

QB365 Question Bank Software

12th Chemistry CBSE Case Study Questions The d- and f- Block Elements For - 2024

12th Standard

Chemistry

SECTION - A

2 x 4 = 8

1) Read the passage given below and answer the following questions:

Transition elements are elements that have partially filled d-orbitals. The configuration of these elements corresponds to $(n - 1)d^{1-10} ns^{1-2}$. It is important to note that the elements mercury, cadmium and zinc (Ire not considered transition elements because of their electronic configurations, which corresponds to $(n - 1)d^{1-10} ns^2$.

Some general properties of transition elements are :

These elements can form coloured compounds and ions due to d-d transition;

These elements exhibit many oxidation states;

A large variety of ligands can bind themselves to these elements, due to this, a wide variety of stable complexes formed by these ions. The boiling and melting point of these elements are high. These elements have a large ratio of charge to the radius.

In these questions (i-iv), a statement of assertion followed by a statement of reason is given.

Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) **Assertion:** Tungsten has very high melting point.

Reason: Tungsten is a covalent compound.

(ii) **Assertion:** Zn, Cd and Hg are normally not considered transition metals.

Reason: d-Orbitals in Zn, Cd and Hg elements are completely filled, hence these metals do not show the general characteristics properties of the transition elements.

(iii) **Assertion:** Copper metal gets readily corroded in acidic aqueous solution such as HCl and dil. H_2SO_4

Reason: Free energy change for this process is positive.

(iv) **Assertion:** Tailing of mercury occurs on passing ozone through it.

Reason: Due to oxidation of mercury.

Answer : (i) (c) :Tungsten is a transition element and is very hard due to high metallic bonding.

(ii) (a)

(iii) (d): Non-oxidising acids (HCl and dil. H_2SO_4) do not have any effect on copper. However they dissolve the metal in presence of air. As it is a non-spontaneous process so, ΔG cannot be -ve.

(iv) (a): When mercury is exposed to ozone it gets superficially oxidised and loses its meniscus and sticks to the glass.

2) The d-block of the periodic table contains the elements of the groups 3 to 12 and are known as transition elements. In general, the electronic configuration of these elements is

$(n - 1)d^{1-10} ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e. 3d, 4d and 5d series. However Zn, Cd and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation stables, complex formation, formation of coloured ions, alloys, catalytic activity etc. Transition metals are hard (except Zn, Cd and Hg) and have a high melting point.

(a) Why are Zn, Cd and Hg non-transition elements?

(b) Which transition metal of 3d series does not show variable oxidation state?

- (c) Why do transition metals and their compounds show catalytic activity?
(d) Why are melting points of transition metals high?
(e) Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution?

Answer : (a) It is because neither they nor their ions have incompletely filled d-orbitals.

(b) Scandium (Sc) and Zinc (Zn).

(c) It is because they show variable oxidation state, can form intermediate complexes and have large surface area for adsorption of gases.

(d) It is due to strong interatomic forces of attraction due to presence of unpaired electrons.

(e) It is because Cu^{2+} has one unpaired electron and undergoes d-d transition by absorbing light from visible region and radiate blue colour, where as Zn^{2+} is colourless due to absence of unpaired electron.