5 **(a)** Explain what is meant by *electric field strength*.

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.....

[2]

(b) In a crystal of sodium chloride, a sodium ion has a positive charge of $+e$. It is separated from its closest chlorine ion by a distance of 2.8×10^{-10} m. The chlorine ion has a charge of $-e$.

Assume that the ions are point charges.

(i) Calculate the magnitude of the electric field strength at the sodium ion due to its closest chlorine ion.

electric field strength = ... N C^{-1} [2]

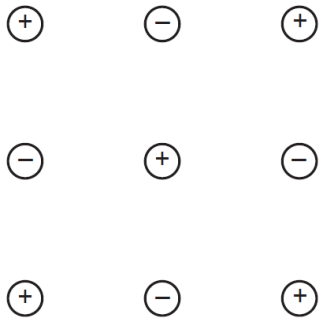
(ii) Calculate the attractive force between the two ions.

force = ... N [1]

(c) The force calculated in **(b)(ii)** would result in the two ions accelerating towards each other. This does not happen because of the presence of other ions.

(i) Fig. 5.1 represents a plane of sodium and chlorine ions.

On Fig. 5.1, draw arrows to show the forces acting on the central sodium ion. Label the arrows to indicate whether these are forces of attraction (A) or repulsion (R). The length of the arrows should reflect the relative magnitudes of the forces.



[2]

Fig. 5.1

(ii) State the resultant force on the central sodium ion.

resultant force = ... N [1]

(iii) When the central sodium ion is displaced out of position, describe the effect of the resultant force on the ion.

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.....

[1]

[Total: 9]