NAME_____

Year 12 Chemistry

Test: Elemental Chemistry 2

1. Carbon dioxide is a naturally occurring gas found in Earth's atmosphere.
   (a) Write the electron configuration of carbon, using subshell notation. /2
   (b) Carbon commonly displays an oxidation state of +4 in its compounds.
      (i) Explain why an oxidation state of +4 is possible for carbon. Refer to the electron configuration of carbon in your answer. /2
      (ii) Identify the other positive oxidation state that carbon commonly displays in its compounds. /1
   (c) Draw a diagram to show the bonding and shape of a molecule of CO_2. /2
   (d) State why the CO_2 is non-polar. /1

2. Controlling the pH of soil is common issue in horticulture and agriculture.
   (a) Calcium oxide, commonly known as quicklime, is often used to reduce soil acidity.
      (i) Explain, in terms of the relative electronegativities of Ca and Si, why CaO will reduce soil acidity but SiO_2 will not. /4
      (ii) Identify the block of the periodic table in which calcium is found. /1
      (iii) Write the electron configuration of the Ca^{2+} ion, using subshell notation. /2
   (b) Chromium occurs naturally as Cr_2O_3 in soils. Cr_2O_3 reacts with both H^+ and OH^- in soils to form soluble ions.
      (i) State the name given to oxides that react with both H^+ and OH^-. /1
      (ii) Write an equation for the reaction of Cr_2O_3 with OH^- to form CrO_2^-. /2
      (iii) State the nature of the element chromium that is demonstrated by the reaction of Cr_2O_3 with OH^-. /1

3. NF_3 is a potent greenhouse gas. The amount of NF_3 in the atmosphere is increasing as a result of its increasing use in the electronics industry.
   (a) Draw a diagram to show the bonding and shape of a molecule of NF_3. /2
   (b) On the diagram you drew for part (a), show the polarity of an N–F bond. /1
   (c) Explain what causes the N–F bond to be polar. /2
   (d) Name and describe the secondary interaction that occurs between molecules of NF_3. /2
   (e) State the oxidation number of N in the NF_3 molecule. /2
   (f) Explain the sign and magnitude of the oxidation number of N in the NF_3 molecule. /2

TOTAL /30