Question 8

8. Suppose that a stable element with atomic number 119, symbol Q, has been discovered.

(a) Write the ground-state electron configuration for Q, showing only the valence-shell electrons.

$8s^1$	One point is earned for the electron configuration.

(b) Would Q be a metal or a nonmetal? Explain in terms of electron configuration.

It would be a metal (**OR** an alkali metal). The valence electron would be held only loosely.	One point is earned for the correct answer and explanation, which must include reference to the valence electron.

(c) On the basis of periodic trends, would Q have the largest atomic radius in its group or would it have the smallest? Explain in terms of electronic structure.

It would have the largest atomic radius in its group because its valence electron is in a higher principal shell.	One point is earned for the correct answer and explanation; the size must refer to number of electron shells.

(d) What would be the most likely charge of the Q ion in stable ionic compounds?

+1	One point is earned for the correct charge. (Must be consistent with configuration in part (a).)

(e) Write a balanced equation that would represent the reaction of Q with water.

$2\ Q(s) + 2\ H_2O(l) \rightarrow 2\ Q^+(aq) + 2\ OH^-(aq) + H_2(g)$	One point is earned for H_2 as a product. One point is earned for balancing the equation.

(f) Assume that Q reacts to form a carbonate compound.

(i) Write the formula for the compound formed between Q and the carbonate ion, CO_3^{2-}.

Q_2CO_3	One point is earned for the formula consistent with the charge given in part (d).

(ii) Predict whether or not the compound would be soluble in water. Explain your reasoning.

It would be soluble in water because all alkali metal carbonates are soluble.	One point is earned for the answer consistent with the identification of Q.