

CHEM 261

Class Test

Monday 5 Sept, 2005

Name:

Time allowed: 50 minutes

Total marks: 50

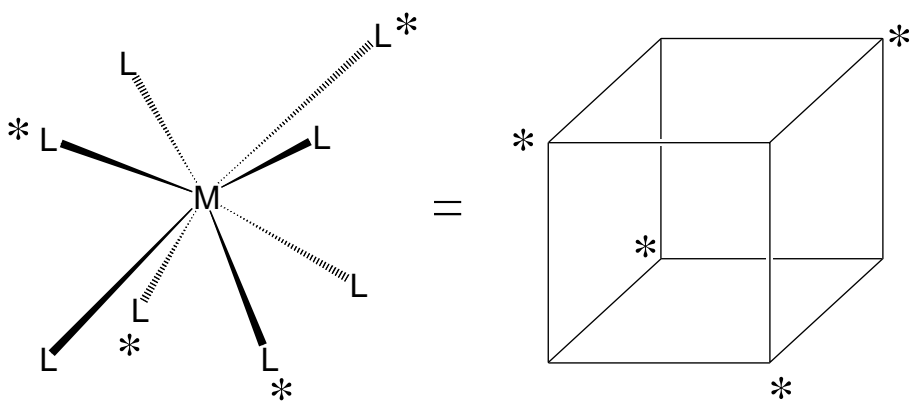
Instructions: Answer **ALL** questions. Use the back of sheets if required.
The number of minutes indicates the time you should spend on a question (e.g. 5 marks = 5 minutes)

Question 1. (10 marks)

- a) Briefly describe what happens during stellar nucleosynthesis. Your answer should explain why high temperatures are required and account for trends in the relative abundance of nuclei of various elements.
- b) How are the nuclei of heavier elements produced?

Question 2 (15 marks)

- a) Show how Crystal Field Theory can be used to develop both a d-orbital energy diagram for an octahedral complex and a modified diagram suitable for a tetragonal complex. Under what circumstances will this kind of distortion be observed?
- b) Some eight-coordinate complexes can be represented by a cube, where the edges of the cube are lines joining adjacent donor atoms. This cube can, in turn, be thought of as two tetrahedra superimposed on one another (the corners of one tetrahedron are marked by asterisks, those of the other are not). Begin with the tetrahedral splitting pattern and explain how you would use it to develop a splitting pattern for a cubic complex.

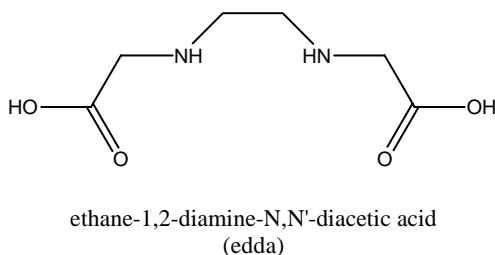
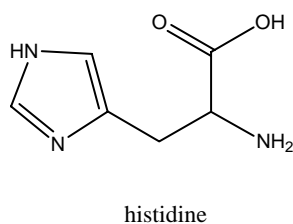
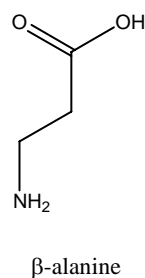
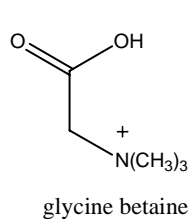
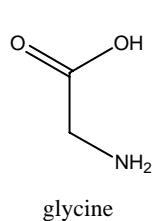


Question 3 (15 marks)

How does a molecular orbital approach (Ligand Field Theory) lead to a better explanation of the order of ligands in the spectrochemical series? Draw appropriate diagrams for an octahedral complex to illustrate your answer and then use the diagrams to explain why complexes of ligands like cyanide are so stable.

Question 4 (10 marks)

Rank the amino acids shown below in order of their ability to form complexes with M^{2+} ions from the first row of the d-block. Explain your answer fully.



END OF PAPER