Figure Captions

1 (a) \( P-T \) diagram of a typical element
(b) \( P-V \) diagram of a typical element

The shaded regions indicate the liquid state. In both diagrams the full lines indicate the boundaries of the given states of matter and limits (triple and critical point) of the liquid state of matter are marked. (These diagrams are not to scale)

2 The separation of the Lennard–Jones potential, \( u(r) \), into a part \( u_0(r) \) containing all the repulsive interaction of the potential (and no attraction) and a part \( u_1(r) \) containing all the attractive interactions (and no repulsion).

3 Plots of isotherm from van der Waals' equation of state. While van der Waals recognised that the isotherm DEF represents unstable states, it remained for Maxwell to exactly show where to draw the line GIG that represents the stable states, namely, so as to equalise the areas CDE and EFG.

4 Analytic property of \( \tilde{\sigma}(k) \) and \( \tilde{\sigma}(-k) \). \( \tilde{\sigma}(k) \) is regular in the domain \( \text{Im}(k) = |k_\perp| > -\varepsilon \). \( \tilde{\sigma}(-k) \) is regular in the domain \( |k_\perp| < \varepsilon \). So in the strip \(-\varepsilon < |k_\perp| < \varepsilon \), both \( \tilde{\sigma}(k) \) and \( \tilde{\sigma}(-k) \) are regular.
5 (a) \( Q'(r) \) at four different densities. The dots at the bottom represent the \( Q'(R) \) values. The lowest value of \( Q'(R) \) refers to the highest \( \eta \).

(b) \( C(r) \) at four different densities. The dots at the top refer to the \( C(R) \) values. The highest value of \( C(R) \) refers to the highest \( \eta \).

6 (a) \( g^0(r) \) values for \( \eta = 0.246 \), with the dashed line for \( \sigma = 0.9 \), the chained line for \( \sigma = 0.1 \) and the solid line for \( \sigma = 0 \).

(b) Same as (a) for \( \eta = 0.37 \)

(c) Same as (a) for \( \eta = 0.435 \)

(d) Same as (a) for \( \eta = 0.462 \)

7 \( S^0(k) \) values for four different densities.

8 \( g(r) \) values beyond the hard core radius
(a) \( \sigma = 0.9 \), (b) \( \sigma = 0.5 \) and (c) \( \sigma = 0.1 \).

9 \( g^{MD}(r) \) values and \( g^{EQ}(r) \) values are represented by the solid and dashed line respectively for \( \eta = 0.37 \).

10 Calculated values (Dotted line) and HS values (Chained line) of \( S(k) \) for liquid neon compared with experimental result (Solid line) for density \( 1.0624 \times 10^3 \text{ kg/m}^3 \).

11 Same as 10 for density \( 1.119 \times 10^3 \text{ kg/m}^3 \).

12 Same as 10 for density \( 1.1630 \times 10^3 \text{ kg/m}^3 \).

13 Same as 10 for liquid argon at density \( 1.401 \times 10^3 \text{ kg/m}^3 \).
<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Figure Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Same as 10 for liquid argon at density $0.87 \times 10^3 \text{ kg/m}^3$.</td>
<td>86</td>
</tr>
<tr>
<td>15</td>
<td>$C(r)$ values beyond the hard core radius for liquid neon at $1.1630 \times 10^3 \text{ kg/m}^3$, $\sigma = 0.02$.</td>
<td>90</td>
</tr>
<tr>
<td>16</td>
<td>The calculated values of interatomic pair potentials $\beta u(r)$ for neon at $35.5^\circ \text{K}$ and density $1.1630 \times 10^3 \text{ kg/m}^3$.</td>
<td>91</td>
</tr>
</tbody>
</table>