1.

Which of the following sets of quantum numbers represent an impossible arrangement -

n l m s

(A) 3 2 -2 (+)1/2

(B) 4 0 0 (-)1/2

(C) 3 2 -3 (+)1/2

(D) 5 3 0 (-)1/2

2.

Correct set of four quantum numbers for the outermost electron of rubidium (Z=37) is:

(A) 5, 0, 0, 1/2

(B) 5, 1, 0, 1/2

(C) 5, 1, 1, 1/2

(D) 6, 0, 0, 1/2

3.

Number of unparired electrons in $1S^2\ 2S^2\ 2P^3$ is -

1. 2

2. 0

3. 3

4. 1

4.

The quantum numbers of four electrons are given below.

	n	l	m	s
(1) Electron 1	3	0	0	-1/2
(2) Electron 2	4	0	1	1/2
(3) Electron 3	3	2	0	1/2
(4) Electron 4	3	1	0	-1/2

The correct order of decreasing energy of these electrons is -

(A) Electron 3 > Electron 1 > Electron 4> Electron 2

(B) Electron 4> Electron 2 > Electron 3 > Electron 1

(C) Electron 3 > Electron 2 > Electron 4 > Electron 1

(D) Electron 2 > Electron 4 > Electron 3 > Electron 1

5.

Which type of radiation is not emitted by the electronic structure of atoms:

(A) Ultraviolet light

(B) X-rays

(C) Visible light

(D) y-rays

6.

Of the following transitions in hydrogen atom, the one which gives an absorption line of lowest frequency is

(A) n=1 to n=2

(B) n=3 to n=8

(C) n=2 to n=1

(D) n=8 to n=3

7.

The maximum number of atomic orbitals associated with a principal quantum number 5 is

(A)9

(B)12

(C) 16

(D) 25

8.

If the Planck's constant $h=6.6 \times 10^{-34}$ Js, the de-Broglie wavelength of a particle having momentum of 3.3×10^{-24} kg m s^{-1} will be

(A) 0.002 Å

(B) 0.02 Å

(C) 0.2 Å

(D) 2Å

9.

Rutherford's scattering experiment is related to -

(A) Nucleus

(B) proton

(C) Electron

(D) Neutron

10.

The quantum numbers of most energetic electron in Ne atom when it is in first excited state is

(A) 2, 1, 0, +1/2

(B) 3, 1, 1, +1/2

(C) 3, 0, 0, +1/2

(D) 3, 1, 0, +1/2

11.

The total number of neutrons in dipositive zinc ions with mass number 70 is -

(A) 34

(B) 40

(C)36

(D) 38

12.

With a certain exciting radiation of a particular frequency, to which hydrogen atoms are exposed, the maximum number of spectral lines obtainable in the emission is 15. The uppermost energy level to which the electron is excited is n=

(A) 4

(B) 5

(C) 6

(D) 7

13.

When accelerated electrons are direct against an anticathode in an X-ray tube, the radiation obtained has a continuous spectrum with a wavelength minimum,

λ_{min} = (1.24 x 10^{-6}/V) m, where V is the voltage used for accelerating the electrons. Calculate λ_{min} for V= 5 x 10^4 volts.

(A) 1.25 Å

(B) 0.75 Å

(C)0.25 Å

(D) 1.00 Å

14.

The wavelengths of two photons are 2000 Å and 4000 Å respectively. What is the ratio of their energies?

(A) 1/4

(B) 4

(C) 1/2

(D) 2

15.

The number of electrons in one molecule of CO$_2$ are -

(A) 22

(B) 44

(C) 66

(D) 88

16.

The ion that is isoelectronic with CO is-

(A) CN^-

(B) O_2^+

(C) O_2^-

(D) N_2^+

17.

If uncertainity in position and momentum are equal, the uncertainty in velocity is:

(A) $\sqrt{h/2\pi}$

(B) $\frac{1}{2m}\sqrt{h/\pi}$

(C) $\sqrt{h/\pi}$

(D) None

18.

When the atoms of gold sheet are bombarded with a beam of α -particles, only a few a-particles get deflected where as most of them go straight undeflected. This is because

(A) The force of attraction on the α-particles by the oppositely charged electron is not sufficient

(B) The nucleus occupies much smaller volume as compared to the volume of atom

(C) The force of repulsion on fast moving α-particles is very small.

(D) The neutrons in the nucleus do not have any effect on α-particles

19.

The number of electrons in the valence shell of calcium is

(A) 6

(B) 8

(C) 2

(D) 4

20.

The brackett series of spectral lines arise when an electron in an excited hydrogen atom jumps from an energy level

(A) n=5 to n=1

(B) n=5 to n=3

(C) n=5 to n=4

(D) n=5 to n=2

21.

The ratio of the wavelengths of last lines of Balmer and Lyman series is-

(A) 4:1

(B) 27:5

(C) 3:1

(D) 9:4

22.

The splitting of spectral lines in a magnetic field, arising out of orbital motion of electrons only and the further splitting due to spin motion are respectively called

(A) Zeeman and Stark effects

(B) Zeeman and anomalous Zeeman effects

(C) Stark and Zeeman effects

(D) Zeeman and Kerr effects

23.

Which transition of electron in the hydrogen atom emits maximum energy:

(A) $2 \rightarrow 1$

(B) $1 \rightarrow 4$

(C) $4 \rightarrow 3$

(D) $3 \rightarrow 2$

24.

Frequency ratio between violet (400nm) and red (750nm) radiations in the visible spectrum, is-

(A) 8/15

(B) 4/15

(C) 15/8

(D) None of these

25.

The minimum value of spin multiplicity possible, when l =3, are

(A) 2

(B) 1

(C) 0

(D) 3

26.

The total spin resulting from a d^7 configuration is -

(A) 3/2

(B) 1/2

(C) 2

(D) 1

27.

Two isotopes of Boron are found in the nature with atomic weights 10.01(I) and 11.01(II). The atomic weight of natural Boron is 10.81. The percentage of (I) and (II) isotopes in it are respectively-

(A) 20 and 80

(B) 10 and 90

(C) 15 and 75

(D) 30 and 70

28.

Rutherford's scattering experiment is related to the size of the-

(A) Nucleus

(B) Atom

(C) Electron

(D) Neutron

29.

There are three energy levels in an atom. How many spectral lines are possible in its emission spectra?

(A) One

(B) Two

(C) Three

(D) Four

30.

The increasing order of energy of electromagnetic radiation can be represented as

(A) microwave < infrared < visible < X-ray

(B) X-ray < visible < infrared < microwave

(C) microwave < infrared < visible < radiowaves

(D) X-ray < infrared < visible < microwave

31.

Mass of neutron is .....times the mass of electron-

(A) 1840

(B) 1480

(C) 2000

(D) None

32.

Which of the following species has more number of electrons in comparison with the neutrons?

1. Al^{3+}

2. O^{2-}

3. F^{-}

4. C

33.

The ratio of the difference in energy between the first and second Bohr orbit to that between the second and the third Bohr orbit is

1. 1/2

2. 1/3

3. 4/9

4. 27/5

34.

The radius of second stationary orbit in Bohr's atom is R. The radius of 3rd orbit will be:-

1. 9R

2. R/4

3. 9R/4

4. 2R

35.

Bohr's model is not valid for:-

(1) H-atom

(2) D-atom

(3) T-atom

(4) He-atom

36.

The ratio of the difference in energy between the first and second Bohr orbit to that between the second and the third Bohr orbit is

1. 1/2

2. 1/3

3. 4/9

4. 27/5

37.

Which of the following pairs of d-orbitals will have electron density along the axes?

(a) d_{z^2}, d_{xz}

(b) d_{xz}, d_{yz}

(c) $d_{z^2}, d_{x^2-y^2}$

(d) $d_{xy}, d_{x^2-y^2}$

38.

Which is the correct order of increasing energy of the listed orbitals in the atom of titanium?

(a) 3s 4s 3p 3d (b) 4s 3s 3p 3d

(c) 3s 3p 3d 4s (d) 3s 3p 4s 3d

39.

What is the maximum numbers of electrons that can be associated with the following set of quantum numbers?

n=3, l = 1 and m=-1

(a) 10
(b) 6
(c) 4
(d) 2

40.

Maximum number of electrons in a subshell with l = 3 and n = 4 is
(a) 14
(b) 16
(c) 10
(d) 12

41.

Which one of the following ions has electronic configuration [Ar]$3d^6$?

(At. no: Mn = 25, Fe = 26, Co = 27, Ni =28)

(a) Ni^{3+} (b) Mn^{3+}

(c) Fe^{3+} (d) Co^{3+}

42.

If uncertainty in position and momentum are equal, then uncertainty in velocity is

(a) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$

(b) $\sqrt{\frac{h}{2\pi}}$

(c) $\frac{1}{m}\sqrt{\frac{h}{\pi}}$

(d) $\frac{h}{\pi}$

43.

The correct Schrodinger's wave equation for a electron with total energy E and potential energy V is given by

1. $\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}+\frac{8\pi^2}{mh^2}(E-V)\,\psi=0$
2. $\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}+\frac{8\pi m}{h^2}(E-V)\,\psi=0$
3. $\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}+\frac{8\pi^2 m}{h^2}(E-V)\,\psi=0$
4. None of the above.

44.

Which of the following expressions represents the spectrum of Balmer series (If n is the principal quantum number of higher energy level) in Hydrogen atom?

1. $\bar{v}=\frac{R(n-1)\,(n+1)}{n^2}\ cm^{-1}$
2. $\bar{v}=\frac{R(n-2)\,(n+2)}{4n^2}\ cm^{-1}$
3. $\bar{v}=\frac{R(n-2)\,(n+2)}{n^2}\ cm^{-1}$
4. $\bar{v}=\frac{R(n-1)\,(n+1)}{4n^2}\ cm^{-1}$

45.

An excited state of H atom emits a photon of wavelength λ and returns in the ground state, the principal quantum number of excited state is given by:

1. $\sqrt{\lambda R(\lambda R-1)}$
2. $\sqrt{\frac{\lambda R}{(\lambda R-1)}}$
3. $\sqrt{\lambda R(\lambda R+1)}$
4. $\sqrt{\frac{(\lambda R-1)}{\lambda R}}$

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