

Questions

1. State the full electronic configuration of the following ions:
(a) V^{3+} (b) Rb^+ (c) Co^{2+} (d) Cu^+
2. For each of the ions in (1), deduce, with a reason, whether the species is paramagnetic or diamagnetic.
3. Select the paramagnetic material from each of the following groups of compounds:
(a) $NaCl$, Cu_2O , CuO
(b) TiO_2 , $TiCl_4$, $TiCl_3$
(c) $MnCl_4$, $GaCl_3$, $ScCl_3$
4. Which of Fe_2O_3 and NiO would be expected to be attracted more strongly towards an external magnetic field? Explain your answer.
5. An ion within a compound is found to possess seven electrons in its f-orbitals. It is suggested this compound would be attracted strongly to a magnetic field. Explain why this is a sensible suggestion.

Answers

1. (a) $1s^22s^22p^63s^23p^63d^2$
(b) $1s^22s^22p^63s^23p^63d^{10}4s^24p^6$
(c) $1s^22s^22p^63s^23p^63d^7$
(d) $1s^22s^22p^63s^23p^63d^{10}$
2. (a) Paramagnetic, two unpaired electrons
(b) Diamagnetic, all electrons paired
(c) Paramagnetic, three unpaired electrons
(d) Diamagnetic, all electrons paired
3. (a) CuO
(b) $TiCl_3$
(c) $MnCl_4$
4. Fe_2O_3 more strongly attracted than NiO . Five unpaired electrons per iron ion compared to just two unpaired electrons in nickel ion.
5. All f-orbitals would contain a single unpaired electron. The spins would be parallel and combine to create a strong paramagnetic effect (and probably a ferromagnetic one as well).