Spot the bonding

The diagrams below show a range of chemical substances and models.

For each diagram either write:

* the name(s) of the type(s) of bonding present
* ‘none’ (if there is no chemical bonding)
* ‘don’t know’ (if you are unsure)

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| An alternating array of small and large circles. The small circles are pale blue and are labelled 'Na+'. The large circles are darker blue and are labelled 'Cl-'. Each small pale blue circle is touching four of its neighbouring larger blue circles and vice versa. | A rectangle containing an array of overlapping circles in five rows and 7 columns. The overlapping pattern continues beyond the rectangle. In the centre of each circles is the letter C. Each circles overlaps with four of its neighbours - one above, one below, one to the left and one to the right. Within each overlapping segment there are two black dots. This means that each circles is surrounded by eight black dots. | 6 white circles with a black outline in a ring. Each of these circles have a C at the centre. The white circles are not touching. Forming a wider ring are six smaller white circles with a black outline, each with an H at the centre. These are aligned with the Cs in the inner ring but not touching the Cs or each other. Surrounding all of the white circles is a pale blue circle with no outline. The pale blue circles overlap so that the whole arrangement makes one shape with a white space at the centre. The shape resembles a ships wheel. |
| **1.** Sodium chloride lattice | **2.** Diamond lattice | **3.** Benzene molecule |
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| A regular arrangement of mid blue circles. Each circle has the symbol Cu^2+ in the centre. The mid blue circles are not touching but are surrounded by a pale blue background. | Two concentric circles with +9 in the centre. The larger (outermost) of the two concentric circles overlaps with a neighbouring smaller circle (the same size as the inner most circle of the two concentric ones). This neighbouring circle has +1 in the centre. The outermost of the concentric circles has 8 dots spaced around in pairs. Two of these dots are at the intersections with the neighbouring circle. The inner concentric circle has two dots on it. | A rectangular box containing a 2D representation of a 3D shape made up of three circles - one large and two smaller circles attached at an angle of about 100 degrees between the smaller circles. The box contains more than 20 of this shape but shown from different orientations. Some of the shapes continue beyond the boundaries of the rectangle so are partially cut-off. The shape is shaded pale blue. |
| **4.** Copper metal lattice | **5.** Hydrogen fluoride molecule | **6.** Liquid water |
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| Two sets of two concentric circles with +9 in the centre. The larger (outermost) of the two pairs of concentric circles overlap.  The outermost of the concentric circles each have 6 dots spaced around in pairs plus an additional two dots at the intersections where they overlap. The inner concentric circles each have two dots on them. | A rectangular box containing a 2D representation of a 3D shape made up of three circles - one large and two smaller circles attached at an angle of about 100 degrees between the smaller circles. The box contains around 20 of this shape but shown from different orientations. Some of the shapes continue beyond the boundaries of the rectangle so are partially cut-off. The shape is shaded pale blue. In addition to the pale blue shape there is a dark blue circle containing the formula NO3^- and another white circle containing the formula Ag^+. | Five pairs of white circles outlined in black, each with the letter O in the centre. None of the circles are touching. However, each pair of circles is surrounded by a pale blue circle which slightly overlaps but has no outline. |
| **7.** Fluorine molecule | **8.** Silver nitrate solution | **9.** Oxygen gas |
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| Eight circles arranged in a 3x3 square (with no circle in the centre), with each circle overlapping with two of its neighbours. Within each overlap there are two black dots. At the centre of every circle there is the letter S. Each circle has two additional pairs of black dots opposite the pair in the overlapping intersections. This results in each circle containing eight black dots. | A large blue dot surrounded by three concentric circles. On the innermost concentric circle there are two black dots, one to the left and one to the right. On the middle concentric circle there are eight black dots - two to the left, two to the right, two at the top and two at the bottom. On the outermost concentric circle there is one black dot to the right. | A structural formula AlCl3. There are two Als, each connected by a single line to three Cls. These are arranged in a T shape with the Al at the centre. Two blue arrows point from a Cl in one T towards the Al in the other T. |
| **10.** Sulfur molecule | **11.** Sodium atom | **12.** Aluminium chloride dimer |
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| A chemical symbol made up of the letter O followed by two lines, then the letter C, another two lines, then another O. (O=C=O) | The structural formula for two ethanoci acid moleucules arranged in a line but where the second has been rotated through 180 degrees. The formula consists of two Cs joined by a single line. The first C is surrounded by three Hs at 90 degrees to each other, each joined to the C by a single line. The second C is joined to an O-H by a single line at a 45 degree angle and to another O by a double line at a 135 degree angle. Between the O-H on the first molecule and the O= there is a dotted line. Also there is a dotted line between the =O on the first  molecule and the H-O on the second one. | Pairs of white circles with black outlines are arranged in a lattice formation where alternating pairs are offset by half their height. In the centre of each white circle is the letter I. None of the white circles are touching but each is surround by a larger pale blue circle which overlaps with all of its neighbours. |
| **13.** Carbon dioxide molecule | **14.** Ethanoic acid dimer | **15.** Iodine lattice |
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| A white circle, outlined in black with the letter N at the centre. Spaced at an equidistant  120 degrees around the circle labelled N are three smaller circles labelled H. These three circles are also white with a black outline. None of the circles are touching. All of the white circles are surrounded by a pale blue circle with no outline. These pale blue circles slightly overlap. | An alternating array of small and large circles. The small circles are mid blue and are labelled 'Mg^2+'. The large circles are white and are surrounded by a pale blue circle. The white circles are labelled 'O^2-'. Each small mid blue circle is touching four of its neighbouring pale blue circles and vice versa. | Five pairs of white circles outlined in black. Each pair contains one larger and one small white circle. The smaller circle has the letter H at the centre. The larger circle has the symbol Cl at the centre. None of the circles are touching. However, each pair of circles is surrounded by a pale blue circle which slightly overlaps but has no outline. |
| **16.** Ammonia molecule | **17.** Magnesium oxide lattice | **18.** Liquid hydrogen chloride |
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