



DPP-3 Solution [Application of Electrochemical Series]

Chapter: Electrochemistry

“If you are here after honestly trying, you are already ahead of most students. Now don't just check the answer — understand the thinking. – Weird Chemist”

TYPE-1: Oxidizing & Reducing Agents

Solution 1

Explanation

For M^{3+}/M^{2+} couple, easiest oxidation from +2 to +3 means lowest (most negative) E° value. Cr has $E^\circ = -0.41$ V (most negative).

Approach

Think: More negative $E^\circ =$ easier oxidation (like rolling downhill).

Answer

(1) Cr

Solution 2

Explanation

Reducing power is inversely related to reduction potential. Lower $E^\circ =$ Higher reducing power. B: -2.50 V (most negative), C: 0.50 V, A: 0.68 V

Approach

More negative = better electron donor. Order: $B > C > A$

Answer

(4) $B > C > A$

Solution 3

Explanation

Reducing power of metals: $Y (-3.303 \text{ V}) > Z (-1.18 \text{ V}) > X (0.52 \text{ V})$

Approach

Most negative potential = strongest reducing metal.

Answer

(1) $Y > Z > X$

Solution 4**Explanation**

K: -2.93 V, Al: -1.66 V, Cr: -0.74 V, Ag: 0.80 V Decreasing reducing power: $K > Al > Cr > Ag$

Approach

Arrange from most negative to most positive.

Answer

(3) $K > Al > Cr > Ag$

Solution 5**Explanation**

B: -3.0 V (strongest), C: -1.2 V, A: $+0.5$ V (weakest)

Approach

B has most negative E° , so highest reducing power.

Answer

(3) $B > C > A$

Solution 6**Explanation**

Strongest reducing agent has most negative E° . Zn: -0.762 V is most negative.

Approach

Zn is most eager to lose electrons (donate them).

Answer

(1) **Zn**

Solution 7**Explanation**

Strongest oxidizing agent (cation) has least negative E° . Mg^{2+} : -2.37 V (least negative among the four)

Approach

Less negative cation = better at accepting electrons.

Answer

(4) Mg^{2+}

Solution 8

Explanation

Convert to reduction potentials: $\text{Fe}^{3+}/\text{Fe}^{2+}$: +0.77 V, $[\text{Fe}(\text{CN})_6]^{3-}/[\text{Fe}(\text{CN})_6]^{4-}$: +0.35 V
Higher reduction potential = stronger oxidizing agent.

Approach

Fe^{3+} has higher E° , so it's the strongest oxidizer.

Answer

(1) Fe^{3+}

Solution 9

Explanation

Lower E° for reduction = stronger reducing agent for the reduced form. Sn^{2+} (from +0.15 V reaction) is stronger reducing agent than Hg_2^{2+} (from +0.92 V).

Approach

Species from lower E° reactions are better electron donors.

Answer

(c) Sn^{2+} is more powerful reducing agent than Hg_2^{2+}

Solution 10

Explanation

F_2/F^- has $E^\circ = +2.87$ V (highest). No chemical substance can oxidize F^- .

Approach

Fluorine is the strongest oxidizing agent - F^- cannot be oxidized chemically.

Answer

(4) No chemical substance

TYPE-2: Displacement Reactions & Activity Series

Solution 11

Explanation

Most reactive metal has most negative E° . A: -3.05 V is most negative.

Approach

More negative = more reactive metal.

Answer

(1) A

Solution 12

Explanation

Zn: -0.76 V (strongest reducer), Cu: 0.34 V, Ag: 0.80 V Zn can reduce both Ag^+ and Cu^{2+} .

Approach

Zn has lowest E° , so it can donate electrons to both.

Answer

(3) Zn can reduce Ag^+ and Cu^{2+}

Solution 13

Explanation

Zn (-0.76 V) is more negative than Fe (-0.44 V), so Zn can reduce Fe^{2+} .

Approach

More reactive metal displaces less reactive one.

Answer

(1) Zn will reduce Fe^{2+}

Solution 14

Explanation

D (-0.402 V) is more negative than A (-0.250 V), so D can displace A.

Approach

More negative metal displaces less negative metal.

Answer**(3) D****Solution 15****Explanation**

Fe (-0.44 V) > Cu ($+0.34\text{ V}$) > Ag ($+0.80\text{ V}$) in reducing power. II: Fe displaces Cu - TRUE
IV: Fe displaces Ag - TRUE

Approach

Fe is most negative, so it can displace both Cu and Ag.

Answer**(3) II and IV****Solution 17****Explanation**

X: -1.46 V , W: -1.24 V , Y: -0.15 V all more negative than Z: $+0.15\text{ V}$ All three can displace Z^{2+} .

Approach

All have lower E° than Z, so all can reduce Z^{2+} .

Answer**(4) All statements are correct****Solution 18****Explanation**

C removes O from XO and YO but not ZO $\rightarrow Z > C$ Y removes O from XO $\rightarrow Y > X$ Order:
 $Z > Y > X$

Approach

More reactive metal retains its oxygen. Z is most reactive.

Answer**(2) ZYX****Solution 20****Explanation**

If x displaces both y and z, then x is most reactive. Option (3) says z displaces x, which contradicts the premise.

Approach

x is most reactive, so z cannot displace x.

Answer

(3) is incorrect

Solution 22

Explanation

Cu turns blue = Cu^{2+} formed = Cu oxidized. Only Ag^+ (+0.80 V) has higher E° than Cu^{2+} (+0.34 V). Reaction: $\text{Cu} + 2\text{Ag}^+ \longrightarrow \text{Cu}^{2+} + 2\text{Ag}$

Approach

Only silver ions can oxidize copper metal.

Answer

(4) AgNO_3

Solution 23

Explanation

Cu (+0.34 V) trying to displace Fe^{2+} (-0.44 V) doesn't work. Cu is less reactive than Fe.

Approach

Cu cannot displace more reactive Fe.

Answer

(3) $\text{Cu} + \text{Fe}^{2+} \longrightarrow \text{Cu}^{2+} + \text{Fe}$

Solution 24

Explanation

Cu (+0.34 V) is less reactive than Fe (-0.44 V). Cu cannot displace Fe from solution. No reaction.

Approach

Less reactive metal cannot displace more reactive one.

Answer

(4) No reaction will take place

Solution 25

Explanation

Al (-1.66 V) is much more reactive than Cu ($+0.34$ V). Cu cannot displace Al from solution.

Approach

Al is way more reactive than Cu. No reaction occurs.

Answer

(4) There is no reaction

Solution 26

Explanation

Fe (-0.44 V) is more reactive than Pb (-0.13 V). Fe reduces Pb^{2+} : $\text{Fe} + \text{Pb}^{2+} \longrightarrow \text{Fe}^{2+} + \text{Pb}$
Result: More Fe^{2+} and more Pb metal.

Approach

Fe dissolves, Pb precipitates.

Answer

(3) More of Pb and Fe^{2+} ions

Solution 27

Explanation

Reaction: $\text{Zn} + \text{Cu}^{2+} \longrightarrow \text{Zn}^{2+} + \text{Cu}$ SO_4^{2-} is spectator ion - doesn't participate. Initial $[\text{SO}_4^{2-}] = 1$ M, remains 1 M.

Approach

Sulfate ions don't react, concentration stays constant.

Answer

(2) 1 M

Solution 28

Explanation

Zn (-0.76 V) can displace: Ag^+ ($+0.80$), Cu^{2+} ($+0.34$), Fe^{2+} (-0.44) Cannot displace: Na^+ (-2.71 V) - Na is more reactive.

Approach

Na is more reactive than Zn, so Zn cannot displace it.

Answer

(4) Na^+

Solution 29**Explanation**

Decreasing order (most positive to most negative): $\text{Zn} (-0.76) > \text{Al} (-1.66) > \text{Ba} (-2.90) > \text{Li} (-3.05)$

Approach

Arrange from least negative to most negative.

Answer

(3) $\text{Zn}, \text{Al}, \text{Ba}, \text{Li}$

Solution 30**Explanation**

To liberate Br_2 from Br^- , need oxidizing agent stronger than Br_2 . $\text{Cl}_2 (+1.36 \text{ V}) > \text{Br}_2 (+1.07 \text{ V})$ Reaction: $\text{Cl}_2 + 2 \text{Br}^- \longrightarrow 2 \text{Cl}^- + \text{Br}_2$

Approach

Halogen hierarchy: Cl is above Br, so Cl_2 oxidizes Br^- .

Answer

(3) Cl_2