



INDIAN SCHOOL AL WADI AL KABIR

Class: XII	DEPARTMENT: SCIENCE (2020-21) SUBJECT: CHEMISTRY	Date of completion: IV week of October, 2020
Worksheet No:11 with answers	TOPIC: THE d- AND f-BLOCK ELEMENTS	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

MULTIPLE CHOICE QUESTIONS

- Which of the following is not a transition metal?
a) Sc b) Cr c) Cu d) Zn
- In 3d series, the element with highest melting point is
a) Mn b) Zn c) Cr d) Fe
- In 3d series, the element with lowest enthalpy of atomization is
a) Zn b) Sc c) Cu d) Ni
- Identify the correct statement from the following:
a) In 3d series, atomic radius decreases from Sc to Zn.
b) In 3d series, atomic radius increases from Sc to Zn.
c) In 3d series, atomic radius decreases from Sc to Ni and then increases.
d) In 3d series, atomic radius increases from Sc to Ni and then decreases.
- Which of the following elements has maximum density?
a) Sc b) Ti c) V d) Cr
- Name a transition element which does not exhibit variable oxidation states.
a) Copper b) Scandium c) Nickel d) Iron
- Identify the wrong statement from the following
a) Cr^{2+} is an oxidizing agent
b) Mn^{3+} is an oxidizing agent
c) Both Cr^{2+} and Mn^{3+} ions have d^4 configuration
d) Third ionization energy of Mn is relatively high.
- The spin only magnetic moment of Ni^{2+} ion is
a) 3.9 BM b) 2.8 BM c) 1.7 BM d) 8.9 BM
- Which of the following ion is colourless in aqueous solution?
a) Sc^{3+} b) Ti^{2+} c) V^{4+} d) Cr^{2+}
- The number of unpaired electrons present in Cu^+ is
a) 0 b) 1 c) 2 d) 3

Read the given passage and answer the questions that follow:

Nearly all the transition elements display typical metallic properties such as high tensile strength, ductility malleability, high thermal and electrical conductivity and metallic lustre. With the exceptions of Zn, Cd, Hg and Mn, they have one or more typical metallic structures at normal temperatures. The transition metals are very much hard and have low volatility. Their melting and boiling points are high.

11. Zinc is not considered as a transition element. Why?
12. The enthalpy of atomization of zinc is very low. Why?
13. Third ionization enthalpy of Zn is quite high. Give reason.

Assertion and Reason Type

14. Assertion: Scandium is considered as a transition element.
Reason: Sc atom has completely filled d orbitals ($3d^{10}$) in its ground state as well as in its oxidized state.
 - a) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
 - b) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.
 - c) Assertion is correct, but reason is wrong statement.
 - d) Assertion is wrong, but reason is correct statement.
15. Assertion: Cu cannot liberate hydrogen from acids.
Reason: Copper has positive electrode potential
 - a) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
 - b) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.
 - c) Assertion is correct, but reason is wrong statement.
 - d) Assertion is wrong, but reason is correct statement.
16. Assertion: In 3d series, density increases from titanium to copper.
Reason: In general, transition metals contain unpaired electrons.
 - a) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion.
 - b) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion.
 - c) Assertion is correct, but reason is wrong statement.
 - d) Assertion is wrong, but reason is correct statement.

Question – Answer Type:

17. Transition metals form complex compounds. Why? 1
18. Write one difference between transition elements and p-block elements with reference to variability of oxidation states. 1
19. Name an element of lanthanoid series which is well known to shown +4 oxidation state. Is it a strong oxidising agent or reducing agent? 1
20. What is lanthanoid contraction? Write its one consequence. 2
21. Give reasons for the following: 2
- (i) Transition elements and their compounds act as catalysts
- (ii) E^0 value for $(\text{Mn}^{2+}/\text{Mn})$ is negative whereas for $(\text{Cu}^{2+}/\text{Cu})$ is positive.
22. Complete the following reactions: 2
- i) $2\text{Cu}^{2+} + 4\text{I}^- \rightarrow$
- ii) $2\text{Cr}^{2+}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow$
23. Use the data to answer the following and also justify giving reason : 2
- | | Cr | Mn | Fe | Co |
|-------------------------------------|--------|--------|--------|--------|
| $E^0_{\text{M}^{2+}/\text{M}}$ | - 0.91 | - 1.18 | - 0.44 | - 0.28 |
| $E^0_{\text{M}^{3+}/\text{M}^{2+}}$ | - 0.41 | + 1.57 | + 0.77 | + 1.97 |
- (a) Which is a stronger reducing agent in aqueous medium, Cr^{2+} or Fe^{2+} and why ?
- (b) Which is the most stable ion in +2 oxidation and why ?
24. Answer the following: 3
- (a) The only oxidation state shown by Scandium is +3. Why?
- (b) MnO is basic while Mn_2O_7 is acidic. Give reason.
- (c) What is the general electronic configuration of lanthanoids?
25. Account for the following : 3
- (i) Manganese shows maximum number of oxidation states in 3d series.
- (ii) E^0 value for $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is much more positive than that for $\text{Cr}^{3+}/\text{Cr}^{2+}$.
- (iii) Ti^{4+} is colourless whereas V^{4+} is coloured in an aqueous solution.

ANSWERS

1.	d
2.	c
3.	a
4.	c
5.	d
6.	b
7.	a
8.	b
9.	a
10.	a
11.	Zinc atom has completely filled d orbitals ($3d^{10}$) in its ground state as well as in its oxidised state, hence it is not regarded as a transition element.
12.	Zinc does not contain unpaired electrons. Therefore, weak metallic bonding.
13.	In Zn, third electron has to be removed from more stable d^{10} configuration.
14.	c) Assertion is correct, but reason is wrong statement.
15.	a) Both assertion and reason are correct statements, and reason is the correct explanation of the assertion
16.	b) Both assertion and reason are correct statements, but reason is not the correct explanation of the assertion
17.	Due to small size, high ionic charge and availability of d-orbital.
18.	Transition elements show variable oxidation states that differ by 1 unit whereas p-block elements it differs by 2 units. Heavier transition elements are stable in higher oxidation state whereas p-block elements are stable in lower oxidation state.
19.	Cerium / Terbium; Oxidizing agent
20.	Steady decrease in atomic radii with increase in atomic number due to poor shielding effect of 4f orbital electrons is called lanthanoid contraction. Consequence: 5d series have almost same size as 4d series.
21.	i) Due to variable oxidation state and ability to form multiple oxidation states. ii) Mn^{2+} is stable due to exactly half filled $3d^5$ configuration. Due to high $\Delta_a H^\theta$ and low $\Delta_{hyd} H^\theta$ for Cu^{2+} / Cu is positive.
22.	i) $2Cu^{2+} + 4I^- \rightarrow Cu_2I_2(s) + I_2$ ii) $2Cr^{2+}(aq) + 2H^+(aq) \rightarrow 2Cr^{3+}(aq) + H_2(g)$
23.	(a) Cr^{2+} , due to lower standard reduction potential (E^θ). (b) Mn^{2+} , due to highest negative standard reduction potential.

24.	<p>a) At +3 state, stable d^0 configuration is obtained.</p> <p>b) MnO has Mn in +2 oxidation State, Mn_2O_7 has Mn in +7 Oxidation state. Higher the oxidation state, higher is the acidic character.</p> <p>c) $4f^{1-14} 5d^{0-1} 6s^2$</p>
25.	<p>i) Due to the presence of maximum no. of unpaired electrons.</p> <p>ii) Cr is more stable in +3 oxidation state due to stable half filled t_{2g} configuration whereas Mn is more stable +2 oxidation state due to half filled $3d^5$ configuration.</p> <p>iii) Due to the presence of one unpaired electron in V^{4+} whereas there is no unpaired electron in Ti^{4+}</p>

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