JARS EDUCATION
Shop No. 1,2,3,4 Ayodhya Nagari, Hendre Pada, Badlapur (West), Thane, Maharashtra - 421503
: 99672 40893
83696 11389
99671 69853

Practice Paper

Time : 2 Hour | 11th standard (JEE BASED) ATOMIC STRUCTURE | Total Marks : 200

Chemistry

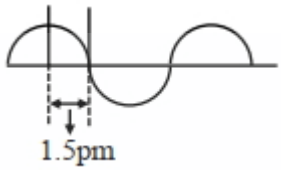
*** SECTION - A** [160]

1. Cathode rays have
   (A) Mass only
   (B) Charge only
   (C) Neither mass nor charge
   (D) Mass and charge both
2. What is the ratio of mass of an electron to the mass of a proton
   (A) $1:2$ (B) $1:1$ (C) $1:1837$ (D) $1:3$
3. Find the number of electrons in ground state of Pd with $l=2$
   (A) 18 (B) 20 (C) 8 (D) 10
4. The ratio between the neutrons in C and Si with respect to atomic masses 12 and 28 is
   (A) $2:3$ (B) $3:2$ (C) $3:7$ (D) $7:3$
5. Consider the following statements :
   (a) Photon is a positively charged nuclear particle
   (b) Size of nucleus is very small as compared to the size of atom
   (c) Photoelectric effect and diffraction show particle nature of light
   (d) Planck's constant has same dimensions as angular momentum
   The correct statements is/are
   (A) a,b,d (B) b,d
   (C) a,d (D) b,c,d
6. The frequency of yellow light having wavelength $600\ nm$ is
   (A) $5.0\times10^{14}Hz$ (B) $2.5\times10^{7}Hz$
   (C) $5.0\times10^{7}Hz$
   (D) $2.5\times10^{14}Hz$
7. The greater the energy of a photon, the
   (A) longer the wavelength and the higher the frequency
   (B) longer the wavelength and the lower the frequency

(C) shorter the wavelength and the higher the frequency

(D) shorter the wavelength and the lower the frequency

8. A hypothetical electromagnetic wave is show below.
(Image)
The frequency of the wave is $\mathrm{x} \times 10^{19}$ Hz. $x = \ldots.$ (nearest integer)



(A) 5 (B) 7 (C) 9 (D) 10

9. A $150\ Watt$ bulb emits light of wavelength $6600\ \overset{o}{A}$ and only 8% of the energy is emitted as light. How many light photons are emitted by the bulb per second?

(A) 4×10^{19} (B) 3.24×10^{19} (C) 4.23×10^{20} (D) 3×10^{20}

10. The frequency of radiation emitted when the electron falls from $n = 4$ to $n = 1$ in a hydrogen atom will be (Given ionization energy of $H = 2.18 \times 10^{-18} J\ \text{atom}^{-1}$ and $h = 6.625 \times 10^{-34}\ Js$)

(A) $3.08 \times 10^{15} s^{-1}$ (B) $2.00 \times 10^{15} s^{-1}$ (C) $1.54 \times 10^{15} s^{-1}$ (D) $1.03 \times 10^{15} s^{-1}$

11. The energy of second Bohr orbit of the hydrogen atom is $-328\ kJ\ mol^{-1}$, hence the energy of fourth Bohr orbit would be ..... kJ mol^{-1}

(A) -41 (B) -1312 (C) -164 (D) -82

12. According to the Bohr theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon ?

(A) $n = 6$ to $n = 1$ (B) $n = 5$ to $n = 4$ (C) $n = 6$ to $n = 5$ (D) $n = 5$ to $n = 3$

13. The ratio of the velocity of electron in the ground state of hydrogen atom and its velocity in second excited state of He^{+} ion is

(A) 3.5 (B) 1.5 (C) 2 (D) 2.5

14. When the electron of hydrogen atom return to L shell from shells of higher energy, we get a series of lines in the spectrum. This series is called

(A) Balmer series (B) Lyman series

(C) Brackett series (D) Paschen series

15. For Li^{+2} ion, $r_2 : r_5$ will be

(A) $9 : 25$ (B) $4 : 25$ (C) $25 : 4$ (D) $25 : 9$

16. The kinetic energy of an electron in the second Bohr orbit of a hydrogen atom is equal to $\frac{\mathrm{h}^2}{\mathrm{xma}_0^2}$. The value of $10\mathrm{x}$ is ..... . (a_0 is radius of Bohr's orbit) (Nearest integer) [Given : $\pi = 3.14$]

(A) 1010 (B) 6135 (C) 3155 (D) 3845

17. Photon of the nmaximum frequeney will be absorbed in the transition (for H atom):

(A) From $n=1$ to $n=4$ (B) From $n=2$ to $n=1$

(C) From $n=2$ to $n=3$ (D) From $n=3$ to $n=2$

18. In Bohr series of lines of hydrogen spectrum, the third line from the red end corresponds to which one of the following inter-orbit in an atom of hydrogen

(A) $4 \rightarrow 1$ (B) $2 \rightarrow 5$ (C) $3 \rightarrow 2$ (D) $5 \rightarrow 2$

19. The De-broglie λ of electron in the 2^{st} Bohr orbit is

(A) $4\pi r_1$ (B) πr_1 (C) $2\pi r_1$ (D) $6\pi r_1$

20. What accelerating potential must be imparted to a proton beam to give it an effective $\lambda = 0.05 \overset{o}{A}$.

$(V = 33\, volt)\ (m_p = 1.672 \times 10^{-27}\, kg)$

(A) $4.95 \times 10^6\, V$ (B) $4.95 \times 10^5\, V$ (C) $2.475 \times 10^6\, V$ (D) $2.475 \times 10^5\, V$

21. The minimum uncertainty in the speed of an electron in an one dimensional region of length $2a_o$

(Where $a_0 =$ Bohr radius $52.9pm$) is kms^{-1}

(Given : Mass of electron $= 9.1 \times 10^{-31} kg$, Planck's constant $h = 6.63 \times 10^{-34}\ Js$)

(A) 548 (B) 547 (C) 546 (D) 545

22. Which of the following elements outermost orbit's last electron has magnetic quantum number $m = 0$?

(A) Na (B) O (C) Cl (D) N

23. How many electrons can be accommodated in a sub-shell for which $n = 3, l = 1$

(A) 8 (B) 6 (C) 18 (D) 32

24. In a given atom no two electrons can have the same values for all the four quantum numbers. This is called

(A) Hund's rule

(B) Aufbau's principle

(C) Uncertainty principle

(D) Pauli's exclusion principle

25. The correct set of four quantum numbers for the valence electron of rubidium atom $(Z = 37)$ is

(A) $5,1,1,+1/2$ (B) $6,0,0,+1/2$ (C) $5,0,0,+1/2$ (D) $5,1,0,+1/2$

26. The structure of external most shell of inert gases is

(A) s^2p^3 (B) s^2p^6 (C) s^1p^2 (D) $d^{10}s^2$

27. For d electrons, the azimuthal quantum number is

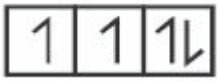
(A) 0 (B) 1 (C) 2 (D) 3

28. Maximum electrons in a d-orbital are

(A) 2 (B) 10 (C) 6 (D) 14

29. Which of the following is correct on the basis of hund's rule but not follow Pauli's principle

(A)



(B)

(C)

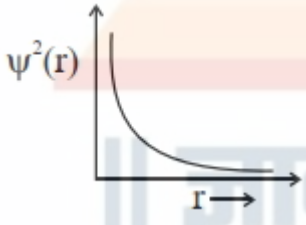
(D)

30. The maximum number of electrons that can have principal quantum number, $n = 3$, and spin quantum number, $m_s = -1/2$, is

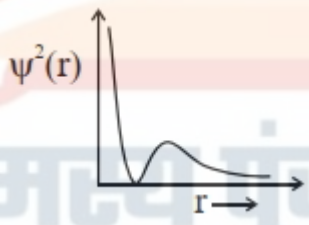
(A) 2 (B) 7 (C) 9 (D) 5

31. Which of the following is the correct plot for the probability density $\psi^2(r)$ as a function of distance ' r ' of the electron form the nucleus for $2s$ orbital?

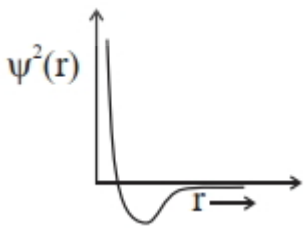
(A)



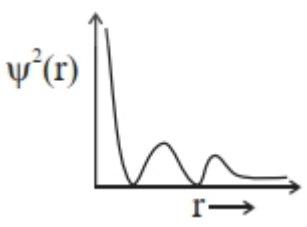
(B)



(C)



(D)



32. Which of the following sets of quantum numbers is not allowed?

(A) $n=3,1=2,m_1=0,s=+\frac{1}{2}$

(B) $n=3,1=2,m_1=-2,s=+\frac{1}{2}$

(C) $n=3,1=3,m_1=-3,s=-\frac{1}{2}$

(D) $n=3,1=0,m_1=0,s=-\frac{1}{2}$

33. Given below are two statements:
Statement-I: The orbitals having same energy are called as degenerate orbitals.
Statement-II: In hydrogen atom, $3\mathrm{p}$ and $3\,\mathrm{d}$ orbitals are not degenerate orbitals.
In the light of the above statements, choose the most appropriate answer from the options given

(A) Statement-I is true but Statement-II is false

(B) Both Statement-I and Statement-II are true.

(C) Both Statement-I and Statement-II are false

(D) Statement-I is false but Statement-II is true

34. The maximum probability of finding an electron in the d_{xy} orbital is

(A) Along the $x-$ axis

(B) Along the $y-$ axis

(C) At an angle of 45^o from the x and $y-$ axes

(D) At an angle of 90^o from the x and $y-$ axes

35. Orbital is

(A) Circular path around the nucleus in which the electron revolves

(B) Space around the nucleus where the probability of finding the electron is maximum

(C) Amplitude of electrons wave

(D) None of these

36. The maximum number of electrons that can be accommodated in the M^{th} shell is

(A) 2 (B) 8 (C) 18 (D) 32

37. The molecule having one unpaired electron is

(A) NO (B) CO (C) CN^- (D) O_2

38. Which of the following quantum number is not obtained by the solution of Schrodinger wave equation

(A) magnetic quantum number

(B) principal quantum number

(C) spin quantum number

(D) azimuthal quantum number

39. The electronic configurations of Cr^{24} and Cu^{29} are abnormal

(A) Due to extra stability of exactly half filled and exactly fully filled sub shells

(B) Because they belong to $d-$ block

(C) Both the above

(D) None of the above

40. Choose the pair whose ions have the similar electronic configuration

(A) Lithium and sodium

(B) Potassium and calcium

(C) Sodium and potassium

(D) Both (a) and (c)

*** SECTION - B** **[40]**

41. What is the maximum number of electrons which can be accommodated in an atom in which the highest principal quantum number value is 4

42. The electronic configuration of a dipositive ion M^{2+} is $2,8,14$ and its atomic mass is 56. The number of neutrons in the nucleus would be :

43. Assume that the radius of the first Bohr orbit of hydrogen atom is $0.6\mathring{A}$. The radius of the third Bohr orbit of $He^{+}$is ..... picometer. (Nearest Integer)

44. The wavelength of an electron and a neutron will become equal when the velocity of the electron is x times the velocity of neutron. The value of x is (Nearest Integer)(Mass of electron is $9.1 \times 10^{-31} kg$ and mass of neutron is $1.6 \times 10^{-27}\, kg$)

45. The longest wavelength of light that can be used for the ionisation of lithium atom (Li) in its ground state is $x \times 10^{-8}\, m$. The value of x is ..... (Nearest Integer)
(Given : Energy of the electron in the first shell of the hydrogen atom is $-2.2 \times 10^{-18}\, J$; $h = 6.63 \times 10^{-34}\, Js$ and $c = 3 \times 10^{8}\, ms^{-1}$)

46. The value of magnetic quantum number of the outermost electron of Zn^{+}ion is ..... .

47. The number of photons emitted by a monochromatic (single frequency) infrared range finder of power $1\ \mathrm{mW}$ and wavelength of $1000\ \mathrm{nm}$, in $0.1\ second$ is $\mathrm{x} \times 10^{13}$. The value of x is ..... .
(Nearest integer)
$\left(\mathrm{h} = 6.63 \times 10^{-34}\ \mathrm{Js}, \mathrm{c} = 3.00 \times 10^{8}\ \mathrm{ms}^{-1}\right)$

48. The number of orbitals associated with quantum numbers $n = 5,\ m_s = +\frac{1}{2}$ is

49. The atomic masses of He and Ne are 4 and $20\ a.m.u.$, respectively. The value of the de Broglie wavelength of He gas at $-73^{\circ}C$ is " M " times that of the de Broglie wavelength of Ne at $727^{\circ}C$. M is

50. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be ..... nm (Rydberg constant $= 1.097 \times 10^{7}\ m^{-1}$)

----- ** BEST OF YOUR KNOWLEDGE ** -----