

Final Revision

1. Element Q is located in the group (6A) in the periodic table, its nucleus contains x number of neutrons and y number of protons. Which of the following choices represents the ion of this element ?

- (a) ${}^x_{{}_y}Q^{2+}$
- (b) ${}^x_{{}_y}Q^{2+}$
- (c) ${}^{x+y}_{{}_y}Q^{2-}$
- (d) ${}^x_{{}_y}Q^{2-}$

2. Which of the following is an electron configuration of a stable atom ?

- (a) $[\text{Ne}] , 3s^2 , 3p^3 , 4s^1$
- (b) $1s^2 , 2s^2 , 2p^4 , 4s^2$
- (c) $[\text{Ne}] , 3s^2 , 3p^6 , 4s^1$
- (d) $1s^1 , 2s^1$

3. Which of the following are the oxidation numbers of nitrogen and chlorine (respectively) in NOClO_4 ?

- a) +2 and -7
- b) -3 and +5
- c) +2 and +7
- d) +3 and +7

4. What is the electron configuration which violates Pauli's exclusion principle ?

- (a) $\uparrow \uparrow \square \square$
- (b) $\uparrow \uparrow \uparrow \square$
- (c) $\uparrow \uparrow \uparrow \uparrow$
- (d) $\uparrow \uparrow \uparrow \uparrow$

5. Which of the following oxygenated acids is stronger ?

- a) HClO_2
- b) HNO_2
- c) HIO_3
- d) HBrO

6. Which of the following sets of quantum numbers is not possible ?

- a) $n = 2, \ell = 0, m_\ell = +1$
- b) $n = 2, \ell = 1, m_\ell = +1$
- c) $n = 2, \ell = 0, m_\ell = 0$
- d) $n = 2, \ell = 1, m_\ell = -1$

7. Which of the following groups its elements electronic configurations end with : ns^2, np^1 ?

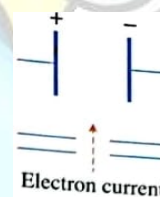
- a) 1A
- b) 2A
- c) 3A
- d) 4A

8. Chlorine replaces iodide ion in potassium iodide solution according to the equation : $\text{Cl}_2 + 2\text{I}^- \rightarrow \text{I}_2 + 2\text{Cl}^-$. What is the oxidizing agent in this reaction ?

- a) Chloride ions.
- b) Chlorine gas.
- c) Iodide ions.
- d) Iodine vapours.

9. The electron configuration of the element (X) ends with the sublevel $4s^1$ What is the product of ionization of XOH in water ? Explain.

10. The atoms of the elements in the periodic table -except hydrogen- contain protons, neutrons and electrons : What is the effect of passing an electron current between the two electrodes of an electric field as shown in the opposite figure ? Explain.



11. Can two elements in the fourth period in the periodic table be similar in containing 3d sublevel in each of them half filled with 5 unpaired electrons ? Explain your answer.

12. The opposite table illustrates the radii of some atoms and ions.

H	Cl	Na	Na ⁺	Cl ⁻
0.3 Å	0.99 Å	1.57 Å	0.95 Å	1.81 Å

Calculate the bond length in each of:

- (1) Hydrogen chloride molecule.
- (2) Sodium chloride formula unit.

13. The term electron was not known at the time of formulating

- a) Rutherford's atomic model.
- b) Bohr's atomic model.
- c) Thomson's atomic model.
- d) Bohr's modified atomic model.

14. If principal quantum number of the last electron in the atom of a noble gas is ($n = 3$).

What is the number of orbitals which are completely filled with electrons in this atom ?

- a) 3
- b) 5
- c) 7
- d) 9

15. Bromine is similar to chlorine in all the following, except that

- a) they are located in the same block in the periodic table.
- b) they have the same oxidation numbers.
- c) they are located in the same group.
- d) they are located in the same period.

16. Which of the following electronic configurations belongs to an atom of an element which the difference between its third and second ionization potentials is very high?

- a) $1s^2, 2s^2, 2p^6, 3s^1$
- b) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$
- c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$
- d) $1s^2, 2s^2, 2p^6, 3s^2$

17. The opposite table shows the types of the oxides of four elements which belong to the same group. What is the letter which refers to the element with the lowest electronegativity ?

Element	Type of oxide
P	Acidic
Q	Amphoteric
R	Amphoteric
S	Basic

- a) R
- b) Q
- c) P
- d) S

Deduce the electron configuration of this element and calculate its atomic number.

Ionization potential (kJ/mol)				
First	Second	Third	Fourth	Fifth
+577.9	+1820	+2750	+11600	+14800

19. Illustrate the electronic configuration to the nearest noble gas of a representative element which is located in the 4th period, group 5A

20. The following figure represents the first four periods in the modern periodic table.

H								B	C		O	F	
Li								Al		P	S	Cl	Ar
Na	Mg												
	Ca		V			Fe		Cu	Zn				

(1) What is the number of the unpaired electrons in the ion of Mg ?

(2) Circle the two elements which combine together to form a compound that glows when an α -particle collide with it. State the name of this compound.

21. If you know that the bond length in ammonia molecule NH_3 equals 1 \AA , and in hydrogen molecule H_2 equals 0.6 \AA , while in water molecule H_2O equals 0.96 \AA . Calculate the bond length in NO molecule.

22. The opposite figure shows a section in the periodic table :

(1) What do these numbers refer to ?

(2) What is the common feature in these elements ?

5				
	14			
	32	33		
		51	52	
				85

23. The following are some postulates of the theories which explain the atomic structure :

- * Theory (A) : The electronic shells surround the nucleus which is in the center of the atom.
- * Theory (B) : The atom is invisible solid sphere.
- * Theory (C) : The atom contains vast space.

What is the historical order of these three theories ?

- a) $A \rightarrow B \rightarrow C$
- b) $B \rightarrow C \rightarrow A$
- c) $A \rightarrow C \rightarrow B$
- d) $B \rightarrow A \rightarrow C$

24. The ratio between the size of the cation to that of the anion is maximum in

- a) CsI
- b) CsF
- c) LiF
- d) NaF

25. All the following combinations of the quantum numbers are possible, except.....

- (a) $n = 2, l = 2, m_l = +1$
- (b) $n = 2, l = -1, m_l = 0$
- (c) $n = 3, l = 2, m_l = +3$
- (d) $n = 4, l = 3, m_l = -2$

26. Which of the following electron configurations does not verify both Hund's rule and the exclusion principle together ?

- (a) $\uparrow\downarrow \quad \uparrow\uparrow \quad \uparrow\uparrow$
- (b) $\uparrow\downarrow \quad \uparrow\downarrow \quad \uparrow\downarrow$
- (c) $\uparrow\downarrow \quad \downarrow\downarrow \quad \downarrow\downarrow$
- (d) $\uparrow\downarrow \quad \uparrow\downarrow \quad \uparrow\downarrow \quad \uparrow$

27. If you know that:

(O - H) bond length in water molecule equals 0.96 \AA

Bond length in oxygen molecule equals 1.32 \AA

Calculate the bond length in hydrogen molecule.

Element	Li	Be	B	C	N	O	F
Atomic number	3	4	5	6	7	8	9
(X) values	1.28	1.91	2.42	3.14	3.83	4.45	5.10

28. The opposite table shows the first three ionization potentials E_1 , E_2 and E_3 of an element. What is the most stable oxidation state of this element ?

- a) +1
- b) +2
- c) +3
- d) +4

E_1	E_2	E_3
7 eV	12.5 eV	42.5 eV

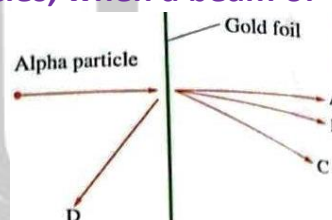
29. Which of the following electronic transitions in hydrogen atom is accompanied by maximum release of energy ?

- a) $(n = 2) \rightarrow (n = 1)$.
- b) $(n = 3) \rightarrow (n = 2)$.
- c) $(n = 4) \rightarrow (n = 3)$.
- d) $(n = 2) \rightarrow (n = 4)$.

30. The opposite figure shows the different paths of alpha particles, when a beam of them hits a foil of gold :

(1) Which of the shown letters represents the path of one in every 20000 alpha particles ?

(2) What can be deduced from this observation ?



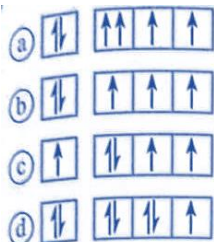
31. Why are there no values for the electronegativities of the elements whose atomic numbers are 2, 10 and 18 ?

- a) Because they are gaseous substances.
- b) Because they are amphoteric.
- c) Because they are radioactive.
- d) Because their electronic configurations are stable.

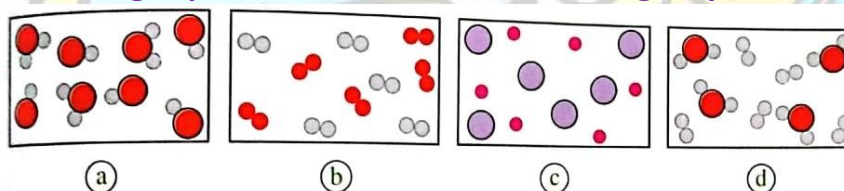
32. What is the number of orbitals in the level $(n = 3)$?

- a) 3
- b) 5
- c) 7
- d) 9

33. Which of the following choices is incompatible with the building-up principle ?



34. Which of the following represents a mixture of two of group zero elements ?



35. Which of the following electron configurations includes two unpaired (single) electrons ?

- (a) $1s^2, 2s^2$
 (b) $1s^2, 2s^2, 2p^3$
 (c) $1s^2, 2s^2, 2p^4$
 (d) $1s^2, 2s^2, 2p^5$

36. The history of proving the presence of a nucleus inside the atom of the element goes back to

- a) Bohr.
 b) Thomson.
 c) Rutherford.
 d) Heisenberg.

37. The properties of the cathode rays differ from those of alpha rays in

1. that they can be observed through flashes.
2. that they both move in straight lines.
3. that they both are particles.
4. the direction of their deflection in an electric field.

38. Bohr's and Rutherford's models are similar in that.....

- a) the electron can gain a quantum of energy.
- b) the electron can not be found within the regions between the energy levels.
- c) the electron orbits the nucleus in definite constant orbits.
- d) the electron is a negatively charged particle.

39. Which of the following properties is not among those of the line spectrum ?

- a) It consists of coloured lines separated by lighted areas.
- b) It arises from the return of the excited electron to its level.
- c) It is produced through heating the atoms of the elements in the state of gas or vapour.
- d) Each element has a characteristic line spectrum.

40. Among the modifications of the wave mechanical theory on Rutherford's model is

- a) that the nucleus of the atom is positively charged.
- b) that the atom is electrically neutral.
- c) that the atom is not solid but contains a vast space.
- d) the probability of finding the electron in the spaces around the nucleus.

41. If $l = 2$, then the values of m_l and m_s of the first electron in the sublevel are

- a) $m_l = +2$, $m_s = +\frac{1}{2}$
- b) $m_l = -1$, $m_s = -\frac{1}{2}$
- c) $m_l = -2$, $m_s = +\frac{1}{2}$
- d) $m_l = +1$, $m_s = +\frac{1}{2}$

42. The opposite table shows the electronic configurations of some elements, the element which has the highest electronegativity is

- a) Y
- b) X
- c) r
- d) z

Element	Quantum numbers
X	$n = 3, l = 0, m_l = 0, m_s = +\frac{1}{2}$
Y	$n = 2, l = 1, m_l = +1, m_s = -\frac{1}{2}$
Z	$n = 2, l = 1, m_l = -1, m_s = -\frac{1}{2}$
R	$n = 3, l = 0, m_l = 0, m_s = -\frac{1}{2}$

43. The ion X^{3+} of an element its electronic configuration ends with $6s^0$, $4f^{14}$, $5d^8$ This element is located in the group

- a) 8
- b) 10
- c) 11
- d) 9

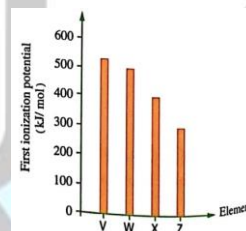
44. 4 elements in the same group their radii are estimated in angstroms.

A	B	C	D
1.96	2.27	1.52	2.48

Which of the following is correct ?

- a) Element (C) has lower electron affinity than element (A).
- b) Element (A) has lower electronegativity than element (B).
- c) Element (D) has higher electronegativity than element (C).
- d) Element (B) has higher ionization potential than element (D).

45. Assisted by the opposite diagram which shows the values of the first ionization potentials of elements of the same group in the periodic table. The element with the highest metallic property is



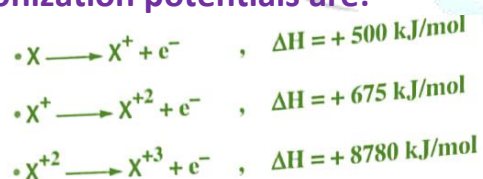
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- a) X
- b) Z
- c) V
- d) W

46. According to the equation : $X + e^- \rightarrow X^-$ + High energy Among the properties of element (X) that

- a) its oxide is amphoteric, and its ionization potential is high.
- b) its oxide is basic, and its ionization potential is high.
- c) its oxide is acidic, and its ionization potential is high.
- d) its oxide is acidic, and its ionization potential is low.

47. You have the element (X) which is a representative element, and their probable ionization potentials are:



Then, the element which precedes it in the same period is located in

- a) the first group A
- b) the second group A
- c) the fourth group A
- d) the third group A

48. In the equation : $\text{HCl}_{(\text{aq})} + \text{HNO}_{3(\text{aq})} \rightarrow \text{NO}_{2(\text{g})} + \frac{1}{2} \text{Cl}_{2(\text{g})} + \text{H}_2\text{O}_{(\text{l})}$ Which of the following represents the previous reaction ?

- a) Nitrogen undergoes oxidation process.
- b) HNO_3 is the reducing agent.
- c) Chlorine undergoes reduction process.
- d) HCl is the reducing agent.

49. In the equation : $2\text{FeCl}_{3(\text{aq})} + \text{H}_2\text{S}_{(\text{aq})} \rightarrow 2\text{HCl}_{(\text{aq})} + 2\text{FeCl}_{2(\text{aq})} + \text{S}_{(\text{s})}$ Which of the following represents the previous reaction ?

- a) FeCl_3 is the oxidizing agent.
- b) A reduction process occurs to sulphur.
- c) H_2S is the oxidizing agent.
- d) An oxidation process occurs to iron.

50. In the compound $\text{C}(\text{OH})_4$, the attraction between (O , C) is equal to the attraction between (O , H), so this compound is ionized

- a) in water as a salt.
- b) according to the type of the medium.
- c) in basic medium as a base.
- d) in acidic medium as an acid.

51. The electronic configuration of the element (X) ends as follows : ns^1 , $(n-1)d^5$, and its electrons are distributed in 5 principal levels. What is the atomic number of this element ?

- a) 29
- b) 24
- c) 47
- d) 42

52. In terms of the opposite table, if the length of the bond (C - Br) in $\text{CBr}_4 = 1.91 \text{ \AA}$. What is the length of the bond in CF_4 ?

- a) 1.14 \AA
- b) 1.41 \AA
- c) 0.77 \AA
- d) 0.64 \AA

Bond	F-F	Br-Br
Bond length	1.28 \AA	2.28 \AA

53. Four ions ${}_{19}\text{M}^+$, ${}_4\text{Z}^{2+}$, ${}_{12}\text{Y}^{2+}$, ${}_{37}\text{X}^+$. What is the correct ascending order of their atomic radii ?

- (a) $\text{Z} < \text{Y} < \text{X} < \text{M}$
- (b) $\text{Y} < \text{Z} < \text{M} < \text{X}$
- (c) $\text{X} < \text{M} < \text{Y} < \text{Z}$
- (d) $\text{Z} < \text{Y} < \text{M} < \text{X}$

54. Which of the following choices is correct for the elements ${}_{19}\text{X}$ and ${}_{17}\text{Y}$?

- a) It is easier to reduce (X) than (Y).
- b) It is easier to oxidize (Y) than (X).
- c) Both (X) and (Y) can be easily reduced.
- d) It is easier to oxidize (X) than (Y).

55. The opposite table shows some properties of the elements (X) and (Y) which are located in the second period in the periodic table. Which of the following statements is correct ?

- a) Element (Y) is located in group (6A).
- b) Element (X) is located in group (2A).
- c) Element (X) is located in group (6A).
- d) Element (Y) is located in group (2A).

Property	(X)	(Y)
Electron affinity	Low	High
ionization potential	Low	High
Oxidation number	+3	-2

56. The element whose last principal energy level ($n = 3$) contains 6 electrons forms

- a) an amphoteric oxide.
- b) an acidic oxide.
- c) a neutral oxide.
- d) a basic oxide.



57. The highest amount of energy is released when the excited electron of hydrogen atom transfers from

- a) the orbit M to the orbit L, and the location of this electron can be determined.
- b) the orbit N to the orbit M, and neither the location nor the speed of this electron can be determined precisely.
- c) the orbit L to the orbit K, and this electron has a dual nature.
- d) the orbit L to the orbit K, and both the location and the speed of this electron can be determined precisely.

58. The opposite table shows the radii of four different atoms. Which element among these elements has the highest electronegativity ?

Element	A	B	C	D
Atomic radius	1.34 Å	2.11 Å	0.73 Å	1.74 Å

- a) A
- b) B
- c) C
- d) D

59. What is the type of the elements in which the electron configuration ends with $nS^{1:2}$, $np^{1:5}$?

- a) Representative.
- b) Main transition.
- c) Inner transition.
- d) Noble.

60. Dalton and Thomson agreed on that carbon atom

- a) has no spaces within it.
- b) is electrically neutral.
- c) contains negative electrons.
- d) is a homogenous sphere.

61. The modern atomic theory agrees with Rutherford's atomic model on

- a) that the atom is not solid.
- b) that the electrons have wave properties.
- c) that it is impossible to determine both the location and the speed of the electron together precisely.
- d) the system of the revolving of the electrons around the nucleus.

62. Bohr's atomic model differs from that of Rutherford. What is the postulate in Bohr's model which clarifies this difference ?

- a) The electron displays a line spectrum when it loses a quantum.
- b) The electron is a negatively charged material particle.
- c) The electron does not display a line spectrum when it loses a quantum.
- d) The electron revolves around the nucleus in certain orbits.

63. When an electron transfers from the level K to the level L, it gains one quantum, and when it transfers from K to N, it gains

- a) 0.5 quantum.
- b) 1 quantum.
- c) 2 quanta.
- d) 3 quanta.

64. Among Heisenberg's modifications of Bohr's atomic model

- a) it is difficult to determine both the location and the speed of the electron together around the nucleus precisely.
- b) the space regions between energy levels are not forbidden for the electrons.
- c) the electron is a material particle with wave properties.
- d) both the location and the speed of the electron can be determined precisely.

65. Bohr's atomic model is distinct from that of Rutherford in that the electrons in Bohr's model

- a) revolve in certain orbitals.
- b) revolve in definite constant energy levels.
- c) revolve in high speed.
- d) revolve around the nucleus.

66. If the electron gains an amount of energy equals 10.2 eV to transfer from the energy level K to L, so to transfer from the energy level M to L . It may.....

- a) lose an amount of energy equals 1.89 eV
- b) gain an amount of energy equals 1.89 eV
- c) lose an amount of energy equals 10.2 eV
- d) gain an amount of energy equals 10.2 eV
- a) neither element (X) nor element (Y) undergoes reduction.

67. What is the drawback of Bohr's model which was modified by the modern atomic theory ?

- a) The electron has wave nature only.
- b) The electron is just a negatively charged particle.
- c) The electron has dual nature.
- d) The electron revolves around the nucleus in an electron cloud.

68. Each of hydrogen and helium contains one energy level. Which of the following choices is correct ?

- a) The two elements are different in their line spectra.
- b) The two elements are equal in the number of electrons in each of them.
- c) The two elements are different in the principal quantum number of their valence electrons.
- d) The two elements are similar in their line spectra.

69. By applying the wave mechanical equation to the last electron in sodium atom $_{11}\text{Na}$. It is found that.....

- a) it is possible to determine its location precisely in the energy level M
- b) it moves back and forth from the nucleus within the energy level M
- c) its energy is lower than that of the electrons of the energy level L
- d) it transfers to the energy level L after losing a quantum.

70. To obtain the hydrogen atom visible spectrum of an electron which has been excited to the third energy level M, this electron must

- a) lose a quantum lower than that gained.
- b) lose a quantum which is gained.
- c) gain a quantum.
- d) lose a quantum higher than that gained.

71. What is the number of electrons lost or gained by nitrogen atom in this conversion : $\text{NO} \rightarrow \text{N}_2\text{O}_3$?

- a) It loses one electron.
- b) It loses two electrons.
- c) It gains one electron.
- d) It gains two electrons.

72. Which of the following choices represents the electronic configuration of the atom which has higher electron affinity ?

- a) $[\text{Ne}], 3s^2, 3p^5$
 b) $[\text{Ne}], 3s^2, 3p^2$
 c) $[\text{Ne}], 3s^2, 3p^6, 3d^5, 4s^1$
 d) $[\text{Ne}], 3s^2, 3p^4$

73. Which of the following loses electrons in the redox (oxidation-reduction) reactions ?

- a) The substance which undergoes oxidation.
 b) The cathode.
 c) The oxidizing agent.
 d) The atom or the ion whose oxidation number decreases.

74. Which of the following is a correct application of one of the postulates of Dalton's theory ?

- a) The atoms of a sample of iron are not necessarily similar.
 b) Hydrogen substance is formed of very minute particles called ions.
 c) Water is formed from hydrogen and oxygen elements in a constant weight ratio.
 d) Carbon and hydrogen elements combine in different weight ratios to form many compounds.