RK VISION ACADEMY

PHYSICS

XII – ATOMS

SECTION A

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

   (1) 1/m

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

   (3) $1/m^2$

   (4) m

2. **Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is**

   (1) 9 : 4

   (2) 1 : 4

   (3) 4 : 1

   (4) 4 : 9

3. **For which one of the following, Bohr's model is not valid?**

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

   (2) Deuteron atom

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

   (4) Hydrogen atom

4. **The total energy of an electron in the nth stationary orbit of the hydrogen atom can be obtained by (eV)**

   (1) $E_n = -13.6/n^2$

   (2) $E_n = -1.36/n^2$

   (3) $E_n = -13.6 \times n^2$

   (4) $E_n = 13.6/n^2$

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

   (1) –3.4 eV, –3.4 eV

   (2) –3.4 eV, –6.8 eV

   (3) 3.4 eV, –6.8 eV

   (4) 3.4 eV, 3.4 eV

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

   (1) 2 : –1

   (2) 1 : –1

   (3) 1 : 1

   (4) 1 : –2

7. **The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is**

   (1) 1

   (2) 4

   (3) 0.5

   (4) 2

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

(1) 20 λ/7

(2) 20 λ/13

(3) 16 λ/25

(4) 9 λ/16

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

(1) 0.025×10^4 m^{-1}

(2) 0.5×10^7 m^{-1}

(3) 0.25×10^7 m^{-1}

(4) 2.5×10^7 m^{-1}

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

(1) 1.46×10^6 m/s

(2) 0.73×10^6 m/s

(3) 3.0×10^8 m/s

(4) 2.92×10^6 m/s

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

(1) 5/27

(2) 4/9

(3) 9/4

(4) 27/5

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

(1) 3

(2) 2

(3) 6

(4) 10

13. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is

(1) 9/31

(2) 5/27

(3) 3/23

(4) 7/29

14. In the following atoms and molecules for the transition from n= 2 to n = 1, the spectral line of minimum wavelength will be produced by

(1) Hydrogen atom

(2) Deuterium atom

(3) Uni-ionized helium

(4) di-ionized lithium

15. The Lyman series of hydrogen spectrum lies in the region

(1) Infrared

(2) Visible

(3) Ultraviolet

(4) X – rays

16. The size of an atom is of the order of

(1) 10^{-8}m

(2) 10^{-10}m

(3) 10^{-12}m

(4) 10^{-14}m

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

(1) Lyman series

(2) Balmer series

(3) Paschen series

(4) Bracket series

18. The Rutherford α-particle experiment shows that most of the α-particles pass through almost unscattered while some are scattered through large angles. What information does it give about the structure of the atom

(1) Atom is hollow

(2) The whole mass of the atom is concentrated in a small centre called nucleus

(3) Nucleus is positively charged

(4) All the above

19. An electron has a mass of 9.1×10^{-31}kg. It revolves round the nucleus in a circular orbit of radius 0.529×10^{-10}metreat a speed of 2.2×10^{6}m/s. The magnitude of its linear momentum in this motion is

(1) 1.1×10^{-34}kg-m/s

(2) 2.0×10^{-24}kg-m/s

(3) 4.0×10^{-24}kg-m/s

(4) 4.0×10^{-31}kg-m/s

20. The ionization potential for second He electron is

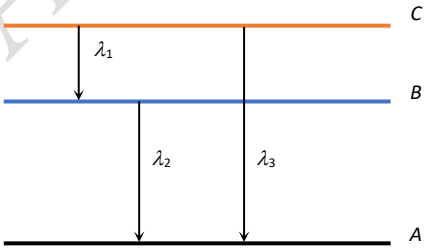
(1) 13.6 eV

(2) 27.2 eV

(3) 54.4 eV

(4) 100 eV

21. Energy levels A, B, C of a certain atom corresponding to increasing values of energy i.e. $E_A < E_B < E_C$. If λ_1, λ_2, λ_3 are the wavelengths of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statements is correct



(1) $\lambda_3=\lambda_1+\lambda_2$

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

(3) $\lambda_1+\lambda_2+\lambda_3=0$

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

22. The angular momentum of electron in n^{th} orbit is given by

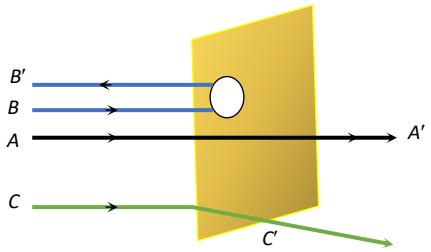
(1) nh

(2) $\frac{h}{2\pi n}$

(3) $n\frac{h}{2\pi}$

(4) $n^2\frac{h}{2\pi}$

23. **A beam of fast moving alpha particles were directed towards a thin film of gold. The parts A′, B′and C′of the transmitted and reflected beams corresponding to the incident parts A, B and C of the beam, are shown in the adjoining diagram. The number of alpha particles in**



(1) B′will be minimum and in C′maximum

(2) A′will be maximum and in B′minimum

(3) A′will be minimum and in B′maximum

(4) C′will be minimum and in B′maximum

24. **In any Bohr orbit of the hydrogen atom, the ratio of kinetic energy to potential energy of the electron is**

(1) 1/2

(2) 2

(3) $-1/2$

(4) – 2

25. **The spectral series of the hydrogen spectrum that lies in the ultraviolet region is the**

(1) Balmer series

(2) Pfund series

(3) Paschen series

(4) Lyman series

26. **Hydrogen atoms are excited from ground state of the principal quantum number 4. Then the number of spectral lines observed will be**

(1) 3

(2) 6

(3) 5

(4) 2

27. **In Bohr's model, the atomic radius of the first orbit is r_0, then the radius of the third orbit is**

(1) $\frac{r_0}{9}$

(2) r_0

(3) $9r_0$

(4) $3r_0$

28. **Minimum excitation potential of Bohr's first orbit in hydrogen atom is**

(1) 13.6 V

(2) 3.4 V

(3) 10.2 V

(4) 3.6 V

29. **If scattering particles are 56 for 90^o angle then this will be at 60^o angle**

(1) 224

(2) 256

(3) 98

(4) 108

30. **If λ_{max} is 6563 Å, then wavelength of second line for Balmer series will be**

(1) $\lambda=\frac{16}{3R}$

(2) $\lambda=\frac{36}{5R}$

(3) $\lambda=\frac{4}{3R}$

(4) None of the above

31. The energy of electron in first excited state of H-atom is - 3.4 eV its kinetic energy is

(1) – 3.4 eV

(2) + 3.4 eV

(3) – 6.8 eV

(4) 6.8 eV

32. If R is the Rydberg's constant for hydrogen the wave number of the first line in the Lyman series will be

(1) $\frac{R}{4}$

(2) $\frac{3R}{4}$

(3) $\frac{R}{2}$

(4) 2R

33. The ratio of minimum to maximum wavelength in Balmer series is

(1) 5 : 9

(2) 5 : 36

(3) 1 : 4

(4) 3 : 4

34. The ratio of the largest to shortest wavelengths in Lyman series of hydrogen spectra is

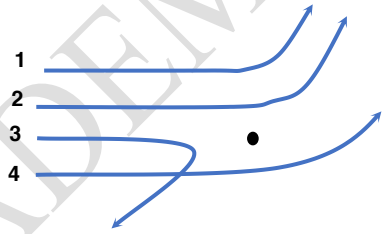
(1) $\frac{25}{9}$

(2) $\frac{17}{6}$

(c) $\frac{9}{5}$

(4) $\frac{4}{3}$

35. The diagram shows the path of four α-particles of the same energy being scattered by the nucleus of an atom simultaneously. Which of these are/is not physically possible



(1) 3 and 4

(2) 2 and 3

(3) 1 and 4

(4) 4 only

SECTION B

36. Energy of electron in a orbit of H-atom is

(1) Positive

(2) Negative

(3) Zero

(4) Nothing can be said

37. The ratio of the longest to shortest wavelengths in Brackett series of hydrogen spectra is

(1) $\frac{25}{9}$

(2) $\frac{17}{6}$

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

(4) $\frac{4}{3}$

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

(1) Stationary

(2) Not stationary

(3) Centralized

(4) None of these

39. With the increase in principle quantum number, the energy difference between the two successive energy levels

(1) Increases

(2) Decreases

(3) Remains constant

(4)Sometimes increases and sometimes decreases

40. The frequency of 1st line of Balmer series in H_2 atom is ν_0. The frequency of line emitted by singly ionised He atom is

(1) $2\nu_0$

(2) $4\nu_0$

(3) $\nu_0/2$

(4) $\nu_0/4$

41. An electron changes its position from orbit n=4 to the orbit n=2 of an atom. The wavelength of the emitted radiation's is (R = Rydberg's constant)

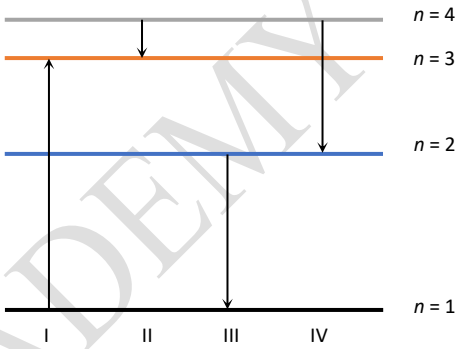
(1) $\frac{16}{R}$

(2) $\frac{16}{3R}$

(3) $\frac{16}{5R}$

(4) $\frac{16}{7R}$

42. The diagram shows-the energy levels for an electron in a certain atom. Which transition shown represents the emission of a photon with the most energy



(1) I

(2) II

(3) III

(4) IV

43. The magnetic moment (μ) of a revolving electron around the nucleus varies with principal quantum number n as

(1) $\mu \propto n$

(2) $\mu \propto 1/n$

(3) $\mu \propto n^2$

(4) $\mu \propto 1/n^2$

44. Radius of first Bohr orbit is r. What is the radius of 2nd Bohr orbit?

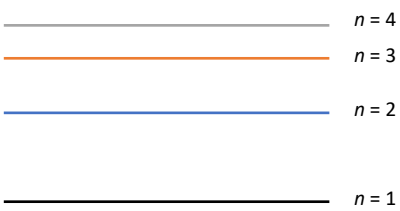
(1) 8r

(2) 2r

(3) 4r

(4) $2\sqrt{2r}$

45. Four lowest energy levels of H-atom are shown in the figure. The number of possible emission lines would be



(1) 3

(2) 4

(3) 5

(4) 6

46. In a hydrogen atom, which of the following electronic transitions would involve the maximum energy change

(1) From n = 2 to n = 1

(2) From n = 3 to n = 1

(3) From n = 4 to n = 2

(4) From n = 3 to n = 2

47. In hydrogen atom which quantity is integral multiple of $\frac{h}{2\pi}$

(1) Angular momentum

(2) Angular velocity

(3) Angular acceleration

(4) Momentum

48. When a hydrogen atom is raised from the ground state to an excited state:

(1) P.E. increases and K.E. decreases

(2) P.E. decreases and K.E. increases

(3) Both kinetic energy and potential energy increase

(4) Both K.E. and P.E. decrease

49. An α-particle moving with a constant energy is scattered by the nucleus. The scattering angle will be maximum when the α-particle :

(1) approaches the nucleus head on

(2) just passes the nucleus

(3) passes at large distance from the nucleus

(4) is attracted by the nucleus

50. Assertion : Bohr had to postulate that the electrons in stationary orbits around the nucleus do not radiate.

Reason: According to classical physics all moving electrons radiate.

(1) Both Assertion and Reason are the true and Reason is a correct explanation of Assertion

(2) Both Assertion and Reason are the true but Reason is not a correct explanation of Assertion

(3) Assertion is true and Reason is false.

(4) Assertion is false and Reason is true

RK VISION ACADEMY

PHYSICS

XII – ATOMS

SECTION A

1. 1
2. 1
3. 3
4. 1
5. 3
6. 2
7. 2
8. 1
9. 3
10. 1
11. 1
12. 3
13. 2
14. 4
15. 3
16. 2
17. 2
18. 4
19. 2
20. 3
21. 2
22. 3
23. 2
24. 3
25. 4
26. 2
27. 3
28. 3
29. 1
30. 1
31. 2
32. 2
33. 1
34. 4
35. 4

SECTION B

36. 2
37. 1
38. 2
39. 2
40. 2
41. 2
42. 3
43. 1
44. 3
45. 4
46. 2
47. 1
48. 1
49. 1
50. 2