



## CHEMISTRY

### BOOKS - PEARSON IIT JEE FOUNDATION

## ATOMIC STRUCTURE AND TRANSFORMATION OF MATTER

### Test Your Concepts Fill In The Blanks

1. The symbol of calcium is \_\_\_\_\_.

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2. Magnesium attains an octet configuration by \_\_\_\_\_ electrons.

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3. The electronic arrangement of an atom with two electrons in the first shell is called \_\_\_\_\_ if the first shell is the valence shell.

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4. Two molecules of sulphur trioxide are indicated by\_\_\_\_\_.

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5. \_\_\_\_\_ is the suffix used while naming the salt of a metal with lower valency.

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6. Name of the radical  $PO^{-3}_4$  is \_\_\_\_\_ .

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7. Formulae of sodium sulphite and sodium sulphate are, respectively \_\_\_\_\_ and \_\_\_\_\_ .

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8. Generally \_\_\_\_\_ changes are reversible because there is no change in the \_\_\_\_\_ of the substance.

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9. Decomposition of solid ammonium chloride is associated with \_\_\_\_\_ change.

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**Test Your Concepts**

1. The number of atoms of a molecule or compound is balanced on either side of a chemical equation by keeping appropriate \_\_\_\_\_ .

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2. The number of electrons present in the K shells of hydrogen and helium are

A. 2 and 1 respectively

B. 2 in both the elements

C. 1 and 2 respectively

D. 1 in both the elements

**Answer: 3**

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3. The charge possessed by permanganate is the same as \_\_\_\_\_ radical.

A. magnesium

B. bisulphate

C. sulphate

D. potassium

**Answer: 2**

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4. If the formulae of respective chlorides of X and Y are  $XCl_3$  and  $YCl_4$ , respectively, then the valencies of X and Y are

A. 3 and 2

B. 3 and 4

C. 1 and 1

D. 1 and 4

**Answer: 2**

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5. The formula of a compound when a positive radical with valency 2 and negative radical with valency 1 combine is \_\_\_\_\_ .

A.  $B_2A$

B.  $A_2B$

C.  $AB_2$

D. AB

**Answer: 3**

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6. Sugar gets charred when treated with conc.  $H_2SO_4$  This is an example of \_\_\_\_\_ .

A. physical change.

B. chemical change.

C. simultaneous physical and chemical change.

D. chemical combination reaction.

**Answer: 2**



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7. Melting of wax is a \_\_\_\_\_.

A. chemical change

B. decomposition reaction

C. both physical and chemical change

D. physical change

**Answer: 4**



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8. Corrosion of a metal involves change in \_\_\_\_\_.

- A. chemical composition
- B. only colour and shape
- C. only density
- D. malleability and ductility

**Answer: 1**



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9. Formation of clouds , mist and fog are the examples of \_\_\_\_\_.

- A. chemical combination of  $O_2$  and  $H_2O$ .
- B. physical change which involves condensation of water vapour
- C. physical change which involves sublimation.



D. chemical change which involves absorption of huge amounts of energy.

**Answer: 2**



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10. The reaction  $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$  is a \_\_\_\_\_ reaction.

- A. chemical displacement
- B. chemical combination
- C. double displacement
- D. decomposition

**Answer: 3**



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11. Which of the following elements is chemically inactive ?

A. Nitrogen

B. Neon

C. Hydrogen

D. Copper

Answer: 2



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12. The formula of chloride of corresponding metal is  $MCl_2$ . What is the valency of the metal?

A. 4

B. 3

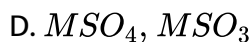
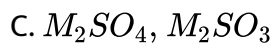
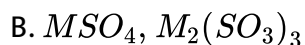
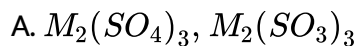
C. 1

D. 2

**Answer: 4**

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**13.** What will be the formula of the sulphate and sulphite of a trivalent metal?



**Answer: 1**

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**14.** Identify the atomic numbers of the pair of elements which possesses same number of electrons in L and M shells.

A. 12 , 18

B. 19 , 20

C. 18 , 16

D. 17 , 18

**Answer: 2**

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**15. Which of the following is a physical change ?**

A. Dissolution of lime in water.

B. Dissolution of  $CO_2$  in water at high pressure.

C. Dissolution of concentrated acid in water.

D. Electrolysis of water.

**Answer: 3**

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16. Which of the following is not a chemical change?

- A. Passing of steam over red hot coke.
- B. Colour change of dilute nitric acid upon long standing.
- C. Absorption of moisture by  $P_2O_5$ .
- D. Absorption of moisture by  $CaCl_2$ .

Answer: 4



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17. Arrange the following point in sequence for derivation of formulae of compounds.

(a) The valencies of the ions or radicals are written below the radicals without positive and negative sign.

(b) If the valencies have common factors, they are divided by the highest common factor.

(c) The magnitude of valencies should be interchanged and written as subscripts on the right side of the respective ions.

(d) The positive radical followed by negative radical are written with their charges.

(e) If the radicals contain more than one atom, they are enclosed in brackets and the appropriate valency (more than one) written as subscripts outside the bracket.

A. bcdea

B. dacbe

C. abcde

D. dabce

**Answer: 2**



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Column A		Column B	
A.	$3\text{O}_2$	( )	a. 4 atoms of helium
B.	$2\text{Na}$	( )	b. 3 oxygen atoms
C.	$4\text{He}$	( )	c. 2 ions of sodium
D.	$8\text{Cl}_2$	( )	d. 2 atoms of sodium
		( )	e. 3 molecules of oxygen
		( )	f. 8 chlorine atoms
		( )	g. 8 molecules of chlorine

18. \_\_\_\_\_

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Column A		Column B	
Name of radical		Charge	
A.	Zincate	( )	a. -3
B.	Stannic	( )	b. +1
C.	Nitride	( )	c. +2
D.	Potassium	( )	d. +4
		( )	e. -2

19. \_\_\_\_\_

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Column A		Column B	
A.	$\text{X} + \text{Y} \rightarrow \text{XY}$	( )	a. Displacement reaction
B.	$\text{X} + \text{YZ} \rightarrow \text{XZ} + \text{Y}$	( )	b. Combination reaction
C.	$\text{AB} + \text{XY} \rightarrow \text{AY} + \text{XB}$	( )	c. Decomposition reaction
D.	$\text{AB} \rightarrow \text{A} + \text{B}$	( )	d. Double displacement reaction

20. \_\_\_\_\_

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## Very Short Answer Type Questions

1. What is the difference between symbol and formula ?

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2. Compare the mass of proton , neutron and electron?

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3. How do not the energy of orbits in an atom vary?

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4. The atomic number and mass number of an element are 13 and 27 respectively. Find the number of neutrons.

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5. Define valency.

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6. Name two metals that can exhibit variable valency. Also give the names of radicals.

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7. What is meant by synthesis reaction? Given an example.

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8.  $A + BC \rightarrow AC + B$  In the above equation , compare the reactivities of A and B.

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9. What is meant by electrolytic decomposition? Give an example.

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10. Give reason for the stability of inert gases.

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11. What is the valence shell ? What is the maximum number of electrons it can have in an atom?

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12. An atom is electrically neutral .



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13. What is photolytic decomposition ? Give an example.



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14. Identify physical and chemical changes among the following.

- (a) Boiling of milk
- (b) Ripening of fruits
- (c) Curding of milk
- (d) Melting of candle
- (e) Rusting of iron
- (f) Blackening of silverware



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15. Why should a chemical equation be balanced ?

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16. Dissolution of calcium oxide in water is which type of reaction?

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17. In a double decomposition reaction , one of the products is insoluble .

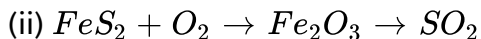
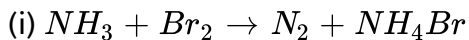
What type of reaction is that ?

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18. Potassium chlorate on strong heating gives potassium chloride and oxygen . What type of reaction is this?

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19. Balance the following chemical equations.

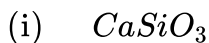


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20. In the table given below, some compounds are listed. In listed. In each case, identify the positive and negative radicals present in the compound.

Positive radical    Negative radical

No.    Compound



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Short Answer Type Questions

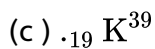
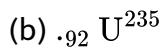
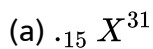
1. Give the characters (symbol , charge , mass) of all fundamental particles.

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2. Why do metals form cations and non - metals form anions?

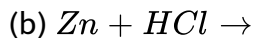
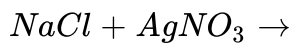
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3. Calculate the number of neutrons in the following.



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4. For each of the following reactions identify the products formed and balance the reaction.



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5. Define radical . Give some examples of bivalent negative radicals.

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6. How do you distinguish physical change and chemical change?

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7. Mention different types of combination reactions with example.

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8. What is meant by thermal decomposition ? Give an example.

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9. Define double decomposition reaction . Give an example.

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10. What is a chemical displacement reaction ? Mention the condition required for it.

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11. Distinguish between cations and anions.

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12. In the table given below, some commonly used positive and negative radicals are listed. Use the crisscross method to obtain the formulae of the compound that is formed using the given radicals. Name the compound thus obtained.

No.	Positive radicals	Negative radicals	Formula	Name of the compound
1.	$Al^{+3}$	$PO_4^{-3}$		
2.	$Ca^{+2}$	$NO_3^{-1}$		
3.	$NH_4^{+1}$	$SO_4^{-2}$		
4.	$Al^{+3}$	$Ca^{-4}$		

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13. Distinguish between atomic number and mass number with an example.

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14. Draw the geometrical representation of sulphur.

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15. Derive the formula of the following compounds.

(a) Ammonium nitrate

(b) Ferrous sulphate



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16. How do you distinguish metals and non - metals with respect to electronic arrangement?



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17. Write the electronic configurations of the following elements.

(a) magnesium

(b) Silicon

(c) Sulphur

(d) Argon



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18. Explain the following of sodium chloride.

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19. Write the symbols of the following elements.

(a) Cadmium

(b) Bismuth

(c) Silicon

(d) Argon

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20. Explain the observable change taking place during reaction of iron with the aqueous solutions of  $H_2SO_4$  and  $CuSO_4$  respectively.

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1. Explain in detail the modern structure of atom.

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2. Give the electronic configuration and geometrical representation of the following elements.

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3. Classify the chemical reactions into various types depending on the way the products are formed by giving suitable examples.

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4. Mention the postulates and limitations of Dalton's atomic theory.

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5. Write the step in balancing a chemical equation with an example.

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6. What is valency ? Write short note on different types of valencies of cations with examples.

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### Concept Application Level 1

1. The number of electrons in second shell of a metal with three valence electrons in the third shell is eight.

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2. The valency of helium is zero.

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3. The name of  $CrO_4^{-2}$  radical is dichromate ion.

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4. Rusting of iron is an example of both physical and chemical change.

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5. Sublimation of camphor is a physical change.

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6. The central part of the atom called nucleus accounts for the mass of an atom.

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7. Both protons and neutrons possess the same magnitude of charge but opposite signs.

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8. The maximum number of electrons in L shell is two.

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9. An atom is electrically neutral .

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10. In phosphide ion , the total number of electrons is equal to 12.

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11. The symbol of cobalt is \_\_\_\_\_.

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12. The mass of an electron is \_\_\_\_\_ times that of mass of a proton.

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13. The maximum number of electrons that can be accommodated in the outermost orbit is equal to \_\_\_\_\_.

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14. The valency of argon is \_\_\_\_\_.

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15. In the formation of sodium chloride , each chlorine gains\_\_\_\_\_ electron.

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16. The formula of a zincate radical is \_\_\_\_\_.

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17. The combining capacity of the metal which can exhibit more than one valency is called\_\_\_\_\_.

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18. Balackening of silverware is a \_\_\_\_\_ change.

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19.  $2HOCl \rightarrow 2HCl + O_2$  is a \_\_\_\_\_ decomposition reaction.



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20. Atomic number of a metal having 12 neutrons and mass number 23 is \_\_\_\_\_ .



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21. The nucleus consists of

- A. proton and electrons
- B. electrons and neutron
- C. protons and neutrons
- D. All the above

Answer: 3



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22. The maximum number of electrons that can be accommodated in an orbit is equal to \_\_\_\_\_ where n is the number of orbits.

A.  $4n^2$

B.  $2n^2$

C.  $(2n + 1)^2$

D.  $n^2 + 4$

**Answer: 2**



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23. Among the noble gases which gas does not have octet configuration?

A. Neon

B. Helium

C. Argon

D. Xenon

**Answer: 2**

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**24.** Which among the following pairs of elements forms cation and anion respectively ?

A. Sulphur and neon

B. Chlorine and sodium

C. Potassium and phosphorus

D. Aluminum and lithium

**Answer: 3**

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25. Which is a negative radical among the following ?

- A. Silcate
- B. Ammonium
- C. Ferrous
- D. Chromium

Answer: 1



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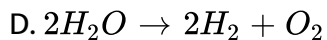
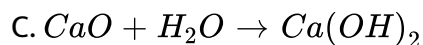
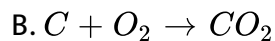
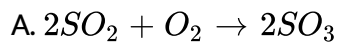
26. Which among the following reactions is not balanced ?

- A.  $2KClO_3 \rightarrow 2KCl + 3O_2$
- B.  $2Fe(OH)_3 + 4H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 6H_2O$
- C.  $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$
- D.  $2KNO_3 + FeSO_4 \rightarrow FeSO_4 \rightarrow K_2SO_4 + Fe(NO_3)_2$

**Answer: 2**

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**27.** Among the following reactions , identify the synthesis reaction.



**Answer: 2**

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**28.** Identify a useful change among the following chemical changes.

A. Blackening of silverware

- B. Rusting of iron
- C. Curding of milk
- D. All the above

**Answer: 3**



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**29.** Which among the following is not a characteristic of a physical change?

- A. The change is temporary.
- B. No new substance is formed.
- C. Molecular formula of a compound changes.
- D. Change of state of matter takes place without any change in molecular composition.

**Answer: C**

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30. Among the following types of chemical reactions, application of metal reactivity series is involved with which reaction?

- A. chemical combination of  $O_2$  and  $H_2O$ .
- B. Chemical displacement
- C. Chemical decomposition
- D. Double decomposition.

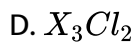
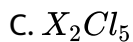
**Answer: 2**

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31. If a solid non-metal X forms oxide of type  $X_2O_5$ , then the formula of its corresponding chloride is \_\_\_\_\_ .

- A.  $XCl_3$

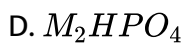
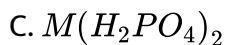
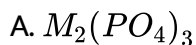




**Answer: 2**

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**32.** If the formula of a metal nitrite is  $M(NO_2)_2$ , then the formula of its dihydrogen phosphate is



**Answer: 3**

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33. Identify the number of neutrons present in a pair of elements with atomic numbers 20 and 13, if their mass numbers are 40 and 27, respectively.

A. 20 and 13

B. 20 and 13

C. 17 and 20

D. 20 and 14

**Answer: 4**

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34. Heating solid ammonium chloride involves change in the \_\_\_\_\_.

A. physical state only

B. physical state as well as chemical composition

C. colour only

D. both colour and volume only

**Answer: 2**

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**35.** Which of the following is a chemical change ?

A. Formation of clouds

B. Formation of rust

C. Manufacture of milk powder from milk

D. Formation of black coating on the walls of tube light

**Answer: 2**

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36. Arrange the following sequence in order to derive the formula of zinc oxide.

(a) The valencies of ions formed by zinc and oxygen are written below without positive and negative sign.

(b) The positive ion that is  $Zn^{+2}$  followed by the negative ion, that is oxide ( $O^{-2}$  ion are written with their charges.

(c) The valencies of zinc and oxide ion have common factors and hence they are divided by their highest common factor.

(d) The magnitude of valencies of the ions should be interchanged and written as subscripts on right side of the respective ions.

A. badc

B. abcd

C. bacd

D. cabd

**Answer: 3**



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Column A		Column B	
A. $4\text{SO}_2$	( )	a.	Three atoms of oxygen.
B. $2\text{Na}^+$	( )	b.	Three oxygen molecules.
C. $3\text{O}_2$	( )	c.	Eight molecules of chlorine.
D. $8\text{Cl}_2$	( )	d.	Eight chlorine atoms.
	( )	e.	Two sodium atoms.
	( )	f.	Four sulphur dioxide molecules.
	( )	g.	Two sodium ions

37.



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Column A		Column B	
Name of the radical		Charge	
A. Aluminium	( )	a.	-1
B. Stannous	( )	b.	+3
C. Bisuphite	( )	c.	+2
D. Silicate	( )	d.	+4
	( )	e.	-2

38.



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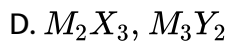
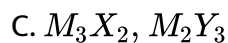
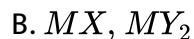
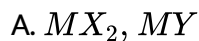
Column A		Column B	
A. $2\text{Pb}(\text{NO}_3) \rightarrow \text{PbO} + 4\text{NO}_2 + \text{O}_2$	( )	a.	Combination reaction
B. $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$	( )	b.	Double decomposition reaction
C. $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$	( )	c.	Decomposition reaction
D. $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$	( )	d.	Displacement reaction

39.

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Level 2

1. X and Y are non metals in which M shell is valence shell . Y is precedent to X . X shows uninegative valence . Identify the formulae of the compounds formed when X and Y react with divalent metal M.



**Answer: 1**

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2. Identify the formula of the corresponding hydride of a nonmetal 'X' which attains octet by gaining three electrons.

A.  $XH$

B.  $XH_2$

C.  $XH_3$

D.  $X_2H_4$

**Answer: 3**



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3. The number of positively charged particles in the elements A, B, C are 10, 18, 8 respectively . Identify the element which is chemically reactive?

A. A

B. B

C. C

D. Both A and B

**Answer: 3**



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4. If a dipositive ion of an element 'X' consists of 12 protons and 12 neutrons and another dipositive ion of an element 'Y' consists of 18 electrons and twice the number of electrons of dipositive ion X is the number of neutrons of Y. Then the mass number would be in the ratio of

A. 1 : 2

B. 3 : 5

C. 12 : 19

D. 2 : 3

**Answer: 2**



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5. If a uninegative ion has 10 neutrons and 9 protons , electronic configuration of the atom of the element is

A. 2, 8, 1

B. 2, 7

C. 2, 8

D. 2, 8 , 8

**Answer: 2**



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6. Mass of total positive charge present in an atom is 55110 times to that of mass of electron . Write the electronic configuration of the element.

A. 2, 8 , 9 , 2

B. 2 , 8 , 18 , 1

C. 2, 8 , 18 , 2

D. 2, 8, 8 2

**Answer: 3**



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7. The ratio of difference in the number of electrons between K and M shells is 3:2 for X and Y elements respectively. 'X' possesses stable electronic configuration and M is the valence shell for both X and Y. Give the electronic configurations of X and y.

A. 2, 8, 5 and 2, 8, 4

B. 2, 8, 8 and 2, 8, 6

C. 2, 8, 8 and 2, 6, 6

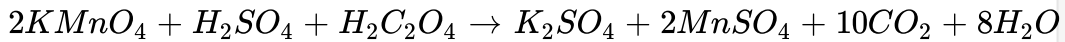
D. 2, 8, 6 and 2, 8, 4

**Answer: 2**



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8.



Potassium permanganate oxidizes oxalic acid in acidic medium as per the above chemical reaction . Identify the coefficients of  $H_2SO_4$  and  $H_2C_2O_4$  in the above equation.

A. 3 , 5

B. 4 , 4

C. 5 , 3

D. 4 , 2

**Answer: 1**



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9. Heating of a mixture consisting of potassium nitrate , carbon and sulphur involves which of the following chemical changes ?

A. Decomposition and combination.

B. Double decomposition.

C. Combination and displacement.

D. Displacement and decomposition.

**Answer: 1**

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10.  $CuSO_4 + X \rightarrow XSO_4 + Cu$ ,  $CuSO_4 + Y \rightarrow YSO_4 + Cu$ ,

$XSO_4 + Y \rightarrow$  No reaction,  $CuSO_4 + Z \rightarrow$  No reaction,

Arrange Cu, X, Y and Z in the ascending order of reactivity.

A. X, Y, Z, Cu

B. Cu, Y, X, Z

C. Cu, X, Z, Y

D. Z, Cu, Y, X

**Answer: 4**

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**11.** A metal M shows variable valencies 2 and 3. Calculate the ratio of oxygen atom present in their corresponding sulphates.

A. 1 : 3

B. 3 : 1

C. 3 : 4

D. 3 : 2

**Answer: 1**

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**12.** Identify the formula of the corresponding hydride of a nonmetal 'X' which attains octet by gaining two electrons.

A.  $XH$

B.  $XH_3$

C.  $XH_4$

D.  $XH_2$

**Answer: 4**



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**13.** The number of valence electrons in the valence shells, 1, 2, 3 of the X, Y, Z elements are 2, 8, 6 respectively. Identify the element which doesn't exist in monoatomic state.

A. X

B. Z

C. Y

D. X and Y

**Answer: 2**

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**14.** The number of neutrons are equal to the number of protons present in the nucleus of two elements and their respective dinegative ions possess 8 electrons in L and M shells respectively . Then the ratio of mass numbers of the two elements is

A. 1 : 2

B. 3 : 3

C. 3 : 4

D. 2 : 5

**Answer: 1**

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15. Tripositive ion of an element has 13 protons and 14 neutrons . Calculate the of number of electrons present in K and M shells of the neutral atom.

A. 2:3

B. 2:1

C. 1:1

D. 2:5

**Answer: 1**



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16. The ratio of number of electrons present I four shells of an element is 1:4:4:1, fourth shell is the valence shell . Then mass of total positive charge present in the atom is \_\_\_\_\_ times to that of mass of electron



A. 36 , 704

B. 27 , 555

C. 18 , 370

D. 55, 110

**Answer: 1**

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17. The difference in the number of electrons between K, L and L, M shells in the same for an atom of element 'X' (M shell is the valence shell) and the difference value is the number of valence electrons in M shell of the other element 'Y' . Give the electronic configurations of their stable ions.

A. 2 , 8 , 2 and 2 , 8 , 6

B. 2 , 8 and 2 , 8

C. 2 , 8 and 2 , 8 , 8

D. 2 , 8 , 8 and 8 , 8

**Answer: 3**

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**18.** The colour change of  $CuSO_4$  solution can be observed when it is made to react with

- A. silver
- B. silver chloride solution
- C. zinc
- D. gold

**Answer: 3**

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**19.** Identify the ratio of the coefficients of the products  $CuO$ ,  $NO_2$  and  $H_2O$  formed respectively when hydrated copper nitrate

is thermally decomposed.



A. 2 : 3 : 1

B. 1 : 2 : 3

C. 1 : 1.5 : 1

D. 3 : 2 : 1

**Answer: 2**



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**20.** Which of the following chemical change is a photolytic decomposition reaction?

A. Decomposition of HOCl on standing.

B. Formation of hydrogen chloride from their constituent elements.

C. Decomposition of limestone .

D. Both 1 and 2.

**Answer: 1**

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**21.** While explaining modern concept of atom , Jack asked the teacher " why are electrons , assumed to be in continuous motion around the nucleus instead of being stationary" ? What could be the explanation given by the teacher?

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**22.** A stable neutral atom 'X' contains two completely filled orbits . Find out its mass number if it consists of 10 neutrons.

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**23.** Mass of total positive charge present in an atom is 7348 times to that of the mass of a negativity charged particle . Find the atomic number of an element . Find out its valency.

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**24.** While coming back from school in the school in the school bus , Bill asked his friend Gill to predict the atoms, X and Y while form a stable dinegative ion and a uninegative ion respectively . They have same number of electrons in the L shell which is the shell inner to the valence shell . predict the answer given by gill .

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**25.** Predict the valencies of the elements with atomic numbers 7 , 15 , 16 , 18 , 19 and justify Also give the formulae of hydrides formed by the above elements if any.

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26. In an atom, L and M shells have the same number of electrons. N shell has one electron less than K shell. Explain the formation of compound by this element and oxygen atom.

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27. Explain the formation of the compound formed by two elements with  $Z = 20$  and  $Z = 17$ .

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28. An atom of an element has the electrons distributed in four shells. If the electrons present in I and IV shells is in 1:1 ratio and, the ratio of electrons in II and III shell is also 1:1, predict its valency and justify. Write the formulae of (a) nitride (b) silicate (c) chloride.

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29. A negative ion of an atom element X has 18 electrons and 16 protons . Calculate the number of electrons and protons in its corresponding atom . Also calculate the number of neutrons , if the mass number is units than double the number of protons.

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30. If the formula of metal sulphite of a metal M is  $MSO_3$  , give the formulae of its

(a) phosphate

(b) hydrogen phosphate

(c) chloride

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31. In a chemical laboratory , a student broke the thermometer while performing an experiment . Immediately , the mercury which was spilled

over was removed by the lab - incharge by sprinkling sulphur on it . The teacher asked the students to predict the type of change / reaction associated with the above process. Explain with appropriate reasons.

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**32.** Asha 's mother asked her daughter Asha to boil the milk and after some time , she told Usha , Asha 's sister to add little curd in the same luke warm milk . Next day , their father while teaching " Transformation of matter " to his daughters wanted to relate the given activity . so he asked them - " what type of change was involved in the activities performed by you yesterday ?" Predict the answer given by them and justify.

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**33.** What is the valency of iron in the products formed

(a) When iron is exposed to humid air for a long time?

(b) When red hot iron is made to react with steam?





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**34.** Give the necessary chemical equations and balance them.

(a) Reaction of red hot iron with steam to give  $Fe_3O_4$ .

(b) burning magnesium ribbon in an atmosphere of nitrogen.

(c) Displacement of copper from the solution of its sulphate by zinc.

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**35.** In a science fair, a student took two test tubes labelled A and B filled with copper sulphate solution, then he put magnesium ribbon in test tube A silver foil in tube B. Predict the observation and justify.

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Level 3

1. An atom of an element 'X' has three completely filled shells. The ratio of electrons in 1 and 4 shells is 1:1. Find the atomic number of 'X'. Also write the formulae of its bicarbonate, chromate and phosphide.

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2. A metal (M) and a non-metal (X) form a compound with formula  $M_4X_3$ . Predict the electronic arrangements of M and X assuming that M has three occupied shells and X has two occupied shells. Also derive the formulae of (a) sulphate (b) dihydrogen phosphate (c) hydroxide of ion of M.

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3. Two metals A and B possess the same number of electrons in L shell and they differ by 1 unit in the number of electrons present in valence shell and number of valence electrons are greater in B than A. The ions formed get the configuration of the nearest inert gases namely argon

and neon respectively. Give the probable electronic configurations of metals corresponding to A and B and give the formulae of their corresponding nitrite, nitrate, sulphite and bisulphite.

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4. Number of atoms on either side of a chemical equation is balanced by keeping appropriate coefficients and not by changing the subscripts of the element in the formulae. Justify.

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5. An atom of an element has two shells with electrons. The valence shell has  $2n + 1$  electrons where  $n$  is the number of electrons in the inner shell. This element can form a radical X with hydrogen and two radicals Y and Z with oxygen, Z has more number of oxygen than Y. Identify the element and the radicals. Write the reaction taking place between solutions of two salts, AgZ and XCl. Identify the type of reaction.



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## Assessment Test 1

1. Which of the following involves only physical change ?

- A. Dissolution of lime in water.
- B. Dissolution of carbon dioxide in water at high pressure.
- C. Dissolution of concentrated acid in water.
- D. Electrolysis of water.

**Answer: 3**



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2. Arrange the points in sequence to draw the geometrical representation of an atom which is represented as  ${}_{Z}X^A$ .

(a) Calculation of the number of protons and neutrons.

- (b) Identification of the atomic number and mass number of the given element.
- (c) Placement of the electrons in shells around the nucleus according to the electronic configuration.
- (d) Writing the electronic configuration of the atom.
- (e) Protons and neutrons are shown in nucleus.

A. baedc

B. bacde

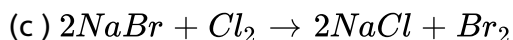
C. abcde

D. ecbad

**Answer: 1**



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(d)  $2NaCl \rightarrow 2Na + Cl_2$  Arrange the above reactions in order s double displacement reaction, combination reaction, decomposition reaction and displacement reaction.

A. badc

B. bdac

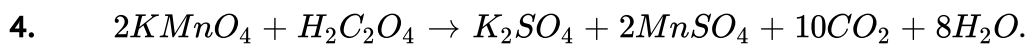
C. bacd

D. abdc

**Answer: 1**



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Itvrgt Potassium permanganate oxidises oxalic acid in acidic medium as per the above chemical reaction. Identify the coefficient of  $H_2SO_4$  in the above equatio.

A. 3

B. 4

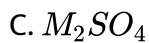
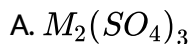
C. 5

D. 2

**Answer: 1**

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5. What will be the formula of the sulphate and sulphite of a trivalent metal that is  $M^{+3}$  ?



**Answer: 1**

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6. Match the element in column A with the electronic configuration given in column B.

Column A		Column B
(A) Chlorine	( ) (a)	2, 2
(B) Scandium	( ) (b)	2, 8, 7,
(C) Manganese	( ) (c)	2, 8, 9, 2
(D) Beryllium	( ) (d)	2, 8, 13, 2

A.  $A \rightarrow C,$      $B \rightarrow d,$      $C \rightarrow a,$      $D \rightarrow b$

B.  $A \rightarrow d,$      $B \rightarrow a,$      $C \rightarrow b,$      $D \rightarrow c$

C.  $A \rightarrow b,$      $B \rightarrow a,$      $C \rightarrow d,$      $D \rightarrow a$

D.  $A \rightarrow d,$      $B \rightarrow a,$      $C \rightarrow c,$      $D \rightarrow b$

**Answer: 3**



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7. Assertion (A) : Mass number of a carbon is 12.

Reason ( R) : Carbon possesses equal number of all three fundamental



particles.

- A. Both A and R are true and R is the correct explanation For A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.
- D. A is false and R is true.

**Answer: 2**



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**8.** Identify the atomic numbers of the pair of elements which possesses same number of electrons in L and M shells.

- A. 18
- B. 19
- C. 16
- D. 18

**Answer: 2**



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9. If  $\bar{X}$  ion has 10 neutrons and 9 protons , then the electronic configuration of the atom of the element x is

- A. 1, 8, 1
- B. 2, 1
- C. 2, 8
- D. 2, 8, 8

**Answer: 2**



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10. Assertion (A): Copper exhibits variable valency.

Reason (R): Copper loses two electrons from its valence shell and it can

also lose one more electron from the second last shell.

- A. Both A and R are true and R is the correct explanation For A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.
- D. A is false and R is true.

**Answer: 3**



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11. The ratio of difference in the number of electrons between K and M shells is 3:2 for X and Y elements respectively . 'X' possesses stable electronic configuration and M is the valence shell for both X and Y. The electronic configurations of X and Y are respectively.

- A. 2 , 8 , 5 and 2 , 8 , 4
- B. 2 , 8 , 8 and 2 , 8 , 6
- C. 2 , 8 , 8 and 2 , 6 , 6

D. 2, 8, 6 and 2, 8, 4

**Answer: 2**

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**12.** Which of the following is not a chemical change ?

- A. Passing of steam over red hot coke.
- B. Change in the colour of dilute nitric acid upon long standing.
- C. Absorption of moisture by  $P_2O_5$ .
- D. Absorption of moisture by  $CaCl_2$ .

**Answer: 4**

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13. The atomic number of three elements A, B and C are 10 , 18 and 8 respectively . Identify the element which is chemically reactive ?

A. A

B. B

C. C

D. Both a and B

**Answer: 3**



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14. If a dipositive ion of an element 'X' consists of 12 protons and 12 neutrons and another dipositive ion of an element 'Y' consists of 18 electrons and twice the number of electrons of dipositive ion X is the number of neutrons of Y. Then the mass number would be in the ratio of

A. 1 : 2

B. 3: 5

C. 12: 19

D. 2: 3

**Answer: 2**

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15. The formula of chloride of corresponding metal is  $MCl_2$ . What is the valency of the metal?

A. 4

B. 3

C. 1

D. 2

**Answer: 4**

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## Assessment Test 2

1. Heating solid ammonium chloride involves change in the \_\_\_\_\_.

- A. physical state only
- B. physical state as well as chemical composition
- C. colour only
- D. both colour and volume only

**Answer: 2**

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2. Arrange the following points in a sequence to draw the geometrical representation of  ${}_{20}\text{Ca}^{40}$ . (1) Protons and neutrons are shown in the nucleus. (2) Writing the electronic configuration of the atom. (3) Arrange the electrons in shells around the nucleus following the electronic configuration.

nfiguration.(4) Calculation of the number of protons and neutrons.

(5) Identification of the atomic number and mass number of the atom.

A. edcba

B. edabc

C. abcde

D. cabde

**Answer: 2**



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**3.** Four types of reactions are given below in a particular order.

(1) Displacement reaction

(2) Combination reaction

(3) Double displacement displacement

(4) Decomposition reaction

Following this sequence to arrange the reaction given below.

(a)  $A + B \rightarrow AB$ .



(b)  $AB \rightarrow A + B$

(c)  $AB + C \rightarrow CB + A$

(d)  $AC + BD \rightarrow AD + BC$

A. cadb

B. bacde

C. bdac

D. acbd

**Answer: 1**



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4. Identify the coefficients of the product CuO and NO<sub>2</sub> formed respectively when hydrated copper nitrate is thermally decomposed.



A. 3, 4

B. 2, 4

C. 4 , 5

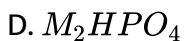
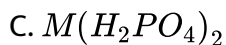
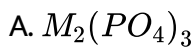
D. 2 , 3

**Answer: 2**



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5. If the formula of a metal ion is  $M^{+2}$  then the formula of its dihydrogen phosphate is



**Answer: 3**



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6. Match the element in column A with the valency exhibited by the element given in column B

Column A		Column B	
(A) Neon	( )	(a) 4	
(B) Oxygen	( )	(b) 3	
(C) Potassium	( )	(c) 2	
(D) Boron	( )	(d) 1	
(E) Silicon	( )	(d) 0	

A.  $A \rightarrow b$ ,  $B \rightarrow c$ ,  $C \rightarrow d$ ,  $D \rightarrow e$ ,  $E \rightarrow a$

B.  $A \rightarrow b$ ,  $B \rightarrow c$ ,  $C \rightarrow a$ ,  $D \rightarrow e$ ,  $E \rightarrow d$

C.  $A \rightarrow e$ ,  $B \rightarrow d$ ,  $C \rightarrow a$ ,  $D \rightarrow b$ ,  $E \rightarrow c$

D.  $A \rightarrow e$ ,  $B \rightarrow c$ ,  $C \rightarrow d$ ,  $D \rightarrow b$ ,  $E \rightarrow a$

**Answer: 4**



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7. Assertion (A) : The total mass of the protons of a boron atom is 6185 times the total mass of electrons.

Reason (R) : Mass of one proton is 1837 times the mass of electron.

A. Both A and R are true and R is the correct explanation For A.

B. Both A and R are true but R is not the correct explanation for A.

C. A is true and R is false.

D. A is false and R is true.

**Answer: 4**

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8. Identify the number of neutrons present in a pair of element with atomic numbers 20 and 13 , if their mass numbers are 40 and 27 respectively.

A. 20 and 13

B. 20 and 20

C. 17 and 20

D. 20 and 14

**Answer: 4**

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**9.** Tripositive ion of an element has 13 protons and 14 neutrons . Calculate the of number of electrons present in K and M shells of the neutral atom.

A. 2

B. 1

C. 3

D. 5

**Answer: 3**

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**10.** Assertion (A): Sodium forms a monovalent ion.

Reason (R): Sodium loses only one electron from the second last shell.

- A. Both A and R are true and R is the correct explanation For A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.
- D. A is false and R is true.

**Answer: 3**

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**11.** The difference in the number of electrons between K, L and L, M shells in the same for an atom of element 'X' (M shell is the valence shell) and the difference value is the number of valence electrons in M shell of the other element 'Y'. Give the electronic configurations of their stable ions.

- A. 2, 8, 2 and 2, 8, 6
- B. 2, 8 and 2, 8
- C. 2, 8 and 2, 8, 8
- D. 2, 8, 8 and 2, 8, 8

**Answer: 3**

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**12.** Which of the following is a chemical change ?

- A. Formation of clouds
- B. Formation of rust
- C. Manufacture of milk powder from milk
- D. Formation of black coating on the walls of tube light

**Answer: 2**

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**13.** The atomic numbers of the elements X, Y and Z are 2, 10 and 16, respectively. Identify the element which does not exist in monoatomic state.

A. X

B. Z

C. Y

D. X and Y

**Answer: 2**

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**14.** The number of neutrons are equal to the number of protons present in the nucleus of two elements and their respective dinegative ions possess 8 electrons in L and M shells respectively . Then the ratio of mass numbers of the two elements is

A. 1 : 2

B. 2 : 3

C. 3 : 4

D. 2 : 5



**Answer: 1**

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15. If a solid non - metal 'X' forms oxide of type  $X_2O_5$  , the valency of X is

A. 3

B. 5

C. 6

D. 4

**Answer: 2**

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**Example**

1. Calculate the number of neutrons in the following.



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2. Calculate the number of neutrons in the following.  ${}_{92}\text{U}^{235}$

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3. Calculate the number of neutrons in the following.  ${}_{19}\text{K}^{39}$

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4. Give the electronic configuration and geometrical representation of the following element ? Flourine.

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5. Give the electronic configuration and geometrical representation of the following element ? Sodium.

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6. Give the electronic configuration and geometrical representation of the following element ? Chlorine.

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7. Give the electronic configuration and geometrical representation of the following element ? Carbon.

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8. Derive the formulae of the following compound Ammonium nitrate.

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9. Derive the formulae of the following compound Ferrous sulphate.

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10. Give the necessary chemical equations and balance them.

Reaction of red hot iron with steam to give  $Fe_3O_4$ .

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11. Give the necessary chemical equations and balance them.

Burning magnesium ribbon in an atmosphere of nitrogen.

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12. Give the necessary chemical equations and balance them.

Displacement of copper from its sulphate salt solution by zinc.

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13. Explain the observable change taking place during reaction of iron with the aqueous solutions of  $H_2SO_4$  and  $CuSO_4$  respectively.

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14. In the table given below, some compounds are listed. In each case identify the positive and negative radicals present in the compound.

Compounds	Positive radical	Negative radical
(a) $SiO_2$		
(b) $CuS$		
(c) $H_2O_2$		
(d) $BaO_2$		
(e) $MgS$		
(f) $NaAlO_2$		
(g) $MnO_2$		
(h) $LiH$		
(i) $KMnO_4$		
(j) $CaSiO_3$		
(k) $CaF_2$		
(l) $HOCl$		
(m) $CaCO_3$		

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1. The symbol of calcium is \_\_\_\_\_ .

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2. Magnesium attains an octet configuration by \_\_\_\_\_ electrons.

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3. The electronic arrangement of an atom with two electrons in the first shell is called \_\_\_\_\_ if the first shell is the valence shell.

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4. Two molecules of sulphur trioxide are indicated by \_\_\_\_\_.

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5. \_\_\_\_\_ is the suffix used while naming the salt of a metal with lower valency.

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6. Name of the radical  $PO^{-3}_4$  is \_\_\_\_\_ .

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7. Formulae of sodium sulphite and sodium sulphate are, respectively \_\_\_\_\_ and \_\_\_\_\_ .

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8. Generally \_\_\_\_\_ changes are reversible because there is no change in the \_\_\_\_\_ of the substance.

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9. Decomposition of solid ammonium chloride is associated with \_\_\_\_\_ change.

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10. The number of atoms of a molecule or compound is balanced on either side of a chemical equation by keeping appropriate \_\_\_\_\_ .

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11. The number of electrons present in the K shells of hydrogen and helium are

A. 2 and 1, respectively

B. 2 in both the elements

C. 1 and 2, respectively



D. 1 in both the elements

**Answer: C**



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**12.** The charge possessed by permanganate is the same as \_\_\_\_\_ radical.

A. magnesium

B. bisulphate

C. sulphate

D. potassium

**Answer: b**



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13. If the formulae of respective chlorides of X and Y are  $XCl_3$  and  $YCl_4$ , respectively, then the valencies of X and Y are

- A. 3 and 2
- B. 3 and 4
- C. 1 and 1
- D. 1 and 4

**Answer: b**



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14. The formula of a compound when a positive radical with valency 2 and negative radical with valency 1 combine is \_\_\_\_\_ .

- A.  $B_2A$
- B.  $A_2B$
- C.  $AB_2$

D. AB

**Answer: c**

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15. Sugar gets charred when treated with conc.  $H_2SO_4$  This is an example of \_\_\_\_\_ .

A. physical change

B. chemical change

C. simultaneous physical and chemical changes

D. chemical combination reaction

**Answer: b**

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16. Melting of wax is a \_\_\_\_\_.

- A. chemical change
- B. decomposition reaction
- C. both physical and chemical change
- D. physical change

**Answer: d**



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17. Corrosion of a metal involves change in \_\_\_\_\_.

- A. chemical composition
- B. only colour and shape
- C. only density
- D. malleability and ductility

**Answer: a**



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**18.** Formation of clouds , mist and fog are the examples of \_\_\_\_\_.

A. chemical combination of  $O_2$  and  $H_2O$ .

B. physical change which involves condensation of water vapour.

C. physical change which involves sublimation.

D. chemical change which involves absorption of huge amounts of energy.

**Answer: b**



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**19.** The reaction  $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$  is a \_\_\_\_\_ reaction.

A. chemical displacement

B. chemical combination

C. double displacement

D. decomposition

**Answer: c**

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**20.** Which of the following elements is chemically inactive ?

A. Nitrogen

B. Neon

C. Hydrogen

D. Copper

**Answer: b**

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21. The formula of chloride of a corresponding metal is  $MCl_2$ . What is the valency of the metal?

A. 4

B. 3

C. 1

D. 2

Answer: d

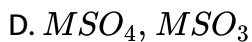
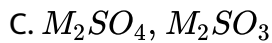


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22. What will be the formula of the sulphate and sulphite of a trivalent metal?

A.  $M_2(SO_4)_3$ ,  $M_2(SO_3)_3$

B.  $MSO_4$ ,  $M_2(SO_3)_3$



**Answer: a**

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**23.** Identify the atomic numbers of the pair of elements which possesses same number of electrons in L and M shells.

A. 12, 18

B. 19, 20

C. 18, 16

D. 17, 18

**Answer: b**

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24. Which of the following is a physical change ?

- A. Dissolution of lime in water.
- B. Dissolution of  $CO_2$  in water at high pressure.
- C. Dissolution of concentrated acid in water.
- D. Electrolysis of water.

Answer: c



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25. Which of the following is not a chemical change?

- A. Passing of steam over red hot coke.
- B. Colour change of dil nitric acid upon longstanding.
- C. Absorption of moisture by  $P_2O_5$ .
- D. Absorption of moisture by  $CaCl_2$ .

**Answer: d**



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**26.** Arrange the following points in a sequence for derivation of formulae of compounds.

(1) The valencies of the ions or radicals are written below the radicals without positive and negative sign

(2) If the valencies have common factors, then they are divided by the highest common factor.

(3) The magnitude of valencies should be inter changed and written as subscripts on the right side of the respective ions.

(4) The positive radical followed by negative radical are written with their charges.

(5) If the radicals contain more than one atom, they are enclosed in brackets and the appropriate valency (more than one) written as subscripts outside the bracket.

A. 2, 3, 4, 5, 1

B. 4, 1, 3, 2,5

C. 1, 2, 3, 4, 5

D. 4, 1, 2, 3,5

Answer: b



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Column A		Column B
A. $3\text{O}_2$	( )	a. 4 atoms of helium
B. $2\text{Na}$	( )	b. 3 oxygen atoms
C. $4\text{He}$	( )	c. 2 ions of sodium
D. $8\text{Cl}_2$	( )	d. 2 atoms of sodium
	( )	e. 3 molecules of oxygen
	( )	f. 8 chlorine atoms
	( )	g. 8 molecules of chlorine

27.



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Column A		Column B
Name of radical		Charge
A. Zincate	( )	a. -3
B. Stannic	( )	b. +1
C. Nitride	( )	c. +2
D. Potassium	( )	d. +4
	( )	e. -2

28.



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Column A		Column B
A. $X + Y \rightarrow XY$	( )	a. Displacement reaction
B. $X + YZ \rightarrow XZ + Y$	( )	b. Combination reaction
C. $AB + XY \rightarrow AY + XB$	( )	c. Decomposition reaction
D. $AB \rightarrow A + B$	( )	d. Double displacement reaction

29.



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**30.** What is the difference between symbol and formula ?

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**31.** Compare the mass of proton , neutron and electron?

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**32.** How do not the energy of orbits in an atom vary?

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**33.** The atomic number and mass number of an element are 13 and 27 respectively. Find the number of neutrons.

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34. Define valency.

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35. Name two metals that can exhibit variable valency .Also give the names of redicals.

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36. What is meant by synthesis reaction ? Given an example.

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37.  $A + BC \rightarrow AC + B$  In the above equation , compare the reactivities of A and B.

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**38.** What is meant by electrolytic decomposition? Give an example.

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**39.** Give reason for the stability of inert gases.

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**40.** What is the valence shell ? What is the maximum number of electrons it can have in an atom?

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**41.** An atom is electrically neutral .

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42. What is photolytic decomposition ? Give an example.

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43. Identify physical and chemical changes among the following.

- (a) Boiling of milk
- (b) Ripening of fruits
- (c) Curding of milk
- (d) Melting of candle
- (e) Rusting of iron
- (f) Blackening of silverware

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44. Why should a chemical equation be balanced ?

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45. Dissolution of calcium oxide in water is which type of reaction?

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46. In a double decomposition reaction , one of the products is insoluble .

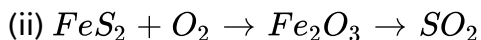
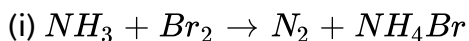
What type of reaction is that ?

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47. Potassium chlorate on strong heating gives potassium chloride and oxygen . What type of reaction is this?

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48. Balance the following chemical equations.



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49. In the following table, some compounds are listed. In each case, identify the positive and negative radicals present in the compound.

No.	Compounds	Positive radical	Negative radical
-----	-----------	------------------	------------------

(i)  $\text{CaSiO}_3$

(ii)  $\text{H}_2\text{SO}_3$

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### Test Your Concepts Short Answer Type Questions

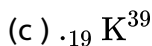
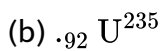
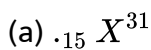
1. Give the characters (symbol, charge, mass) of all fundamental particles.

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2. Why do metals form cations and non - metals form anions?

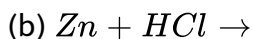
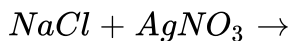
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3. Calculate the number of neutrons in the following.



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4. For each of the following reactions identify the products formed and balance the reaction.



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5. Define radical . Give some examples of bivalent negative radicals.

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6. How do you distinguish physical change and chemical change?

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7. Mention different types of combination reactions with example.

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8. What is meant by thermal decomposition ? Give an example.

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9. Define double decomposition reaction . Give an example.

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10. What is a chemical displacement reaction ? Mention the condition required for it.



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11. Distinguish between cations and anions.



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12. In the table given below , some commonly used positive and negative radicals are listed . Use the crisscross method to obtain the formulae of the compound that is formed using the given radicals . Name the compound thus obtained.

No.	Positive radicals	Negative radicals	Formula	Name of the compound
1.	$Al^{+3}$	$PO_4^{-3}$		
2.	$Ca^{+2}$	$NO_3^{-1}$		
3.	$NH_4^{+1}$	$SO_4^{-2}$		
4.	$Al^{+3}$	$Ca^{-4}$		



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13. Distinguish between atomic number and mass number with an example.



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14. Draw the geometrical representation of sulphur.



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15. Derive the formula of the following compounds.

(a) Ammonium nitrate

(b) Ferrous sulphate



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**16.** How do you distinguish metals and non - metals with respect to electronic arrangement?

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**17.** Write the electronic configurations of the following elements.

(a) magnesium

(b) Silicon

(c ) Sulphur

(d) Argon

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**18.** Explain the formation of sodium chloride.

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19. Write the symbols of the following elements.

(a) Cadmium

(b) Bismuth

(c) Silicon

(d) Argon

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20. Explain the observable change taking place during reaction of iron with the aqueous solutions of  $H_2SO_4$  and  $CuSO_4$  respectively.

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## Test Your Concepts Essay Type Questions

1. Explain in detail the modern structure of atom.

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2. Give the electronic configuration and geometrical atomic theory representation of the following elements:

(a) fluorine

(b) sodium

(c) chlorine

(d) carbon



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3. Classify the chemical reactions into various types of valencies of cations with examples. depending on the way the products are formed by giving suitable examples.



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4. Mention the postulates and limitations of Dalton's atomic theory.



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5. Write the steps in balancing a chemical equation with an example.

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6. What is valency ? Write short note on different types of valencies of cations with examples.

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### Concept Application Level 1

1. The number of electrons in second shell of a metal with three valence electrons in the third shell is eight.

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2. The valency of helium is zero.

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3. The name of  $CrO_4^{-2}$  radical is dichromate ion.

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4. Rusting of iron is an example of both physical and chemical change.

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5. Sublimation of camphor is a physical change.

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6. The central part of the atom called nucleus accounts for the mass of an atom.

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7. Both protons and neutrons possess the same magnitude of charge but opposite signs.

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8. The maximum number of electrons in the L shell is two.

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9. An atom is electrically neutral .

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10. In phosphide ion , the total number of electrons is equal to 12.

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11. The symbol of cobalt is \_\_\_\_\_.

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12. The mass of an electron is \_\_\_\_\_ times that of mass of a proton.

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13. The maximum number of electrons that can be accommodated in the outermost orbit is equal to \_\_\_\_\_.

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14. The valency of argon is \_\_\_\_\_.



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15. In the formation of sodium chloride , each chlorine gains \_\_\_\_\_ electron.



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16. The formula of a zincate radical is \_\_\_\_\_.



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17. The combining capacity of the metal which can exhibit more than one valency is called \_\_\_\_\_.



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18. Blackening of silverware is a \_\_\_\_\_ change.



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19.  $2\text{HOCl} \rightarrow 2\text{HCl} + \text{O}_2$  is a \_\_\_\_\_ decomposition reaction.



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20. Atomic number of a metal having 12 neutrons and mass number 23 is \_\_\_\_\_.



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21. The nucleus consists of

A. proton and electrons.

B. electrons and neutron.

C. protons and neutrons.

D. all the above.

**Answer: C**



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**22.** The maximum number of electrons that can be accommodated in an orbit is equal to \_\_\_\_\_ where  $n$  is the number of orbits.

A.  $4\pi^2$

B.  $2\pi^2$

C.  $(2n + 1)^2$

D.  $\pi^2 + 4$

**Answer: b**



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23. Among the noble gases which gas does not have octet configuration?

- A. neon
- B. helium
- C. argon
- D. xenon

**Answer: b**



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24. Which among the following pairs of elements forms cation and anion respectively ?

- A. sulphur and neon
- B. chlorine and sodium
- C. potassium and phosphorus
- D. aluminium and lithium

**Answer: c**

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**25.** Which is a negative a radical among the following ?

A. silicate

B. ammonium

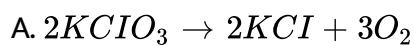
C. ferrous

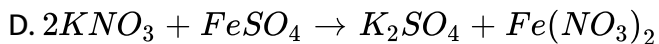
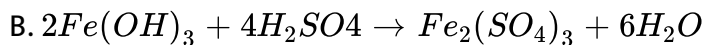
D. chromium

**Answer: a**

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**26.** Which among the following reactions is not balanced ?

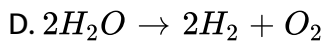
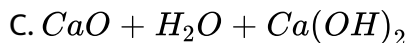
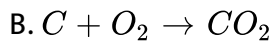
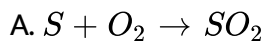




**Answer: b**

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**27.** Among the following reactions, identify the synthesis reaction.



**Answer: b**

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28. Identify a useful change among the following chemical changes.

A. blackening of silverware.

B. rusting of iron.

C. curdling of milk.

D. all the above.

**Answer: c**



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29. Which among the following is not a characteristic of a physical change?

A. The change is temporary.

B. No new substance is formed.

C. Molecular formula of a compound changes.

D. Change of state of matter takes place without any change in molecular composition.

**Answer: c**



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**30.** Among the following types of chemical reactions, application of metal reactivity series is involved with which reaction?

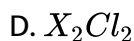
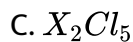
- A. chemical combination
- B. chemical displacement
- C. chemical decomposition
- D. double decomposition

**Answer: b**



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31. If a solid non-metal X forms oxide of type  $X_2O_5$ , then the formula of its corresponding chloride is \_\_\_\_\_ .

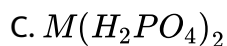
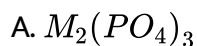


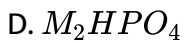
Answer: b



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32. If the formula of a metal nitrite is  $M(NO_2)_2$ , then the formula of its dihydrogen phosphate is





**Answer: c**



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**33.** Identify the number of neutrons present in a pair of elements with atomic numbers 20 and 13, if their mass numbers are 40 and 27, respectively.

- A. 20 and 13
- B. 20 and 13
- C. 17 and 20
- D. 20 and 14

**Answer: d**



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34. Heating solid ammonium chloride involves change in the \_\_\_\_\_.

- A. physical state only
- B. physical state as well as chemical composition.
- C. colour only.
- D. both colour and volume only.

**Answer: b**



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35. Which of the following is a chemical change?

- A. formation of clouds.
- B. formation of rust.
- C. manufacture of milk powder from milk.
- D. formation of black coating on the walls of a tube light.



Answer: b



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36. Arrange the following sequence in order to derive the formula of zinc oxide.

(1) The valencies of ions formed by zinc and oxygen are written below without positive and negative sign.

(2) The positive ion, i.e.,  $Zn^{+2}$  followed by the negative ion, i.e., oxide ( $O^{-2}$ ) ion are written with their charges.

(3) The valencies of zinc and oxide ion have common factors, and hence, they are divided by their highest common factor.

(4) The magnitude of valencies of the ions should be interchanged and written as subscripts on right side of the respective ions.

A. 2, 1, 4,3

B. 1, 2, 3, 4

C. 2, 1, 3, 4

D. 3, 1, 2, 4.

Answer: c



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Column A

Column B

A.  $4SO_2$

( )

a. Three atoms of oxygen

37.

Column A

Column B

B.  $2Na^+$

( )

b. Three oxygen molecules

C.  $3O_2$

( )

c. Eight molecules of chlorine

D.  $8Cl_2$

( )

d. Eight chlorine atoms

( )

e. Two sodium atoms

( )

f. Four sulphur dioxide molecules

( )

g. Two sodium ions



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Column A Names of the radical	Column B Charges
-------------------------------------	---------------------

- |              |     |       |
|--------------|-----|-------|
| A. Aluminium | ( ) | a. -1 |
| B. Stannous  | ( ) | b. +3 |
| C. Bisulfite | ( ) | c. +2 |
| D. Silicate  | ( ) | d. +4 |
|              | ( ) | e. -2 |

38.

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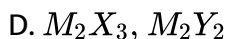
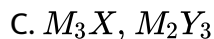
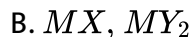
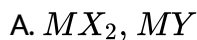
Column A	Column B
A. $2\text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbO} + 4\text{NO}_2 + \text{O}_2$	( ) a. Combination reaction
B. $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$	( ) b. Double decomposition reaction
C. $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$	( ) c. Decomposition reaction
D. $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$	( ) d. Displacement reaction

39.

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## Concept Application Level 2

1. X and Y are non metals in which M shell is valence shell . Y is precedent to X . X shows uninegative valence . Identify the formulae of the compounds formed when X and Y react with divalent metal M.



**Answer: a**



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2. Identify the formula of the corresponding hydride of a nonmetal 'X' which attains octet by gaining three electrons.

A.  $XH$

B.  $XH_2$

C.  $XH_3$

D.  $X_2H_4$

**Answer: c**



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3. The number of positively charged particles in the elements A, B, C are 10, 18, 8 respectively . Identify the element which is chemically reactive?

A. A

B. B

C. C

D. both A and B

**Answer: c**

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4. If a dipositive ion of an element 'X' consists of 12 protons and 12 neutrons and another dipositive ion of an element 'Y' consists of 18 electrons and twice the number of electrons of dipositive ion X is the number of neutrons of Y. Then the mass number would be in the ratio of

A. 1:2

B. 3:5

C. 12:19

D. 2:5

**Answer: b**

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5. If a uninegative ion has 10 neutrons and 9 protons, electronic configuration of the atom of the element is

A. 2, 8, 1

B. 2,7

C. 2,8

D. 2, 8, 8

**Answer: b**



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**6.** Mass of total positive charge present in an atom is 55110 times to that of mass of electron . Write the electronic configuration of the element.

A. 2, 8, 9, 2

B. 2, 8, 18, 1

C. 2, 8, 18,2

D. 2, 8, 8,2

**Answer: c**

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7. The ratio of difference in the number of electrons between K and M shells is 3:2 for X and Y elements respectively. 'X' possesses stable electronic configuration and M is the valence shell for both X and Y. The electronic configurations of X and Y are respectively.

A. 2, 8, 5 and 2, 8, 4

B. 2, 8, 8 and 2, 8, 6

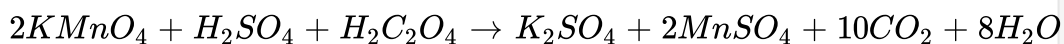
C. 2, 8, 8 and 2, 6, 6

D. 2, 8, 6 and 2, 8, 4

**Answer: b**

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8.





Potassium permanganate oxidizes oxalic acid in acidic medium as per the above chemical reaction . Identify the coefficients of  $H_2SO_4$  and  $H_2C_2O_4$  in the above equation.

A. 3,5

B. 4,4

C. 5,3

D. 4,2

**Answer: a**



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9. Heating of a mixture consisting of potassium nitrate , carbon and sulphur involves which of the following chemical changes ?

A. decomposition and combination

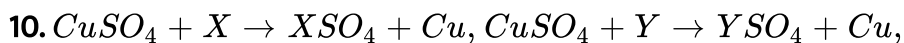
B. double decomposition

C. combination and displacement

## D. displacement and decomposition

Answer: a

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Arrange Cu , X, Y and Z in the ascending order of reactivity.

A. X, Y, Z, Cu

B. Cu, Y, X, Z

C. Cu, X, Z, Y

D. Z, Cu, Y, X

Answer: d

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11. A metal M shows variable valencies 2 and 3. Calculate the ratio of oxygen atom present in their corresponding sulphates.

A. 1:3

B. 3:1

C. 3:4

D. 3:2

**Answer: a**



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12. Identify the formula of the corresponding hydride of a nonmetal 'X' which attains octet by gaining two electrons.

A. XH

B.  $XH_3$

C.  $XH_4$

D.  $XH_2$

**Answer: d**



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13. The number of valence electrons in the valence shells, 1, 2, 3 of the X, Y, Z elements are 2, 8, 6 respectively. Identify the element which doesn't exist in monoatomic state.

A. X

B. Z

C. Y

D. X and Y

**Answer: b**



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14. The number of neutrons are equal to the number of protons present in the nucleus of two elements and their respective dinegative ions possess 8 electrons in L and M shells respectively . Then the ratio of mass numbers of the two elements is

A. 1:2

B. 2:3

C. 3:4

D. 2:5

**Answer: a**



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15. Tripositive ion of an element has 13 protons and 14 neutrons . Calculate the of number of electrons present in K and M shells of the neutral atom.

A. 2:3

B. 2:1

C. 1:1

D. 2:5

**Answer: a**



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**16.** The ratio of number of electrons present in four shells of an element is 1:4:4:1, fourth shell is the valence shell. Then mass of total positive charge present in the atom is \_\_\_\_\_ times to that of mass of electron

A. 36740

B. 27555

C. 18370

D. 55110

**Answer: a**

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17. The difference in the number of electrons between K, L and L, M shells in the same for an atom of element 'X' (M shell is the valence shell) and the difference value is the number of valence electrons in M shell of the other element 'Y'. Give the electronic configurations of their stable ions.

A. 2, 8, 2 and 2, 8, 6

B. 2, 8 and 2,8

C. 2, 8 and 2, 8, 8

D. 2, 8, 8 and 2, 8, 8

**Answer: c**

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18. The colour change of  $CuSO_4$  solution can be observed when it is made to react with

- A. silver
- B. silver chloride solution
- C. zinc
- D. gold

**Answer: c**



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19. Identify the ratio of the coefficients of the products  $CuO$ ,  $NO_2$  and  $H_2O$  formed respectively when hydrated copper nitrate is thermally decomposed.



- A. 2:3:1



B. 1:2:3

C. 1:1.5:1

D. 3:2:1

**Answer: b**



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**20.** Which of the following chemical change is a photolytic decomposition reaction?

A. Decomposition of HOCl on standing

B. Formation of hydrogen chloride from their constituent elements

C. Decomposition of limestone

D. Both 1 and 2

**Answer: a**



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21. While explaining the modern concept of an atom, Jack asked the teacher why are electrons, assumed to be in continuous motion around the nucleus instead of being stationary? What could be the explanation given by the teacher?

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22. A stable neutral atom X contains two completely filled orbits. Find out its mass number if it consists of 10 neutrons. 23. Mass of total positive charge present in an atom is 7348 times to that of the mass of a negatively charged particle. Find the atomic number of an element. Find out its valency.

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23. Mass of total positive charge present in an atom is 7348 times to that of the mass of a negatively charged particle. Find the atomic number of

an element . Find out its valency.

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**24.** While coming back from school in the school bus , Bill asked his friend Gill to predict the atoms, X and Y while form a stable dinegative ion and a uninegative ion respectively . They have same number of electrons in the L shell which is the shell inner to the valence shell . predict the answer given by gill .

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**25.** Predict the valencies of the elements with atomic numbers 7 , 15 , 16 , 18 , 19 and justify Also give the formulae of hydrides formed by the above elements if any.

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26. In an atom , L and M shells have the same number of electrons . N shell has one electron less than K shell . Explain the formation of compound by this element and oxygen atom.

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27. Explain the formation of the compound formed by two elements with  $Z = 20$  and  $Z = 17$  .

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28. An atom of an element has the electrons distributed in four shells . If the electrons present in I and IV shells is in 1:1 ration and , the ratio of electrons in II and III shell is also 1:1 , predict its valency and justify .Write the formulae of (a) nitride (b) silicate (c ) chloride.

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**29.** A negative ion of an atom of element X has 18 electrons and 16 protons. Calculate the number of electrons and protons in its corresponding atom. Also calculate the number of neutrons, if the mass number is 2 units more than double the number of protons.

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**30.** If the formula of metal sulphite of a metal M is  $MSO_3$ , give the formulae of its

(a) phosphate

(b) hydrogen phosphate

(c) chloride

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**31.** In a chemical laboratory, a student broke the thermometer while performing an experiment. Immediately, the mercury which was spilled over was removed by the lab-in-charge by sprinkling sulphur on it. The

teacher asked the students to predict the type of change / reaction associated with the above process. Explain with appropriate reasons.

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**32.** Asha's mother asked her daughter Asha to boil the milk and after some time, she told Usha, Asha's sister, to add a little curd in the same lukewarm milk. Next day, their father while teaching 'transformation of matter to his daughters wanted to relate the given activity. So, he asked them, 'what type of change was involved in the activities performed by you yesterday?' Predict the answer given by them and justify.

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**33.** What is the valency of iron in the products formed

(a) When iron is exposed to humid air for a long time?

(b) When red hot iron is made to react with steam?

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**34.** Give the necessary chemical equations and balance them.

(a) Reaction of red hot iron with steam to give  $Fe_3O_4$ .

(b) burning magnesium ribbon in an atmosphere of nitrogen.

(c) Displacement of copper from the solution of its sulphate by zinc.



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**35.** In a science fair, a student took two test tubes labelled A and B filled with copper sulphate solution, then he put magnesium ribbon in test tube A silver foil in tube B. Predict the observation and justify.



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### Concept Application Level 3

**1.** An atom of an element 'X' has three completely filled shells. The ratio of electrons in 1 and 4 shells is 1:1. Find the atomic number of 'X'. Also

write the formulae of its bicarbonate , chromate and phosphide.

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2. A metal (M) and a non - metal (X) form a compound with formula  $M_4X_3$  . Predict the electronic arrangements of M and X assuming that M has three occupied shells and X has two occupied shells. Also derive the formulae of (a) sulphate (b) dihydrogen phosphate ( c) hydroxide of ion of M.

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3. Two metals A and B possess the same number of electrons in the L shell and they differ by 1 unit in the number of electrons present in valence shell and number of valence electrons is greater in B than A. The ions formed get the configuration of the nearest inert gases namely argon and neon, respectively. Give the probable electronic configurations of the metals corresponding to A and B and also give the formulae of their corresponding nitrite, nitrate, sulphite and bisulphite.





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4. Number of atoms on either side of a chemical equation is balanced by keeping appropriate coefficients and not by changing the subscripts of the element in the formulae . Justify .



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5. An atom of an element has two shells with electrons. The valence shell has  $2n + 1$  electrons where  $n$  is the number of electrons in the inner shell. This element can form a radical X with hydrogen and two radicals Y and Z with oxygen, Z has more number of oxygen than Y. Identify the element and the radicals. Write the reaction taking place between solutions of two salts, AgZ and XCl. Identify the type of reaction.



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1. Which of the following involves only physical change ?

A. dissolution of lime in water.

B. dissolution of carbon dioxide in water at high pressure.

C. Dissolution of concentrated acid in water.

D. electrolysis of water.

**Answer: c**



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2. Arrange the points in sequence to draw the geometrical representation of an atom which is represented as  $ZXA$  (1) calculation of the number of protons and neutrons. (2) identification of the atomic number and mass number of the given element. (3) placement of the electrons in shells around the nucleus according to the electronic configuration (4) writing the electronic configuration of the atom. (5) protons and neutrons are shown in nucleus.

A. 2, 1, 5, 4,3

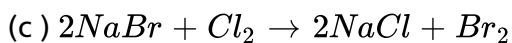
B. 2, 1, 3, 4, 5

C. 1, 2, 3, 5, 4

D. 5, 3, 2, 1,4

**Answer: a**

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(d)  $2NaCl \rightarrow 2Na + Cl_2$  Arrange the above reactions in order s double displacement reaction, combination reaction, decomposition reaction and displacement reaction.

A. 2, 1, 4,2

B. 2, 4, 1,2

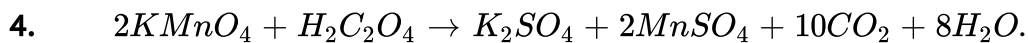
C. 2, 1, 3, 3

D. 1, 2, 4, 2

**Answer: a**



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Itvrgt Potassium permanganate oxidises oxalic acid in acidic medium as per the above chemical reaction. Identify the coefficient of  $H_2SO_4$  in the above equatio.

A. 3

B. 4

C. 5

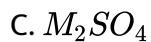
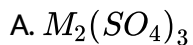
D. 2

**Answer: a**



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5. What will be the formula of the sulphate and sulphite of a trivalent metal that is  $M^{+3}$  ?



**Answer: a**

6. Match the element in column A with the electronic configuration given in column B.

Column A	Column B
----------	----------

## Column A

## Column B

(A) Chlorine	( )	(a) 2, 2
(B) Scandium	( )	(b) 2, 8, 7
(C) Manganese	( )	(c) 2, 8, 9, 2
(D) Beryllium	( )	(d) 2, 8, 13, 2

A.  $A \rightarrow c, B \rightarrow c, C \rightarrow a, D \rightarrow b$

B.  $A \rightarrow d, B \rightarrow a, C \rightarrow d, D \rightarrow c$

C.  $A \rightarrow b, B \rightarrow a, C \rightarrow d, D \rightarrow a$

D.  $A \rightarrow d, B \rightarrow a, C \rightarrow c, D \rightarrow b$

**Answer: c**



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7. Assertion (A) : Mass number of a carbon is 12.

Reason ( R ) : Carbon possesses equal number of all three fundamental particles.

A. Both A and R are true and R is the correct explanation for A.

B. Both A and R are true but R is not the correct explanation for A.

C. A is true and R is false.

D. A is false and R is true.

**Answer: b**

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8. Identify the atomic numbers of the pair of elements which possesses same number of electrons in L and M shells.

A. 18

B. 19

C. 16

D. 18

**Answer: b**

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9. If  $\bar{X}$  ion has 10 neutrons and 9 protons , then the electronic configuration of the atom of the element x is

A. 2,8,1

B. 2,7

C. 2,8

D. 2,8,8

**Answer: b**

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10. Assertion (A): Copper exhibits variable valency.

Reason (R): Copper loses two electrons from its valence shell and it can also lose one more electron from the second last shell.



- A. Both A and R are true and R is the correct explanation for A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.
- D. S false and R is true.

**Answer: c**

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11. The ratio of difference in the number of electrons between K and M shells is 3:2 for X and Y elements respectively . 'X' possesses stable electronic configuration and M is the valence shell for both X and Y. The electronic configurations of X and Y are respectively.

- A. 2, 8, 5 and 2, 8, 4
- B. 2, 8, 8 and 2, 8, 6
- C. 2, 8, 8 and 2, 6, 6
- D. 2, 8, 6 and 2, 8, 4

**Answer: b**

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**12.** The atomic number of three elements A, B and C are 10 , 18 and 8 respectively . Identify the element which is chemically reactive ?

A. A

B. B

C. C

D. both A and B

**Answer: c**

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**13.** If a dispositive ion of an element 'X' consists of 12 protons and 12 neutrons and another dipositive ion of an element 'Y' consists of 18

electrons and twice the number of electrons of dipositive ion X is the number of neutrons of Y. Then the mass number would be in the ratio of

- A. 1:2
- B. 3:5
- C. 12:19
- D. 2:3

**Answer: b**



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**14.** The formula of chloride of a metal is  $MCl$ . What is the valency of the metal?

- A. 4
- B. 3
- C. 1

D. 2

**Answer: d**



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## Assessment Test Test 2

1. Heating solid ammonium chloride involves change in the \_\_\_\_\_.

- A. physical state only.
- B. physical state as well as chemical composition.
- C. colour only.
- D. both colour and volume only

**Answer: b**



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2. Arrange the following points in a sequence to draw the geometrical representation of  ${}_{20}\text{Ca}^{40}$ . (1) Protons and neutrons are shown in the nucleus. (2) Writing the electronic configuration of the atom. (3) Arrange the electrons in shells around the nucleus following the electronic configuration. (4) Calculation of the number of protons and neutrons. (5) Identification of the atomic number and mass number of the atom.

A. 5, 4, 3, 2, 1

B. 5, 4, 1, 2, 3

C. 1, 2, 3, 4, 5

D. 3, 1, 2, 4, 5

**Answer: b**



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3. Four types of reactions are given below in a particular order.

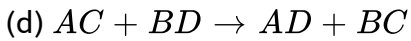
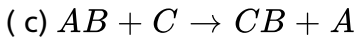
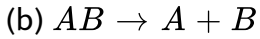
(1) Displacement reaction

(2) Combination reaction

(3) Double displacement displacement

(4) Decomposition reaction

Following this sequence to arrange the reaction given below.



A. cadb

B. bacd

C. bdac

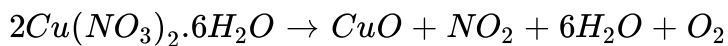
D. acdb

**Answer: a**



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4. Identify the coefficients of the product CuO and NO<sub>2</sub> formed respectively when hydrated copper nitrate is thermally decomposed.



A. 3, 4

B. 2, 4

C. 4, 5

D. 2, 3

Answer: b

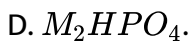
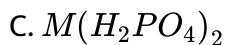


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5. If the formula of a metal ion is  $M^{+2}$  then the formula of its dihydrogen phosphate is

A.  $M_2(\text{PO}_4)_3$

B.  $M\text{HPO}_4$



Answer: c

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6. Match the elements in column A with the valency exhibited by the element given in column B.

Column A		Column B	
(A) Neon	( )	(a) 4	
(B) Oxygen	( )	(b) 3	
(C) Potassium	( )	(c) 2	
(D) Boron	( )	(d) 1	
(E) Silicon	( )	(e) 0	

A.  $A \rightarrow b, B \rightarrow c, C \rightarrow d, D \rightarrow e, E \rightarrow a$

B.  $A \rightarrow b, B \rightarrow c, C \rightarrow a, D \rightarrow e, E \rightarrow d$

C.  $A \rightarrow e, B \rightarrow b, C \rightarrow a, D \rightarrow b, E \rightarrow c$



D.  $A \rightarrow e, B \rightarrow c, C \rightarrow d, D \rightarrow b, E \rightarrow a$

**Answer: d**



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7. The total mass of the protons of a boron atom is 6185 times the total mass of electrons.

Reason (R): Mass of one proton is 1837 times the mass of electron.

- (a) Both A and R are true and R is the correct explanation for A.
- (b) Both A and R are true but R is not the correct explanation for A.
- (c) A is true and R is false.

A false and R true.

- A. Both A and R are true and R is the correct explanation for A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.
- D. A is false and R is true.

**Answer: d**



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8. Identify the number of neutrons present in a pair of elements with atomic numbers 20 and 13, if their mass numbers are 40 and 27, respectively.

A. 20 and 13

B. 20 and 13

C. 17 and 20

D. 20 and 14

**Answer: d**



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9. Tripositive ion, i.e.,  $X^{+3}$  has 13 protons and 14 neutrons. Calculate the number of electrons present in the M shell of the neutral atom.

- A. 2
- B. 1
- C. 3
- D. 5

**Answer: c**



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10. Assertion (A): Sodium forms a monovalent ion.

Reason (R): Sodium loses only one electron from the second last shell.

- A. Both A and R are true and R is the correct explanation for A.
- B. Both A and R are true but R is not the correct explanation for A.
- C. A is true and R is false.

D. A is false and R is true.

**Answer: c**

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11. The difference in the number of electrons between K, L and L, M shells in the same for an atom of element 'X' (M shell is the valence shell) and the difference value is the number of valence electrons in M shell of the other element 'Y'. Give the electronic configurations of their stable ions.

A. 2, 8, 2 and 2, 8, 6

B. 2, 8 and 2, 8

C. 2, 8 and 2, 8, 8

D. 2, 8, 8 and 2, 8, 8

**Answer: c**

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12. Which of the following is a chemical change?

- A. formation of clouds
- B. formation of rust
- C. manufacture of milk powder from milk
- D. formation of black coating on the walls of a tube light

**Answer: b**



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13. The atomic numbers of the elements X, Y and Z are 2, 10 and 16, respectively. Identify the element which does not exist in monoatomic state.

- A. X
- B. Z
- C. Y

D. X and Y

**Answer: b**

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14. The number of neutrons are equal to the number of protons present in the nucleus of two elements and their respective dinegative ions possess 8 electrons in L and M shells respectively . Then the ratio of mass numbers of the two elements is

A. 1:2

B. 2:3

C. 3:4

D. 2:5

**Answer: a**

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15. If a solid non - metal 'X' forms oxide of type  $X_2O_5$  , the valency of X is

A. 3

B. 5

C. 6

D. 4

**Answer: b**



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