CHEMISTRY

BOOKS - MTG IIT JEE FOUNDATION

FOOTSTEPS TOWARDS(CBSE BOARD)

Section A

1. Which particles determine the mass of an atom ?

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2. How does a proton differ from a neutron?
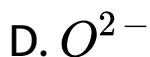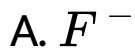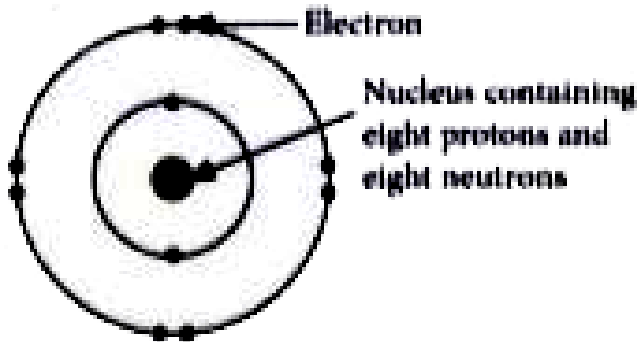
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3. Arrange the following substances in the increasing order of force of attraction between their particles :

Salt, water , nitrogen

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4. Name the particle whose electronic arrangement is shown in figure.

Electron

Nucleus containing eight protons and eight neutrons

A. F^-

B. N^{3-}

C. Ne

D. O^{2-}

Answer: d

5. Write one limitation of law of definite proportions.

6. What is solubility ?

7. Find the atomic number and valency of an element whose atom has the electronic configure 2,8,4.

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8. How many electrons are there in the L-shell of chlorine atom?

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9. Name the proprty of gases due to which it is possible to fill CNG in cylinders for using as fuel in cars.

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10. Which of the following are pure substances ?

Milk, iron, water, mercury, wood , air , blood, ink.

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11. Choose the solution from the following :

Sea-water, coal, air , soda water.

12. state one instance where water undergoes a physical change and one in which it which it undergoes a chemical change .

13. If 12 g of carbon is burnt in the presence of 32g of oxygen, how much CO_2 will be formed?

14. What is the volume of 44g of CO_2 at S.T.P. ?

15. Why are Bohr's orbits called stationary states ?

16. Write down the formula of magnesium oxide.

17. How will you separate the components of a mixture containing benzene and toluene?

18. How would you obtain a sample of pure iodine from impure iodine?

19. Assertion : 1 L of O_2 gas and 1L of O_3 gas contain the same number of moles under identical conditions.

Reason : Under identical conditions, 1L of O_2 gas and 1L of O_3 gas contain the same number of oxygen atoms.

A. Both A and R are true, and R is correct explanation of the assertion.

B. Both A and R are true, but R is not the correct explanation of the assertion.

C. A is true, but R is false.

D. A is false , but R is true.

Answer: C

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20. Assertion : Hot water is used for separation of benzoic acid from naphthalene.

Reason : Whenever a crystal is formed it tends to leave out the impurities.

A. Both A and R are true, and R is correct explanation of the assertion.

B. Both A and R are true, but R is not the correct explanation of the assertion.

C. A is true, but R is false.

D. A is false , but R is true.

Answer: b

21. Assertion : A solution of table salt in a glass of water in heterogeneous.

Reason : A solution having same composition throughout is homogeneous.

    A. Both A and R are true, and R is correct explanation of the assertion.

B. Both A and R are true, but R is not the

correct explanation of the assertion.

C. A is true, but R is false.

D. A is false , but R is true.

Answer: d

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22. Assertion : The number of electrons

gained, lost or shared by the atom of an

element so as to complete its octet is called

the valency of the element.

Reason : Elements having the same number of valence electrons in their atoms possess different chemical properties.

A. Both A and R are true, and R is correct explanation of the assertion.

B. Both A and R are true, but R is not the correct explanation of the assertion.

C. A is true, but R is false.

D. A is false , but R is true.

Answer:

23. The change in which the shape , size, appearance or state of a subtance may alter but its chemical composition remains the same is called a physical change . In a physical change, no new substance is formed. Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called a chemical change.

Chemical changes are usually accompanied with heat exchanges. Chemical changes are permanent changes which are usually irreversible.

Which of the following is always true when a substance undergoes a physical change ?

A. It changes colour.

B. A new substance is formed

C. It boils

D. Its composition remains the same.

Answer: D

24. The change in which the shape , size, appearance or state of a subtance may alter but its chemical composition remains the same is called a physical change . In a physical change, no new substance is formed. Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called a chemical change.

Chemical changes are usually accompanied with heat exchanges. Chemical changes are

permanent changes which are usually irreversible.

Which of the following involves both physical and chemical change?

A. Burning of a candle

B. Rusting of iron

C. Cooking of food

D. Boiling of water

Answer: a

25. The change in which the shape , size, appearance or state of a subtance may alter but its chemical composition remains the same is called a physical change . In a physical change, no new substance is formed. Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called a chemical change.

Chemical changes are usually accompanied with heat exchanges. Chemical changes are permanent changes which are usually

irreversible.

An example of a chemical change is

A. formation of clouds

B. glowing of an electric light

C. dropping sodium into water

D. dissolving of salt in water.

Answer: c

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26. The change in which the shape , size, appearance or state of a subtance may alter but its chemical composition remains the same is called a physical change . In a physical change, no new substance is formed. Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called a chemical change.

Chemical changes are usually accompanied with heat exchanges. Chemical changes are permanent changes which are usually

irreversible.

Chemical changes are

A. temporar, reversible and a new
   substance is produced

B. always accompanied by exchange of
   light

C. permanent, irreversible and a new
   substance is produced

D. never accompanied by exchange of light
   and heat energy.

Answer: c

27. The change in which the shape , size, appearance or state of a subtance may alter but its chemical composition remains the same is called a physical change . In a physical change, no new substance is formed. Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called a chemical change.

Chemical changes are usually accompanied with heat exchanges. Chemical changes are permanent changes which are usually irreversible.

Select the incorrect statement (s).

(I) Although ice, water and water vapour all look different and display different physical properties, they are chemically the same.

(II) During burning of a candle, both physical and chemical changes take place.

(III) Both water and cooking oil are liquid but their chemical characteristics are different. They differe in odour and inflammability.

(IV) It is the physical property of oil that makes it different from water.

A. I and II

B. II and III

C. I,II and III

D. Only IV

Answer: d

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28. Each element has a characteristic atomic mass. The atoms are extremely small particles and it is very difficult to determine their actual masses. For example, mass of one atom of hydrogen has been found to be 1.66×10^{-24}. Obviously, such a small mass cannot be determined even with the help of a very sensitive balance. To overcome, this problem, the atomic masses are expressed as relative masses i.e., with reference to mass of a standard atom. In 1961, the International Union of Chemists selected the stable isotope

of carbon (carbon -12) as the standard for comparing the atomic and molecular masses of elements and compounds. The atomic mass of the standard, the isotope carbon-12 of carbon is chosen to be 12. Thus, atomic mass may be defined as the relative mass of an atom of the element as compared to an atom of carbon (carbon-12) taken as 12.

Which of the following represents 1 amu ?

A. Mass of C-12 atom

B. Mass of O-16 atom

C. $1/12^{th}$ of mass of C-12 atom

D. Mass of hydrogen molecule

Answer: c

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of carbon (carbon-12) taken as 12.

52u of He contains

A. $4 \times 6.022 \times 10^{23}$ atoms

B. 13 atoms

C. $13 \times 6.022 \times 10^{23}$ atoms

D. 4 atoms

Answer: c

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The relative atomic mass of sodium is

A. the mass of one sodium atom

B. the mass of one sodium ion

C. the mass of one sodium atom compared

with one twelfth the mass of one

carbon-12 atom

D. the average mass of one sodium atom

compared with one twelfth the mass of

one carbon-12 atom.

Answer: d

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31. Each element has a characteristic atomic mass. The atoms are extremely small particles and it is very difficult to determine their actual masses. For example, mass of one atom of hydrogen has been found to be 1.66×10^{-24}. Obviously, such a small mass cannot be determined even with the help of a very sensitive balance. To overcome, this problem, the atomic masses are expressed as relative masses i.e., with reference to mass of a standard atom. In 1961, the International Union of Chemists selected the stable isotope

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Calculate the number of gram atoms in 360 g of magnesium.

A. 15

B. 12

C. 20

D. 18

Answer: a

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32. Each element has a characteristic atomic mass. The atoms are extremely small particles and it is very difficult to determine their actual masses. For example, mass of one atom of hydrogen has been found to be 1.66×10^{-24} .

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atom of the element as compared to an atom

of carbon (carbon-12) taken as 12.

Arrange the following in the increasing order

of mass in grams :

(I) One atom of silver

(II) Two grams atom of nitrogen

(III) One mole of calcium

(IV) Two grams of sodium

[At. masses : Ag = 108u, N = 14u, C a= 40 u, Na

=23u]

    A. $I < II < III < IV$

    B. $IV < III < II < I$

C. $I < IV < II < III$

D. $III < II < I < IV$

Answer: c

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33. The maximum number of the electrons which are permitted to be assigned to an energy shell of an atom is called the electron capacity of that shell. The distribution of electrons in different orbits or shell is

governed by a scheme known as Bohr-Bury scheme. According to this scheme :

(I) The maximum number of the electrons that can be present in any shell is given by the formula $2n^2$ where, n is the number of energy level.

(II) The maximum number of electrons that can be accommodated in the outermost shell is 8.

Electrons are filled in the shells in a stepwise manner in increasing order of energy of the energy shell.

What is the maximum electrons capacity of N shell?

A. 24

B. 8

C. 18

D. 32

Answer: d

34. The maximum number of the electrons which are permitted to be assigned to an energy shell of an atom is called the electron capacity of that shell. The distribution of electrons in different orbits or shell is governed by a scheme known as Bohr-Bury scheme. According to this scheme :

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(II) The maximum number of electrons that

can be accommodated in the outermost shell is 8.

Electrons are filled in the shells in a stepwise manner in increasing order of energy of the energy shell.

Identify the element with the configuration K-2,L-8,M-3

A. Aluminium

B. Magnesium

C. Sodium

D. Beryllium

Answer: a

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(II) The maximum number of electrons that can be accommodated in the outermost shell is 8.

Electrons are filled in the shells in a stepwise manner in increasing order of energy of the energy shell.

Which of the following configuration represent sodium ?

A. 2,8,4

B. 2,8,5

C. 2,3

D. 2,8,1

Answer: d

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36. The maximum number of the electrons which are permitted to be assigned to an energy shell of an atom is called the electron capacity of that shell. The distribution of

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(I) The maximum number of the electrons that can be present in any shell is given by the formula $2n^2$ where, n is the number of energy level.

(II) The maximum number of electrons that can be accommodated in the outermost shell is 8.

Electrons are filled in the shells in a stepwise manner in increasing order of energy of the energy shell.

The number of electrons in carbon and fluorine are respectively

A. 6,9

B. 9,6

C. 4,7

D. 8,8

Answer: a

37. The maximum number of the electrons which are permitted to be assigned to an energy shell of an atom is called the electron capacity of that shell. The distribution of electrons in different orbits or shell is governed by a scheme known as Bohr-Bury scheme. According to this scheme :

(I) The maximum number of the electrons that can be present in any shell is given by the formula $2n^2$ where, n is the number of energy level.

(II) The maximum number of electrons that

can be accommodated in the outermost shell

is 8.

Electrons are filled in the shells in a stepwise

manner in increasing order of energy of the

energy shell.

Which of the following is an accurate

illustration of a nitrogen atom?

A.

B.
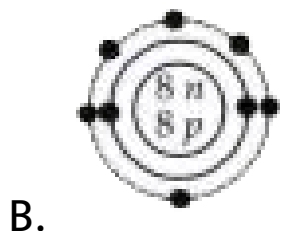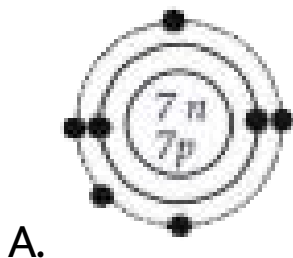
C.

D.

Answer: a

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38. The knowledge of valencies of various radicals helps us to write the formulae of

chemical compounds. The total positive charge on positive ions (cations) is equal to the total negative charge on negative ions (anions) in a molecule. Therefore, in writing the formula of a compound, the positive and negative ions 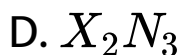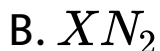are adjusted in such a way that the total number of positive charges of positive ions (cations) becomes equal to the total number of negative charges of negative ions (anions) . There is another simple method for writing the formulae of ionic compounds. In this method, the valencies (or positive or negative charges) of the ions can

be 'crossed over' to give subscripts. The purpose of crossing over of charges is to find the number of ions required to equalise the number of positive and negative charges.

Element X has two valencies 5 and 3 and Y has valency 2. The elements X and Y are most likely to be respectively

A. copper and sulphur

B. sulphur and iron

C. phosphorus and nitrogen

D. nitrogen and iron.

Answer: d

39. The knowledge of valencies of various radicals helps us to write the formulae of chemical compounds. The total positive charge on positive ions (cations) is equal to the total negative charge on negative ions (anions) in a molecule. Therefore, in writing the formula of a compound, the positive and negative ions are adjusted in such a way that
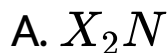
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The formula of the sulphate of an element X is

$X_2(SO_4)_3$. The formula of nitride of element X will be

A. X_2N

B. XN_2

C. XN

D. X_2N_3

Answer: C

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40. The knowledge of valencies of various radicals helps us to write the formulae of chemical compounds. The total positive charge on positive ions (cations) is equal to the total negative charge on negative ions (anions) in a molecule. Therefore, in writing the formula of a compound, the positive and negative ions are adjusted in such a way that the total number of positive charges of positive ions (cations) becomes equal to the total number of negative charges of negative ions (anions) . There is another simple

method for writing the formulae of ionic compounds. In this method, the valencies (or positive or negative charges) of the ions can be 'crossed over' to give subscripts. The purpose of crossing over of charges is to find the number of ions required to equalise the number of positive and negative charges.

The formula of a compound is X_3Y. The valencies of elements X and Y will be respectively.

A. 1 and 3
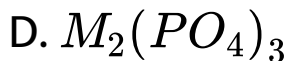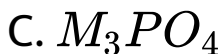
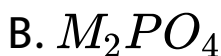B. 3 and 1

C. 2 and 3

D. 3 and 2

Answer: a

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41. The knowledge of valencies of various radicals helps us to write the formulae of chemical compounds. The total positive charge on positive ions (cations) is equal to the total negative charge on negative ions (

anions) in a molecule. Therefore, in writing the formula of a compound, the positive and negative ions are adjusted in such a way that the total number of positive charges of positive ions (cations) becomes equal to the total number of negative charges of negative ions (anions) . There is another simple method for writing the formulae of ionic compounds. In this method, the valencies (or positive or negative charges) of the ions can be 'crossed over' to give subscripts. The purpose of crossing over of charges is to find the number of ions required to equalise the

number of positive and negative charges.

The formula of chloride of a metal M is MCl_3, then the formula of the phosphate of metal M will be

A. MPO_4

B. M_2PO_4

C. M_3PO_4

D. $M_2(PO_4)_3$

Answer: a

42. The knowledge of valencies of various radicals helps us to write the formulae of chemical compounds. The total positive charge on positive ions (cations) is equal to the total negative charge on negative ions (anions) in a molecule. Therefore, in writing the formula of a compound, the positive and negative ions are adjusted in such a way that the total number of positive charges of positive ions (cations) becomes equal to the total number of negative charges of negative

ions (anions) . There is another simple method for writing the formulae of ionic compounds. In this method, the valencies (or positive or negative charges) of the ions can be 'crossed over' to give subscripts. The purpose of crossing over of charges is to find the number of ions required to equalise the number of positive and negative charges.

Chlorine reacts with sodium to form the compound NaCl. Chlorine also reacts with phosphorus to form the compound PCl_3. What will be the chemical formula of the

compound formed between sodium and phosphorus ?

A. Na_2P_3

B. Na_3P

C. NaP

D. NaP_3

Answer: b

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Section B

1. Write down the formula of potassium dichromate.

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2. 10^{22} atoms of an element 'X' are found to have a mass of 930 mg. Calculate the molar mass of the element 'X'.

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3. Can we consider vacuum as matter ?

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4. When a small amount of common salt is added to water in a graduated cylinder, there is no detectable change in the level of water. Explain why is it so ?

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5. Explain what happens when :

an electric field is passed through a colloidal solution?

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6. Explain what happens when :

a beam of light is passed through a colloidal solution?

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7. When alpha rays hit a thin foil of gold, a very few alpha particles are deflected back. What does it prove?

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8. Which atom does not have any neutron in the nucleus and why?

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9. What were the observations that led to the conclusion that cathode rays are negatively charged?

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10. Compute the difference between 10^3 moles each of calcium atoms and calcium ions. Which one is heavier ? (Mass of an electron $= 9.1 \times 10^{-31} kg.$)

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11. Atomic number of chlorine is 17 and mass number is 35. Draw the structure of chlorine showing the composition of the nucleus as well as distribution of electrons in different shells. Also comment on its valency.

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Section C

1. A hot solution contains 5g of a substance in 15g of water at $35°C$. What is the solubility of the substance at this temperature?

2. A beam of light is visible when it is passed through a colloidal solution, but it is not visible when passed through true solution and suspensions. Explain.

3. Smoke and fog both are aerosols. In what way are they different?

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4. How do sol and gel differ from each other? Give one example for each.

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5. Classify the following as sol, solution and suspension :

(i) Milk of magnesia (ii) Coloured gemstones

(iii) Aerated drinks (iv) Sand in water

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6. What is the number of valence electrons in the atom of an element A having atomic number 20? Name the valence shell of this atom.

7. The atomic number and the mass number of an element M are 12 and 24 respectively . Calculate the number of neutrons in an atom of the element.

8. Calculate the mass of
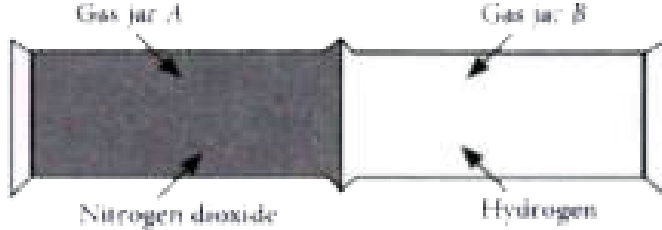
(i) one atom of aluminium

(ii) 3.0 mol of Cl^- ion

(iii) 10 carbon atoms

(At. Mass : O = 16u, Cl = 35.5u, Na = 23u, Al= 27u, C = 12u)

9. The diagram shows the apparatus set-up for an experiment. Gas jar (A) contains a brown gas, nitrogren dioxide and gas jar (B) contains hydrogen > The molecular masses of nitrogen dioxide and hydrogen are 46 and 2 respectively.

Gas jar A

Gas jar B

Nitrogen dioxide

Hydrogen

Describe and explain the follwoing observations in the two gas jars as the experiment proceeds.
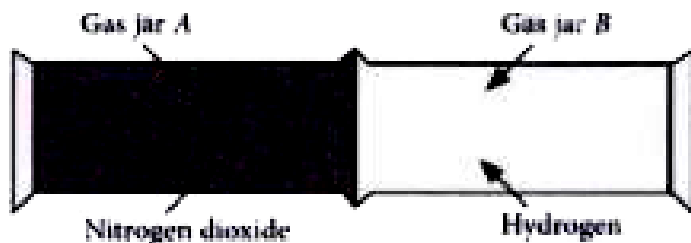
The colour of the gas.

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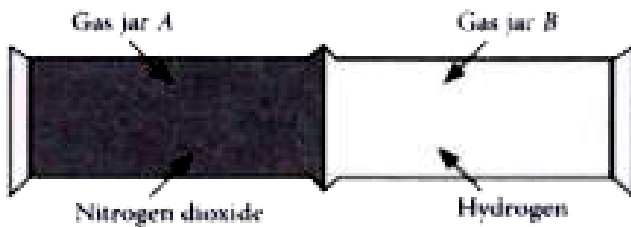

Describe and explain the follwoing observations in the two gas jars as the experiment proceeds.

The speed of the gas particles.

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Gas jar A   Gas jar B

Nitrogen dioxide   Hydrogen

Describe and explain the follwoing observations in the two gas jars as the experiment proceeds.

The amount of the gases in the gas jars.

12. A metal M forms an ionic compound X of formula $M_2(SO_4)_3$.

(a) Identify the cation in X.

(b) Given the relative formula mass of X is 392, determine the relative atomic mass of metal M.

(c) (i) What is the formula of the nitrate of metal M?

(ii) Calculate the relative formula mass of nitrate compound in (c)(i).

13. Tell whether each of the following properties describes a heterogeneous mixture, a solution or a homogeneous mixture, a compound or an element.

(i) A homogeneous liquid which leaves a solid residue on boiling.

(ii) A cloudly liquid which after some time appear more cloudly towards the bottom.

(iii) A uniform white solid that has a sharp and definite melting point which cannot be

decomposed into simpler substances by special techniques.

(iv) A colourless liquid which boils at definite temperature and can be decomposed into simpler substances.

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14. Take three test tubes and label them as A,B and C. Fill upto two -third with sugar solution, chalk powder in water and milk, respectively. Allow these to stand on test tube stand for

some time.

(i) In which of the test tubes will you observe particles settle down?

(ii) Which of the test tubes will look transparent?

(iii) Which of the test tubes will look opaque ?

15. The given table shows the sub-atomic particles of six particles, represented by the letters P to U .

(The letters are not the actual symbols of the particles .)

Particle	Protons	Neutrons	Electrons
P	16	18	18
Q	10	10	10
R	20	20	20
S	20	20	18
T	14	15	18
U	11	12	10

(a) Find the particles which can be

(i) noble gases.

(ii) positive ions.

(iii) negative ions.

(b) Which two particles are an atom and an ion of the same element?

(c) (i) Which particle is the lightest ?

(ii) Which particle is the heaviest?

Section D

1. Why did Rutherford select a gold foil in his α -ray scattering experiment ?

2. Which of the two will be chemically more reactive? Element X with atomic number 16 or element Y with atomic number 17.

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3. Name the gas which produces anode rays consisting of protons in the discharge tube experiment.

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4. The nucleus of a gaseous element is represented as $_{y}^{2y}X$. This gas is used in weather observation balloons. Identify the element.

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5. Atomic number does not change during a chemical reaction. Give reasons.

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6. (i) If an atom contains one electron and one proton, will it carry any charge or not ?

(ii) On the basis of Thomson's model of an atom, explain how the atoms is electrically neutral.

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7. Given that natural sample of iron has isotopes $^{54}_{26}Fe$, $^{56}_{26}Fe$ and $^{57}_{26}Fe$ in the ratio of 5%, 90% and 5% respectively . What will be the average atomic mass of iron ?

8. if you are given a mixture of hydrogen and carbon dioxide, how would you remove the carbon dioxide gas?

9. How would you separate :
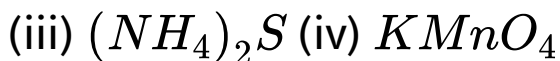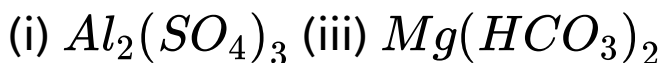
(i) benzene (b.pt. $80°C$) from toluene or methyl benzene (b.pt. $111°C$) with which it is miscible ?

(ii) lead sulphate from a mixture of lead sulphate and lead chloride?

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10. Write the names of the following compounds :

(i) $Al_2(SO_4)_3$ (iii) $Mg(HCO_3)_2$

(iii) $(NH_4)_2S$ (iv) $KMnO_4$

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11. A silver ornament of mass 'm' gram is polished with gold equivalent to 1% of the mass of silver. Compute the ratio of the number of atoms of gold and silver in the ornament. [At. Mass : silver = 108u, gold = 197u]

12. A sample of ethane (C_2H_6) gas has the same mass as 1.5×10^{20} molecules of

methane (CH_4) . How many C_2H_6 molecules does the sample of gas contain?

13. Arrange the following in order of their increasing masses in grams.

(i) 0.1 mole of H_2SO_4

(ii) 10^{23} atoms of carbon

(iii) 1 mole of oxygen molecules

(At masses : Ag = 108 u, H = 1u, S = 32u, O = 16u, C = 12u)

14. Which will weigh more 10^{23} molecules of oxygen or 10^{23} molecules of ozone and how many times ? What will be the relationship between their volumes under the same conditions of temperature and pressure?