PRIFYSGOL BANGOR
BANGOR UNIVERSITY

ENTRANCE SCHOLARSHIPS

IONAWR / JANUARY 2018

CEMEG / CHEMISTRY
1. Explain the meaning of **FIVE** of the following:
   (a) Ionic bond,
   (b) Endothermic reaction,
   (c) Electron affinity,
   (d) Isotope;
   (e) Allotrope;
   (f) p-block element;
   (g) Alkaline earth metal.

   (5 marks each)
   **Total 25 marks**

2. Describe and explain the shapes of the following molecules:
   (a) PCl$_5$
   (b) H$_2$S
   (c) SF$_4$
   (d) SO$_2$
   (e) NH$_3$

   (5 marks each)
   **Total 25 marks**
3. (a) How do alkenes react with:
   (i) hydrogen,
   (ii) bromine,
   (iii) hydrogen chloride,
   (iv) sulphuric acid,
   (v) alkaline potassium permanganate solution.

   (3 marks each)

(b) Give the mechanisms of the reactions of alkenes with:
   (i) bromine
   (ii) hydrogen chloride

   How is this type of reaction classified?

   (5 marks each)

Total 25 marks

4. Describe the following experimental techniques and their purpose, giving diagrams where appropriate:
   (a) distillation,
   (b) heating under reflux,
   (c) recrystallisation,
   (d) filtration,
   (e) solvent extraction.

   (5 marks each)

Total 25 marks

5. (a) Explain what is meant by the term 'ideal gas'.

   (5 marks)

(b) An ideal gas initially at a 298 K and 506625 Nm⁻² is expanded to three times its volume with a final pressure of 101325 Nm⁻². What is the final temperature of the gas?

   (10 marks)
A gas, enclosed in a piston at a pressure of 202650 Nm$^{-2}$, is allowed to expand against an external pressure of 101325 Nm$^{-2}$ in such a way that no heat is transferred to or from the gas. Do you think the temperature of the gas will rise, fall or stay the same? Explain your reasoning.

(10 marks)

Total 25 marks

6. Answer **ALL** parts (a) - (b).

(a) State Hess’s Law.

Given that the enthalpies of combustion of carbon and carbon monoxide are $-393$ kJ mol$^{-1}$ and $-253$ kJ mol$^{-1}$ respectively, calculate the enthalpy of the formation of carbon monoxide.

(10 marks)

(b) Write notes to describe the Bohr atom.

(15 marks)

Total 25 marks