**Multiple choice questions.**

**1)** In which carbon allotrope are all electrons localised?

**A** buckminsterfullerene

**B** diamond

**C** graphite

**D** graphene

**2)** When aqueous bromine is shaken with cyclohexane and allowed to stand, two layers form. The top cyclohexane layer is coloured and the bottom aqueous layer is almost colourless. What is the most likely explanation for this observation?

**A)** Bromine is reduced to bromide ions in the bottom layer.

**B)** Bromine molecules are non-polar.

**C)** Bromine reacts with water but cannot react with cyclohexane.

**D)** The product of the reaction between bromine and cyclohexane is coloured.

**3)** In which change are **only** temporary dipole-induced dipole forces overcome?

**A** $C_2H_5OH(l) \rightarrow C_2H_5OH(g)$

**B** $H_2O(s) \rightarrow H_2O(l)$

**C** $O_2(s) \rightarrow O_2(l)$

**D** $C_4H_{10}(l) \rightarrow C_4H_{10}(s)$

**4)** The complete combustion of 2 moles of an alkane produces 400 $dm^3$ of carbon dioxide measured at 301K and $1 \times 10^5$Pa. Carbon dioxide can be assumed to behave as an ideal gas under these conditions. What is the formula of the alkane?

**A** $C_8H_{18}$

**B** $C_{16}H_{34}$

**C** $C_{20}H_{42}$

**D** $C_{40}H_{82}$

**5)** Which statement explains why iodine is less volatile than chlorine?

**A** Chlorine is more electronegative than iodine and so has more repulsion between its molecules.

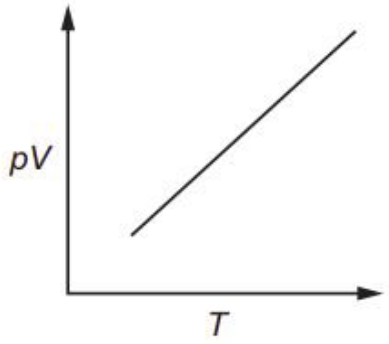
**B** The greater number of electrons in iodine leads to larger temporary dipole-induced dipole forces.

**C** The I–I bond energy is smaller than the Cl –Cl bond energy.

**D** The iodine molecules have stronger permanent dipole-permanent dipole forces.

**6)**

A graph of $pV$ against $T$ is shown for a fixed mass of gas. ($p$ = pressure, $V$ = volume and $T$ = temperature in K.)




Which gas gives this graph over the widest range of temperatures and pressures?

**A** hydrogen, $H_2$

**B** hydrogen chloride, $HCl$

**C** hydrogen fluoride, HF

**D** oxygen, $O_2$

**7)** A weather balloon is filled with 12.0 kg helium. The weather balloon reaches a height of 20 km, the pressure inside the balloon is 6000Pa and the temperature is 216K. What is the volume of the weather balloon at this height, correct to three significant figures?

**A** 897 $dm^3$ **B** 1790 $dm^3$

**C** 897 000 $dm^3$ **D** 1 790 000 $dm^3$

**8)** 1.8 g of water, heated to 227 °C in a sealed container, turns to steam with a pressure of 200 kPa. What is the approximate volume of the container?

**A** $9 \times 10^{-4}\ m^3$ **B** $2 \times 10^{-3}\ m^3$

**C** $2\ m^3$ **D** $8 \times 10^{7}\ m^3$

**9)** The table shows some properties of four substances.

Which substance could be potassium iodide?

| | melting point of solid / °C | electrical conductivity when molten |
|---|---|---|
| **A** | –66 | poor |
| **B** | –39 | good |
| **C** | 680 | good |
| **D** | 1600 | poor |

**10)**

X, Y and Z are all gases that behave ideally and react according to the equation shown.

$$X(g) + 2Y(g) \rightarrow 2Z(g)$$

When 3.0 mol of X and 3.0 mol of Y are placed inside a container with a volume of 1.0 $dm^3$, they react to form the maximum amount of Z.

The final temperature of the reaction vessel is 120 °C.

What is the final pressure inside the reaction vessel?

**A** $4.49 \times 10^6$ Pa

**B** $9.80 \times 10^6$ Pa

**C** $1.47 \times 10^7$ Pa

**D** $1.96 \times 10^7$ Pa

**11)** Which pair of substances are both simple molecular?

**A** $C_{60}$ and graphene

**B** $C_{60}$ and iodine

**C** graphene and graphite

**D** graphite and iodine

**12)** In this question you should assume the vapour behaves as an ideal gas. 0.175 g of a volatile liquid produces a vapour of volume $4.50 \times 10^{-5}$ $m^3$ at 100 °C and pressure of $1.013 \times 10^5$Pa. What is the Mr of the liquid?

**A** 31.9 **B** 87.1 **C** 119 **D** 127

**13)** A sample of gas occupies 240 $cm^3$ at 37 °C and 100 kPa. How many moles of gas are present in the sample?

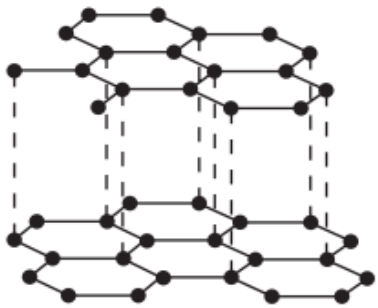
**A** $9.32 \times 10^{-6}$ **B** $9.32 \times 10^{-3}$

**C** 0.0781 **D** 78.1

**14)**

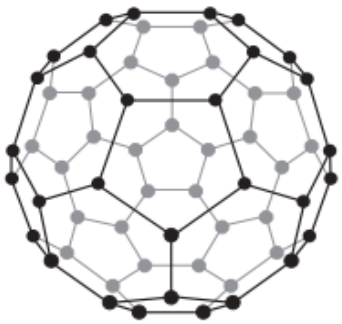
P, Q and R represent three different structures of an element.

P



Q

R



Which structures are giant molecular?

**A** P, Q and R

**B** P and Q only

**C** P and R only

**D** Q and R only

**15)**

For each of the questions in this section, one or more of the three numbered statements **1** to **3** may be correct.

Decide whether each of the statements is or is not correct (you may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

| A | B | C | D |
|---|---|---|---|
| **1**, **2** and **3** are correct | **1** and **2** only are correct | **2** and **3** only are correct | **1** only is correct |

No other combination of statements is used as a correct response.

Buckminsterfullerene is a fullerene allotrope of carbon.
Which statements about buckminsterfullerene are correct?

**1)** Buckminsterfullerene is a giant covalent molecule.
**2)** Buckminsterfullerene has delocalised electrons.
**3)** Buckminsterfullerene has strong intramolecular bonds.