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NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
END OF FIRST SEMESTER EXAMINATIONS – DECEMBER 2004
INORGANIC CHEMISTRY I – SCH 1101
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ANY FOUR (4)** questions from the five (5) provided.
Each question carries 25 marks.

1. (a) Which of the following sets of quantum numbers represent permissible solutions of the Schrodinger Wave Equations?

n	l	m	s
3	1	0	-1/2
3	1	1	1
3	2	4	-1/2
5	4	-3	1/2
2	-1	-1	-1/2

- (b) Write out all the permissible sets of quantum numbers for:

- (i) 4 electrons in 3p orbitals
(ii) 4 electrons in 5d orbitals

- (c) Write the complete ground-state electronic configuration of the first three members of the nitrogen family: N(Z=7), P(Z=15) and As(Z=33), showing all unpaired electrons. Underline the parts responsible for their similarity in chemical behaviour.

2. (a) Which molecule would have the weakest bond? Why?

Li₂, Rb₂, H₂, K₂ and Na₂.

- (b) Which molecule would have the shortest bond distance?

Cl₂, I₂, Br₂ and F₂

- (c) With what neutral fluoride molecule is the molecule-ion ClF₄⁺ isoelectronic? What are its possible geometries?

3. (a) Without consulting a table of ionic radii, decide which is the largest ion in each group below:
- (i) O^{2-} , S^{2-} , F^- and Cl^- .
 - (ii) Na^+ , Mg^{2+} , O^{2-} and F^- .
- (b) The metals below are bcc crystal structure. Which would have the lowest melting point?
Li, Na, K, Rb, and Cs.
4. The bond angle in water is 104.5° .
- (a) Explain this observation using VSEPR Theory.
 - (b) Using a sketch, predict the orientation of the dipole moment in the H_2O molecule.
 - (c) The metallic radii of Mo and W are both 136pm. How does this observation differ from the normal behaviour of the atomic radius within a group, and what is the explanation?
5. (a) List ten (10) basic hybridisation rules. ←
- (b) According to De Broglie, how is the wave length associated to the mass and velocity with particles of matter?
 - (c) What are localised and delocalised π MOs

End of question Paper!!!