SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

METALS AND NON-METALS

Class 10 - Science

Time Allowed: 3 hours **Maximum Marks: 166**

Section A

1. Metal which is liquid at room temperature is**:** **[1]**

   a) Sodium b) Lead

   c) Mercury d) Silver

2. Bronze is an alloy of **[1]**

   a) Copper, Tin and Zinc b) Copper and Zinc

   c) Aluminium and Tin d) Copper and Tin

3. What happens when ammonia reacts with hydrogen chloride? $NH_3 + HCl \rightarrow ?$ **[1]**

   a) Both H_2 and NH_4Cl b) H_2 gas is evolved

   c) NH_4Cl is formed d) Cl_2 gas is evolved.

4. When zinc reacts with sodium hydroxide, the product formed is: **[1]**

   a) Sodium oxide b) Zinc hydroxide

   c) Sodium zincate d) Zinc oxide

5. Galvanisation process involves elements of zinc and iron. Which of the two metals is sacrificing its life to save the life of the other? **[1]**

   a) Mg b) Both sacrifice each other's life

   c) Zn d) Fe

6. The melting point of NaCl is: **[1]**

   a) 100 K b) 1000 K

   c) 1074 K d) 1047 K

7. When iron nail is placed in copper sulphate solution for a few hours the blue colour of solution will **[1]**

   a) Remain blue b) Change to colourless

   c) Change to pink d) Change to green

8. Which of the following are not ionic compounds? **[1]**

   i. KCl

   ii. HCl

   iii. CCl_4

   iv. NaCl

a) (ii) and (iii)

b) (i) and (iii)

c) (i) and (ii)

d) (iii) and (iv)

9. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z? **[1]**

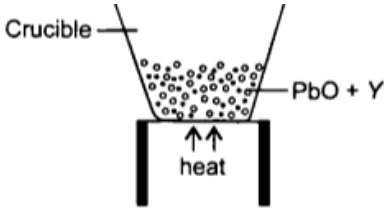
a) Occurs as solid

b) Conducts electricity in molten state

c) Has high melting point

d) Has low melting point

10. Observe the given figure carefully. **[1]**



The residue left behind in the crucible, substance Y and the substance which can replace Y in the above process are respectively.

a) Brown crystals of Pb_2O_3, C and CO

b) Shiny globules of Pb, C and Mg

c) Black mass of Pb_2O_3, CO and Cu

d) White powder of Pb, Cu and K

11. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam? **[1]**

a) Fe_2O_3 and Fe_3O_4

b) FeO

c) Fe_2O_3

d) Fe_3O_4

12. Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg)? **[1]**

a) HNO_3

b) H_2SO_4

c) HCl

d) All of these

13. **Statement 1:** Metal sulphides and carbonates are converted to metal oxides before the process of reduction. **[1]**
Statement 2: The reduction of metal oxides is easier than the reduction of metal sulphides and carbonates.

a) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

b) Statement 1 is true and statement 2 is false

c) Both statements 1 and 2 are false.

d) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

14. Food cans are coated with tin and not with zinc because: **[1]**

a) Zinc is costlier than tin.

b) Zinc has a higher melting point than that of tin.

c) Zinc is more reactive than tin.

d) Zinc is less reactive than tin.

15. Which of the following substances produce hydrogen on reacting with metals? **[1]**

a) All of these

b) Water (H_2O)

c) C_2H_5OH d) H_2SO_4

16. Which one of the following is metal? **[1]**

a) C b) N

c) Na d) O

17. A metal and a non-metal that exists in liquid state at the room temperature are respectively: **[1]**

a) Mercury and Bromine b) Bromine and Mercury

c) Mercury and Iodine d) Iodine and Mercury

18. Which one of the following elements symbolized as A and B is a metal**:** $^{23}_{11}A,^{40}_{20}B$? **[1]**

a) Neither A nor B is a metal b) Both A and B are metals

c) A is metal d) B is metal

19. Generally, non-metals are not lustrous. Which of the following nonmetal is lustrous? **[1]**

a) Iodine b) Nitrogen

c) Sulphur d) Oxygen

20. Generally, non-metals are not conductors of electricity. Which of the following is a good conductor of electricity? **[1]**

a) Fullerene b) Sulphur

c) Diamond d) Graphite

21. **Assertion (A):** In alumino thermite process, the metals like iron melts due to the heat evolved in the reaction. **[1]**
Reason (R): The reaction is
$Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

22. **Assertion (A):** Aluminium is used to make utensils for cooking. **[1]**
Reason (R): Aluminium is a highly reactive metal.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

23. **Assertion (A):** On reacting with water, calcium starts floating over water. **[1]**
Reason (R): Calcium reacts with cold water at room temperature.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

24. **Assertion (A):** Carbon reacts with oxygen to form carbon dioxide which is an acidic oxide. **[1]**
Reason (R): Non-metals form acidic oxides.

a) Both A and R are true and R is the correct b) Both A and R are true but R is not the

explanation of A.

correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

25. **Assertion (A):** C and N do not react with dil. HCl and dil. H_2SO_4. **[1]**

Reason (R): Metals do not react with dil. HCl and dil. H_2SO_4.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

26. **Assertion (A):** Bronze is an alloy of lead and tin. **[1]**

Reason (R): Alloys are a heterogeneous mixture of metals with other metals and non-metals.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

27. **Assertion (A):** Platinum, gold and silver are used to make jewellery. **[1]**

Reason (R): It is because they are very lustrous.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

28. **Assertion (A):** Metals generally act as reducing agents. **[1]**

Reason (R): The reducing character is expressed in terms of electron releasing tendency.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

29. Name two metals that are obtained by electrolysis of their chlorides in molten form. **[1]**

30. Name one metal which reacts neither with cold water, nor with hot water, but reacts with steam to produce hydrogen gas. **[1]**

31. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels. **[1]**

32. Why alkalis like sodium hydroxide and potassium hydroxide should not be left exposed to air? **[1]**

33. Name one metal which has a low melting point. **[1]**

34. Aluminium strips were placed in a solution of copper sulphate. After one hour, it was observed that the colour of solution changes. What will be the colour of the solution? Give reasons. **[1]**

35. Name the metals which are usually alloyed with gold to make it harder. **[1]**

36. Write one constituent each of brass and bronze that is not common to both. **[1]**

37. Why are food cans tin-plated instead of zinc plated though zinc is cheaper than tin? **[1]**

38. Name one metal which does not displace copper from copper sulphate solution. **[1]**

Section B

39. To remove gangue from iron ore, a white substance is mixed with it in the blast furnace. What is it? State its one other application. **[2]**

40. Brass is preferred over stainless steel for door settings. Give reason. **[2]**

41. What property is made use of in the concentration of ore by: **[2]**
(i) gravity separation
(ii) froth floatation process?

42. Give reason for the difference in the stability of sodium atom and its ion. **[2]**

43. Arrange the following metals in the decreasing order of reactivity Na, K, Cu and Ag. **[2]**

44. a. Sodium metal is stored under kerosene oil. Why? **[2]**
b. Some metal oxides are soluble in water. What are the aqueous solutions of these oxides called? Write one example of such a solution.
c. At ordinary temperature the surface of metals such as magnesium, aluminium, zinc etc. is covered with a thin layer. What is the composition of this layer? State its importance.

45. State giving reason for the change in appearance observed when each of the following metal is exposed to atmospheric air for some time: **[2]**
i. Silver,
ii. Copper and
iii. Iron

46. List three differentiating features between the processes of galvanisation and alloying. **[2]**

47. Give the composition and one use of alnico. **[2]**

48. i. What type of oxides are formed when non-metals react with oxygen? Explain with an example. **[2]**
ii. What type of oxides are formed when metals combine with oxygen? Explain with the help of an example.

Section C

49. 'M' is an element which may be one out of Cu, Fe, Al, Na. It shows the following properties: **[3]**
(i) One of its ore is rich in M_2O_3.
(ii) M_2O_3 is not affected by water.
(iii) It corrodes easily.
(iv) It form to chlorides MCl_2 and MCl_3. Identify 'M'.

50. The atomic number of an element is 20. Write its electronic configuration. State whether this element is a metal or a non-metal. What is its valency? Write the name and formula of the compound which this element forms with chlorine. **[3]**

51. i. Which types of metals can be obtained in their pure form by just heating their oxides in air? Give one example. **[3]**
ii. Consider the reaction given below used to obtain Manganese metal in pure form:
$3MnO_2(s) + 4Al(s) \longrightarrow 3Mn(l) + 2Al_2O_3(s) + Heat$
a. What type of reaction is it?
b. What is the role of aluminium in this reaction?

52. Hydrogen is not a metal but it has been assigned a place in the reactivity series of metals. Explain. **[3]**

53. A lady bought a new iron container and kept blue vitriol solution into it. On the next day, she found that the blue colour of the solution fades. She went to the shopkeeper and complained. **[3]**
But the shopkeeper argued that the container is of good quality and he refused to return her money. An aware person Ankit came there and asked the matter. He told the lady that the container is of good quality and you have kept the wrong substance in it, so fault is all yours.
On the basis of given passage, answer the following questions.

i. What qualities are exhibited by Ankit?

ii. Why the container becomes porous when blue vitriol solution is kept into it?

54. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows: **[3]**

Metal	**Iron(II) sulphate**	**Copper(II) sulphate**	**Zinc sulphate**	**Silver nitrate**
A	No reaction	Displacement	—	—
B	Displacement	—	No reaction	—
C	No reaction	No reaction	No reaction	Displacement
D	No reaction	No reaction	No reaction	No reaction

Use the table above to answer the following questions about metals A, B, C and D.

i. Which is the most reactive metal?

ii. What would you observe if B is added to a solution of copper(II) sulphate?

iii. Arrange the metals A, B, C and D in the order of decreasing reactivity.

55. A zinc plate was kept in a glass container having copper sulphate solution. On examining it was found that the blue colour of the solution is fading slowly. After a few days when the zinc plate was taken out of the solution, a number of small holes were noticed in it. State the reason and give chemical equation of the reaction involved. **[3]**

56. How can a layer of aluminium oxide on an aluminium object be made thicker? What is this process called? **[3]**

57. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it. **[3]**

What will be the action of gas on

i. Dry litmus paper?

ii. Moist litmus paper?

Write a balanced chemical equation for the reaction taking place.

58. Sample pieces of five metals A, B, C, D and E were added to the tabulated solutions separately. The results observed are shown in the table: **[3]**

Metal	$FeSO_4$	$CuSO_4$	$ZnSO_4$	$AgNO_3$	$Al_2(SO_4)_3$
A	No Change	No Change	No Change	Coating on metal	No Change
B	Grey Deposit on metal	Brown Coating on metal	No Change	Coating on metal	No Change
C	No Change	No Change	No Change	No Change	No Change
D	No Change	--------	No Change	Coating on metal	No Change
E	--------	Brown Coating	New Coating	New Coating	No Change

Based on the observations recorded in the table, answer the following:

(1) Which is the most reactive metal?

(2) Which is the least reactive metal?

(3) What would be observed if metal D were added to a solution of copper (II) sulphate?

(4) What would be observed if metal E were added to a solution of iron (II) sulphate?

(5) Arrange the metals A, B, C, D and E in decreasing order of their reactivity?

Section D

59. **Read the following text carefully and answer the questions that follow:** **[4]**

Non-metals are either solids or gases. Non-metal can exist in different forms such as carbon. Each form is called allotrope. Alkali metal is so soft that it can be cut with a knife. They have low density and low melting point. Some metal can melt if they are kept in the palm.

i. What are the physical properties of metals? (1)

ii. Differentiate between the physical properties of metals and non metals? (1)

iii. Give some exception of metals which does not obey the properties of metals? (2)

OR

Why is sodium always kept in kerosene oil? (2)

60. **Read the following text carefully and answer the questions that follow:** **[4]**

Almost all metals combine with oxygen to form metal oxides. Metal oxides are generally basic in nature. But some metal oxides show both basic as well as acidic behaviour. Different metals show different reactivities towards oxygen. Some react vigorously while some do not react at all.

i. What happens when copper is heated in air? (Give the equation of the reaction involved). (1)

ii. Why are some metal oxides categorized as amphoteric? Give one example. (1)

iii. Complete the following equations: (2)

i. $Na_2O_{(s)} + H_2O_{(l)} \rightarrow$

ii. $Al_2O_3 + 2NaOH \rightarrow$

OR

On burning Sulphur in oxygen a colourless gas is produced. (2)

i. Write chemical equation for the reaction.

ii. Name the gas formed.

iii. State the nature of the gas.

iv. What will be the action of this on a dry litmus paper?

61. **Read the following text carefully and answer the questions that follow:** **[4]**

The metals produced by various reduction processes are not very pure. They contain impurities, which must be removed to obtain pure metals. The most widely used method for refining impure metals is electrolytic refining.

i. What is the cathode and anode made of in the refining of copper by this process? (1)

ii. Name the solution used in the above process and write its formula. (1)

iii. How copper gets refined when electric current is passed in the electrolytic cell? (2)

OR

You have two beakers **A** and **B** containing copper sulphate solution. What would you observe after about 2 hours if you dip a strip of zinc in beaker **A** and a strip of silver in beaker **B**? Give reason for your observations in each case. (2)

62. **Read the following text carefully and answer the questions that follow:** **[4]**

On the basis of reactivity metals are grouped into three categories-

i. Metals of low reactivity

ii. Metals of medium reactivity

iii. Metals of high reactivity

Therefore metals are extracted in pure form from their ores on the basis of their chemical properties.

Metals of high reactivity are extracted from their ores by electrolysis of the molten ore.

Metals of low reactivity are extracted from their sulphide ores, which are converted into their oxides. The oxides of these metals are reduced to metals by simple heating.

i. Name the process of reduction used for a metal that gives vigorous reaction with air and water both. (1)

ii. Carbon cannot be used as a reducing agent to obtain aluminium from its oxide? Why? (1)

iii. Describe briefly the method to obtain mercury from cinnabar. Write the chemical equation for the reactions involved in the process. (2)

OR

Differentiate between roasting and calcination giving chemical equation for each. (2)

63. **Read the following text carefully and answer the questions that follow:** **[4]**

Non-metals are highly electronegative in nature. They have a tendency to gain electrons in their valence shell to achieve nearest noble gas configuration. Thus, they form anions and act as good oxidising agents.

$$\underset{(\text{non-metal atom})}{X} + ne^- \rightarrow \underset{(\text{anion})}{X^{n-}}$$

They react with air or oxygen on heating to form oxides which react with water to form acids. Thus, non-metal oxides are acidic in nature. Non-metals do not react with dilute acids at all. This is because they are electronegative and therefore, cannot displace hydrogen from acids but they form covalent hydrides when heated with hydrogen.

i. What happens when sulphur trioxide reacts with water? (1)

ii. Why non-metals are electronegative in nature? (1)

iii. Why non-metals generally act as oxidising agents? (2)

OR

Why do non-metals not react with dilute acids? (2)

64. **Read the following text carefully and answer the questions that follow:** **[4]**

Three metal samples of magnesium, aluminium and iron were taken and rubbed with sand paper. These samples were then put separately in test tubes containing dilute hydrochloric acid. Thermometers were also suspended in each test tube so that their bulbs dipped in the acid. The rate of formation of bubbles was observed. The above activity was repeated with dilute nitric acid and the observations were recorded.

Answer the following questions:

a. When activity was done with dilute hydrochloric acid, then in which one of the test tubes was the rate of formation of bubbles the fastest and the thermometer showed the highest temperature? **(1)**

b. Which metal did not react with dilute hydrochloric acid? Give reason. **(1)**

c. Why is hydrogen gas not evolved when a metal reacts with dilute nitric acid? Name the ultimate products formed in the reaction. **(2)**

OR

Name the type of reaction on the basis of which reactivity of metals is decided. You have two metals X and Y. How would you decide which is more reactive than the other? **(2)**

65. **Read the following text carefully and answer the questions that follow:** **[4]**

Metals are required for a variety of purposes. For this we need their extraction from their ores. Ores mined from

the earth are usually contaminated with many impurities which must be removed prior to the extraction of metals. The extraction of pure metal involves the following steps:

1. Concentration of ore
2. Extraction of the metal from the concentrated ore
3. Refining of the metal

Questions:

i. Name an ore of Mercury and state the form in which Mercury is present in it. (1)

ii. What happens to zinc carbonate when it is heated strongly in a limited supply of air? (1)

iii. The reaction of a metal A with Fe_2O_3 is highly exothermic and is used to join railway tracks. (2)

a. Identify the metal A and name the reaction taking place.

b. Write the chemical equation for the reaction of metal A with Fe_2O_3.

OR

We cannot use carbon to obtain sodium from sodium oxide. Why? State the reactions taking place at cathode and anode during electrolytic reduction of sodium chloride. (2)

Section E

66. How will you get metal from concentrated ore? **[5]**

67. You are given a hammer, a battery, a bulb, wires and a switch. **[5]**

i. How could you use them to distinguish between samples of metals and non-metals.

ii. Assess the usefulness of these tests in distinguishing between metals and non-metals.

68. Define an alloy. How is an alloy prepared? List two advantages of making alloys. Write the composition of stainless steel. Why is steel preferred over iron? List two reasons. **[5]**

69. i. How do you classify elements into metals and non-metals on the basis of their electronic configuration? Choose metal and non-metal out of the following: **[5]**

$^{23}_{11}A, ^{19}_{9}B, ^{24}_{12}C, ^{31}_{15}D, ^{35}_{17}E$

ii. What type of bond will be formed if

a. 'A' combines with 'B'?

b. 'A' combines with 'E'?

c. 'C' combines with 'E'?

d. 'D' combines with 'E'?

70. a. Name two metals which are obtained from their ores by simple heating. **[5]**

b. Differentiate between calcination and roasting, taking examples of zinc ores.

c. What is thermit reaction? State its significance.

71. i. By the transfer of electrons, illustrate the formation of bond in magnesium chloride and identify the ions present in this compound. **[5]**

ii. Ionic compounds are solids. Give reasons.

iii. With the help of a labelled diagram show the experimental set up of action of steam on a metal.

72. An ore on treatment with dilute hydrochloric acid gives a smell like that of rotten eggs. What type of ore is this? How can it be concentrated? How can the metal be obtained from the concentrated ore? **[5]**

73. Give reasons for the following: **[5]**

i. Ionic compounds have higher melting and boiling points.

ii. Sodium is kept immersed in kerosene.

iii. Reaction of calcium with water is less violent.

iv. Prior to reduction the metal sulphides and carbonates must be converted into metal oxides for extracting metals.

74. (i) Name the metal which does not stick to glass? **[5]**

(ii) Name the non-metal which is a good conductor of electricity?

(iii) Name the metal which is commonly used in thermit welding?

(iv) What gets deposited at the cathode, a pure or impure metal?

(v) What is the nature of Zinc oxide?

75. i. Write the electron-dot structures for sodium, oxygen and magnesium. **[5]**

ii. Show the formation of Na_2O and MgO by the transfer of electrons.

iii. What are the ions present in these compounds?