Multiple Choice Questions (MCQs)

DIRECTIONS : This section contains multiple choice questions. Each question has four choices (a), (b), (c) and (d) out of which only one is correct.

- 1. The three elements calcium, strontium and barium form a triad. What is the basis of this grouping?
 - (i) Elements are in the increasing order of their atomic weights.
 - (ii) The atomic weight of the middle element is equal to the average of the atomic weight of extreme elements.
 - (iii) Elements in a triad have similar chemical properties.
 - (a) Only (i) and (ii) (b) Only (ii) and (iii)
 - (c) Only (i) and (iii) (d) (i), (ii) and (iii)
- 2. Which one of the following elements will form an acidic oxide?
 - (a) An element with atomic number 7
 - (b) An element with atomic number 3
 - (c) An element with atomic number 12
 - (d) None of these
- 3. On the basis of following features identify correct option.
 - (i) These elements majorly forms acidic oxides.
 - (ii) These elements are majorly non-metals.
 - (a) *s*-block elements (b) *p*-block elements
 - (c) *d*-block elements (d) *f*-block elements
- **4.** Hydrogen has three isotopes ¹H, ²H and ³H. On what basis these elements were placed in modern periodic table ?
 - (a) Atomic mass (b) Atomic number
 - (c) Both (a) and (b) (d) None of these
- 5. An element 'X' is forming an acidic oxide. Its position in modern periodic table will be
 - (a) Group 1 and Period 3 (b) Group 2 and Period 3
 - (c) Group 13 and Period 3 (d) Group 16 and Period 3

- 6. If Cl, Br and I, are Dobereiner's triad and the atomic masses of Cl and I are 35.5 and 127 respectively the atomic mass of Br is
 - (a) 162.5 (b) 91.5
 - (c) 81.25 (d) 45.625
- 7. Newland could classify elements only upto
 - (a) copper (b) chlorine
 - (c) calcium (d) chromium
- 8. Mendeleev classified elements in
 - (a) increasing order of atomic groups
 - (b) eight periods and eight groups
 - (c) seven periods and nine groups
 - (d) eight periods and seven groups
- 9. Noble gases were included in Mendeleev's periodic table in the
 - (a) 1st group (b) 7th group
 - (c) 8th group (d) none of these
- 10. The long form of periodic table consists of
 - (a) seven periods and eight groups
 - (b) seven periods and eighteen groups
 - (c) eight periods and eighteen groups
 - (d) eighteen periods and eight groups
- **11.** In the modern periodic table which of the following does not have appropriate position?
 - (a) Transition elements
 - (b) Inert gases
 - (c) Inner transition elements
 - (d) Halogens
- An element M has atomic number 9 and atomic mass 17. Its ion will be represented by –
 - (a) M (b) M^{2+}
 - (c) M^- (d) M^{2-}

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13.	The correct order of first II	E of C, N, O, F is –		(a) halogens	(b) noble gases
	(a) $F > O > N > C$	(b) $C > N > O > F$		(c) noble metals	(d) light metals
	(c) $O > N > F > C$	(d) $F > N > O > C$	24.	How many periods are	e there in the long form of the
14.	Elements belonging to the	he same group have similar		periodic table?	
	properties because –			(a) 6	(b) 7
	(a) they have similar el	ectronic configuration of the		(c) 8	(d) 9
	(b) their atomic numbers	a on increasing as we may	25.	The elements with atom	ic numbers 3, 11, 19, 37 and 55
	down the group.	go on increasing as we move		(a) alkali metals	(b) alkaline earth metals
	(c) all of them are metall	ic elements.		(c) halogens	(d) noble gases
	(d) none of the above		26	The elements with atom	$\begin{array}{c} (u) & \text{none gases} \\ \text{norm part } 0 & 17 & 35 & 53 \text{ and } 85 \\ \end{array}$
15.	The atoms of elements be	longing to the same group of	20.	belong to	ine numbers 9, 17, 55, 55 and 65
10.	periodic table have the sam	ne –		(a) alkali metals	(b) alkaline earth metals
	(a) number of protons			(c) halogens	(d) noble gases
	(b) number of electrons		27.	Each transition series co	ontains a total of –
	(c) number of neutrons			(a) 2 elements	(b) 8 elements
	(d) number of electrons i	n the outermost shell		(c) 10 elements	(d) 18 elements
16.	Which of the following is size?	s the correct order of relative	28.	The number of element series are –	ts in each of the inner transition
	(a) $I^- > I^+ > I$	(b) $I^- > I > I^+$		(a) 2	(b) 8
	(c) $I > I^+ > I^-$	(d) $I^+ > I^- > I$		(c) 10	(d) 14
17.	The element with the smal (a) beryllium	lest size in the group 13 is – (b) carbon	29.	The number of elements table are –	in the third period of the periodic
	(c) aluminium	(d) boron		(a) 2	(b) 8
18.	The element present in the	4th period is –		(c) 18	(d) 32
	(a) chlorine	(b) iodine	30.	The total number of e	elements in VII A group of the
	(c) fluorine	(d) bromine		periodic table are $-$	(b) 5
19.	The most metallic element	in the fifth period is –		(a) 3	(0) 3 (d) 9
	(a) silver	(b) rubidium	21	(c) /	(u) 9
	(c) gold	(d) rhodium	31.	(a) (b) (c)	(b) 5
20.	If the two members of a Do	obereiner triad are chlorine and		(a) 5 (c) 7	(d) 9
	iodine, the third member o	f this triad is –	37	Which of the following	alaments has the least nonmetallic
	(a) fluorine	(b) bromine	52.	character?	
	(c) sodium	(d) calcium		(a) fluorine	(b) chlorine
21.	If the two members of a D and antimony the third me	obereiner triad are phosphorus		(c) bromine	(d) iodine
	(a) arsenic	(b) sulphur	33.	About how many known	n elements are there till date?
	(c) iodine	(d) calcium		(a) 10	(b) 50
22.	According to Mendeleev	periodic law, the properties of		(c) 118	(d) 200
	elements are periodic func	tion of their –	34.	Elements in the mode	ern periodic table are arranged
	(a) atomic masses	(b) atomic numbers		according to increasing	- (h) startin
	(c) atomic volumes	(d) densities		(a) atomic number	(b) atomic weight
23.	The elements with atomic 86 are all –	numbers 2, 10, 18, 36, 54 and	35.	Which of these things	you will not find in the periodic

table?

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	(a) element name and sym	ıbol	47.	Elements in which 4 <i>f</i> orbit	tals are progressively filled are
	(b) atomic weight			called as –	(b) lanthanidag
	(c) atomic orbital radius			(a) transition elements	(d) inert gases
	(d) atomic number		10	Which of the following of	(u) mort gases
36.	Which scientist came up w table that included all of the	with the concept of a periodic e known elements?	40.	earth element)?	(b) californium
	(a) Joseph Priestly	(b) Dmitri Mendeleev		(c) cerium	(d) cesium
	(c) Antoine Lavoisier	(d) Albert Einstein	40	If the valene shall electron	ic configuration for an element
37.	The alkali metals are in v table?	which group of the periodic	47.	is ns^2np^5 , this element will (a) alkali metals	l belong to the group of – (b) inert metals
	(a) Group 1	(b) Group 2		(c) noble gases	(d) halogens
	(c) Group 3	(d) Group 4	50	If an atom has electronic	configuration $1s^2 2s^2 2n^6 3s^2$
38.	As you go down the group,	, the alkali metals become –	50.	$3p^6 3d^3 4s^2$, it will be place	$\frac{1}{2} \frac{1}{2} \frac{1}$
	(a) brighter	(b) hotter		(a) second group	(d) sixth group
	(c) more reactive	(d) less reactive	F1		
39.	Where are the transition metal (a) In group 0	tals in the periodic table?	51.	the metallic character –	ght across a period in the table
	(a) In group 0	(d) In group 1		(a) increases	
	(c) In group 2	(d) In a central block		(b) decreases	
40.	The noble gases are unreact	tive because		(c) remains constant	1
	(a) they react with sodium	1.		(d) first increases and the	en decreases
	(b) they have a full outer s	shell of electrons.	52.	Which of the following	is the atomic number of a
	(c) they have a half outer	shell of neutrons.		(a) 32	(h) 34
	(d) they are too thin.			(c) 36	(d) 38
41.	Which of the following eler	ment is not in the liquid state?	53	Which has the maximum a	atomic radius?
	(a) Hg	(b) Li		(a) Al	(b) Si
	(c) Ga	(d) Br		(c) P	(d) Mg
42.	Which of the following early alkaline earth metal group?	lements does not belongs to	54.	Which one of the followin ionic radius?	ig ions has the highest value of
	(a) Rb	(b) Sr		(a) O ^{2–}	(b) B ³⁺
	(c) Ba	(d) Ra		(c) Li ⁺	(d) F ⁻
43.	Arrange the following in in radius : Na K Mg Rb –	creasing order of their atomic	55.	Which one of the followin (a) N^{3-}	g is the smallest in size? (b) O ²⁻
	(a) $Mg < K < Na < Rb$	(b) $Mg < Na < K < Rb$		(c) F ⁻	(d) Na ⁺
	(c) $Mg < Na < Rb < K$	(d) $Na < K < Rb < Mg$	56.	The size of the following s	species increases in the order –
44.	Which is metalloid?			(a) $Mg^{2+} < Na^+ < F^- < A^-$	l l
	(a) Pb	(b) Sn		(b) $F^- < Al < Na^+ > Mg^2$	+
	(c) Si	(d) Zn		(c) $Al < Mg^{2+} < F^{-} < Na$	L ⁺
45.	Which shows variable vale	ncy?		(d) $Na^+ < Al < F^- < Mg^2$	2+
	(a) <i>s</i> -block elements	(b) p -block elements	57.	The correct order of radii	is –
	(c) <i>d</i> -block elements	(d) Radioactive elements		(a) $N < Be < B$	
46.	Dobereiner triads is –			(b) $F^- < O^{2-} < N^{3-}$	
	(a) Li, K, Rb	(b) Mg, S, As		(c) $Na < Li < K$	
	(c) Cl, Br, I	(d) P, S, As		(d) $Fe^{3+} < Fe^{2+} < Fe^{4+}$	

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- 58. Which of the following is correct regarding ionic radii? (a) $Ti^{4+} < Mn^{7+}$ (b) ${}^{35}Cl^- < {}^{37}Cl^-$
 - (c) $K^+ > Cl^-$ (d) $P^{3+} > P^{5+}$
- **59.** Consider following as a portion of the periodic table from Group No. 13 to 17. Which of the following statements is/are true about the elements shown in it?
 - I. V., W, Y and Z are less electropositive than X.
 - II. V, W, X and Y are more .electronegative than Z.
 - III. Atomic size of Y is greater than that of W.
 - IV. Atomic size of W is smaller than that of X.

		V	Z
			Y
W			
Х			

- (a) I, II and III (b) II and III
- (c) I and IV (d) III and IV
- **60.** Mendeleev's periodic law states that the properties of elements are a periodic function of their
 - (a) reactivity of elements (b) atomic size
 - (c) atomic mass (d) electronic configuration
- 61. Chemical symbol of metal tungusten is

(a)	W		(b)	Xe

- (c) Y (d) Zr
- **62.** Which is incorrect order of size?

(a)
$$Na > Na^+$$
 (b) $Na^+ > Mg^{2+}$

(c)
$$CI > CI$$
 (d) $F > O$

- **63.** The anion O^{2-} is isoelectronic with
 - (a) F^+ (b) F^-
 - (c) N^{2-} (d) N^{+3}
- **64.** A part of the modern periodic table is presented below in which the alphabets represent the symbols of elements.

Group	1	12	14	15	16	17
\rightarrow						
Period \downarrow						
2				М	Q	V
3	А	J			R	W
4	Е		L			Т
5	G					Х

Consult the above part of the periodic table to predict which of the following is a covalent compound-

- (a) RQ₂ (b) AT
- (c) JQ (d) JX_2

- **65.** The maximum number of electrons that can be filled in the shell with the principal quantum number n = 4 is
 - (a) 64 (b) 26
 - (c) 18 (d) 32
- **66.** The ionic radii of N^{3–}, O^{2–}, F[–], Na⁺ follow the decreasing order
 - (a) $N^{3-} > O^{2-} > F^{-} > Na^{+}$
 - (b) $N^{3-} > Na^+ > O^{2-} > F^-$
 - (c) $Na^+ > O^{2-} > N^{3-} > F^-$
 - (d) $O^{2-} > F^{-} > Na^{+} > N^{3-}$
- **67.** Consider the elements A, B, C and D with atomic numbers 6, 7, 14 and 15, respectively. Which of the following statements are correct concerning these elements?
 - I. D will lose electron more easily than C.
 - II. C will gain electron more easily than B.
 - III. The element with highest electronegativity is D.
 - IV. The element with largest atomic size is C.
 - (a) I and II (b) II and III
 - (c) II and IV (d) III and IV
- **68.** Which of the following statement can help a chemistry student to predict chemical properties of an element?
 - I. Position of element in the periodic table
 - II. Atomic number of the element
 - III. Number of shells in the atom
 - IV. Number of electron in the outer most shell
 - (a) I, II and III (b) I, II and IV
 - (c) I, III and IV (d) II, III and IV
- 69. The element which normally exist in the liquid state are
 - (a) Bromine and Iodine
 - (d) Mercury and chlorine
 - (c) Iodine and mercury
 - (d) Bromine and mercury
- 70. Which gas being filled in weather balloon?
 - (a) Helium (b) Neon
 - (c) Hydrogen (d) Nitrogen
- **71.** Manya, Kartik, Gurnoor and Sheena had arranged the ions F⁻, Na⁺, O²⁻ and Mg²⁺ in decreasing orders of their ionic radii.

Manya $-O^{2-} > Mg^{2+} > F^{-} > Na^{+}$

Kartik $-Mg^{2+} > Na^+ > O^{2-} > F^-$

Gurnoor $-O^{2-} > F^- > Na^+ > Mg^{2+}$

Sheena $-F^- > Na^+ > O^{2-} > Mg^{2+}$

Who had provided the correct order of their decreasing ionic radii?

- (a) Manya (b) Kartik
- (c) Gurnoor (d) Sheena

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- **72.** Consider the elements A, B, C and D with atomic numbers 11, 12, 16 and 17, respectively. Which among the following statements regarding these elements are correct?
 - I. The element C will gain electron more easily than element D.
 - II. The element B tends to lose electron more readily than C.
 - III. The oxide of A will be least basic while that of D will be most basic.
 - IV. The energy required to remove an electron from outermost shell from A will be minimum while that from D will be maximum.
 - (a) I and III only (b) I and IV only
 - (c) II and III only (d) II and IV only
- **73.** Which of the following is the correct order of reactivity of metals?
 - (a) Mg > Al > Zn > Fe
 - (b) Mg > Zn > Fe > Al
 - (c) Al > Mg > Zn > Fe
 - (d) Mg > Zn > Al > Fe
- 74. The following is the correct decreasing order of the ionic radii-
 - (a) $K^+ > Ca^{2+} > S^{2-} > Cl^-$
 - (b) $K^+ > Ca^{2+} > Cl^- > S^{2-}$
 - (c) $Ca^{2+} > K^+ >> Cl^- > S^{2-}$
 - (d) $S^{2-} > Cl^- > K^+ > Ca^{2+}$
- **75.** Electro-negativity of the following elements increase in the order:
 - (a) C, N, Si, P (b) Si, P, C, N
 - (c) P, Si, N, C (d) N, Si, C, P
- **76.** Which of the following statements is not a correct statement about the trends when going from left to right across the periods of periodic table.
 - (a) The elements become less metallic in nature.
 - (b) The number of valence electrons increases.
 - (c) The atoms lose their electrons more easily.
 - (d) The oxides become more acidic.
- 77. Element X forms a chloride with the formula XCl₂, which is a solid with a high melting point? X would most likely be in the same group of the periodic table as :
 - (a) Na (b) Mg
 - (c) Al (d) Si

Case/Passage Based Questions

DIRECTIONS : *Study the given case/passage and answer the following questions.*

Case/Passage - 1

Metallic Character The ability of an atom to donate electrons and form positive ion (cation) is known as electropositivity or metallic character. Down the group, metallic character increases due to increase in atomic size and across the period, from left to right electropositivity decreases due to decrease in atomic size. Non-Metallic Character The ability of an atom to accept electrons to form a negative ion (anion) is called non-metallic character or electronegativity. The elements having high electro-negativity have a higher tendency to gain electrons and form anion. Down the group, electronegativity decreases due to increase in atomic size and across the period, from left to right electronegativity increases due to decrease in atomic size.



- 78. Which of the following correctly represents the decreasing order of metallic character of Alkali metals plotted in the graph? [CBSE Sample Issued 2021]
 - (a) Cs > Rb > Li > Na > K
 - (b) K > Rb > Li > Na > Cs
 - (c) Cs > Rb > K > Na > Li
 - (d) Cs > K > Rb > Na > Li
- **79.** Hydrogen is placed along with Alkali metals in the modern periodic table though it shows non-metallic character
 - (a) as Hydrogen has one electron & readily loses electron to form negative ion
 - (b) as Hydrogen can easily lose one electron like alkali metals to form positive ion
 - (c) as Hydrogen can gain one electron easily like Halogens to form negative ion
 - (d) as Hydrogen shows the properties of non-metals
- 80. Which of the following has highest electronegativity?
 - (a) F (b) Cl
 - (c) Br (d) I

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- 81. Identify the reason for the gradual change in electronegativity in halogens down the group.
 - (a) Electronegativity increases down the group due to decrease in atomic size
 - (b) Electronegativity decreases down the group due to decrease in tendency to lose electrons
 - (c) Electronegativity decreases down the group due to increase in atomic radius/ tendency to gain electron decreases
 - (d) Electronegativity increases down the group due to increase in forces of attractions between nucleus & valence electrons
- 82. Which of the following reason correctly justifies that "Fluorine (72pm) has smaller atomic radius than Lithium (152pm)"?
 - (a) F and Li are in the same group. Atomic size increases down the group
 - (b) F and Li are in the same period. Atomic size increases across the period due to increase in number of shells
 - (c) F and Li are in the same group. Atomic size decreases down the group
 - (d) F and Li are in the same period and across the period atomic size/radius decreases from left to right.

Case/Passage - 2

The table given below refers to the elements of the periodic table with atomic number from 3 to 18. These elements are shown by letters. (not by the usual symbols of the elements).

3	4	5	6	7	8	9	10	
А	В	С	D	Е	F	G	Н	
11	12	13	14	15	16	17	18	
Ι	J	Κ	L	М	Ν	0	Р	

- 83. Which of the following are noble gases?
 - (a) H and P (b) G and O (d) A and I
 - (c) D and L
- **84.** Which are halogens?

(a)	H and L	(b) C and M
(c)	G and O	(d) E and P

85. Which of the following elements have valency 4?

(a)	F and N	(b)	C and K
(c)	D and L	(b)	H and P

(\mathbf{c})		(u)	11 anu i	L
	~		•	

Case/Passage - 3

Group VII A elements are strong non-metals because they can easily accept an electron to form an anion whereas group 1 A element are strong metals because they can very easily lose one electron to form cation.

Metals have the tendency to lose their valence electrons and form positive ions, so metallic character is related to the ionisation potential. Elements having low ionisation potential, lose electrons easily. Thus, metallic character generally decreases across a period and increases down a group.

- 86. The non metallic character on moving along a period – (a) increases (b) decreases
 - (c) depends on the period (d) remains the same
- 87. Group 1 and group 2 elements are considered as strong metals because
 - (a) they have incomplete octet.
 - (b) they can easily gain electrons.
 - (c) they can easily lose electrons.
 - (d) they form anions.
- 88. Which of the following is the correct decreasing order of metallic character?
 - (a) Ca > Sc > Ti > K(b) K > Ca > Sc > Ti
 - (c) K > Sc > Ca > Ti(d) Ti > Sc > Ca > K

Case/Passage - 4

Question numbers 1 - 3 are based on the periodic table. Study the part of the modern periodic table presented below in which the alphabets represent the symbols of elements and answer the following questions.

Group	1	12	14	15	16	17
\rightarrow						
Period \downarrow						
2				М	Q	V
3	А	J			R	W
4	Е		L			Т
5	G					Х

- 89. Consult the above part of the periodic table to predict which of the given combination is a covalent compound: RQ₂, AT, JQ, JX₂.
- 90. Considering the above part of the periodic table, which of the given element is the most electropositive element?
- 91. Which of the given element is the most electronegative element?
- 92. Study the data of the following three categories A, B and C.

Category	Name of the element	Atomic Mass
А	Li Na K	7 23 39
В	N P As	14 31 74
С	B Al Ga	10.8 27 69.7

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- (i) From the given three categories A, B and C, Pick the one which forms Dobereiner's Triads.
- (ii) Why did Mendeleev placed elements of category A, B and C in three different groups?
- (iii) Is Newland law of octaves applicable to all the three categories?

 \mathbf{X}

Give reason to justify your answer.

Assertion & Reason

DIRECTIONS: Each of these questions contains an assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

- If both Assertion and Reason are correct and Reason is (a) the correct explanation of Assertion.
- (b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
- If Assertion is correct but Reason is incorrect. (c)
- (d) If Assertion is incorrect but Reason is correct.
- **93.** Assertion: Ionic size of N³⁻ is greater than F⁻. **Reason:** N^{3–} and F[–] are isoelectronic anions.

94. Assertion: Atomic radius of aluminium atom is larger than magnesium atom.

Reason: Effective nuclear charge increase from magnesium to aluminium.

95. Assertion: Oxygen atom is divalent in most of its compounds.

Reason: Valency is the number of valence electrons present in the outermost shell of its atom.

Assertion: Silicon, germanium are the metalloids in the 96. modern periodic table.

Reason: Silicon, germanium has properties of metal as well as non metals.

97. Assertion: Bulbs are usually filled with chemically active gases.

Reason: Nitrogen and argon gases are filled in order to prolong the life of the filament.

98. Assertion : Group 1 elements are known as the alkali elements.

Reason : *s*-orbital can accommodate only two electrons.

99. Assertion : Nitrogen has higher ionization energy than that of oxygen.

Reason : Nitrogen has smaller atomic size than that of oxygen.

100. Assertion : According to Mendeleev, periodic properties of elements are functions of their atomic number.

Reason : Atomic number is equal to the number of protons.

101. Assertion : Elements in the same vertical column have similar properties.

Reason : Elements have periodic dependence upon the atomic number.

Match the Following \mathbf{X}

DIRECTIONS : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column I have to be matched with statements (p, q, r, s) in column II.

102. Column II give period to which an element in column I belongs, match them correctly.

		Column I		Column II
	(A)	Hydrogen	(p)	3
	(B)	Sodium	(q)	4
	(C)	Calcium	(r)	6
	(D)	Barium	(s)	1
103.	Mate	ch the column –		
	Col	umn I		Column II
	(A)	Element with largest	(p)	boron
		size in second period		
	(B)	Element with smallest	(q)	fluorine
		size in group 13		
	(C)	Element with maximum	(r)	bromine
		non-metallic character.		
	(D)	Element with smallest	(s)	lithium
		size in fourth period		

Column II

- (p) Alkali metals
- (q) Alkaline earth metals
- (C) Representative elements

Column I

(A) s-block elements

(B) *p*-block elements

104.

(D) High ionisation energy

(r) Halogens

(s) Noble gases

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Fill in the Blanks

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

- 105. The law of triads was given by
- **106.** According to modern periodic law, the elements are arranged in the periodic table in the order of their increasing
- **107.** Elements with eight electrons in their outermost energy shell are called
- **108.** If two elements have the same number of valence electrons, then they belong to the same of the periodic table.
- **109.** The elements in groups 1, 2 and 13 to 18 are known as elements.
- 110. The valency of an atom is equal to its
- **111.** The atomic size in a period from left to right.
- **112.** Dobereiner grouped the elements into triads and Newlands gave the
- **113.** Mendeleev arranged the elements in increasing order of their and according to their properties.
- **114.** Mendeleev predicted the existence of some yet to be discovered elements on the basis of in his periodic table.
- **115.** Elements in the modern periodic table are arranged in vertical columns called and horizontal rows called

True / False

DIRECTIONS : *Read the following statements and write your answer as true or false.*

- **116.** As nuclear charge increases, atomic orbitals become smaller and more stable.
- **117.** As number of shells increases, atomic orbitals become larger and less stable.
- **118.** Atomic radii decrease from left to right across a row of the periodic table.
- **119.** Atomic radii increase from top to bottom down a column of the periodic table.
- 120. Fluorine has highest electron affinity in the periodic table.
- **121.** Noble gases are placed extremely left in the periodic table.
- 122. Magnesium is more metallic in nature than sodium.
- **123.** The number of shells increases in a given period from left to right in the periodic table.
- **124.** The elements silicon, germanium and arsenic are called metalloids.
- **125.** Elements are classified on the basis of similarities in their properties.
- **126.** Rows in the periodic table are called periods.
- **127.** The columns of the periodic table are called groups.
- **128.** You will find metals on the extreme right side of the periodic table.
- **129.** Although the order of elements is based on atomic number, vertical families share similar chemical properties.

ANSWER KEY & SOLUTIONS

- (d) Dobereiner noticed that strontium had similar chemical properties as that of calcium and barium and its atomic weight fell midway between the two. Hence, elements like calcium, strontium and barium form a triad based on the given characteristics.
- (a) Non-metals form acidic oxides. Element with atomic number 7 (electronic configuration 2, 5) is non-metal (N) and hence will form an acidic oxide, other elements Li(3) and Mg(12) are metals and hence form basic oxides.
- **3.** (b) *p*-block elements majorly forms acidic oxides and are non-metals.
- (b) On the basis of atomic number, elements were placed in the modern periodic table.
- 5. (d) Elements of group 16 and period 3 are non metals. Non metals generally form acidic oxides. Elements of group 1 and 2 form basic oxides while elements of group 13 form amphoteric oxides.
- 6. (c) According to Dobereneir's triad the atomic mass of Br will be average of the atomic masses of Cl & I

Atomic mass of Br
$$=$$
 $\frac{35.5 + 127}{2} = 81.25$

7. (c) 8. (c) 9. (d) 10. (b)

- 11. (c)
- 12. (c) The element is halogen and has one electron less than inert gas configuration, hence its ion can be represented as M^- ion.
- 13. (d) In a period, the value of ionisation potential increases from left to right with breaks where the atoms have stable configurations hence the correct order will be

F > N > O > C

- 14. (a) 15. (d) 16. (b) 17. (d)
- 18. (d) On moving along a period atomic radii decreases.
- **19.** (b) The metallic character decreases as we move from left, to right in a period.
- 20. (b) 21. (a) 22. (a) 23. (b)
- 24. (b) 25. (a) 26. (c) 27. (c)
- 28. (d) 29. (b)

- **30.** (b) The VII A group has 5 elements. F, Cl, Br, I and At
- 31. (a) Group I B contain Cu, Ag and Au.
- 32. (d) Non-metallic character decreases in a group from top to bottom, hence iodine will be least non-metallic.
- **33.** (c) There are about 118 known elements listed in the periodic table.
- 34. (a) The elements of the modern periodic table are organized according to increasing atomic number. The atomic number represents the number of electrons which is equal to number of protons in a neutral atom.
- **35.** (c) You will not get information about the atomic radius of an atom. Periodic table will have the atomic number, atomic weight, name, and symbol for each element.
- **36.** (b) Dmitri Mendeleev is credited with designing the modern periodic table.

37.	(a)	38. (c)	39. (d)	40. (b)
41.	(b)	42. (a)	43. (b)	44. (c)
45.	(c)	46. (c)	47. (b)	48. (c)

- 49. (d) 50. (c) 51. (b)
- **52.** (d) 38 is the atomic no. of stronium (Sr) which is *s*-block element and all elements of *s*-block are metals.
- **53.** (d) Mg, as we move across the period atomic radius decreases.
- 54. (a) O^{2-} has the highest value of ionic radii as this can be explained on the basis of Z/e $\left\{\frac{\text{Nuclear charge}}{\text{No. of electrons}}\right\}$

When Z/e ratio increases, the size decreases and when Z/e ratio decreases, size increases.

55. (d)
$$Na^+ < F^- < O^{2-} < N^{3-}$$

All are isoelectronic, effective nuclear charge is highest for Na⁺ so it has smallest size.

56. (a) $Mg^{2+} < Na^+ < F^- < Al$

F⁻ has bigger size than Mg²⁺ and Na⁺

57. (b) Ionic radii decreases significantly from left to right in a period among representative elements.

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- **58.** (d) Nuclear charge per electron is greater in P^{5+} . Therefore, its size is smaller.
- 59. (c) Electropositive nature increases from top to bottom in a group and decrease along a period. Therefore X is most electropositive.

Atomic size decreases along a period and increases down the group. Therefore W < X.

- Mendeleev's periodic law states that the physical 60. (c) and chemical properties of the elements are a periodic function of their atomic mass.
- 61. (a) Tungsten \rightarrow W
- (d) Size of F^- is less than O^{2-} 62.
- (b) Anion O^{2-} has 10 electrons. 63.

Anion F⁻ has 10 electrons.

- 64. (a) R and Q are members of Group 16th which is non metallic having O, S, Se, Te etc. These are characterised by showing the formation of covalent bond.
- 65. (d) The maximum number of electrons that can be filled in the shell with principle quantum number(n) = $2n^2$. Maximum number of electrons = $2(4)^2 = 32$
- (a) Increase in positive charge decrease the ionic radii **66.** of cation while increase in negative charge increases the ionic size of anion. So $N^{3-} > O^{2-} > F^- > Na^+$.
- 67. (c)
- **68**. (b) Position, atomic number and number of electrons in the outermost shell of an element predicts its chemical properties.
- 69. (d) Bromine and mercury exist in the liquid state.
- 70. (a) Helium is filled in weather balloon.
- 71. (c) The ions F^- , Na⁺, O²⁻ and Mg²⁺ are isoelectronic species having same electronic configuration but their nuclear charges differ from each other because of their difference in the number of protons in the nucleus. With increase in the number of protons in the nucleus, the electrons are more attracted towards nucleus thereby causing the decrease in ionic radius. Therefore, the given ions are

 F^- : no. of proton = 9 and no. of electron = 10

 Na^+ : no. of proton = 11 and no. of electron = 10

 O^{2-} : no. of proton = 8 and no. of electron = 10

 Mg^{2+} : no. of proton = 12 and no. of electron = 10

Electronic Atomic Element Number configuration A(11) Na 2, 8, 1 2, 8, 2 B(12) Mg 2, 8, 6 C(16) S D(17) Cl 2, 8, 7

From the above table it is clear that:

- (a) Chlorine (D) will gain electrons more easily than sulphur (C).
- (b) The oxide of sodium (A) which is an alkali metal, will be the most basic while that of chlorine (D) which is a halogen, will be the most acidic.
- 73. (a) The correct order of reactivity is as follows.

Mg > Al > Zn > Fe

Alkali metals and alkaline earth metals are very reactive elements in the periodic table and reactivity decreases on moving from left to right in the periodic table.

74. (d) Among the isoelectronic species greater the ratio larger will be the ionic radii, hence the order is

 $S^{2-} > C^{1-} > K^+ > Ca^{2+}$

75. (b) Electro-negativity increases on moving left to right in the periodic table, while it decreases on moving down the group.

The correct order of E.N. is

(1.8)(2.1)(2.5)(3.0)

- 76. (c) As we move from left to right in a period no. of shells remains same whereas one more electron is added thus the size of atom decreases and hence the valence electron becomes more and more near to the nucleus and hold of nucleus on valence electron increases, due to this, the tendency of an atom to lose valence electron decreases.
- 77. (b) X forms XCl_2 suggests that X is in +2 state in XCl_2 . Therefore X would most like be in gp 2 of periodic table.
- 78. (c) Cs > Rb > K > Na > Li
- (b) As Hydrogen can easily lose one electrion like alkali 79. metals to form positive ion
- 80. (a) F
- 81. (c) Electronegativity decreases down the group due to increase in atomic radius/ tendency to gain election decreases.

72. (d)

Si < P < C < N

- 82. (d) F and Li are in the same period and across the period atomic size/radius decreases from left to right.
- 83. (a) H and P have complete octet.
- **84.** (c) G and O

Both have 7 electrons in their outermost shell.

- 85. (c) Both have four electrons in their outermost shell.
- 86. (a) 87. (c)
- **88.** (b) On moving along a period metallic character decreases.
- **89.** R and Q are members of group 16th having elements, O, S, Se, Te etc. RQ₂ is characterised by showing the formation of covalent bond.
- **90.** Element 'G' is the most electropositive element.
- 91. Element 'V' is the most electronegative element
- 92. (i) Dobereiner's Triads is A.
 - (ii) Mendeleev placed elements of category A,B and C in three different groups because they have different physical and chemical properties.
 - (iii) No, Newland's Law of octaves is not applicable for all three categories.

Because the **law of octaves** states that every eighth element has similar properties when the elements are arranged in the increasing order of their atomic masses.

- 93. (b) N³⁻ and F⁻ are isoelectronic anions. N³⁻ has only seven protons and F⁻ has nine. Therefore, N³⁻ has larger ionic size.
- **94.** (d) Atomic radius of aluminium atom is smaller than magnesium atom because of increased effective nuclear charge.
- **95.** (c) Valency of an element is determined by the number of valence electrons present in the outermost shell of its atom.
- **96.** (a) Silicon and germanium are among the metalloids in the modern periodic table.
- 97. (d) Bulbs are usually filled with chemically inactive gases. Nitrogen and argon gases are inactive and are filled in order to prolong the life of the filament.

- **98.** (b) Group I elements are known as alkali metals as the hydroxides of these metals are soluble in water and these solutions are highly alkaline in nature.
- **99.** (c) Nitrogen has higher ionisation energy as it has stable half filled electronic configuration.
- **100.** (d) According to Mendeleev, periodic properties of elements is a function of their atomic masses.
- 101. (b)
- **102.** $A \rightarrow (s)$; $B \rightarrow (p)$; $C \rightarrow (q)$; $D \rightarrow (r)$
- **103.** A \rightarrow (s); B \rightarrow (p); C \rightarrow (q); D \rightarrow (r)
- **104.** $A \rightarrow (p, q); B \rightarrow (r, s); C \rightarrow (p, q, r); D \rightarrow (r, s)$
- **105.** Dobereiner **106.** atomic number
- 107. noble gases108. group
- **109.** main group **110.** combining capacity
- 111. decreases 112. law of octaves
- **113.** atomic masses, chemical **114.** gaps
- **115.** 18, groups, 7, periods
- 116. True 117. True 118. True
- **119.** True **120.** False
- **121.** False

Noble gases are placed extremely right in the periodic table.

122. False **123.** False

The number of shells remain same in a given period.

- **124.** True **125.** True
- 126. True

Rows in the periodic table are called periods. The columns of the periodic table are called groups.

- 127. True
- 128. False

Inert gases are found on the far right of the periodic table. Halogens are in the second group form the right. Metals of all types are found around the left. Transition metal are found in the middle side of the periodic table.

129. True