

UNIT NUMBER 1- TUTORIAL 13- PERIODIC TRENDS RELATED MCQ - 2026

- Radius of the Br^- ion is 1.95 \AA . Inter atomic distances in KBr(s) and KCl(s) are 3.28 \AA and 3.14 \AA respectively. Calculate the radius of the Cl^- ion.
a. 2.09 \AA b. 1.95 \AA c. 1.90 \AA d. 1.84 \AA e. 1.81 \AA
- State whether the following statements are true or false
a. The second ionization energy is lowest in a group two element.
b. All elements have a second ionization energy.
c. Second ionization energy of an element is always greater than its' first ionization energy.
d. Second ionization energies are always endothermic.
e. The first ionization energies of the d-block elements generally increase.
f. The radius of elements in a period increases across the period due the increase in the effective nuclear charge.
g. Cu has a lower first ionization energy than Zn.
- State whether the following statements are true or false.
a. The ability of an atom to attract electrons towards itself in a bond is known as electro negativity.
b. The electronegativity of an atom depends on the environment of that atom.
c. Electronegativity decreases as the radius of the atom increases.
d. Be has the highest electronegativity out of the s-block elements.
e. Electronegativity increases when going down in the group.
f. Maximum electronegativity is for an element in group 17.
g. There is 0 electronegativity for group 18 elements.
- Which species has the largest ionic radius?
a. S^{2-} b. Na^+ c. F^- d. O^{2-} e. Mg^{2+}
- Which out of the following has the highest 1st ionization energy?
a. Na b. Be c. Ne d. Xe e. F
- Which element out of the following has the highest 2nd ionization energy?
a. Na b. Mg c. Al d. Si e. Ar
- A, B, and C are three non-transition elements that belongs to the same period. A- nonmetal, B- Metal, C shows both metallic and non-metallic properties. What is the sequence of which these elements appear in the periodic table.
a. A, C, B b. B,A,C c. B,C,A d. C,A,B e. C,B,A
- W, X, Y and Z are successive non-transition elements in the periodic table. Their first ionization energies vary $W < X < Y$. Oxide of Z is basic. What would be the electronic configuration of the last energy level.
a. ns^1np^0 b. ns^2np^1 c. ns^2np^2 d. ns^2np^3 e. ns^2np^4
- What is sequence of which electrons are filled into the energy level in the period 4.
a. 4s, 4p, 4d b. 4s,4p,4d c. 4s,3d,4p d. 3s,4p,4d e. 3d,4s,4p

10. X, Y and Z are three non-transition elements present consecutively in the periodic table. Their 1st and 3rd ionization energies are given below. To which group does X belongs to?

	X	Y	Z
1 st Ionization energy kJ mol ⁻¹	1012	999	1251
3 rd Ionization energy kJ mol ⁻¹	2912	3361	3822

- a. 1 b. 2 c. 13 d.14 e.15
11. 3rd Ionization enthalpy is maximum
g. Al b. Si c. S d. Mg e. Ar
12. Which statement is incorrect regarding N³⁻, O²⁻ and F⁻?
a. They all have the same electronic configuration.
b. They nuclear charge increases N³⁻ < O²⁻ < F⁻.
c. They all are isoelectronic with Ne.
d. Their ionic radius changes as N³⁻ < O²⁻ < F⁻.
e. If Li is reacted with N₂, O₂ and F₂ respectively these ions containing compounds are formed.
13. What is the correct order of increasing the atomic radius?
f. O<C<Al<P<Ca b. O<C<P<Al<Ca c. C<O<P<Al<Ca
d. C<O<Al<P<Ca e. C<O<Al<Ca<P
14. Which statement out of the following is incorrect regarding atomic properties
a. The covalent radius of I is less than its' van der Waals radius.
b. The first electron affinity of O is less than that of N.
c. Ionization energy of an atom is determined only by its nuclear charge and the radius.
d. The nuclear charge experienced by the valance electron of Li is less than 3.
e. The values of electronegativities of C and S are same as given according to the Pauling's scale of electronegativity.
15. The correct order of first ionization energies of Na, Mg, K, N, P and F is
f. K<Na<Mg<N<P<F b. K<Na<Mg<P<N<F c. K<Na<P<Mg<N<F
d. Na<Mg<K<N<P<F e. Mg<K<Na<N<P<F
16. The correct order of the increase in the atomic radius given by
a. Li<Na <Mg <S b. C<Si<S<Cl c. B<C<N<P d. Li<Na<K<Ca e.
B<Be<Na<K
17. Identify the pair of elements having the highest difference in electronegativity
g. B and Al b. Be and Al c. B and Si d. B and C e. Al and C
18. The third ionization energy is maximum out of the following elements
h. B b. C c. N d. O e. F
19. Which element out of following has the highest electronegativity?
i. I b. O c. C d. S e. Si
20. The element with an atomic number forms a +1 ionic form. Determine the number of unpaired electrons in this ionic species.
j. 1 b.2 c.5 d.6 e.7

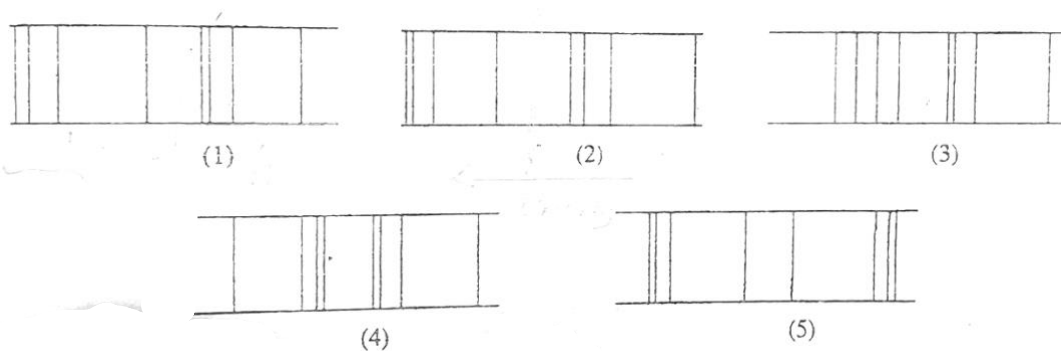
21. The number of electrons in the last sub energy level of the +4 ions formed by an element having an atomic number 43 is
 k. 1 b.2 c.3 d.4 e.5
22. The correct increasing order of the second ionization energies of Ca, Al, Si, P and S is
 1. Ca<Al<Si<P<S b. S<P<Si<Al<Ca c. Ca<Si<Al<P<S
 d. Al<Ca<Si<P<S e. Ca<Al<S<P<Si
23. The valencies of an element, whose outer electronic configuration is of the form $ns^2 np^3$, are most likely to be,
 1. 2 and 4
 2. 2 and 5
 3. 1 and 5
 4. 3 and 5
 5. 4 and 5
24. Which of the following statements/ statement concerning electrons are/is true?
 a) Electrons tend to move in a curved path in a magnetic field.
 b) Electrons have both particle and wave properties.
 c) Electrons cannot be added to or removed from an atom.
 d) The speed of electrons is equal to the speed of light.
25. Which of the following statements/statement are/is true regarding Ca^{2+} ($Z= 20$) and Zn^{2+} ($Z= 30$) ions?
 a) Both ions have 6 electrons each in the outermost p – sub shell.
 b) Both ions have 18 electrons each in the outermost shell.
 c) Ca^{2+} ion has 8 electrons in the outermost shell and Zn^{2+} ion has 18 electrons in the outermost shell.
 d) Both ions have 8 electrons each in the outermost shell.

26.

First Statement	Second Statement
Chemical and physical properties of isotopes are similar.	Isotopes have the same number of protons but a different number of neutrons.

27. Which of the following get(s) deflected when moving across a magnetic field?
 a) Neutrons
 b) Cathode rays
 c) Protons
 d) Helium atoms
28. A certain sample of CO has only $^{14}C_6$ and $^{16}O_8$ isotopes. Another sample of CO has $^{12}C_6$ and $^{18}O_8$ isotopes only. The property that shows a significant difference between the two samples is,
 1. Chemical reactivity
 2. Molar mass
 3. Molar volume
 4. Density at STP
 5. Percentage compositions of C and O by mass
29. Which of the following statements is correct regarding the atomic emission spectrum of hydrogen?
 1. The radiation corresponding to the $n = 2$ to $n = 1$ transition has the longest wavelength.
 2. The $n = 3$ to $n = 2$ transition corresponds to the H_α line.
 3. The first series of the lines (Lyman) occurs in the infra- red region.
 4. In each series, the separation between adjacent lines increases in the direction of increasing energy.
 5. Emission of higher radiation occurs when electrons undergo transition to higher levels from lower levels.

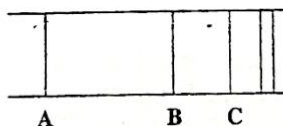
30. The valencies of an element with electronic configuration $ns^2 np^4$ can be,
- 1 and 4
 - 2 and 1
 - 2 and 5
 - 2 and 6
 - 5 and 6
31. Which one of the following statements is **not** true regarding the atomic spectrum of hydrogen?
- The transition from $n = 4$ to $n = 2$ corresponds to H_β line.
 - The energy difference from $n = \infty$ and $n = 1$ levels is the ionization energy of hydrogen.
 - Each line in the spectrum corresponds to an energy level of the H- atom.
 - The energy difference between $n = 2$ and $n = 1$ levels is smaller than the energy difference between $n = 3$ and $n = 2$ levels.
32. The order of filling electrons into energy levels of the atoms in the fourth period of the Periodic Table,
- 4s, 4p, 4d
 - 4s, 4d, 4p
 - 4s, 3d, 4p
 - 3s, 4p, 4d
 - 3d, 4s, 4p
33. Which of the following statement(s) is/are true for an atom of $^{118}_{50}Sn$?
- It has 50 electrons.
 - It has 50 protons.
 - It has a total number of 118 electrons are protons.
 - It has 68 neutrons.
34. Which of the following correctly represents the arrangement of the emission lines in two consecutive series in the atomic spectrum of hydrogen



35. Which one of the following columns (1) – (5) correctly matches the name of each scientist in the column with the activities in the activity column?

Columns					Activity
(1)	(2)	(3)	(4)	(5)	
Bohr	Rutherford	Rutherford	Bohr	Thompson	Proposed the nuclear model of the atom.
Rutherford	Bohr	Thompson	Thompson	Bohr	Interpreted the atomic spectrum of hydrogen.
Thompson	Thompson	Millikan	Millikan	Faraday	Determined the charge to mass ratio of the electron.

36. The emission lines of the Balmer series of the atomic spectrum of hydrogen are shown below.



The colours of the lines **A**, **B** and **C** are respectively,

1. Red , Green , Blue
 2. Blue , Green , Red
 3. Green , Red , Blue
 4. Blue , Red , Green
 5. Red , Blue , Green
37. Which of the following statement/s is/are true?
- a) Electrons have particle as well as wave properties.
 - b) A proton is heavier than a neutron.
 - c) All atoms have electrons, protons and neutrons.
 - d) All ions have at least one proton.
38. Which of the following statements is **incorrect** regarding isotopes of an element? They have,
1. The same number of electrons.
 2. The same density.
 3. Similar chemical properties.
 4. Different numbers of neutrons.
 5. The same number of protons.
39. The colour imparted on the Bunsen flame by metal atoms results from the light energy released when the electrons return to the ground state (energy = ϵ_0) from the 1st excited state (energy = ϵ_1). The flame colours of some atoms are given below.

Li	Cu	Na	K
Red	Green	Yellow	Violet

The correct order of $\epsilon_1 - \epsilon_0$, for the atoms is,

1. $Li < Cu < Na < K$
 2. $Na < Li < K < Cu$
 3. $Cu < Li < Na < K$
 4. $K < Cu < Na < Li$
 5. $Na < K < Li < Cu$
40. Which of the following statements is/are true?
- a) Bohr theory is a nuclear model of the atom
 - b) Rutherford proposed the first nuclear model of the atom.
 - c) Electrons do not behave as waves and particles at one and the same time.
 - d) e/m ratio of cathode rays varies with the gas inside a cathode ray tube.

41.

First Statement	Second Statement
The atomic spectrum of hydrogen is a line spectrum.	The energy associated with each line of the spectrum is equal to the energy of the electronic level corresponding to the line.

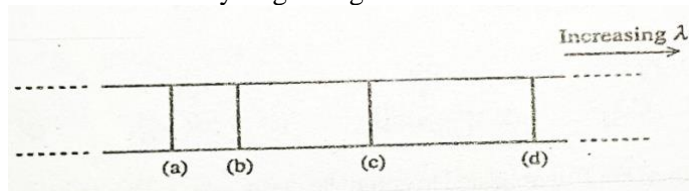
42. The number of electrons and the number of neutrons present in ${}_{12}^{25}Mg^{2+}$ ion are, respectively,
1. 12 and 13
 2. 11 and 13
 3. 10 and 13
 4. 10 and 12
 5. 12 and 11

43. Which of the following statements is/are **true**?
- Positive rays are formed when an electron is removed from an atom or molecule in a cathode ray tube.
 - Cathode rays originate from the cathode.
 - Positive rays originate from the anode.
 - Cathode rays are a type of electromagnetic radiation.
44. Which of the following pairs of lines has/have a difference(s) between them which is equal to that between the 3rd (H_γ) and 4th (H_δ) lines of the Lyman series of the atomic spectrum of hydrogen?
- 3rd and 4th lines of Balmer series
 - 1st and 2nd lines of Paasschen series
 - 2nd and 3rd lines of Balmer series
 - 3rd and 4th lines of Paasschen series

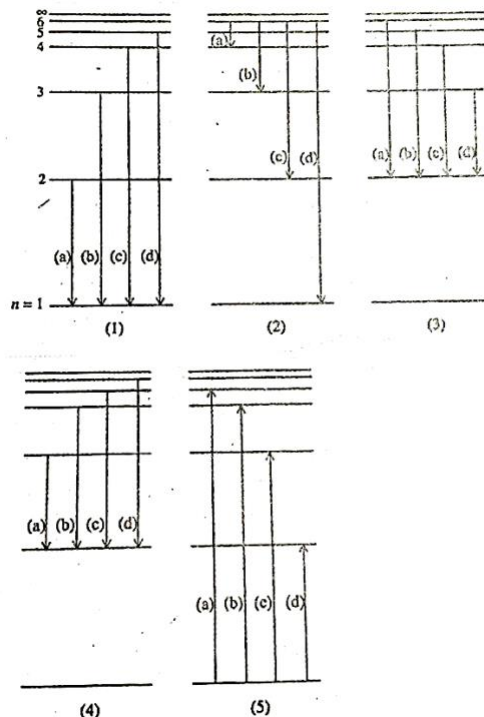
45.

First Statement	Second Statement
Electrons behave sometimes as particles and sometimes as waves.	Electrons have both particle and wave properties.

46. A sample of H atoms in a flame has electrons distributed in $n = 1, 2, 3, 4$ and 5 energy levels. How many different wavelengths of radiation are emitted by the sample according to Bohr theory.
- 4
 - 5
 - 8
 - 10
 - 15
47. Out of the following scientists, identify who was **not** connected with the development of the atomic theory.
- Neils Bohr
 - J. J. Thomson
 - Chadwick
 - Linus Pauling
 - Rutherford
48. Which of the following statements is **not** true regarding sub - atomic particles?
- Electrons show both wave properties and particle properties.
 - Electrons in an atom are dispersed in 3-dimensional regions of space around the nucleus referred to as orbitals.
 - The neutron was detected when Beryllium was bombarded with high energy α particles (Helium nuclei)
 - The neutron is an uncharged particle with its mass approximately equal to that of the proton.
 - The numbers of protons in isotopes of an element are different from each other.
49. A part of the emission spectrum of atomic hydrogen is given below.



Which of the following diagrams represents the electronic transitions corresponding to the lines labelled as (a), (b), (c) and (d)?



50. Which of the following statements is/are **true** regarding positive rays which have been detected during experiments with discharge tubes in determining atomic structure?
- They are found together with cathode rays and responsible for the glow observed in the region behind a perforated cathode.
 - They are formed by loss of electrons from atoms or molecules.
 - They consist of particles whose mass is independent of the residual gas.
 - They are not affected by electric and magnetic fields.
51. The energy of one mole of photons with wavelength 305 nm is, (Planck constant = 6.62×10^{-34} Js, Speed of light = 3.00×10^8 ms⁻¹)
- 256 kJ
 - 302 kJ
 - 392 kJ
 - 452 kJ
 - 512 kJ
52. The number of sub-shells (sub energy levels), orbitals and the maximum number of electrons that could be present in the main energy level described by the quantum number, $n = 3$ are respectively,
- 9, 3 and 8
 - 3, 9 and 18
 - 3, 6 and 32
 - 2, 9 and 18
 - 3, 4 and 18
53. Which of the following statements is **incorrect** regarding the arrangement of electrons among main energy levels and orbitals?
- When orbitals of equal energy are available, they first fill singly (one electron in each orbital), with electron spins parallel.
 - No two electrons in an atom can have the same four quantum numbers.
 - Electrons occupy orbitals in such a way as to minimize the energy of the atom.
 - The maximum number of electrons in a main energy level described by the principal quantum number, n , is equal to $2n^2$.
 - The energy of an atom is minimized by filling completely the principal energy levels in succession.

54. Which of the following statements is/are **true** regarding Rutherford's gold foil experiment?
- All the positive charges reside in a small region referred to as the nucleus.
 - The atom has a large empty space in which electrons move around the nucleus.
 - Thomson's model of the atom was proved acceptable.
 - Electrons travel in fixed orbitals.
55. The identity of an electron in an atom can be expressed using four quantum numbers (n , l , m_l , m_s). Identify which set of numbers given below is **not** acceptable as a set of quantum numbers for an electron in an atom.
- $[4, 2, 0, +\frac{1}{2}]$
 - $[3, 1, -1, +\frac{1}{2}]$
 - $[3, 2, -3, +\frac{1}{2}]$
 - $[2, 1, 1, +\frac{1}{2}]$
 - $[4, 0, 0, -\frac{1}{2}]$

Questions 56 and 58 are based on the following paragraph. Read the paragraph carefully and select the answers for the questions.

“When light strikes on certain metal surfaces, electrons can be ejected from it. The energy carried by the photons in light is transferred to electrons in the metal and if an electron acquires sufficient energy to overcome its attractive forces with the positively charged nucleus, it may escape from the surface as a photoelectron. The minimum energy required for the electron to escape varies from one metal to another.”

56. The energy required for photoelectrons to be ejected from the surface of barium is 240 kJ per mole of electrons. The minimum frequency of light capable of producing a photoelectron in barium is,
- $5 \times 10^{12} \text{ s}^{-1}$
 - $6 \times 10^{12} \text{ s}^{-1}$
 - $2 \times 10^{14} \text{ s}^{-1}$
 - $6 \times 10^{14} \text{ s}^{-1}$
 - $5 \times 10^{15} \text{ s}^{-1}$
57. The maximum wavelength of light that can produce this effect in barium is,
- 450 nm
 - 480 nm
 - 500 nm
 - 530 nm
 - 550 nm
58. The number of atomic orbitals possible for which the quantum numbers $n = 3$ and $m_l = -1$ is,
- 1
 - 2
 - 3
 - 4
 - 5

59.

First Statement	Second Statement
All emission ends up at $n = 1$ for the Balmer series in the hydrogen spectrum.	The Bohr model is used to explain the origin of the hydrogen spectrum.

60. The neutron was discovered by,
- Neils Bohr
 - Ernest Rutherford
 - James Chadwick
 - Albert Einstein
 - Eugen Goldstein

61. The maximum number of electrons having quantum numbers $n = 3$ and $l = 2$ in an atom are,
1. 2
 2. 4
 3. 6
 4. 8
 5. 10
62. Which of the following statements is/are **true** regarding electromagnetic radiation of wavelength 200 nm?
- a) It has a higher frequency than radiation of wavelength 400 nm.
 - b) It is in the visible region of the electromagnetic spectrum.
 - c) In a vacuum, it has a higher velocity than radiation of wavelength 400 nm.
 - d) Its photon has a higher energy than a photon of radiation of wavelength 100 nm.
63. Which out of the following has the highest ionic radius?
- m. S^{2-} b. Na^+ c. F^- d. O^{2-} e. Mg^{2+}
64. Which atom exhibits the highest 1st ionization energy?
- n. Na b. Be c. Ne d. Xe e. F
65. Which element out of the following has the highest 2nd ionization energy?
- o. Na b. Mg c. Al d. Si e. Ar
66. A, B and C are three non-transition elements located in the same period. A- metal, B-nonmetal, C-metalloid. The correct order of how these elements appear in the periodic table would be.
- p. A,C,B b. B,A,C c. B,C,A d. C,A,B e. C,B,A
67. W, X, Y and Z are four consecutive elements in the periodic table which are non-transition. The first ionization energies of W, X and Y vary $W < X < Y$. The oxide formed by Z is basic. What is the electronic configuration of the last energy level of Z.
1. ns^1, np^0 2. $ns^2 np^1$ 3. $ns^2 np^2$ 4. $ns^2 np^3$ 5. $ns^2 np^4$
68. The correct order of filling electrons to the sub energy levels of the 4th period is
- q. 4s, 4p, 4d b. 4s,4d,4p c. 4s,3d,4p d. 3s, 4p, 4d e. 3d, 4s, 4p
69. X, Y and Z are non-transition elements located in the periodic table in a consecutive manner. Their 1st and the 3rd ionization energy values are given below. Identify the group of which the element X belongs to.

	X	Y	Z
1 st IE/ kJ mol ⁻¹	1012	999	1251
3 rd IE/ kJ mol ⁻¹	2912	3361	3822

- a. I b. II c. III d. IV e. V

70. The 3rd ionization energy is maximum for
- r. Al b. Si c. S d. Mg e. Ar

71. What is the false statement regarding N^{3-} , O^{2-} , F^- ions?
- They all have the same electronic configuration.
 - The nuclear charge varies $\text{N}^{3-} < \text{O}^{2-} < \text{F}^-$
 - They all have the same number of electrons to Ne.
 - Their radius varies $\text{N}^{3-} < \text{O}^{2-} < \text{F}^-$
 - When Li reacts with N_2 , O_2 and F_2 respectively, compounds containing these ions are formed.
72. The correct increasing order of the atomic radius of C, O, Al, P and Ca is
- $\text{O} < \text{C} < \text{Al} < \text{P} < \text{Ca}$
 - $\text{O} < \text{C} < \text{P} < \text{Al} < \text{Ca}$
 - $\text{C} < \text{O} < \text{P} < \text{Al} < \text{Ca}$
 - $\text{C} < \text{O} < \text{Al} < \text{P} < \text{Ca}$
 - $\text{C} < \text{O} < \text{Al} < \text{Ca} < \text{P}$
73. Which statement out of the following is false regarding the properties of atoms?
- The covalent radius of an atom of iodine is smaller than its van der Waals radius.
 - The first electron gain enthalpy of O is much higher than that of N
 - aa. The ionization energy of any atom is decided by its nuclear charge and the radius.
 - bb. Electron in the valance shell of Li experience lower nuclear charge than 3.
 - cc. The electro negative value of C, S and I are the same.
74. The correct ascending order of the first ionization energies of Na, Mg, K, N, P and F is
- dd. $\text{K} < \text{Na} < \text{Mg} < \text{N} < \text{P} < \text{F}$
 - b. $\text{K} < \text{Na} < \text{Mg} < \text{P} < \text{N} < \text{F}$
 - c. $\text{K} < \text{Na} < \text{P} < \text{Mg} < \text{N} < \text{F}$
 - d. $\text{Na} < \text{Mg} < \text{K} < \text{N} < \text{P} < \text{F}$
 - e. $\text{Mg} < \text{K} < \text{Na} < \text{N} < \text{P} < \text{F}$

	First Statement	Second Statement
72	First ionisation energy of O is lower than that of N.	The amount of energy required to form O^{2-} from O is less than the amount of energy required to form N^{3-} from N.
73	Van der Waals radius and the covalent radius are both the same.	Covalent radius is also considered when a bond is formed between a hetero atom.
74	The ionic radius of K^+ is much greater than that of Na^+	The number of energy levels in Na^+ and K^+ are the same
75	The number of energy levels of an atom has a significant effect on the radius of an atom.	The radius increases whenever the nuclear charge increase.
76	The nuclear charge increases down the group	Effective nuclear charge increases down the group too.
77	The shielding effect increases when the number of electrons in the inner energy level increases.	The shielding effect depends on the number of valance electrons too.
78	All d block elements are metals	A metallic radius is measured for metals
79	The radius of elements in 3d decreases across the period and then increases slightly	All elements in 3d are metals.
80	Radius of H and He^+ are similar	They both have one electron each
81	The nuclear charge and the effective nuclear charge both increases when moving from the left to right hand side in a period.	The shielding effect decreases when moving from the left-hand side to the right-hand side.
82	Van der Waals radius is lower than the covalent radius	In covalent radius the bond length is measured between atoms which are bonded by a covalent bond. In van der Waals radius the bond is measured

		between atoms which are not bounded to each other.
83	Br^- is much larger than Br.	The nuclear charge increases from Br to Br^- .
84	When the number of electrons participated in metallic bonding increases, metallic bond strength increases too.	The metallic bond strength decreases whenever the radius of the cation increases.
85.	The number of energy levels increases when moving from one period to the other.	The shielding effect increases when moving from one period to another.