

MODEL ANSWERS

MAY 2015 EXAMINATION DIET

SCHOOL OF CHEMISTRY

MODULE CODE: CH5517

MODULE TITLE: Advanced Molecular Inorganic Chemistry

EXAM DURATION: 2 Hours

EXAM INSTRUCTIONS (a) Answer **ALL** questions.
(b) Note the distribution of marks within questions.

2. (a) Photoluminescence is the emission observed as a result of excitation of a species due to the absorption of a photon. Electroluminescence is the generation of light in response to an electrical current. Specifically, light is produced when holes and electrons, generated at opposite electrodes, combine to form an exciton, which radiatively decays.
- (b) Acceptable answers include: bioluminescence, chemiluminescence, crystalloluminescence, cathodoluminescence, mechanoluminescence, radioluminescence, sonoluminescence, thermoluminescence. See: http://www.tf.uni-kiel.de/matwis/amat/admat_en/kap_5/advanced/t5_2_4.html

Bookwork, requires understanding of the lectured material

3. (a) Kasha's rule states that emission will occur from the lowest energy excited state.
- (b) The Stokes' shift is the energy difference between the lowest energy absorption maximum and the emission maximum.

Bookwork, requires understanding of the lectured material

- 4 (a) The HOMO must be localized on the quinoxazine ring and the electron withdrawing Br group helps to stabilize the HOMO while the electron donating MeO group helps to destabilize the HOMO.
- (b) Unstructured emission is an indication of a charge-transfer emission. The triplet state should thus be preferentially stabilized in more polar media and a red-shift is predicted (and observed).

- (c) The electron-withdrawing amide groups are removed and so the LUMO is destabilized and the emission is blue-shifted.

Application of course work to an unseen problem Data taken from: *Inorg. Chem.* **2013**, *52*, 448–456