CHEMISTRY

BOOKS - BHARATI BHAWAN CHEMISTRY (HINGLISH)

PERIODIC CLASSIFICATION OF ELEMENTS

Solved Examples

1. Given that calcium reacts with chlorine to form a compound of the formula $CaCl_2$. Predict the formmula of the product of the reaction between magnesium and chlorine.

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2. Calassify the following elements as metals, nonmetals or metalloids, (a) Sn (b) Br, (c) Mo , (d) Cd, (e) Si and (f) Xe.

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3. Given below are the atomic radii of three elements A, B and C of the peroodic table,each having n electrons in the outermost shell of its atom.

Answer the following

(i) Will the valencies of these elements be the same or different ?

(ii) which the element will have the highes atomic number ?

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4. Carbon (atomic number 6) and silicon (atomic number 14) are elements in the same group of the periodic table. Give the electronic arrangements of the carbon and silicon atoms, and state the group in which these elements, occur.

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5. In the table below, some of the elements of the periodic table with atomic numbers from 3 to 18 are given . These are represented by

letters. Which are not the usual symblos of the elements.

(a) which of these

(i) is a noble gas

(ii) is a halogen

(iii) are alkali metals

(iv) is an element with valency 4.

(b) if A combines with F, what would be the formula of the resulting compound ?

(c) what is the electronic arrangement of G ?

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Exercises

1. According to Mendeleev's perodic law, the properties of elements are a periodic function of their

A. atomic numbers

B. atomic masses

C. atomic volumes

D. atomic sizes

Answer: B

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2. According to Mendeleef's periodic law, the properties of elements are periodic function of

A. atomic masses

B. atomic volumes

C. atomic numbers

D. densities

Answer: C

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3. Mendeleev classified elements in order of increasing

A. atomic numbers

B. chemical reactivity

C. atomic mass

D. valency

Answer: C

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4. The law of octaves was given by .....

A. Lothar meyer

B. Mendeleev

C. Dobereiner

D. Newlands

Answer: D

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5. From top to bottom in a group of the periodic table the electropositive character of the element

A. increases

B. decreases

C. remains unchanged

D. changes irregularly

Answer: B

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6. From left to right in a period, the acidic nature of the oxides of elements

A. decreases

B. increases

C. does not change

D. changes irregularly

Answer: B

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7. Atomic number and not the atomic weight is the fundamental property of a element was enunciated by ?

A. Lothar meyer

B. Moseley

C. Mendeleev

D. Bohr

Answer: B

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8. Which of the following is the most nonmetallic element ?

A. Br

B. Cl

C. P

D. S

Answer: A

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9. Which of the following is the most reactive halogen ?

A. F

B. Cl

C. Br

D. I

Answer: A

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10. The most acidic oxide is

A. Na_2O

B. Al_2O_3

C. SO_2

D. NO_2

Answer: D

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11. If element A belongs to group 3 and the second period of the periodic table , which of the following sets of properties would it exhibit ?

A. Liquid , most metallic

B. Gaseous, moderately metallic

C. Solid, nonmetallic

D. Solid, less metallic

Answer: B

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12. Magnesium belongs to

A. group 1 of the periodic table

B. group 2 of the periodic table

C. the family of nonmetals

D. group 8 of the periodic table

Answer: C

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13. The elements of group 1 of the periodic table are known as

A. normal elements transition elements

B. alkali metals

C. lanthanides

D. actinides

Answer: B

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14. which of the following statements does not apply to elements belonging to the same period of the periodic table ?

A. The number of valence electrons increases on moving from left to right.

B. The atomic size increases from left and right

C. The atomic size goes on decreasing from left to right

D. The metallic character of elements decreases from left to right .

Answer: D

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15. Which of the following elements is expected to show nonmetallic character ?

A. As

B. Be

C. B

D. Br

Answer: D

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16. Which pair following elements of the following is likely to have similar chemical behaviour ?

A. Sodium and aluminium

B. Argon and potassium

C. Boron and germanium

D. Nitrogen and phosphorus

Answer: D

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Very Short Answer Questions

1. Name one alkali metal and one alkaline earth metal each starting with the letter 'S'

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2. What is the basic of Mendeleev's periodic law ?

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3. Why is the atomic number the basis of the modern periodic law ?

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4. What are the vertical columns in the periodic table called ?

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5. Horizontal rows in modern periodic table.

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6. How many vertical columns are there in the periodic table ?

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7. How many Horizontal rows are there in the periodic table ?

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8. An element of group 14 has atomic number 14. Examine if this element will have metallic properties or not .

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9. Name two other elements which belong to the same family as

(i) fluorine (ii) calcium (iii) carbon.

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10. Name the factor that determines which element will be the first and which the last in a period of the periodic table.

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11. Give an example of an element discovered after mendeleev gave the periodic table.

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12. How many elements are there in the third period ?

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13. Give symbols for

(i) a metal belonging to the second group of the periodic table.

(ii) a metal belonging to the third group of the periodic table

(iii) two nonmetals belongs to the halogen family

(iv) the most active halogen

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14. Why have noble gases not found any place in Newlands ' octave ?

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15. Sodium and potassium show similar reactivity towards water. What property do these elements possess in common ?

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Short Answer Question

1. What is the need for the classification of elements ?

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2. Fluorine, chlorine ,bromine and iodine were put in one group on the basis of their similar properties.

(a) what is the name of this group or family ?

(b) State two of these similar properties.

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3. What are alkali metals ? Where are they placed in the periodic table ? \

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4. Explain why potassium is more reactive than lithium and chlorine less reactive than fluorine.

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5. State Mendeleev's periodic law.

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6. State two defects in Mendeleev's periodic table.

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7. State the modern periodic law.

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8. What is a period in a periodic table ? How does the electronic configuration change in a period with increase in atomic number from left to right ?

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9. Give advantages of long form of periodic table.

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10. Magnesium forms the following compounds .

Magnesium oxide - MgO

Megnesium hydroxide - $Mg(OH)_2$

Magnesium sulphate - $MgSO_4$

If radium too belongs to the same group as magnesium , what would be the formula of radium oxide, radium hydroxide and radium sulphate ?

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11. Name two other elements which are in the same family as (a) carbon , (b) fluorine, and (c) sodium.

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12. Write the names of first four members of the halogen family. Write their symbols in the order of increasing atomic number. How are their melting points expected to be related to their atomic numbers ?

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13. From their positions in the periodic table, select the atom with the larger size in each of the following pairs :

(a) Li and Be (b) Na and Mg

(c) Cl and I (d) B and C

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14. In what respect does modern statement of the periodic law differ from stated in

Mendeleev's periodic law ?

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15. Mention any two peoperties of elements belonging to the same group of periodic table .

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16. Mention any two properties of elements belonging to the same period of periodic

table.

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17. Explain , why do all elements belonging to the same group of periodic table show similar chemical behaviour ?

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Long Answer Questions

1. What were the early attempts to classify the elements ?

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2. What is the significance of the blank spaces in Mendeleev's periodic table ?

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3. What is meant by the statement , 'Properties of elements are a periodic function of atomic number ?

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4. Why is the atomic number of an element more important than its atomic mass in the context of its properties ?

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5. Define the following :

(a) group (b) period , (c) , representative elements , (d) transition elements , (e) , lanthanides and (f) actinides

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6. State how atomic size varies from left to right in a period and from top to bottom in a group .

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7. What is the basic difference between Mendeleev's periodic table been overcome in the modern periodic table ?

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8. How have the shortcomings of Mendeleev's periodic table been overcome in the modern periodic table ?

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9. Describe briefly Mendeleev's periodic table along

with its merits.

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10. Write the electronic structures of the atoms of (a) potassium (b) lithium (c) fluorine and (d) chlorine. Use these eletronic structures to exlpain why potassium is more reactive than lithium, and fluorine more reactive than chlorine.

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11. What is the difference between valence electrons and valency of an element ? Discuss with an example.

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12. Sodium and aluminium have atomic numbers 11 and 13 respectively. They are separated by one element in the periodic table

and have valencies 1 and 3 respectively . Chlorine and potassium are also separated by one element in the periodic table. Their atomic numbers are 17 and 19 respectibely, buth both have a valency of 1. Explain why.

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13. The atomic number of an element X is 17. Predict (a) its valency, (b) whether it is a metal or nonmetal (c) the nature of the element, (d) the name of the element and (e) the relative

size with respect to other members of its group .

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14. Two elements X and Y belong to groups 1 and 2 respectively in the same period. Compare them with respect to (a) the number of electrons in the outermost shell, (b) the number of valence electrons , (c) metallic character, (d) size of the atoms and (e)

formulae of the oxdies , hydrides and chlorides.

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15. Define periodic law. Why was it necessary to changes the basis of classification from atomic mass to atomic number ?

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16. Explain the terms atomic radius, ionization energy and electron affinity. Mention the units in which they are measured. How do they generally vary (i) in a group and (ii) in a period ?

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Fill In The Blanks

1. On the basis of Newlands' classification of elements, the properties of sulphur are similar to those of oxygen because sulphur is the _____ element starting from oxygen.

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2. The element having the same number of ____ occur at regular intervals is the periodic table.

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3. Group 1 elements are known as _____

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4. The tendency to gain electron ____ on going from top to bottom in a group of the periodic table.

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5. The period number of an element is equal to the from left to right in a period of the periodic table.

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6. Elements forming oxides with same type of formulae will have _____ chemical properties.

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7. The number of _____ determines which elements will be the first and which the last in a period of the periodic table.

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Write Yes Or No

1. Did Lavoisier calssify elements into metals and nonmetals on the basis of some of their physical properties ?

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2. Is Newland's law also valid for elements with higher atomic masses ?

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3. Did Mendeleev predict the properties of scandium and gallium even when these elements were not discovered ?

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4. Are the isotopes of an elements placed at different positions in the periodic table ?

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5. Is the electron affinity of fluorine lower than that of chlorine ?

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6. Does the number of valence electron (s) in an atom determine the valency of the element concerned ?

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7. Does the nature of the oxides of elements in a period change from strongly basic to strongly acidic ?

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Mark The Statements True T Or False F

1. The elements in a group are not arranged consectively on the basis of atomic numbers.

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2. The elements in a period have consecutive atomic numbers.

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3. Metals are found on the right side of the periodic table.

4. In a period, all the elements have the same valency.

5. In a period, all the metallic charcacter of elements increases from left to right.

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6. Different elements in a group have different chemical properties.

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7. The fundamental property on which the modern periodic table is based is atomic number, not atomic mass.

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8. The elements with the same valence shell belong to the same period of the periodic table.

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9. The modern periodic table does not explain the periodicity in properties of elements.

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10. The elements become less metallic in nature in going from left to right across the periods of periodic table.

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11. The number of valence electrons increases down a group of the periodic table.

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VMCQ

1. Which of the following elements has the greatest nonmetallic character ?

A. S

B. Cl

C. Br

D. F

Answer:

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2. An element belongs to group 16 and third period. Which of the following statement is (are) correct about the element ?

A. It is a solid

B. it is a gas.

C. It is a nonmetal

D. It is a liquid

Answer:

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3. Which of the following is the least reactive element ?

A. Li

B. Na

C. K

D. Cs

Answer:

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4. Which of the following is the correct order of atomic radii ?

A. $Mg < Na < Al$

B. $Al > Mg > Na$

C. $Na > Mg > Al$

D. $Na > Al > Mg$

Answer:

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5. The number of element discovered when Mendeleev proposed his periodic table was

A. 51

B. 57

C. 63

D. 80

Answer: C

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6. The element with the smallest atomic radius is

A. K

B. Ca

C. Cr

D. Si

Answer: 4

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7. How many groups are there in the modern periodic table as per the latest IUPAC convention ?

A. 8

B. 16

C. 18

D. 10

Answer: 3

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8. On moving down a group of the periodic table,

A. the melting points and the boiling points of elements show a graduakl increase

B. the melting points and the boiling points of elements show a gradual decrease

C. The melting points and the boiling points of elements remain unchanged

D. The melting points increase, while the boiling points decrease

Answer: 2

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Very Short Answer Question

1. Which group of elements was not known at the time when Mendeleev created his periodic table ?

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2. What werer the two factors on which Mendeleev based the creation of his periodic table ?

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3. Name the scientist who proposed the law of octave.

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4. Give two examples each of (i) group 2 elements and (ii) group 18 elements.

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5. Can an element X having an atomic number 25.5 be placed in the periodic table between Cr (24) and Mn (25) ?

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6. Give the names of three elements which form the Dobereiner's triad.

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7. How does the metallic character of elements change on going from left to right in a period of the periodic table ?

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8. An element X belongs to the second period and group 13. What will be the formula of its oxide ?

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9. Name two elements, one of which is most metallic and the other least metallic.

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10. Give the names of two elements whose valencies are the same as their group numbers.

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11. Give the names of the first three elements of the periodic table.

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12. What are the three elements whose properties were predicted long before they were discovered ?

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13. Classify the following elements into metals and nonmetals :

P , Al, Cl , F , Brf Au, I ,Cr

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Short Answer Questions

1. State Dobereiner's law of triads. Give an example.

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2. State and explain Newlands' law of octaves .

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3. In which part of the periodic table are the metals, nonmetals and metalloids located ?

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4. How are the positions of isotopes of elements settled in the long form of the periodic table ?

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5. Explain why atomic radius decreases from Li to F.

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6. How does the tendency of elements to lose electrons change in a group of the periodic table ?

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7. Name the period of the modern periodic table to which the two elements with atomic numbers 12 and 16 belong. What type of bond is likely to be formed when thety combine ?

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8. The atomic numbers of three elements A, B and C are 11, 13 and 19 respectively. Explain which two of the elements will belong to the same group of the periodic table.

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9. Discuss the relationship the exists amongst some of the elements of 2nd and 3rd periods of the periodic table.

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10. How are the group number and period number of an element in the periodic table determined from the electronic configuration of the element ?

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11. What are the limitations of the law of octaves ?

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12. What common property do all elements of the boron group have ?

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13. Why have to noble gas been placed in a separate group ?

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14. Why did Mendeleev leave some vacant places in his periodic table ?

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15. Elements A,B,C ,D E and F and their respective atomic numbers (withoin brackets) are given below "

A(3), B(10) , C(11) , D(12) , E(14) ,F (17)

(a) Which of these is

(i) a noble gas ?

(ii) an element belonging to group 17 of the periodic table ?

(iii) an element with valency 4 ?

(b) Write the electronic arrangement of E (14)

(c) What will be the formula of the compound formed when A and F combine ?

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16. How does the atomic size of elements vary in a period of the perioedic table ? Give reasons for your answer.

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17. Which of the two elements N (at. No. 7) and P (at. No . 15) will be more electronegative and why ?

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Long Answer Question

1. Describe the essential features of Mendeleev's periodic periodic table.

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2. (a) state the modern periodic law.

(b) Describe in brief the main features of the long form of the periodic table.

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3. The electron distribtution of the elements represented by the letters. A, B, C and D are so follows :

$A \rightarrow$ 2,8,2 C $\rightarrow$ 2,8,8

B $\rightarrow$ 2,7 D $\rightarrow$ 2,8,8,2

Now , answer the following:

(i) which one of the elements belongs to the 2nd period ?

(ii) Name the elements which belong to the same group.

(iii) Which of the elements is a noble gas ?

(iv) Which of the elements are metals ?

(v) What type of bond is likely to be formed when B and D combine ?

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4. (a) why was the classification of elements required ?

(b) Why were the noble gases not included in Mendeleev's periodic table ?

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5. How do the following properties of elements change in a group of the periodic table ?

(i) size of atoms (ii) Valency

(iii) Ionization energy (iv) Electron affinity

(v) Metallic character (vi) Chemical reactivity

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6. Explain the following :

(i) Nonmetallic character increases in going

from left to right in a period .

(ii) The basic nature of oxides of the elements decreases in going from left to right in period.

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Others

1. Horizontal rows of elements in the periodic table are called ____

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2. Vertical columns of elements in the periodic table are called ____

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3. The elements of group 17 are known as _____

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4. The number of electrons in the valence shell of the atom of an element indicates the ____ to

which the element belongs.

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5. The first period contains _____ elements

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6. Moseley classified elements according to their atomic _____

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7. Elements in the same group have similar

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8. In a period from left to right , the matallic character of elements _____ and nonmetallic character _____

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9. Mendeleev's periodic table is based on atomic _____

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10. Halogens belong to group _____

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11. The valency of elements in group 2 is _____

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12. The oxides of the elements of groups 1 and 2 are _____ in nature.

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13. In the modern periodic table, elements are arranged in

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14. elements lying in a group contain the same number of _____

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15. Element with atomic mass 14 is ____

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16. Element with atomic number 16 is ____

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17. The element with two electronic shells, both completely filled up with electrons, is _____

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18. The alkaline earth metal with the smallest atomic number is _____

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19. All the known elements could not be classified into triads.

20. Within a group , various elements show variation in properties.

21. Elements having atomic numbers 57 to 71 consistute the lanthanide series.]

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22. The elements of group 2 are called alkali metals.

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23. From left to right in a period, metallic character gradually decreases.

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24. The nature of an element can be perdicted on the basis of its position in the periodic table.

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