Homework
Lesson 3

General properties of transition elements:

1) All the following are properties of Titanium except:

(Exp. Model 2025)

a) Can form different oxides as TiO, Ti_2O_3 and TiO_2
b) Rigid and strong metal with low density
c) Does not cause any poisoning effect when implanted in the body
d) Its melting point is lower than Aluminum

2) The atomic radii of d-block elements from chromium to copper are relatively constant. Which of the following causes this phenomenon?

(Exp. Model 2025)

a) Electrons filling the 3d orbital
b) Increasing nuclear charge
c) Greater repulsion between 3d electrons
d) Answers (b) and (c) are correct.

3) An element of the first transition series, considered as a Para magnetic element, has the highest density, one of its compounds is used in:

(Exp. Model 2025)

a) Detecting malignant tumors
b) Galvanizing metals
c) Sunscreen products
d) Glucose detection

4) Which of the following is correct regarding the properties of the followin transition elements? $_{21}Sc$, $_{24}Cr$, $_{26}Fe$, $_{28}Ni$: **(Exp. Model 2025**

a) Ni has the highest atomic mass
b) Fe has the highest density
c) Cr has the lowest melting point
d) Sc is the least reactive

5) The five elements are from the first transition series, if you know that element (B) has higher atomic number than element (A).

The element symbol	A	B	C	D	E
The number of single electrons in 3d of atomic state	0	0	1	4	5

1) The element which is located within the elements of group IIIB is
a) A
b) B
c) C
d) D

2) The group which contains the element (D) is .....
a) IVB
b) VIB
c) VIIB
d) VIII

3) The general electronic configuration of the column contains the element (A) is .....
a) $4s^1, 3d^{10}$
b) $4s^1, 3d^9$
c) $ns^1, (n-1)d^{10}$
d) $ns^1, (n-1)d^9$

4) Which ions have electronic structure ends with $3d^5$?
a) A^{+2}/B^{+2}
b) D^{+3}/C^{+2}
c) D^{+2}/E^{+2}
d) D^{+3}/E^{+2}

6) The density for the first four successive elements (X, Y, Z & M) in transition series are 7.2, 3.1, 4.4, 6 g/cm³ (not respectively), so which of the following is correct ?

a) density of Z = 6 g/cm³
b) graduation of density for these 4 elements explained by increasing both atomic masses & atomic volume by increasing their atomic number
c) (Z & M) are the best from them to be used in making aeroplane body
d) element with density 7.2 g/cm³ is the smallest atomic mass of them

14) The electronic configuration for the cations of elements (X, Y & Z) in their compounds as shown in the table:

Compound	The electronic configuration of the cations
XO	$[_{18}Ar], 3d^5$
YO_2	$[_{18}Ar], 3d^5$
Z_2O_3	$[_{18}Ar], 3d^5$

The correct arrangement for these elements according to the effective nuclear charge is .....

a) X < Y < Z
b) Y < X < Z
c) X < Z < Y
d) Z < X < Y

15) The following figure represents section of the fourth period of d-block which shows 5 successive elements

If you know that element E show abnormality in its atomic mass.

A	B	C	D	E

Which element have anomalous electronic configuration?

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

16) Consecutive elements lie in the first transition series has symbols A, B, C
A<B<C in atomic radius, C < B < A in density
So correct choice that represents the symbols is

Choices	A	B	C
a)	vanadium	Chromium	manganese
b)	Iron	Cobalt	Nickel
c)	Chromium	Vanadium	Titanium
d)	cobalt	Nickel	Copper

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7) The following table shows the atomic mass estimated in(u) of eight of the first transition series elements:

Which of these elements is nickel?

Element	(W)	(X)					(Y)	(Z)
Atomic mass (u)	47.867	50.942	51.996	54.938	55.845	58.933	58.693	63.564

a) W
b) X
c) Y
d) Z

8) The atomic mass of the heaviest nickel isotope is ..... 58.7u.

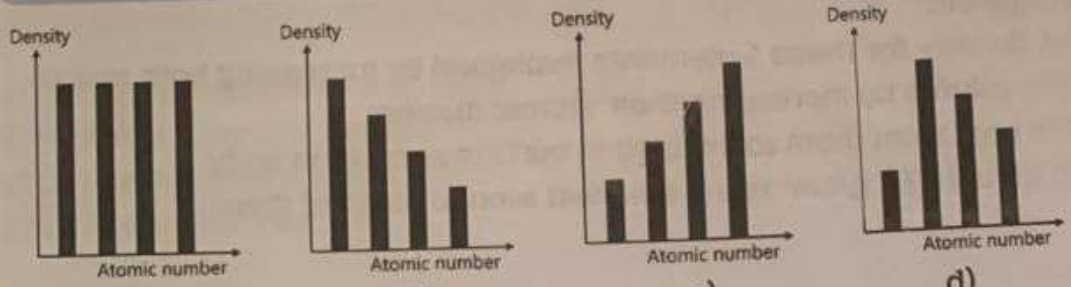
a) more than
b) less than
c) equals
d) slightly less than

9) The following sentences express properties of some elements in the first transition series. Which one represents the element of the highest density?

(Experimental model 2023)

a) has lower atomic mass than its proceeding element
b) has greatest magnetic moment in its atomic state
c) its ion is hardly reduced from +3 to +2
d) the biggest atomic size in the first transition series

10) The correct graphical representation that represents a relation between density and atomic number for first transition series elements



a) b) c) d)

1 Transition Elements

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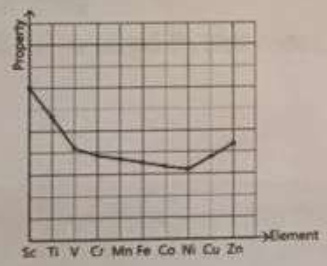
17) The transition element which is chemically active and contains one unpaired electrons in atomic state..... (2nd session 2021)

a) Ti
b) Fe
c) Cu
d) Sc

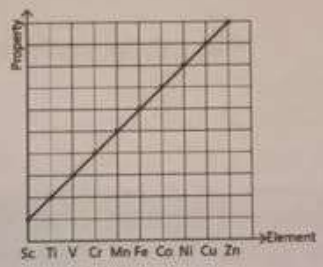
18) In which of the following equations does metal (M) refers to scandium?

a) $FeO_{(s)} + M_{(s)} \rightarrow Fe_{(s)} + MO_{(s)}$
b) $2M_{(s)} + 6H_2O_{(l)} \rightarrow 2M(OH)_{3(aq)} + 3H_{2(g)}$
c) $M_{(s)} + H_2SO_{4(aq)} \rightarrow MSO_{4(aq)} + H_{2(g)}$
d) $2M_{(s)} + O_{2(g)} \rightarrow 2MO_{(s)}$

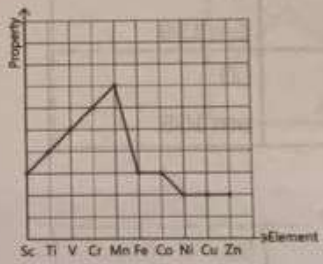
19) The following graphical figures represents the graduation in three properties of the elements of the first transition series



(1)



(2)



(3)

Which of the following determines the property whose graduation is represented by each of the three graphical figures?

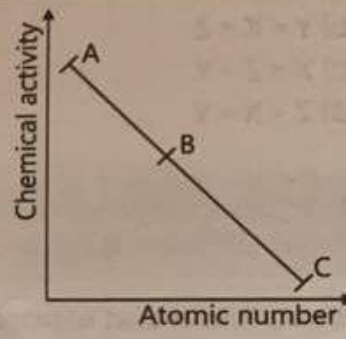
Choices	Graduation of the atomic radius property	Graduation of the effective nuclear charge property	Graduation of highest common oxidation state property
a)	1	2	3
b)	3	2	1
c)	1	3	2
d)	2	1	3

11) If you Know density of vanadium is 6.07g/cm³ and density of cobalt is 8.7g/cm³ so density of manganese is ..... g/cm³

a) 3.1
b) 8.92
c) 7.21
d) 8.7

12) The figure shows the most active and the least active 3d elements, if the element (B) gets rusted in humid air.
Which of the following shows chromium density position compared to the three metals?

a) (A) < (Cr) < (B) < (C)
b) (C) < (B) < (Cr) < (A)
c) (C) < (Cr) < (B) > (A)
d) (B) < (Cr) < (A) < (C)



13) By studying the corresponding table, the correct order of the elements (Z, Y and X) in order of density:

The following table: **(Exp. Model 2025)**

Electronic structure	Ion symbol
[Ar], $3d^2$	X^{+2}
[Ar], $3d^4$	Y^{+3}
[Ar], $3d^6$	Z^{+3}

a) X > Y > Z
b) Z > Y > X
c) Y > X > Z
d) X > Z > Y

1 Transition Elements

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20) Which of the following choices represents the radii of four transition elements (W), (X), (Y) & (Z) lie in the first and the second transition series in two successive groups in the periodic table?

a)

(W) pm 139	(X) pm 140
(Y) pm 158	(Z) pm 172

b)

(W) pm 172	(X) pm 158
(Y) pm 140	(Z) pm 139

c)

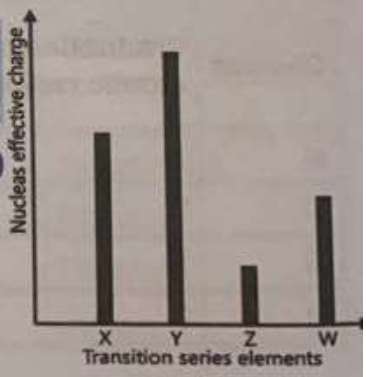
(W) pm 140	(X) pm 139
(Y) pm 172	(Z) pm 158

d)

(W) pm 158	(X) pm 172
(Y) pm 139	(Z) pm 140

21) From the opposite graph:
Which of the following choices is correct?

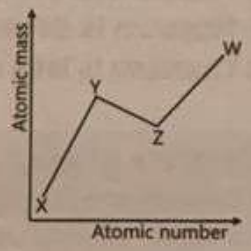
(1st session 2023)



a) element Z is less dense than element W
b) element Y is less dense than element Z
c) element W has higher ionization potential than element X
d) element X has higher ionization potential than element Y

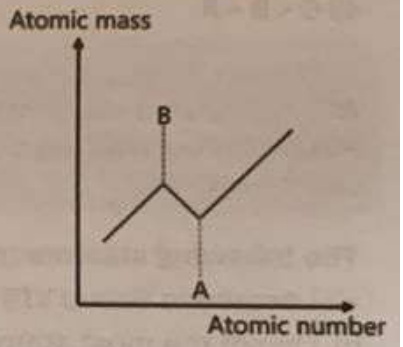
22) The following graph illustrates the relation between the atomic mass of four successive transition elements (X, Y, Z & W) and their atomic numbers. which of the following is incorrect about these elements.....

a) X, Y and Z found in the same group in periodic table
b) $X + WSO_4 \rightarrow W + XSO_4$
c) Y, Z and W found in the same group in periodic table
d) $W + XSO_4 \rightarrow$ no reaction



23) Which of the following is correct, if (A) and (B) are consecutive in the atomic number?

a) The ratio between density of (A) to density of (B) is less than 1
b) The magnetic moment of (A) < (B) in atomic state
c) (A) is used in the manufacture of magnets and leather tanning
d) (B) is used in the manufacture of dry cell



24) Element (M) has two oxidation states in which it is diamagnetic in the lower state and paramagnetic in the higher state, and element (Q) has a single oxidation state in which it is diamagnetic and in the atomic state paramagnetic. Which of the following statements is true?

(Exp. Model 2025)

a) Element M is more active and more dense than element Q
b) Element M is less active and more dense than element Q
c) Element M is more active and less dense than element Q
d) Element M is less active and less dense than element Q

38) An element has magnetic moment which measured by 3 unpaired electrons in its oxide formula X_2O_3, the atomic number of the elements equals.....

a) 26
b) 25
c) 24
d) 23

39) .....of 3+ ion of an element in group VIIB is ..... than that of the ion 3+ of an element of group IIIB.

a) magnetic moment / more
b) magnetic moment / less
c) atomic radius / bigger
d) density / lower

40) (A, B & C) are three successive elements in period 4 in periodic table as (C) only is a main transition element, so magnetic moment of (C) in its Atom is measured by..... unpaired electrons

a) 4
b) 3
c) 2
d) 1

41) (X, Y & Z) are three ordered but not successive elements in 1st transition series if you know that
-(X) has only one oxidation state
-(Y) has highest oxidation state
-(Z) has lowest oxidation state
Which of the following is more attracted to magnets?

a) X_2O_3
b) Y_2O_3
c) Z_2O_3
d) ZO

1 Transition Elements

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25) Which of the following statements compare between two d-block elements is correct: (Exp. Model 2025)

a) Titanium is denser than Nickel but has a smaller atomic radius.
b) Titanium is less dense than Nickel but has a larger atomic radius.
c) Titanium is denser than Nickel and has a larger atomic radius.
d) Titanium is less dense than Nickel and has a smaller atomic radius.

26) (A, B & C) are 3 successive elements in the 1st transition series & the three elements are found in the same group so, their order according to magnetic moment in oxidation state +2 is .....

a) A < B < C
b) B < C < A
c) B < A < C
d) C < B < A

27) Transition element X from the first transition series reaches its maximum oxidation state when it loses 3 electrons from the 3d sublevel which one of.

The following statements is true about element X:

a) Located in Group VIB of the periodic table.
b) One of the most abundant 3d elements in the Earth's crust.
c) Equal to cobalt in its magnetic moment.
d) no correct answer

28) Three elements from the first transition series are [X, Y, Z], where:

- **Element (X) has an oxidation state greater than its group number.**
- **Element (Y) is the most chemically active element in the series.**
- **Element (Z) is a non-transition element.**

Which of the following is correct? (Exp. Model 2025)

a) Element (X) react with dilute HCl acid.
b) Element (Z) is used to protect metals from corrosion.
c) Element (Y) does not react with water.
d) One alloy of element (X) is used in heating coils.

34) Which one of the following pairs is paramagnetic?

(Exp. Model 2025)

a) $_{30}Zn^{+2}$ and $_{26}Fe^{+2}$
b) $_{21}Sc^{+3}$ and $_{26}Fe^{+2}$
c) $_{30}Zn^{+2}$ and $_{24}Cr^{+2}$
d) $_{26}Fe^{+2}$ and $_{24}Cr^{+2}$

35) The correct arrangement to the cations of following compounds according to their magnetic moment is .....

a) $ZnSO_4 < FeCl_2 < CoCl_2 < Fe_2(SO_4)_3$
b) $ZnSO_4 < CoCl_2 < FeCl_2 < Fe_2(SO_4)_3$
c) $Fe_2(SO_4)_3 < FeCl_2 < CoCl_2 < ZnSO_4$
d) $CoCl_2 < FeCl_2 < Fe_2(SO_4)_3 < ZnSO_4$

36) (A), (B) and (C) are three successive transition elements found at the first transition series where element A has only one oxidation state, they form the following compounds AX_3, BX_2, CX_2, the correct arrangement of their ions according to their magnetic moment is .....

a) $C^{2+} > B^{2+} > A^{3+}$
b) $A^{3+} > B^{2+} > C^{2+}$
c) $C^{2+} > A^{3+} > B^{2+}$
d) $A^{3+} > C^{2+} > B^{2+}$

37) Elements (Z, Y, X) are successive transition elements in the first transition series and the largest in atomic number (X) and have the following compounds Z_2O_5, $K_2Y_2O_7$, KXO_4
The correct order of the elements according to their magnetic moment is:

(Exp. Model 2025

a) Y>X>Z
b) X>Z>Y
c) X>Y>Z
d) Y>Z>X

29) Which of the following compounds attracted to external magnetic field?

(1st session 2022)

a) $ScCl_3$
b) Ni_2O_3
c) TiO_2
d) $Zncl_2$

30) Which of the following repels an external magnetic field?

a) $_{21}Sc^{3+}$
b) $_{27}Co^{2+}$
c) $_{25}Mn^{3+}$
d) $_{23}V^{2+}$

31) All of the following elements can form diamagnetic substances except:

(Exp. Model 2025)

a) Titanium
b) Chromium
c) Manganese
d) Iron

32) Manganese has the highest magnetic moment in the .....

a) Compound used as an oxidizing agent in dry cell
b) Compound used as an antiseptic substance and oxidizing agent
c) Compound used as fungicide

33) Two non-consecutive transition elements X and Y can form compounds in which the magnetic moment is zero, and their oxidation numbers are +3 and +2 respectively. The elements X and Y are .... and..... respectively.

a) Fe, Zn
b) Fe, Cu
c) Sc, Cu
d) Sc, Zn

46) Transition element X is found in the 4th period where XCl_3 has magnetic moment equals zero ,the electronic configuration of element which found with X in the same group is periodic table is.....

a) $4s^2, 3d^3$
b) $5s^2, 4d^3$
c) $4s^2, 3d^1$
d) $5s^2, 4d^1$

47) If you have four elements (A), (B), (C) and (D),
element (A) has no colored compounds,
element (B) has an oxide used in manufacture of dyes,
element (C) used in the manufacture of MIG fighter jets,
element (D) has maximum oxidation number in its ion,
so these elements are ..... respectively

a) zinc - vanadium - scandium - manganese
b) manganese - vanadium - titanium – zinc
c) vanadium - zinc - manganese – titanium
d) zinc - manganese – titanium-vanadium

48) All the following represents properties of most of the first transition series elements, Excent .....

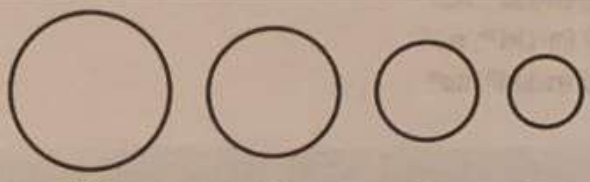
Choices	The property	The reason
a)	Paramagnetic substance	The presence of unpaired electrons in 3d sublevel
b)	Have high densities	Their atomic sizes are constant and their atomic masses are large
c)	Ideal catalysts	The easiness of losing two electrons of 4s sublevel
d)	Have high melting points	Their metallic bonds are strong

52) Which one of the following transition elements has the highest 1st ionization potential?

a) $Sc \rightarrow Sc^{+}$
b) $Co \rightarrow Co^{+}$
c) $Ti \rightarrow Ti^{+}$
d) $V \rightarrow V^{+}$

53) The following figure represents the atomic radii of consecutive elements from the first transition series.
Which of the following is correct?

a) (D) has a higher ionization potential than (A).
b) (A) has a higher density than (D).
c) (B) has a higher effective nuclear charge than (C).
d) (B) has a higher density than (D).



54) The first ionization Potential of titanium is M the following choices represents the 2nd, 3rd, 4th, 5th in a random way, which one of them represents the 5th ionization energy?

a) 2M
b) 6M
c) 15M
d) 50M

55) Which of the following ions is more stable in aqueous solutions?

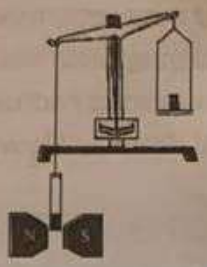
a) Mn^{3+}
b) Cr^{6+}
c) V^{2+}
d) Ti^{2+}

42) Element (X) from the 1st transition series but its density is lower than most of elements in this series. If this element can form with chlorine only these compounds XCl_2, XCl_3 & XCl_4 so atomic number of (X) is .....

a) 28
b) 22
c) 24
d) 27

43) Which of the following options indicates the substance inside the tube?

a) $ZnSO_4$
b) Sc_2O_3
c) V_2O_5
d) $CrCl_3$



44) A, B and C are 3 successive transition elements located in the first transition series, element (C) violates Aufbau's Principle then solution of ..... does not attracted to external magnetic field.

a) A^{4+} only
b) C^{2+} only
c) B^{5+} only
d) Both a and c are correct

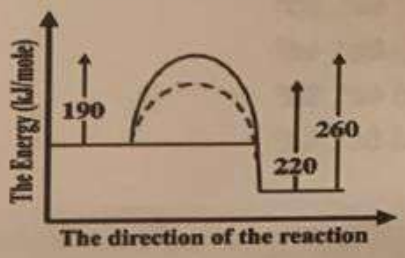
45) (A) is a transition element found in the 4th period where A^{+2} contains two unpaired electrons in d-sublevel and AO_2 is paramagnetic substance. The group which contains the element A is .....

a) IB
b) IIB
c) VIII
d) IVB

49) The opposite diagram shows the activation energy before and after using transition element as a catalyst. Answer the following questions.

1) What is the value of activation energy without using catalyst?

a) 220
b) 190
c) 150
d) 260

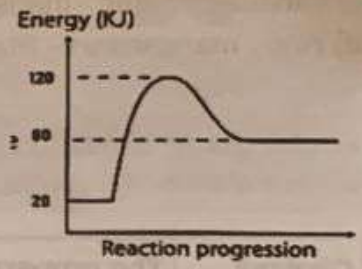


2) What is the value of activation energy after using catalyst?

a) 220
b) 190
c) 150
d) 260

50) The opposite graph represents uncatalyzed reaction: which of the following is correct if the reaction is catalyzed and the catalyst saves 20 KJ?

a) activation energy without catalyst is 120 KJ/mol
b) The released energy = 60 KJ/mol
c) ΔH decreased by 20 KJ/mol
d) The activation energy with catalyst is 80 KJ/mol



51) Ozone (O_3) decomposes in three steps in the presence of a catalyst, the catalyst being.....

- First step: O_3 + sunlight → O_2 + O
- Second step: O_3 + NO → NO_2 + O_2
- Third step: NO_2 + O → NO + NO_2

a) Sunlight
b) O_2
c) NO_2
d) NO

66) Two successive elements (X & Y) from first transition series, if atomic radius of (X) is smaller than the previous elements and nearly equal to the following elements
Write the formula of its diamagnetic compounds with oxygen.

.....
.....
.....

67) Through the following compounds [VCl_5 – $CuSO_4$ – $Fe_2(SO_4)_3$ – $CrCl_3$]
Which of the previous compounds represents a substance:

(1st session 2024)

a) Diamagnetic
.....

b) Its solution is colored and has the least magnetic moment
.....

c) Its solution is colored and has the highest magnetic moment
.....

d) Paramagnetic and its solution is green
.....

68) Choose from the following compounds:

Cu_2Cl_2, $ScCl_3$, $FeCl_3$, $ZnCl_2$

(Exp. Model 2025)

a) Compound has paramagnetic properties
.....
.....

b) A compound of a non-transition element
.....
.....

c) A compound of transition element whose cation's oxidation state matches its group number
.....
.....

d) A compound of transition element has one oxidation state
.....
.....

56) The transition element, used in process of metal plating due to passivity, the electronic configuration of its ion (M^{3+}) is .....

a) $[_{18}Ar], 3d^4$
b) $[_{18}Ar], 3d^3$
c) $[_{18}Ar], 4s^2, 3d^4$
d) $[_{18}Ar], 4s^1, 3d^5$

57) Which of the following electronic configuration belongs to the element which can have the highest oxidation state?

a) $(n-1)d^3, ns^2$
b) $(n-1)d^5, ns^1$
c) $(n-1)d^{10}, ns^2$
d) $(n-1)d^5, ns^2$

58) Element W from the first transition series elements is lowest in mass and higher in density than the element before it in the series, what is the electronic configuration for W^{3+} ion? .....

a) $[Ar], 3d^7$
b) $[Ar], 3d^4$
c) $[Ar], 3d^5$
d) $[Ar], 3d^6$

59) The least dense element from the first transition series and the highest in boiling point is used in .....

a) tanning leathers
b) manufacture of heating coils
c) manufacture of railway tracks
d) manufacture of military aircraft structure

60) Fischer-Tropsch method uses element (Y) as a catalyst so which of the following is more attracted to external magnetic field?

a) Y_2O_3
b) YSO_4
c) $Y(SO_4)_3$
d) YCl_2

61) Compound of transition element (X) is used as fungicide, and it has the highest oxidation state in the first transition series, so the magnetic property of the element after it in atomic state is...

a) Paramagnetic, and its magnetic moment equals 4
b) Diamagnetic, and its magnetic moment equals 4
c) Paramagnetic, and its magnetic moment equals 5
d) Diamagnetic, and its magnetic moment equals 5

62) The element (X) from d-block which is used in galvanization of iron .....

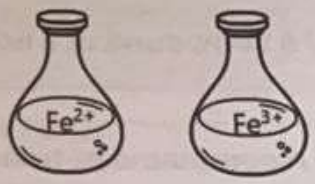
a) is a transition element
b) is colored at oxidation state 2+
c) can form XCl
d) none of the above

63) $_{30}Zn$ & $_{29}Cu$ are different in all the following except:

a) period number & series number in periodic table
b) both have unexpected electronic configuration
c) both are attracted to magnet in oxidation state +2
d) they are considered as a transition element

64) In the figure, by leaving the two solutions in air for a period of time, it was noticed that one of them changed and became the same color of the other which one is changed?

a) Fe^{2+} changed into Fe^{3+}
b) Fe^{3+} changed into Fe^{2+}
c) a & b are correct
d) no correct answer



65) (A, B, X, Y) are in the second transition series, which the 4d sublevel in both ACl_6 & BO_3 is empty,
while the 4d sublevel in both XCl & YO is completely filled so what is the atomic numbers of four elements?

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