Answers to Option A test yourself questions

1 **a** N – covalent
b M/R boundary – covalent (borderline ionic)
c X/Y boundary – covalent
d M – covalent (borderline ionic)
e R – covalent
f D/E boundary – ionic

2 **a** no; **b** yes; **c** no; **d** yes

3 **a** $Bi_2O_3 + 3C \rightarrow 2Bi + 3CO$; or $2Bi_2O_3 + 3C \rightarrow 4Bi + 3CO_2$
b $CuO + C \rightarrow Cu + CO$; or $2CuO + C \rightarrow 2Cu + CO_2$
c $Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$; or $2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$

4 **a** $MgCl_2 \rightarrow Mg + Cl_2$
b $2KCl \rightarrow 2K + Cl_2$

5 **a** 500 C; **b** 86 400 C; **c** 75.6 C

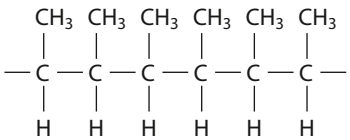
6 **a** 0.0205 mol; **b** 22.4 mol; **c** 0.179 mol

7 **a** 2.16 g; **b** 9.07 g; **c** 101 g

8 $9.2\,mg\,dm^{-3}$; $2.3 \times 10^{-4}\,mol\,dm^{-3}$

9 Molecule I, a rod-shaped, polar molecule

10



Different forms (atactic/isotactic/syndiotactic) are possible depending on how the methyl groups are arranged relative to the main carbon skeleton.

11 Plastic A will be of lower density *and* more flexible: the branches prevent the main parts of the chains getting so close together – hence lower density; there will be weaker forces between the chains – hence more flexible.

12 **a** 31.71%; **b** 19.72%; **c** 81.32%

13 **a** CO_2 and H_2O
b CO_2, H_2O and HF
c CO_2, H_2O, HCN and NO_x

14 **a** PCDD; **b** phthalate ester; **c** PCB; **d** phthalate ester; **e** PCB; **f** PCDD

15 **a** RIC 6; **b** RIC 1; **c** all; **d** RIC 3

16 **a** Face-centred cubic (fcc) – four atoms per unit cell
b Body-centred cubic (bcc) – two atoms per unit cell
c Simple cubic – one atom per unit cell

17 14.9°; 30.9°; 50.4°

18 **a** 4.079×10^{-10} m; **b** 337 pm

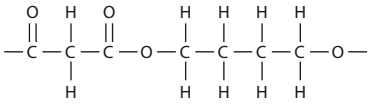
19 **a** 3.27×10^{-22} g; **b** 1.59×10^{-22} g

20 **a** 1.31×10^{-21} g; **b** 3.18×10^{-22} g

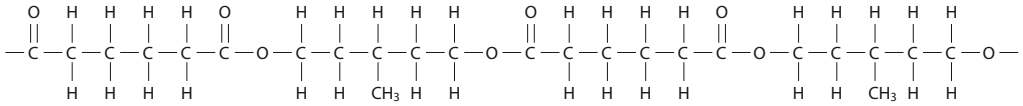
21 **a** $19.3\,g\,cm^{-3}$; **b** $8.31\,g\,cm^{-3}$

22 Unit cell length = 5.57×10^{-10} m;
density = $1.54\,g\,cm^{-3}$

23



24 **a**



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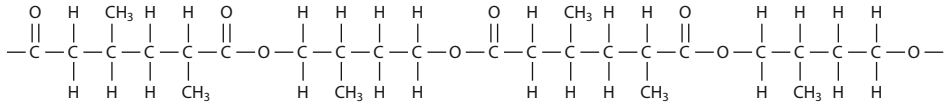
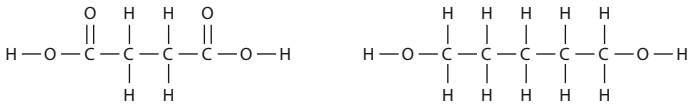


25 **a**



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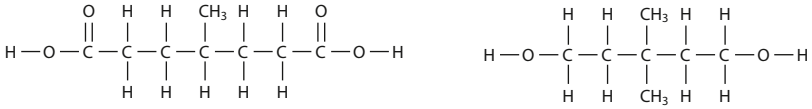

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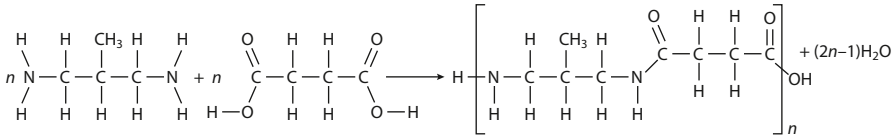
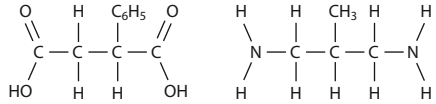


27



28 **a** 1.7×10^{-10}; **b** 7.8×10^{-16}; **c** 2.0×10^{-39}

29 **a** $1.3 \times 10^{-4}\,mol\,dm^{-3}$; ($K_{sp} = s^2$)
b $1.2 \times 10^{-17}\,mol\,dm^{-3}$; ($K_{sp} = 4s^3$)
c $1.6 \times 10^{-5}\,mol\,dm^{-3}$; ($K_{sp} = 27s^4$)
d $6.3 \times 10^{-4}\,mol\,dm^{-3}$; ($K_{sp} = 4s^3$)

30 **a** $2.0 \times 10^{-4}\,mol\,dm^{-3}$; **b** $1.0 \times 10^{-30}\,mol\,dm^{-3}$

31 Between 9 and 10 (pH = 9.7)

32 1.5×10^{-9} g