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**DEPARTMENT OF CHEMISTRY**

**NEET/JEE CRASH COURSE 2020**

**TOPIC: STRUCTURE OF ATOM AND CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES**

1. Rutherford's alpha particle scattering experiment eventually led to the conclusion that **[IIT 1986; RPMT 2002]**

(a)Mass and energy are related

(b)Electrons occupy space around the nucleus

(c)Neutrons are buried deep in the nucleus

(d)The point of impact with matter can be precisely determined

Ans: (b) Electrons in an atom occupy the extra nuclear region.

2. Bohr's model can explain **[IIT 1985]**

(a)The spectrum of hydrogen atom only

(b)Spectrum of atom or ion containing one electron only

(c)The spectrum of hydrogen molecule

(d)The solar spectrum

Ans: (b) According to the Bohr model atoms or ions contain one electron.

3. When atoms are bombarded with alpha particles, only a few in million suffer deflection, others pass out undeflected. This is because **[MNR 1979; NCERT 1980; AFMC 1995]**

(a)The force of repulsion on the moving alpha particle is small

(b)The force of attraction on the alpha particle to the oppositely charged electrons is very small

(c)There is only one nucleus and large number of electrons

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

Ans: (d) The nucleus occupies much smaller volume compared to the volume of the atom.

4. Which one of the following is not the characteristic of Planck's quantum theory of radiation**[AIIMS 1991]**

(a) The energy is not absorbed or emitted in whole number or multiple of quantum

(b) Radiation is associated with energy

(c) Radiation energy is not emitted or absorbed conti- nuously but in the form of small packets called quanta

(d) This magnitude of energy associated with a quantum is proportional to the frequency

Ans: (a) Energy is always absorbed or emitted in whole number or multiples of quantum.

5. For the energy levels in an atom, which one of the following statement is not correct?

a) There are seven principal electron energy levels

b) The second principal energy level has four sub-energy levels and contains

maximum of eight electrons

c) The principal energy level N can have a maximum of 32 electrons

d) The 4s sub-energy level has higher energy than 3d sub-energy level.

Ans:d) 4s sub-energy level has higher energy than 3d sub-energy level.

6. Which of the following statements does not form part of Bohr's model of the hydrogen atom**[CBSE PMT 1989]**

(a) Energy of the electrons in the orbit is quantized

(b) The electron in the orbit nearest the nucleus has the lowest energy

(c) Electrons revolve in different orbits around the nucleus

(d) The position and velocity of the electrons in the orbit cannot be determined simultaneously

Ans:(d) It represents Heisenberg’s uncertainty principle.

7. When an electron revolves in a stationary orbit The energy of second Bohr orbit of the hydrogen atom is –328 *kJ mol*–1, hence the energy of fourth Bohr orbit would be

**[CBSE PMT 2005]**

(a)– 41 *kJ mol*–1 (b)–1312 *kJ mol*–1 (c)–164 *kJ mol*–1 (d)– 82 *kJ mol*–1

Ans: (d) ****;**

8. The frequency of an electromagnetic radiation is . What is its wavelength in metres (Velocity of light )

(a) (b) (c) (d)

Ans: (c) When  than 

9. If wavelength of photon is*J-sec,* then momentum of photon is **[MP PET 1999]**

(a) (b) (c) (d)

Ans: (a) 

10. If change in energy  and  then wavelength of the light is **[CBSE PMT 2000]**

(a) (b) (c) (d)

Ans: (c)  or 



11. The radius of first Bohr’s orbit for hydrogen is 0.53 Å. The radius of third Bohr’s orbit would be **[MP PMT 2001]**

(a)0.79 Å (b)1.59 Å (c)3.18 Å (d)4.77 Å

Ans:(d) 



12. The energy of a radiation of wavelength 8000 Å is and energy of a radiation of wavelength 16000 Å is . What is the relation between these two **[Kerala CET 2005]**

(a) (b) (c) (d)

Ans: (b) 



13. If the mass attributed to the neutrons were halved and that attributed to electrons were doubled then atomic mass of 6C12 would

a) remain approximately the same

b) be doubled.

c) Approximately be halved.

**d) be reduced by approximately 25%.**

Ans: d) number of neutrons in C-12=6

If mass of each neutron is halved. The mass of nucleons will be approx.=6+3=9amu. Thus the mass of carbon will be reduced from 12 to 9. The approximate decrease is 25%

14. The ratio of area covered by second orbital to the first orbital is **[AFMC 2004]**

(a)1 : 2 (b)1 : 16 (c)8 : 1 (d)16 : 1

**Ans:** (d) 



15. The radius of which of the following orbit is same as that of the first Bohr's orbit of hydrogen atom **[IIT Screening 2004]**

(a) (b) (c) (d)

**Ans:** (d) 

For hydrogen ;  and therefore



For  and  Therefore

.

16. The wavelength of the radiation emitted, when in a hydrogen atom electron falls from infinity to stationary state 1, would be (Rydberg constant )**[AIEEE 2004]**

(a)406 *nm* (b)192 *nm*  (c)91 *nm*  (d)

**Ans:** (c) 



 

We know  So 

17. The de-Broglie wavelength of a particle with mass  and velocity  is **[CBSEPMT 1999; EAMCET 1997; AFMC 1999; AIIMS 2000]**

(a) (b) (c) (d)

Ans: (a) 

18. If the velocity of hydrogen molecule is , then its de-Broglie wavelength is **[MP PMT 2003]**

(a)2 Å (b)4 Å (c)8 Å (d)100 Å

Ans: (b) According to de–Broglie



.

19. If uncertainty in the position of an electron is zero, the uncertainty in its momentum would be **[CPMT 1988]**

(a)Zero (b) (c) (d)Infinite

Ans: (d)  if  then .

20. Which of the following sets of quantum numbers represent an impossible arrangement **[IIT 1986; MP PET 1995]**

*n l m *

(a) 3 2 – 2 (+)

(b) 4 0 0 (–)

(c) 3 2 –3 (+)

(d) 5 3 0 (–) 

Ans: (c) If  to .

21. In the ground state of Cu+, the number of shell occupied, subshell occupied, filled orbitals and unpaired electrons respectively are

a) 4,8,15,0 b) 3,6,15,1 **c) 3,6,14,0** d) 4,7,14,2

Ans: c) 29Cu= 1s2,2s2,2p6,3s2,3p6, 4s1,3d10

Cu+=1s2,2s2,2p6,3s2,3p6, 3d10, 4s0

22. The total number of orbitals in an energy level designated by principal quantum number  is equal to**[AIIMS 1997; J&K CET 2005]**

(a) (b) (c) (d)

Ans: (d)No. of electronshence no. of orbital .

23. The number of nodal planes in a  is**[IIT Screening 2000]**

(a)One (b)Two (c)Three (d)Zero

Ans: (a) The number of nodal plane are present in a ** is one or no. of nodal place = *l*

for  orbital *l* = 1

Nodal plane

*x*

24. The wavelength of a spectral line emitted by hydrogen atom in the Lyman series is cm. What is the value of principal quantum number in the excited state?(R= Rydberg constant)

a) 2 b) 3 **c) 4** d) 1

Ans:c) For Lyman series , 1/λ= R[1/12-1/n22]

∴ R[1/12-1/n22]

n2=4

25. **Assertion :**A spectral line will be seen for a  transition.

**Reason :** Energy is released in the form of wave of light when the electron drops from  orbital.**[AIIMS 1996]**

*(a) both assertion and reason are true and the reason is the correct explanation of the assertion.*

*(b) both assertion and reason are true but reason is not the correct explanation of the assertion.*

*(c) assertion is true but reason is false.*

*(d)the assertion and reason both are false.*

Ans: (d) Both assertion and reason are false.  and  orbitals are degenerate orbitals, i.e., they are of equal energy and hence no possibility of transition of electron.

26. Light of wavelength λ shines on a metal surface with intensity ***x*** and the metal emits ***y*** electros per second of average energy, ***z***. What will happen to ***y*** and ***z*** if ***x*** is doubled?

a) *y* will be doubled and *z* will become half.

b) *y* will remain same and *z* will be doubled.

c) both *y* and *z* will be doubled.

**d) *y* will be doubled but *z* will remain same.**

Ans: d) when intensity is doubled, number of electrons emitted per second is also doubled but average energy of photoelectrons emitted remains the same.

27. The ratio of the radii of the first three Bohr orbits and the velocities of the electron in the first three Bohr orbits respectively are

a)1:0.5:0.33 and 1:4:9 b)1:2:3 and1:4:9

**c)1:4:9 and 1:0.5:0.33** d)1:8:27 and 1:0.5:0.33

Ans:c) Hint: rn=(53pm)n2 or rnα n2 and vn= 2.16x106() ms-1

**CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES**

28. Dobereiner traids is **[RPMT 1997]**

(a), ,  (b) (c),  (d), 

Ans: (c) According to Dobernier law of triads the atomic mass of the central element was nearly the arithmetic mean of atomic masses of other two elements.

29. An element has electronic configuration . Predict their period, group and block**[CPMT 2000]**

(a)Period = 3rd, block = *p*, group = 16 (b)Period = 5th, block = *s*, group = 1

(c)Period = 3rd, block = *p*, group = 10 (d)Period = 4th, block = *d*, group =12

Ans: (a) By obserbing principal quantum number (n), Orbital  and equating no. of ’s we are able to find the period, block and group of element in periodic table.

30. The element *X, Y, Z* and *T* have the indicated electronic configurations. Starting with the innermost shell, which is the most metallic element **[CPMT 1979, 93]**

(a) (b) (c) (d)

Ans: (c) *Z* = 2,8,8,1.  it would donate  more easily.

31. The most predominantly ionic compounds will be obtained from the combination of elements belonging to

(a)1 and 7 groups (b)2 and 6 groups

(c)3 and 5 groups (d)0 and 7 groups

Ans: (a) Ionic bond is formed when there is large difference of electro-negativities between the atoms.

32. Chloride of an element  gives neutral solution in water. In the periodic table, the element  belongs to**[AIIMS 1992; UPSEAT 2001]**

(a)First group (b)Third group (c)Fifth group (d)First transition series

Ans: (a) First group

*e.g.* ⇌

33. The electronic configuration of the element which is just above the element with atomic number 43 in the same periodic group is **[MNR 1992; UPSEAT 1999, 2000, 02]**

(a) (b)

(c) (d)

Ans: (a) .

34. The atomic radius of elements of which of the following series would be nearly the same **[MP PET 1997]**

(a) (b) (c) (d)

Ans: (c) . Due to shielding of *d*-electrons, the effect of increased nuclear charge due to increase in atomic no. neutralised. Consequently atomic radius remains almost unchanged after chromium.

35. The correct sequence of increasing covalent character is represented by

**[CBSE PMT 2005]**

(a) (b)

(c) (d)

Ans: (c) Order of polarising power 

Hence order of covalent character 

36. The incorrect statement among the following is**[IIT-JEE 1997]**

(a)The first ionisation potential of  is less than the first ionisation potential of 

(b)The second ionisation potential of  is greater than the second ionisation potential of 

(c)The first ionisation potential of  is less than the first ionisation potential of 

(d)The third ionisation potential of  is greater than the third ionisation potential of 

Ans: (b) I.E.(II) of  is higher than that of  because in case of , the second  has to be remove from the noble gas core while in case of  removal of second  gives a noble gas core. has high first ionisation potential than  because of its stable  configuration.

37.  and . The energy required to pull out the two electrons are  and  respectively. The correct relationship between two energy would be

(a) (b) (c) (d)

Ans: (a)  because second I.E. is greater than first I.E.

38. Ionic compounds are formed most easily with **[DPMT 2005]**

(a)Low electron affinity, high ionisation energy

(b)High electron affinity, low ionisation energy

(c)Low electron affinity, low ionisation energy

(d)High electron affinity, high ionisation energy

Ans: (b) The formation of ionic bond depends upon easy formation of cation and anion. therefore the ionisation energy value of the metal atom should be low, so that it can easily form cation. on the other hand, the electron affinity value of the non-metal atom should be high so that it can easily form anion.

39. The electron affinity values (in ) of three halogens  and  are respectively

– 349, – 333 and – 325. Then  and  are respectively **[EAMCET 2003]**

(a) and  (b) and  (c) and  (d) and 

Ans: (b) In IB group all elements are metals.

40. The solubilities of carbonates decreases down the magnesium group due to a decrease in **[AIEEE 2003]**

(a)Lattice energies of solids (b)Hydration energies of cations

(c)Inter-ionic attraction (d)Entropy of solution formation

Ans: (b) Due to decrease in hydration energy of cation and lattice energy remains almost unchanged.

41. The order in which the following oxides are arranged according to decreasing basic nature is **[CPMT 1985]**

(a) (b)

(c) (d)

Ans: (a) . More the metallic character higher the  donating tendency. Therefore lower the I.E. more the basic nature of oxide.

42. An element of atomic weight 40 has 2, 8, 8, 2 as the electronic configuration. Which one of the following statements regarding this element is not correct

(a)It belongs to II group of the periodic table

(b)It has 20 neutrons

(c)The formula of its oxide is 

(d)It belongs to 4th period of the periodic table

Ans: (c) Its valency is 2. So it will form *MO* type compound.

43. Elements A and B with their respective electronic configurations  and  in their outermost shell are

(a)Both non-metals (b)Both coinage metals

(c)A is a non-metal and B is coinage metal

(d)A is a coinage metal and B is non-metal

Ans: (b) Both are coinage metals

; 

44. Which of the following sequence correctly represents the decreasing acid nature of oxides **[AMU 2000]**

(a) (b)

(c) (d)

Ans: (b) On passing from left to right in a period acidic character of the normal oxides of the element goes on increasing with increase in electronegativity.

45. An element *X* which occurs in the first short period has an outer electronic structure . What are the formula and acid-base character of its oxides **[DCE 1999]**

(a) basic (b) basic

(c) amphoteric (d) acidic

Ans: (c) ,are amphoteric oxides.

46. Beryllium and aluminium exhibit many properties which are similar. But, the two elements differ in **[AIEEE 2004]**

(a)Forming covalent halides

(b)Forming polymeric hydrides

(c)Exhibiting maximum covalency in compounds

(d)Exhibiting amphoteric nature in their oxides

Ans: (c) Beryllium has the valency of +2 while aluminum exhibits its valency as +3

47. In which of the following arrangements the order is NOT according to the property indicated against it **[AIEEE 2005]**

(a) : Increasing ionic size

(b) : Increasing first ionization enthalpy

(c) : Increasing electron gain enthalpy (with negative sign)

(d) : Increasing metallic radius

Ans: (b) ; When we move from *B* to *O* in a periodic table the first ionisation enthalpy increase due to the attraction of nucleous towords the outer most of electron.

48. The first ionization potentials in electron volts of nitrogen and oxygen atoms are respectively given by **[IIT 1987]**

(a)14.6, 13.6 (b)13.6, 14.6 (c)13.6, 13.6 (d)14.6, 14.6

Ans: (a) First I.E. of  First I.E. of *O.*

49. A sudden large jump between the values of second and third ionisation energies of an element would be associated with the electronic configuration

**[CBSE PMT 1992; AFMC 1998; CPMT 1999]**

(a) (b) (c)  (d)

Ans: (d) - In III transition  is to be removed from stable configuration.

50. The elements which occupy the peaks of ionisation energy curve, are **[CBSE 2000]**

(a) (b) (c) (d)

Ans: (d) All the nobal gases occupy the peaks of I.E. curve.