$

C. $200P_m$

D. $\frac{P_m}{200}$

Answer: C

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135. What is the de-Broglie wavelength associated with an electron moving with an electron, accelerated through a potential difference of 100 volt?

A. 12.27Å

B. 1.227Å

C. 0.1227Å

D. 0.001227Å

Answer: B

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136. Calculate de Broglie wavelength associated with an electron, accelerated through a potential difference of $400V$.

A. 0.03 nm

B. 0.04 nm

C. 0.12 nm

D. 0.06 nm

Answer: D

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137. The potential difference V required for accelerating an electron to have the de-Broglie wavelength of 1Å is

A. 100 V

B. 125 V

C. 150 V

D. 200 V

Answer: C

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138. An electron of mass m has de broglie wavelength λ when accelerated through a potential difference V . When a proton of mass

M is accelerated through a potential difference 9V, the de broglie wavelength associated with it will be (Assume that wavelength is determined at low voltage) .

A. $\frac{\lambda}{5}\sqrt{\frac{M}{n}}$

B. $\frac{\lambda}{3}\frac{M}{m}$

C. $\frac{\lambda}{3}\sqrt{\frac{m}{M}}$

D. $\frac{\lambda}{3}\frac{m}{M}$

Answer: C

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139. Find the de-Broglie wavelength of an electron with kinetic energy of 120 eV.

A. 112 pm

B. 95 pm

C. 124 pm

D. 102 pm

Answer: A

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140. An electron accelerated through a potential of 10,000 V from rest has a de-Broglie wavelength λ. What should be the accelerating potential so that the wavelength is doubled?

A. 20,000 V

B. 40,000 V

C. 5,000 V

D. 2,500 V

Answer: D

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141. A proton and an α-particle are accelerated through same potential difference. Find the ratio of their de-Brogile wavelength.

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. $\sqrt{3}$

D. $2\sqrt{3}$

Answer: B

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142. Electrons with de- Broglie wavelength λ fall on the target in an X- rays tube . The cut off wavelength of the emitted X- rays is

A. $\lambda_0 = \lambda$

B. $\lambda_0 = \frac{2mc\lambda d^2}{h}$

C. $\lambda_0 = \frac{2h}{mc}$

D. $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

Answer: B

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143. In Davisson-Germer experiment the decrease of the wavelength of the electron wave was done by

A. keeping more distance between the anode and filament

B. keeping the same potential difference between anode and filament.

C. decreasing the potential difference between anode and filament.

D. increasing the potential difference between anode and filament.

Answer: D

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144. In experiment of Davisson-Germer, emitted electron from filament is accelerated through voltage V then de-Broglie wavelength of that electron will be .... m.

A. $\frac{2Vem}{\sqrt{h}}$

B. $\frac{\sqrt{h}}{2Vem}$

C. $\frac{\sqrt{2Vem}}{h}$

D. $\frac{h}{\sqrt{2Vem}}$

Answer: D

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145. The largest distance between the interatomic planes of crystal is $10^{-7}cm$. The upper limit for the wavelength of X - rays which can be usefully studied with this crystal is

A. 1 Å

B. 2Å

C. 10Å

D. 20Å

Answer: D

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146. An electron in a hydrogen atom undergoes a transition from higher energy level to a lower energy level. The incorrect statement of the following is

A. kinetic energy of the electron increases.

B. velocity of the electron increases

C. angular momentum of the electron remains constant.

D. wavelengths of de-Broglie wave associated with the motion of electron decreases.

Answer: C,A,B,D

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147. Hydrogen atom excites energy level from fundamental state to $n = 3$. Number of spectrum lines according to Bohr, is

A. 4

B. 3

C. 1

D. 2

Answer: B

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148. Number of spectral lines in hydrogen atom is

A. 6

B. 8

C. 15

D. ∞

Answer: D

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149. An electron of stationary hydrogen atom jumps from 4^{th} energy level to ground level. The velocity that the photon acquired as a result of electron transition will be (h = Plank's constant, R = Rydberg's constatn, m = mass of photon)

A. $\frac{9Rh}{16m}$

B. $\frac{11hR}{16m}$

C. $\frac{13hR}{16m}$

D. $\frac{15hR}{16m}$

Answer: D

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150. A photon of wavelength 300nm interacts with a stationary hydrogen atom in ground state. During the interaction, whole energy of the photon is transferred to the electron of the atom. State which possibility is correct, (consider, Plank's constant $= 4 \times 10^{-15}$ eVs, velocity of light $= 3 \times 10^{8} ms^{-1}$ ionisation energy of hydrogen =13.6 eV)

A. Electron will be knocked out of the atom.

B. Electron will go to any excited state of the atom.

C. Electron will go only to first excited state of the atom.

D. Electron will keep orbitting in the ground state of atom.

Answer: C

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151. If the electron in hydrogen atom jumps from second Bohr orbit to group state and difference between energies of the two state is radiated in the form of photons. If the work function of the material of photons. If the work function of the material is 4.2eV then stopping potential is (energy of electron is nth orbit $= \frac{13.6}{n^2} eV \Big)$

A. 2eV

B. 4eV

C. 6 eV

D. 8eV

Answer: A

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152. What is the wavelength of ligth for the least energetic photon emitted in the Lyman series of the hydrogen spectrum. (Take , hc =1240 eV -nm)

A. 122 nm

B. 82 nm

C. 150 nm

D. 102 nm

Answer: A

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153. Atomic weight of boron is 10.81 and it has two isotopes $._5 B^{10}$ and $._5 B^{11}$. Then ratio of $._5 B^{10}$ in nature would be.

A. $19:81$

B. $10:11$

C. $15:16$

D. $81:19$

Answer: A

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154. If a proton and anti-proton come close to each other and annihilate, how much energy will be released ?

A. 1.5×10^{-10} J

B. 3×10^{-10} J

C. 4.5×10^{-10} J

D. None of these

Answer: B

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155. A nucleus splits into two nuclear parts having radii in the ratio $1:2$ Their velocities are in the ratio

A. $4:1$

B. $8:1$

C. $2:1$

D. $6:1$

Answer: B

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156. A nucleus of mass 20 u emits a γ-photon of energy 6 MeV. If the emission assume to occur when nucleus is free and rest, then the nucleus will have kinetic energy nearest to (take $1u = 1.6 \times 10^{-27}$ kg)

A. 10 keV

B. 1 keV

C. 0.1 keV

D. 100 keV

Answer: B

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157. Half-life of radioactive sample, when activity of material initially was 8 counts and after 3 hours it becomes 1 count is

A. 2 hours

B. 1 hour

C. 3 hours

D. 4 hours

Answer: B

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158. If $20gm$ of a radioactive substance due to radioactive decay reduces to $10gm$ in 4 minutes, then in what time $80gm$ of the same substance will reduce to $10gm$?

A. In 8 minutes

B. In 12 minutes

C. In 16 minutes

D. In 20 minutes

Answer: D

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159. Given a sample of radius -226 having half-life of 4 days. Find, the probability, a nucleus disintegrates after 2 half lifes.

A. 1

B. $\frac{1}{2}$

C. 1.5

D. $\frac{3}{4}$

Answer: D

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160. During mean life of a radioactive element, the fraction that disintegrates is

A. e

B. $\frac{1}{e}$

C. $\frac{e-1}{e}$

D. $\frac{e}{e-1}$

Answer: C

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161. A mixture consists of two radioactive materials A_1 and A_2 with half-lives of $20s$ and $10s$ respectively. Initially the mixture has $40g$ of

A_1 and $160g$ of a_2. The amount the two in the mixture will become equal after

A. 60s

B. 80 s

C. 20 s

D. 40 s

Answer: D

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162. The activity of a radioactive sample is measured as N_0 counts per minute at t=0 and N_0 / e counts per minute at t=5 minutes . The time (in minutes) at which the activity reduces of half its value is

A. $5 \log_e 2$

B. $\log_e \frac{2}{5}$

C. $\frac{5}{\log_e 2}$

D. $5 \log_{10} 2$

Answer: A

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163. (I): In a β^{-1} decay in a nucleus, a daughter nucleus that has discrete energy states is produced. The daughter nucleus reaches ground state from excited state by emitting γ-rays.

(II)- The binding energy of hydrogen nucleus is far less than the binding energy of helium nucleus:

A. 1 False, II False

B. 1 False, II True

C. I True, II False

D. I True, II True

Answer: D

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164. Half-life of a radioactive substance is 20 minutes. Difference between points of time when it is 33% disintegrated and 67% disintegrated is approximate.

A. 10 min

B. 20 min

C. 30 min

D. 40 min

Answer: B

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165. A radioactive substance of half-life 6 minutes is placed near a Geiger counter which is found to register 1024 particles per minute.

How many particles per minute will it register after 42 minutes?

A. 8

B. 16

C. 24

D. 32

Answer: A

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166. A particle A of mass m and initial velocity v collides with a particle of mass $m/2$ which is at rest. The collision is head on, and elastic. The ratio of the de-broglie wavelength λ_A and λ_B after the collision is

A. $\frac{\lambda_A}{\lambda_B} = \frac{2}{3}$

B. $\frac{\lambda_A}{\lambda_B} = \frac{1}{2}$

C. $\frac{\lambda_A}{\lambda_B} = \frac{1}{3}$

D. $\frac{\lambda_A}{\lambda_B} = 2$

Answer: D

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167. In a hydrogen like atom electron make transition from an energy level with quantum number n to another with quantum number $(n-1)$ if $n >> 1$, the frequency of radiation emitted is proportional to :

A. $\frac{1}{n}$

B. $\frac{1}{n^2}$

C. $\frac{1}{n^{3/2}}$

D. $\frac{1}{n^3}$

Answer: D

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168. Light of wavelength $500nm$ is incident on a metal with work function $2.28eV$. The de Broglie wavelength of the emitted electron is

A. $\leq 2.8 \times 10^{-12}$m

B. $< 2.8 \times 10^{-10}$m

C. $< 2.8 \times 10^{-9}$m

D. $\geq 2.8 \times 10^{-9}$m

Answer: D

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169. The radiation corresponding to $3 \rightarrow 2$ transition of hydrogen atom falls on a metal surface to produce photoelectrons . These electrons are made to enter circuit a magnetic field $3 \times 10^{-4}T$ if the ratio of the largest circular path follow by these electron is `10.0 mm , the work function of the metal is close to

A. 1.8 eV

B. 1.1 eV

C. 0.8 eV

D. 1.6 eV

Answer: B

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170. Hydrogen atom in ground state is excited by a monochromatic radiation of $\lambda = 975 \text{Å}$. Number of spectral lines in the resulting spectrum emitted will be

A. 3

B. 2

C. 6

D. 10

Answer: C

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171. The ionisation energy of hydrogen is 13.6 eV . The energy of the photon released when an electron jumps from the first excited state (n=2) to the ground state of hydrogen atom is

A. 3.4 eV

B. 4.53 eV

C. 10.2 eV

D. 13.6 eV

Answer: C

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172. When an $\alpha -$ 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 :

A. $\frac{1}{m^2}$

B. m

C. $\frac{1}{m}$

D. $\frac{1}{\sqrt{m}}$

Answer: C

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173. The de - Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature $T(\text{kelvin})$ and mass m, is

A. $\frac{h}{\sqrt{3mkT}}$

B. $\frac{2h}{\sqrt{3mkT}}$

C. $\frac{2h}{\sqrt{mkT}}$

D. $\frac{h}{\sqrt{mkT}}$

Answer: A

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174. The de-Broglie wavelength of thermal neutrons at 27° C will be

A. 1.77Å

B. 1.77 mm

C. 1.77 cm

D. 1.77 m

Answer: A

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175. The energy released by the fission of one uranium atom is 200 MeV. The number of fission per second required to prodice 6.4W power is

A. 10^{11}

B. 2×10^{11}

C. 10^{10}

D. 2×10^{10}

Answer: B

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176. Assertion: Energy is released when heavy nuclei undergo fission or light nuclei undergo fusion.

Reason: For heavy nuclei, binding energy per nucleon increases with increasing Z while for light nuclei it decreases with increasing Z.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False but, Reason is True.

Answer: C

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177. If an alpha particle and a deuteron move with velocity v and 2v respectively, the ratio of their de-Broglie wave length will be ....

A. $1 : \sqrt{2}$

B. $2 : 1$

C. $1 : 1$

D. $\sqrt{2} : 1$

Answer: C

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178. A particle is droped from a height H. The de-broglie wavelength of the particle as a function of height is proportional to

A. $H^{-1/2}$

B. H^{0}

C. $H^{1/2}$

D. H

Answer: A

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179. According to de-Broglie hypothesis, the wavelength associated with moving electron of mass 'm' is λ_e. Using mass energy relation and Planck's quantum theory, the wavelength associated with photon is λ_p. If the energy (E) of electron and photon is same then relation between λ_e and λ_p is

A. $\lambda_p \propto \lambda_e$

B. $\lambda_p \propto \lambda_e^2$

C. $\lambda_p \propto \sqrt{\lambda_e}$

D. $\lambda_p \propto \frac{1}{\lambda_e}$

Answer: A

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180. the number of de broglie wavelength contained in the second bohr orbit of hydrogen atom is

A. 1

B. 2

C. 3

D. 4

Answer: B

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Evaluation Test

1. Two radioactive materials X_1 and X_2 have decay constants 5λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of muclei of X_1 to that of X_2 will be $\frac{1}{e}$ after a time

A. $\frac{1}{2\lambda}$

B. $\frac{1}{4\lambda}$

C. $\frac{1}{6\lambda}$

D. $\frac{1}{8\lambda}$

Answer: B

Watch Video Solution

2. What amount of energy should be added to an electron to reduce its de-Broglie wavelength from 200 pm to 100 pm?

A. 113 eV

B. 356 eV

C. 453 eV

D. 648 eV

Answer: A

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3. In the process of nuclear fission of 1g uranium, the mass lost is 0.90 milligram. The efficiency of power station run by it is 10%. To obtain 200 megawatt power from the power station, the uranium required per hour is $(c = 3 \times 10^8)$ m/s.

A. 24g

B. 49 g

C. 68 g

D. 89g

Answer: D

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4. Assertion: Lyman series lies in the visible region of electromagnetic spectrum.

Reason: This is because Balmer series also lies in visible region.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Statement-2 is not a correct explanation for Reason.

C. Assertion is True, Reason is false.

D. Assertion is False but, Reason is True.

Answer: D

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5. When a hydrogen atom is excited from ground state to first excited state then

A. its kinetic energy increases by 10.2 eV.

B. its kinetic energy decreases by 20.4 eV.

C. its potential energy decreases by 20.4 eV.

D. its angular momentum increases by 1.05×10^{-34} J-s.

Answer: D

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6. A stationary helium ion emits a photon corresponding to the first line of Lyman series. That photon liberates a photoelectron form a stationary hydrogen atom in ground state. Find the velocity of photoelectron. Take mass of electron $= 9.11 \times 10^{-31} kg$ and ionisation energy of hydrogen atom=13.6ev.

A. 1.5×10^6 m/s

B. 3.1×10^6 m/s

C. 4.5×10^6 m/s

D. 6.2×10^7 m/s

Answer: B

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7. Average lifetime of a hydrogen atom excited to $n = 2$ state is $10^{-6}s$ find the number of revolutions made by the electron on the average before it jump to the ground state

A. 4.2×10^{-7}

B. 2.3×10^{-7}

C. 1.5×10^{-7}

D. 1.2×10^{-7}

Answer: D

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8. The binding energy per nucleon for ${}_1H^2$ and ${}_2He^4$ are 1.1 MeV and 7.1 MeV respectively. The energy released when two ${}_1H^2$ to form ${}_2He^4$ is .... MeV.

A. 24 MeV

B. 42 MeV

C. 12 MeV

D. 14 MeV

Answer: A

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9. Binding energy per nucleon for C^{12} is $7.68 MeV$ and for C^{13} is $7.74 MeV$. The energy required to remove a neutron from C^{13} is .

A. 5.49 MeV

B. 4.95 MeV

C. 9.45 MeV

D. 5.94 MeV

Answer: B

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10. Half-life of a substance is 10 minutes. The time between 33% decay and 67% decay is

A. 5 min

B. 10 min

C. 20 min

D. 40 min

Answer: B

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11. An hydrogen atom moves with a velocity u and makes a head on inelastic collision with another stationary H-atom. Both atoms are in ground state before collision. The minimum value of u if one of them is to be given a minimum excitation energy is

A. $6.25 \times 10^4 ms^{-1}$

B. $2.64 \times 10^4 ms^{-1}$

C. $4.26 \times 10^4 ms^{-1}$

D. $2.46 \times 10^{-4} ms^{-1}$

Answer: A

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12. Magnetic moment by virtue of the orbital motion of an electron in an atom when orbital angular momentum = one quantum unit is

A. $2.9 \times 10^{-20} Am^2$

B. $9.2 \times 10^{-20} Am^{-2}$

C. $9.2 \times 10^{-24} Am^2$

D. $2.9 \times 10^{-26} Am^2$

Answer: C

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13. The minimum kinetic energy of a ground state hydrogen atom required to have head-on collision with another ground state hydrogen atom but at rest to produce a photon is given by

A. 4.20 eV

B. 20.4 eV

C. 2.04 eV

D. $-9.1eV$

Answer: B

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14. When a deuteron of mass 2.0141 a.m.u and negligible K.E. is absorbed by a Lithium $\left(._3 Li^6\right)$ nucleus of mass 6.0155 a.m.u. the compound nucleus disintegration spontaneously into two alpha particles, each of mass 4.0026 a.m.u. Calculate the energy carried by each α particle.

A. 1.18 MeV

B. 8.11 MeV

C. 1.1 MeV

D. 11.08 MeV

Answer: D

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15. A material found within the body of an organism trapped in an ice berg had a ${}_{6}C^{14}$ activity of about 0.144 Bg per g. ${}_{6}C^{14}$ activity of the living organism is 0.28 Bq per g and its half life 5730 years. The age of organism would be

A. 1250 yr

B. 2400 yr

C. 5500 yr

D. 7600 yr

Answer: C

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Watch Video Solution

16. Assertion: Ionisation energy of atomic hydrogen is greater than atomic deuterium.

Reason: Ionisation energy is proportional to reduced mass.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is false.

D. Assertion is False but, Reason is True.

Answer: D

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17. Transition between three energy energy levels in a particular atom give rise to three Spectral line of wevelength , in increasing magnitudes. λ_1, λ_2 and λ_3. Which one of the following equations correctly ralates λ_1, λ_2 and λ_3?

A. $\lambda_1 = \lambda_2 - \lambda_3$

B. $\lambda_1 = \lambda_2 < \lambda_3$

C. $\frac{1}{\lambda_1} = \frac{1}{\lambda_2} + \frac{1}{\lambda_3}$

D. $\frac{1}{\lambda_1} = \frac{1}{\lambda_3} - \frac{1}{\lambda_2}$

Answer: C

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18. If the average life time of an excited state of hydrogen is of the order of 10^{-6} s estimate how may orbits an electron makes, whenit is the state n=2 and before it suffers a transition to state n=1 (Bohr radius $r_0 = 5.3 \times 10^{11}$m)

A. 3.21×10^8

B. 5.46×10^8

C. 8.22×10^8

D. 8.52×10^9

Answer: C

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19. A beam of monochromatic light of wavelength λ ejects photoelectronic from a cesium surface $(W_0 = 1.9eV)$ which are made to collide with hydrogen atoms in ground state. The maximum value of λ for which hydrogen atoms may be ionised is

A. 0.77 nm

B. 7.7 nm

C. 77 nm

D. 770 nm

Answer: C

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