

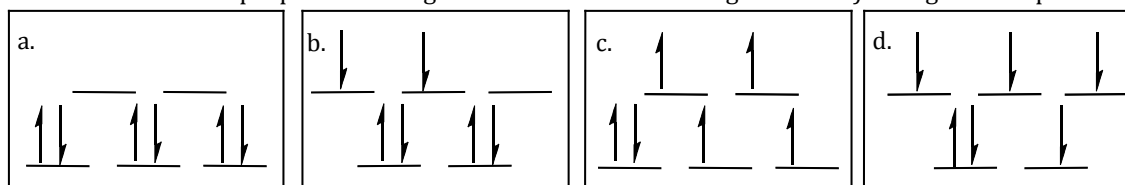
EXAM 4 Answer Key (Ch. 22, 23)

Multiple Choice (3% each)

Please mark the letter of the BEST answer to each question clearly on your answer sheet. Thank you!

- According to your textbook, 99% of the mass of the universe is two elements:
a. H and Fe **b. H and He** c. H and O d. H and Al
- The most abundant **metal** in the earth's **crust** is
a. Fe b. Si c. Ni **d. Al**
- The most mobile (easiest to move from one place to another) form of carbon on earth is
a. coal b. oil c. limestone **d. CO₂**
- When lightning produces nitrogen compounds, in what form do they come to earth when it rains?
a. NO **b. HNO₃** c. NH₃ d. NH₄NO₃
- In which aspect of the earth's systems does phosphorus NOT occur to any significant extent?
a. the hydrosphere b. the lithosphere **c. the atmosphere** d. living things
- In what sequence would the process of extraction and purification of a metal from its ore most likely occur?
a. crushing; flotation; reduction; refining b. reduction; flotation; crushing; refining
c. flotation; crushing; refining; reduction d. refining; crushing; flotation; reduction
- Which metals are most often purified by distillation?
a. Sn and Fe **b. Zn and Hg** c. Al and Na d. K and Ca
- Stainless steels have varying amounts of metals in them, but they always contain _____ and _____ plus Fe.
a. Co ; Cu b. Be ; B c. Mn ; V **d. Cr ; Ni**
- A **Downs Cell** is an electrolytic cell used to produce
a. H₂ and Cl₂ b. NaOH and Cl₂ c. Mg and Cl₂ **d. Na and Cl₂**
- In the operation of a blast furnace to produce Fe, what is the purpose of adding CaO?
a. it is a catalyst b. it removes excess Fe **c. it helps remove Si** d. it lowers the Fe density
- Bauxite, the main ore for Al, is first reacted with _____ to separate the Al from the Fe and Si in the ore.
a. H₂SO₄ **b. NaOH** c. Ca(OH)₂ d. HCl
- Al is often treated to make it less reactive toward other less active metals by what process?
a. painting **b. anodization** c. enameling d. galvanizing
- Mg is often used in alloys with **a. Al** b. Fe c. Cr d. Zn
- Bromine is often used in
a. paints b. fertilizers **c. flame retardants** d. water treatment
- The radioactive isotope of H contains _____ neutrons. a. 1 b. 0 **c. 2** d. 3
- The largest single use of hydrogen commercially is
a. to make NH₃ b. to hydrogenate alkenes c. as a fuel d. to make methanol
- Which elements are most important in chemical fertilizers?
a. N and P b. N and Na c. K and S d. Ca and Mg
- How many d electrons should there be in Cr⁺³ ? a. 4 **b. 3** c. 1 d. 2
- How many **unpaired** d electrons should there be in the Ni⁺³ ion? **a. 3** b. 2 c. 5 d. 4
- The effects of the Lanthanide contraction mean that _____ is almost exactly the same radius as Os.
a. Fe **b. Ru** c. Au d. Pm
- What is the oxidation state of V in VO₂⁺ ? **a. +5** b. +3 c. +1 d. +4
- The compounds and complexes of Zn²⁺ are usually colorless, unless their anions or ligands have a color. Why?
a. Zn²⁺ has a full set of d orbitals b. Zn²⁺ has no p electrons c. Zn²⁺ has no more electrons
- The most common oxidation state for the Lanthanides is a. +2 b. +4 c. +1 **d. +3**
- The members of the Actinides are all radioactive; they have normally last added an electron to their _____ level
a. 8f b. 7f c. 6f **d. 5f**

25. Coordination complexes form when a metal or metal ions reacts with one or more
 a. Lewis acids b. Bronsted-Lowry bases c. Arrhenius acids **d. Lewis bases**
26. EDTA is a hexadentate ligand with a _____ charge a. -3 b. -6 **c. -4** d. -5
27. In the complex $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$ the Co has a +____ charge and the number of counterions present is ____.
 a. 2 ; 1 b. 3 ; 3 c. 2 ; 3 **d. 3 ; 1**
28. The complex species named *triamminetrichloroplatinate(II)* would have the formula
 a. $[(\text{NH}_3)_3\text{Cl}_3\text{Pt}]^{2-}$ b. $[(\text{CH}_3\text{NH}_2)_3\text{Cl}_3\text{Pt}]^{2-}$ **c. $[\text{Pt}(\text{NH}_3)_3\text{Cl}_3]^-$** d. $[\text{Pt}(\text{CH}_3\text{NH}_2)_3\text{Cl}_3]^-$
29. Octahedral complexes can have *cis/trans* isomerism with suitable ligands; it's also possible for ____ geometry
 a. tetrahedral b. trigonal planar c. linear **d. square planar**
30. The hybridization used to explain the bonding in a square planar complex is termed _____ hybridization.
 a. sp^3 **b. dsp^2** c. d^2sp^3 d. dsp^3
31. The orbital diagram from VSEPR hybridization of Fe in $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ predicts _____ unpaired d electrons.
 a. 1 b. 3 c. 5 **d. 0**
32. When we consider the same $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ used in question 31, but now use Crystal Field Theory, we find that it may have either _____ or _____ unpaired electrons, depending upon whether H_2O has a strong field.
 a. 1 ; 5 b. 0 ; 3 **c. 0 ; 4** d. 4 ; 2
33. If we have a strong field ligand, the size of the associated CFSE (Δ) will be _____ than if it is weak field one
a. larger b. smaller
34. Which of these is the proper CFST diagram for the d orbital filling of a *weak field* ligand complex of Ni^{4+} ? **C**



Note that there are no problems on this exam.