Date : / / 201 | Lesson (1) | Day :

Inorganic Chemistry

1) Write the scientific term for each of the following statements:

1) They occupy the middle block of the table which contains the elements with the outermost electrons occupying the d sublevel.
2) It contains ten vertical columns because the d-sublevel can take up ten electrons.
3) It includes the elements in which the sublevel (3d) it filled successively .
4) It includes the elements in which the sublevel (4d) it filled successively.
5) It includes the elements in which the sublevel (5d) it filled successively.
6) Transition series found in the fifth period and consist of ten elements.
7) Transition series found in the third period and consist of ten elements.
8) Transition series found in the fourth period and consist of ten elements.
9) Tradition element's oxide that is used in Sun protection cosmetics.
10) Transition element's oxide that is used as Catalyst and in days
11) Transition element is used in the manufacture of car springs .
12) Transition element used as a catalyst in ammonia's manufacture by aber-Bosch method.
13) One of copper compounds is used to detect glucose .
14) Elements that have (d) or (f) sublevels occupied but incompletely filled in either the free or in one of its oxidation states.
15) The element in which the d or f sublevels are occupied by electrons, but they are not completely filled with electrons either in the atomic or in any state of its oxidation states.
16) The elements in which the 3d sublevel is successively filled.
17) The elements in which the 5d sublevel is successively filled.
18) A group is included in the periodic table in which the elements are similar horizontally more than vertically .
19) The metal which is used in the dental implants and artificial joints.
20) The oxide which is used in the manufacture of dyes used in ceramics industry.
21) The metal which exhibits the passivity phenomenon in the atmospheric air.
22) The alloy which is used in the railway tracks.

23) The method which us used in the conversion of water gas to fuel.

24) The element which is used as a catalyst in Haber-Bosch method.

25) The process in which the metal surface is covered with a layer of zinc.

26) The element which is included in the first transition series, although it is not a transition element.

27) The mixed gas which consists of hydrogen and carbon monoxide gases.

28) The element which us used as a radiation source for highly penetrating gamma rays.

29) The solution of a copper compound which is used in the chemical detection of glucose sugar.

30) The element whose atom has an incompletely filled d-sublevel or which can give cations with an incomplete d-sublevel.

31) The block of elements which contains group 3 to 12 of the periodic table.

32) The transition metals in which d-sublevel is completely filled in their atomic stare, but it isn't completely filled in their different oxidation states .

33) The elements which are characterized by several oxidation states.

34) The metals which often have one oxidation state.

35) The magnetic property which distinguishes.

36) the transition elements having unpaired electrons in the "d" orbitals.

37) The substance which repels with the outer magnetic field as a result of pairing all the electrons of the d-sublevel.

38) The colour which appears if the substance absorbs certain colour.

2) Choose from columns (B) and (C) what is suitable for column (A) :

(A)	(B)	(C)
(1) Titanium $_{22}$ Ti (2) Chromium $_{24}$ Cr (3) Manganese $_{25}$ Mn (4) Cobalt $_{27}$ Co (5) Nickel $_{28}$ Ni (6) Copper $_{29}$ Cu	(a) [Ar] , $3d^{10}$,$4s^1$ (b) [Ar] , $3d^7$,$4s^2$ (c) [Ar] , $3d^2$,$4s^2$ (d) [Ar] ,$3d^8$,$4s^2$ (e) [Ar] ,$3d^5$,$4s^1$ (f) [Ar] , $3d^5$,$4s^2$	(i) one of its compounds used as an oxidizing agent and antiseptic substance. (ii)is used for hydrogenation of oils. (iii)its isotope (60) is used in preserving food. (iv) is used in tanning leather. (v) its alloys used with aluminum in the manufacture of space shuttle. (vi) is used for making Fehling's solution. (vii)is used in the manufacture of car springs.

(A)	(B)	(C)
(1) Scandium $_{21}$Sc (2)Vanadium $_{23}$V (3)Iron $_{26}$Fe (4) Zinc $_{30}$Zn	(a)[Ar] ,4s2 ,3d4 (b)[Ar] , 4s2 , 3d10 (c) [Ar] ,4s2 ,3d3 (d) [Ar] ,4s2 ,3d6 (e) [Ar] ,4s2 ,3d1	(i) one of its oxides is used in the manufacture of dyes used in ceramics and glass industry . (ii) is used as a catalyst in ammonia industry (iii) its alloys with aluminum are used in manufacturing Mig fighter jets. (iv) is used to galvanize other metals. (v) is used in manufacturing sweets and alcoholic drinks.

3) Mention one use for each of the following:

1	Scandium.	2	Titanium
3	Titanium dioxide	4	Vanadium
5	Vanadium pentoxide.	6	Chromium
7	Chromium (III) oxide.	8	Potassium dichromate
9	Manganese-aluminum alloy.	10	Ferromanganese alloy.
11	Manganese dioxide.	12	Potassium permanganate
13	Manganese(II) sulphate	14	Iron
15	Cobalt	16	Cobalt 60
17	Nickel	18	Nickel-chromium alloys.
19	Copper	20	Copper(II) sulphate.
21	Fehling's solution	22	Zinc
23	Zinc oxide.	24	Zinc sulphide

4) Write the symbols of the transition elements or the formula of their compounds for each of the following:

1) It is used as a catalyst in manufacturing sulphuric acid.

2) It is used in dyes industry.

3) It is less denser than steel and it is better in manufacturing space shuttles and aircrafts.

4) It is used in manufacturing the dry cells.

5) It forms an alloy which is named bronze and it has high electrical conductivity.

6) It is too brittle to be used as a pure metal. So, it is mainly used in the form of alloys or compounds.

7) It is used as a catalyst to convert water gas to liquid fuel.

8) It is not an abundant element in the Earth's crust and when a trace element is added to aluminum, an alloy characterized by lightness and strength is formed.

9) Its Nan particles prevent ultraviolet radiation access to the skin.

10) It is used in food preservation and to ensure product quality.

11) It has twelve isotopes.

12) It is used as a catalyst for hydrogenation of oils.

13) It is one of the transition elements and its maximum oxidation number is (+7).

14) It is used in the manufacture of the luminous paints.

15) They are anomalous from the expected electronic configuration of the first transition series.

16) It is a representative element and it has high fourth ionization potential.

17) It has five stable isotopes.

18) It is used in the manufacture of ammonia by Haber-Bosch method.

19) It absorbs the red colour. So, the colour of its compounds is green.

20) It has only one oxidation state (+3), although it is considered as a transition metal.)

21) It is used as a fungicide.

22) It is used as an oxidizing agent and antiseptic substance.

23) It is used in the manufacture of sun protection cosmetics.

24) It is used as an insecticide and fungicide in the purification of water.

25) It is used in manufacturing paints, rubber and cosmetics.

5) Classify the following substances into:

1) Transition and non-transition elements: ($_{48}Cd$, $_{38}Sr$, $_{43}Tc$, $_{28}Ni$)

2) Diamagnetic and paramagnetic substances: ($ZnS0_4$ ' $FeCl_2$ ' $CoCl_2$ ' $Fe_2(S0_4)_3$)

3) Coloured and uncolored substances: ($Ni^{2}+$, $Fe^{2}+$, $Ti^{3}+$, $Zn^{2}+$, $Sc^{3}+$, Fe^{3+})

4) Anomalous and expected electronic configuration of transition elements:

($_{21}Sc$, $_{24}Cr$, $_{27}Co$, $_{29}Cu$)

6) Arrange the following elements and ions in an ascending order, according to :

1) The radius: ($_{25}Mn$, $_{21}Sc$, $_{26}Fe$, $_{22}Ti$)

2) The higher oxidation number: ($_{24}Cr$, $_{21}Sc$, $_{23}Y$, $_{25}Mn$)

3) The number of single electrons: ($_{26}Fe$, $_{23}Y$, $_{21}Sc$, $_{25}Mn$)

4) The magnetic moment: (a) $FeCl_3$ ' Cr_2O_3 ' TiO_2) (b) (Cu^+ , Fe^{3+} , y^{3+} , Co^{2+})

5) The ionization energies: (V^{4+} , V , V^{3+} , V^+ , V^{2+})

6) The density: ($_{23}Y$, $_{29}Cu$, $_{27}Co$, $_{24}Cr$)

7) Choose the alphabetical letter which represents the correct answer for each of the following sentences:

1) Elements found on both sides of periodic table are :

(a) (s) and (d) (b) (d) and (p)

(c) (s) and (p) (d) (d) and (f)

2) Elements occupy the middle of the periodic table are :

(a) (s) and (d) (b) (d) and (p)

(c) (s) and (p) (d) (d) and (f)

3) The main transition elements are :

(a) More than60 (b) Less than 60.

(c) 113 (d) 112.

4) The Main transition elements series starts with group.

(a) 1B (b) 2B

(c) 3B (d) 4B

5) Cadmium 48Cd exists in :

(a) 1st series (b) 2nd series

(c) 3rd series (d) 4th series.

6) Scandium$_{21}$Sc exists in:

(a) 1st series (b) 2nd series

(c) 3rd series (d) 4th series.

7) Lanthanum $_{57}$La exists in:

(a) 1st series (b) 2nd series

(c) 3rd series (d) 4th series.

8) The transition element found in earth's crust by greatest ration is:

(a) Zn (b) Sc

(c) Cu (d) Fe

9) The transition element which is used in plating metals is :

(a) Sc (b) Cu

(c) Cr (d) V

10) The bronze alloy is made of :

(a) Copper-gold (b) Nickel-Chromium.

(c) Nicket-ten. (d) Copper-ten.

11) Excluding ..... , elements of the first transition series are characterized by their

(a) Scandium (b) manganese .

(c) Zinc (d) (a) and (c).

12) The element which has the electronic configuration (Ar) , $3d^{10}$, $4s^2$ is ..... ,

(a) iron (b) vanadium .

(c) copper. (d) Zinc.

13) The transition element which has only one oxidation state (+3) is .

(a) scandium. (b) vanadium.

(c) manganese. (d) zinc.

14) is the element which can give the oxidation state (+7).

(a) 2lSc (b).24Cr

(c) 2SMn (d) 27Co.

15) Excluding coinage metals, the maximum oxidation number of any transition element doesn't exceed Its ..... number.

(a) period (b) group

(c) atomic (d) mass

16) The elements of the first transition series have several oxidation states, because they lose electrons from, ... sublevels.

(a) 3s then 3d (b) 4s only

(c) 4s then 3d (d) 3p only

17) The general electronic configuration of the transition series is ..... .

(a)(n - l)$d^{1.5}$ (b)(n- l)$d^{1.10}$,ns^1

(c) (n -1) $d^{1.10}$, $ns^{1.2}$ (d) (n - 2) $d^{1.14}$, $ns^{1.2}$

18) Chromium is a transition element, where its 4s and 3d orbitals are .....

(a) half filled ($4s^1$,$3d^5$). (b) completely filled (4s2 ,3dlO).

(c) empty ($4s^0$, $3d^0$). (d) no correct answer,

19) The atoms of transition elements lose electrons from, ... to form positive ions.

(a) their 4s sublevel before 3d sublevel (b) their 3d sublevel before 4s sublevel

(c) their 4s sublevel before 3p .sublevel (d) their 3s sublevel before 4d sublevel

20) The d-block elements have to fill .....

(a) their 4s sublevel before 3p sublevel, (b) their 3d sublevel before 4s sublevel.

(c) their 4s sublevel before 3d sublevel. (d) their 3s sublevel before 4d sublevel.

21) ..... is one of the specific properties of the transition metals, which depends on their electronic configuration.

(a) Forming colorless compounds.

(b) Having low densities, melting and boiling points

(c) Forming compounds in which they have one oxidation state.

(d) Catalyzing chemical reactions.

22) Transition metals from titanium to copper can form ..... .

(a) +3 oxidation state. (b) +4 oxidation state.

(c) +2 oxidation state. (d) +1 oxidation state.

23) Transition metals or their compounds are used as catalysts in some important chemical reactions like..... .

(a) decomposition of hydrogen peroxide. (b) hydrogenation of oils.

(c) conversion of water gas into fuel. (d) all the previous.

24) Which of the following ions is expected to be diamagnetic? ..... (a) $_{26}Fe^{3+}$ (b) $_{29}Cu^{2+}$

(c) $_{27}C0^{3+}$ (d) $_{30}Zn^{2+}$

25) Chromium (III) compounds absorb .....colour.

(a) blue (b) red

(c) orange (d) yellow

26) ..... is the highest oxidation state of chromium, according to its electronic configuration

(a) +1 (b) +2

(c) +4 (d) +6

27) Which element has this electronic configuration [Ar] ,$4s^2$, $3d^3$? .....

(a) Sc (b) Ti

(c) V (d) Co

28) Which one of the following elements, doesn't show the variable oxidation states? .....

(a) Sc (b) Ti

(c) Ni (d) Cr

29) Which metal is the most likely to be used in an electrical wiring? .....

(a) Zinc. (b) Iron.

(c) Copper. (d) Manganese.

30) Transition metals have high melting and boiling points because of .....

(a) forming strong metallic bonds. (b) absorbing certain colours.

(c) having magnetic property. (d) showing different oxidation states.

31) .....is used as a catalyst. in Haber-Bosch method.

(a) Ni (b) Hg

(c) Ag (d) Fe

32) Cobalt compounds are..... .

(a) blue. (b) green.

(c) colourless. (d) red.

33) Which of the following is the most stable electronic configuration of Fe^{3+} ion?

(a) [Ar] , 45^0 ,$3d^6$ (b) [Ar] ,$4s^0$,$3d^5$

(c) [Ar] ? $4s^1$, $3d^4$ (d) [Ar] ,$4s^0$,$3d^3$

34) .....has the highest magnetic moment.

(a) V^{3+}. (b) Cr^{3+}.

(c) Fe^{3+}. (d) Co^{3+}.

35) Which of the following ions can't exhibit magnetic properties? .....

(a) Fe^3+ (b) Sc^3+.

(c) Fe^{3+}. (d) V^{3+}

36) .....forms colourless compounds.

(a) Cu^{2+} (b) Cu^{+}

(c) Mn^{2+} (d) V^{3+}

37) Transition elements are .....

(a) all metals. (b) all non-metals.

(c) metals and non-metals. (d) gases.

38) ..... is the ion which exhibits green colour.

(a) Cu^{+} (b) Mn^{2+}

(c) $C02^{+}$ (d) Cr^{3+}

39) The highest magnetic moment is exhibited by the transition metal or ion having the outer configuration.

(a) $3d^2$ (b) $3d^5$

(c) $3d^8$ (d) $3d^7$

40) Transition elements are used as catalysts, because of .....

(a) large ionic charge.

(b) large surface area for the reactants to be adsorbed.

(c) unpaired d-electrons. (d) both (b) and (c).

41) Iron ..... in Haber-Bosch method.

(a) gains electrons (b) loses electrons.

(c) decreases the activation energy (d) increases the activation energy.

42) d-block elements are arranged in ..... .

(a) three series. (b) six series.

(c) two series. (d) four series.

43) The second series of transition elements starts with ..... .

(a) yttrium. (b) chromium.

(c) zinc. (d) cadmium.

44) Magnetic property of transition metal is due to.....

(a) spinning of electron. (b) orbital moment.

(c) both (a) and (b). (d) neither (a) nor (b).

45) ..... is one of the chromium compounds which is used in dyes industry.

(a) $K_2Cr_2O_7$ (b) Cr_2O_3

(c) CrO_2Cl_2 (d) $CrCl_3$

46) The highest oxidation state in the transition elements can be obtained by .....

(a) Fe (b) Mn

(c) V (d) Cr

47) The compounds of Sc^{3+} appear .....

(a) blue. (b) colourless.

(c) yellow. (d) red.

48) The most stable oxidation state of chromium is..... .

(a) +5 (b) +3

(c) +2 (d) +4.

49) The electronic configuration of the fourth transition element included in the first transition series is..... .

(a) [Ar] ,$4s^2$,$3d^4$ (b) [Ar] ,$4s^1$,$3d^5$

(c) [Ar] ,$4s^2$,$3d^7$ (d) [Ar] ,$4s^1$,$3d^{10}$

50) The stability of ferric ion is due to the.....

(a) completely filled d-sublevel. (b) half filled d-sublevel.

(c) half filled f-sublevel. (d) completely filled f-sublevel.

51) Which of the following statements is incorrect about the transition elements? .....

(a) All elements form complexes. (b) All have magnetic properties.

(c) All show variable valency. (d) All are not coloured elements.

52) Element with atomic number 23 is placed in the periodic table in..... .

(a) s-block. (b) p-block.

(c) d-block. (d) f-block.

53) In the first transition series, the incoming electron enters .....

(a) 5d orbitals. (b) 4d orbitals.

(c) 3d orbitals. (d) 2d orbitals.

54) The lightest element is..... .

(a) Fe (b) Sc

(c) Cr (d) Zn

55) The atomic mass increases gradually by increasing the atomic number, except for.....

(a) Co (b) Mn

(c) Cr (d) Ni

56) The most dense transition element is.....

(a) Fe (b) Sc

(c) Cu (d) Ni

57) Which one of the following ionization potentials of the aluminum atom can't be found in the chemical reaction under normal conditions? ..... .

(a) The first ionization potential. (b) The second ionization potential.

(c) The third ionization potential. (d) The fourth ionization potential.

58) Which of the following series of elements have nearly the same atomic radii? .....

(a) Sc , Ti , V , Cr
(b) Ti , V , Cr , Mn
(c) V , Cr , Mn , Fe
(d) Fe , Co , Ni , Cu

59) Variable valences of transition elements are due to .....

(a) different energies of (n-l) d electrons.
(b) different energies of ns electrons.
(c) similar energies of (n-l) d electrons.
(d) very close energies of (n-l)d electrons and ns electrons.

60) Which of the following ions has the minimum magnetic moment? .....

(a) Mn^{2+}
(b) Fe^{2+}
(c) Cr^{2+}
(d) V^{3+}

61) paramagnetism in the substance increases as..... .

(a) the number of paired electrons increases.
(b) the number of unpaired electrons increases.
(c) the number of unpaired electrons decreases.
(d) the number of paired electrons decreases.

62) If red colour is absorbed from white light, the observed colour is.....

(a) yellow.
(b) orange.
(c) violet.
(d) green.

63) If the electronic configuration of a transition element is $4s^2$, $3d^3$ the possible oxidation states are .....

(a) + 1 ,+2 ,+3 ,+ 4
(b) +2 , +3
(c) + 1 , +2 , +3
(d) +2 , +3 , +4 , + 5

64) If a compound absorbs violet colour from the white light, the observed colour is.....

(a) yellow.
(b) orange.
(c) blue.
(d) green.

65) The colour in the transition metal compounds is obtained due to..... (a) the small size of the metal atom.
(b) the absorption of light in a certain region of the white light.
(c) the completely filled of ns sublevel.
(d) the unpaired electrons of d-sublevel.

66) ..... is a diamagnetic ion.

(a) Ti^{4+}
(b) V^{3+}
(c) Cr^{3+}
(d) Co^{2+}

67) The number of unpaired electrons present in Cr^{3+} ion is .....

(a) 1 (b) 2

(c) 3 (d) 4

68) In an oxidation state (+3) of the electronic configuration of a transition metal is [Ar], $3d^4$. So, its element has an electronic configuration of ..... .

(a) [Ar] ,$4s^2$,$3d^5$ (b) [Ar] ,$3d^1$

(c) [Ar] ,$4s^1$,$4p^3$ (d) [Ar) ,$3d^1$,$4p^1$

69) The most abundant transition element is..... .

(a) Cr (b) Fe

(c) Co (d) Mn

70) The magnetic moment of a ttansitiol1 metal ion is 4. So; the number of unpaired electrons present in this ion is.....

(a) 1 (b) 2

(c) 3 (d) 4

71) In 3d transition series, the atomic radius of elements .....

(a) decreases from Sc to Cu . (b) is nearly constant from Cr to Cu

(c) decreases from Sc to Cr and then increases.

(d) increases from Sc to Ni and then decreases.

72) The maximum oxidation state for the transition element which has the electronic configuration [Ar] ,$4s^2$; $3d^3$ is .....

(a) -5 (b) +2

(c) +3 (d) +5

73) The ion of the transition element will be mote stable, if the orbitals of its d-sublevel are

(a) empty. (b) half filled.

(c) Completely filled (d) (a) , (b) , or (c) .

74) The compound $FeCl_2$ is .

(a) paramagnetic and coloured. (b) diamagnetic and colourless.

(c) paramagnetic and colourless. (d) diamagnetic and coloured.

75) The element which has the electronic configuration [Kr] , $5s^2$, $4d^{10}$ is considered ..... .

(a) paramagnetic in its atomic state... (b) paramagnetic at oxidation state (+2).

(c) diamagnetic in its atomic state. (d) no correct answer.

76) If the magnetic moment of an element found in the first transition series equals 2 So; its atomic number may be.....

(a) 21 (b) 27
(c) 23 or 29 (d) 22 or 28

77) The electronic configuration of chromium (24Cr) in the last two levels is ..... .

(a) $3d^4$, $4s^2$ (b) $3d^5$, $4s^1$
(c) $3d^5$, $4s^2$ (d) $3d^{10}$, $4s^1$

78) All the following elements are from the first transition series, except " ..... .

(a) gold. (b) vanadium.
(c) copper. (d) scandium.

79) All the following ions are colourless; except .....

(a) Zn^{2+} (b) Sc^{3+}
(c) Fe^{3+} (d) Cu^{+}

80) All the following ions are paramagnetic, except .....

(a) Zn^{2+} (b) Ti^{3+}
(c) V^{2+} (d) Cu^{+}

81) .....can form a stable ion with +4 oxidation state.

(a) ^{39}Y (b) ^{57}La
(c) ^{52}Te (d) ^{40}Zr

82) From the following table, the element ..... is a transition element .

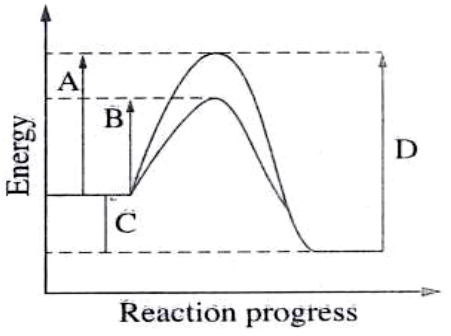
The element	(a)	(b)	(c)	(d)
The melting point	Hight	Low	High	Low
The colour of its chloride solution	Blue	Green	Colourless	White

83) The choice..... represents the suitable catalyst for the suitable chemical process.

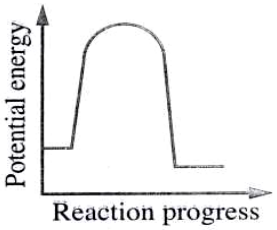
The element	(a)	(b)	(c)	(d)
Manufacturing of H_2SO_4	MnO_2	V_2O_5	V_2O_S	Ni
Decomposition of H_20_2	Fe	MnO_2	Ni	Fe
Conversion of water gas into fuel	V_2O_5	Fe	Fe	V_2O_5

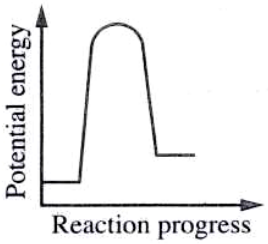
84) The opposite graph shows the energy of chemical reaction. The letter..... represents the activation energy when the catalyst is used.

(a) A (b) B (C) C (d) D

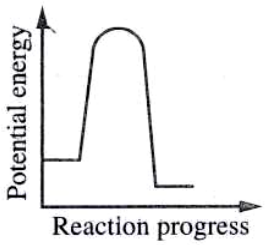


85) The opposite graph represents the reaction progress without using a catalyst, on using a catalyst the reaction progress will be as graph .....





(a)



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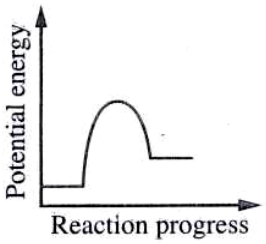

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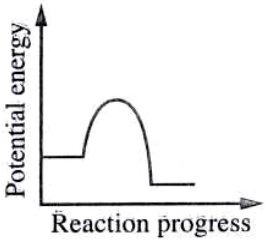

(d)

7) What is meant by :

(1) Transition element.
(2) Paramagnetic substance.
(3) Diamagnetic substance.
(4) Paramagnetic property.
(5) Diamagnetic property.
(6) The main transition element.

8) Give reasons for :

1. However chromium is a highly reactive element, it resists the effect of atmosphere.
2. Titanium is suitable for manufacturing space shuttles and aircrafts;
3. Potassium permanganate solution is used in sterilization processes.
4. W The abnormal electronic configuration of both of chromium ($_{24}Cr$) and copper (^{29}Cu).
5. Manganese (II) ion is difficult to be oxidized into manganese (III) ion, while it is easy to oxidize iron (II) ion into iron (III) ion.
6. It is difficult to oxidize iron III ion into iron IV ion, while it is easy to oxidize titanium III ion into titanium IV ion.
7. Scandium doesn't produce scandium ion Sc^{4+} • Scandium has only one oxidation state (Sc^{3+}).
8. The elements of the first transition series are characterized by the variety of its oxidation states.
9. Coinage metals (copper; gold and silver) are considered of transition elements .
10. Zinc is not considered as a transition element.
11. The gradual decrease in the atomic radius across the elements of the first transition series from left to right is not large.
12. The density of the elements of the first transition series increases by increasing of the atomic number.

13. The density of iron (7.87 g/cm^3) is less than that of cobalt (8.8 g/cm^3).
14. Transition elements have high melting and boiling points.
15. Most of transition elements are attracted to the external magnetic fields.
16. $Fe_2(SO_4)$ is a paramagnetic substance, while $ZnSO_4$ is a diamagnetic one.
17. The magnetic moment of manganese ($_{25}$Mn) is greater than that of cobalt ($_{27}$Co).
18. Copper ion Cu^+ is colourless.
19. Chromium (III) compounds are seen green.
20. Most of transition elements have catalytic activity .
21. The similarity of the properties of Hon, cobalt and nickel.
22. We can consider all the elements of the first transition series as ideal metals.
23. The transition elements are considered as ideal catalysts.
24. - The ions $A1^{4+}$, Mg^{3+} , Na^{2+} can't be obtained through the normal chemical reaction .
    - The second ionization potential of Na is very high.
25. The atomic mass of transition elements increases gradually, as the atomic number increases, except nickel.
26. Manganese is mainly used in alloys or compounds.
27. Manganese alloys with steel are used in manufacturing railway tracks.
28. Manganese-aluminum alloy is used in manufacturing drinks cans.
29. Scandium is added in a small quantity to aluminum.
30. Scandium is added to mercury vapour lamps.
31. The lamps of mercury vapour with scandium are used for filming and television photographing.
32. Titanium is preferable than aluminum in manufacturing space shuttles.
33. Titanium is used in dental implants and artificial joints industry.
34. Titanium dioxide is used in manufacturing Sun protection cosmetics.
35. Vanadium is added in a trace element to steel. So, it can be used in manufacturing car springs.
36. Cobalt 60 is used in food preservation and to ensure product quality.
37. Nickel used for painting the other metals.
38. Nickel-chromium alloys are used in heating coils and electric furnaces.
39. Nickel is used as a catalyst like in oils hydrogenation process.
40. Zinc is used to galvanize other metals. .
41. The elements of the first transition series are used to form substitutional alloys.
42. The overall change in the atomic radii along the transition series is not large and there are great similarities in the atomic radii from chromium to copper.

43. Transition metals and many of their compounds show paramagnetic behaviour.
44. Transition metal ions are generally coloured.
45. 3d series transition metals exhibit +2 as the most common oxidation state.
46. Copper is regarded as a transition metal in spite of having completely filled lid" oritals (d^{10}).
47. Copper is used in electric cables and coins industry.
48. Iron compounds are paramagnetic and coloured.
49. d-block elements form ten vertical columns.
50. The elements of the first transition series are characterized by the variety of its chemical reactivity.
51. Only transition elements with unpaired electrons have paramagnetic property.

Explain why these statements are not correct:

1. The stable scandium ion is Sc^{2+}
2. All diamagnetic substances are coloured.
3. The transition element shows colour, when "d" orbitals are either empty or completely filled
4. The great similarity in the properties of the iron group (iron, cobalt, nickel) is due to the graduation of their radii. .

Various questions :

1. Which of the following elements tends to for the oxide M_2O_3 ? ($_{25}Mn$ - $_{24}Cr$ - $_{23}V$). Give reason.
2. Which of the following elements forms with chlorine the compound MCl_4 ? ($_{22}Ti$ - $_{26}Fe$ - $_{29}Cu$). Give reason.
3. Starting the fourth period in the periodic table, the transition elements appear:
   (a) Show the number of the two groups, where the transition elements located between them.
   (b) State three properties of the transition elements, giving an example for each one.
4. Potassium is a representative element, while nickel is a transition element:
   (a) State only a property which is similar in both of potassium and nickel.
   (b) State two properties which are different in both of the two elements.
5. Compare between :
   (a) The graduation of the atomic radii in the fourth period related to the elements of (A) and (B) groups.
   (b) The paramagnetic and the diamagnetic substances.
6. Matching:
   Match the items of column (A) and column (B) in the following questions :

(1) Match the catalyst given in column (A) with the process given in column (B) :

Column (A) (catalyst)	Column (B) (process)
(i) Divided nickel (ii) Divided iron (iii) Vanadium pentoxide (iv) Manganese dioxide	(a) Conversion of water gas into liquid fuel. (b) Decomposition of hydrogen peroxide. (c) Hydrogenation of vegetable oils. (d) Manufacturing of H2SO4 (e) Sandmeyer reaction.

(2) Match the properties given in column (A) with the metal given in column (B):

Column (A) (property)	Column (B) (Metal)
(i) An element which can show up to +7 oxidation state (ii) The most reactive 3d-element (iii) 3d-transition element with the highest density (iv) 3d-block element has a diamagnetic property	(a) Sc (b) Cu (c) Zn (d) Fe (e) Mn

(3) Match the Statement give in column (A) with the oxidation states given in column (B)

Column (A) (Statements)	Column (B) (Oxidation states)
(i) Oxidation state of Mn in MnO_2 is. (ii) Most stable oxidation state of Ni is. (iii) Most stable oxidation state of Fe is (iv) The highest oxidation state of Mn is (v) The highest oxidation state of Cr is	(a) + 2 (b) + 3 (c) + 4 (d) +5 (e) +6 (f) +7