Solution:

Cd (149) > Pb (138) > Mo (136) > Ru (134) > Zn (133)

Note units of atomic radii are in pm
Solution:

Ionization Energy: The minimum energy required to remove an electron from the ground state.

Going across the d-block the effective nuclear charge increases therefore it is harder to remove an electron and the ionization energy goes up. However going down a period the effective nuclear charge decreases and the ionization energy also decreases.

Therefore the ionization energy increases from left to right across a period and decreases going down a period.
**Solution:**

Na[CoCl₃(NH₃)₃]

Cation (Na⁺)  
sodium

Anion ([CoCl₃(NH₃)₃]⁻)

The ligands are Cl⁻ and NH₃

Cl⁻ → chloro → (3) → trichloro

NH₃ → ammine → (3) → triammine

triamminetrichloro

[CoCl₃(NH₃)₃]⁻ → Therefore Co has charge of +2 → cobaltate(II)

triamminetrichlorocobaltate(II)

Entire Name: sodium triamminetrichlorocobaltate(II)
Solution:
Potassium hexacyanoferrate(II)
Cation (Potassium)
K⁺
Anion (hexacyanoferrate(II))
Hexacyano: cyano = CN⁻  hexa = 6
Ferrate(II): Fe²⁺
[Fe(CN)₆]⁴⁻
To balance charge 4K⁺ are needed
Entire Formula: K₄[Fe(CN)₆]
Coordination Compounds

Isomers

Solution:

A chiral complex is a complex that is not identical to its mirror image.

1. Rotate mirror image a $\frac{1}{4}$ of a turn and it is identical to its non mirror image.

2. You cannot rotate the mirror images of complexes 2, 3, or 4 so that they are identical to their non mirror image.
**Solution:**

Enantiomeric pairs are a chiral complex and its mirror image.

Need to have the same number and types of ligands.

1. A = 1  
C  
B  
2. A = 2  
B  
C  
D  
3. A = 1  
B  
D  
2  
4. A = 2  
B  
C  
D  

Therefore, only complexes 2 and 4 can be enantiomeric pairs.

2  
A  
B  
C  
D  
4  
A  
B  
C  
D  

Rotate  
Same as mirror image of complex 2

E
The Electronic Structure of Complexes

Crystal Field Theory

Solution:

(a) Strong Field Ligand

\[ \uparrow \uparrow \downarrow \downarrow \]

No Unpaired electrons

(b) Weak Field Ligand

\[ \uparrow \uparrow \uparrow \downarrow \downarrow \]

4 Unpaired electrons
The complex is originally diamagnetic because does not have any unpaired electrons it then changes to paramagnetic because it now has multiple unpaired electrons.