ALCOHOLS AND MODERN ANALYTICAL TECHNIQUES HW MS

1.

(i) H^+ ✓ $Cr_2O_7^{2-}$ 2

(ii)

compound E   compound F

$C_7H_{14}O$ $C_7H_{14}O_2$

                                                                                                    3
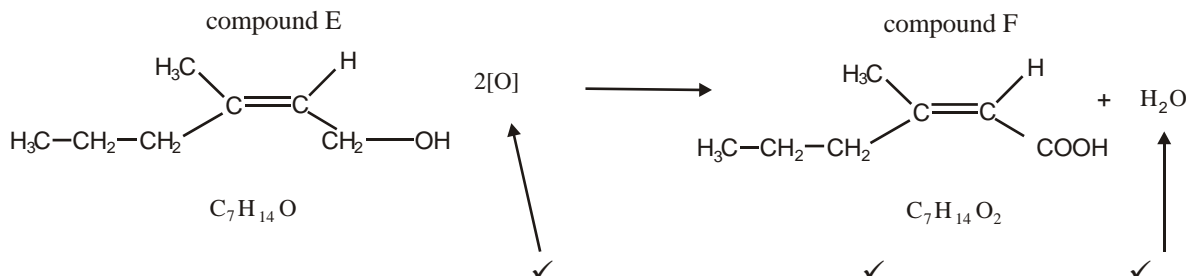
(iii)   carboxylic acid would have an absorption between
        $1680 – 1750$ cm^{-1} /1700 cm^{-1} or $2500 – 3300$ cm^{-1}.   1

                                                                                             [6]

2.   (a)   (i) H^+ 1

                    $Cr_2O_7{}^{2-}$ 1

         (ii)   Orange to green/black/blue   1

       (b)   (i)   contains a C=O/aldehyde, ketone, carboxylic acid and ester/   1
                    carbonyl/carbonyl in an aldehyde

             (ii)   does **not** contain a O−H/ (hydrogen bonded in a) carboxylic acid   1

             (iii)   distillation (no mark) **because** distillation allows loss of volatile   1
                    components /removes butanal from oxidising mixture
                    prevents formation of RCOOH/ partial oxidation would be achieved   1
                    or reverse argument for reflux not being used
                    in that reflux prevents loss of volatile components
                    hence complete oxidation would be achieved/RCOOH would be formed
                    ✓

                                                                                             [7]

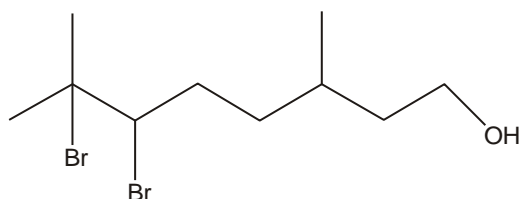**3.**   (a)   (i)   alkene ✓   1

                    alcohol/hydroxy/hydroxyl ✓   1

       (b)   (i)   I = alkene & II = alcohol… both are needed ✓   1
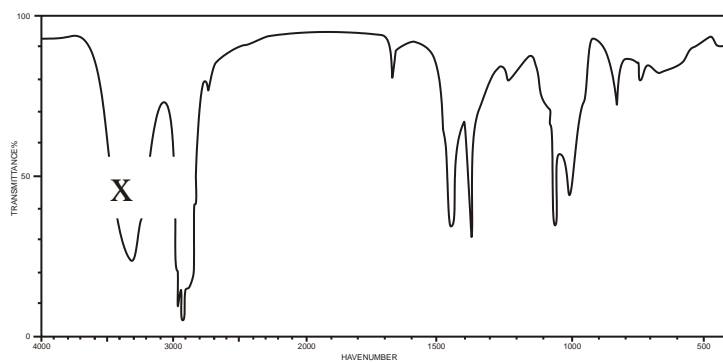
             (ii)   decolourised / colourless ✓   1

             (iii)   ✓   1

             (iv)   **X** as shown below ✓   1

(c)   (i)   Ni/Pt/Rh/Pd ✓   1

       (ii)   compound **B** is $C_{10}H_{22}O$ ✓   1

       (iii) $C_{10}H_{20}O + H_2 \rightarrow C_{10}H_{22}O$ ✓   1

                                                            [9]

4. (a) (i) Alkene/C=C ✔   1

Alcohol/ROH/hydroxy/hydroxyl/OH (not OH⁻ or hydroxide) ✔   1

    (ii) One of the C in both C=C is joined to two atoms or groups that are the same ✔   1

(b) Observation   decolourisation (of Br_2) ✔   1

Molecular formula $C_{10}H_{18}OBr_4$ ✔✔   2

    $C_{10}H_{18}OBr_2$ gets 1 mark

(c) reagent CH_3COOH ✔   1

catalyst H_2SO_4/H^+/HC*l* (aq) *or dilute loses the mark* ✔   1

(d) (i) $C_{10}H_{18}O + 2[O] \rightarrow C_{10}H_{16}O_2 + H_2O$ ✔✔   2

1 mark for H_2O and 1 mark for 2[O]

    (ii) The infra-red spectrum was of compound **Y**

because absorption between 1680 – 1750 cm⁻¹ indicates a C=O ✔   1

and the absence of a peak between 2500 – 3300 cm⁻¹ shows the absence
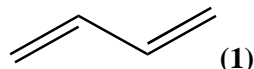
of the OH hydrogen bonded in a carboxylic acid ✔   1

[12]

5. (i) Any two realistic fragments,
e.g. CH_3^+: 15; $C_2H_5^+$: 29; $C_3H_7^+$: 43; $C_4H_9^+$: 57; OH^+: 17, *etc*. **(1) (1)**
Do not penalise missing charge.   2

    (ii) breathalysers/monitoring of air pollution, MOT emission testing, *etc*. **(1)**   1

[3]

6. mole ratio = 88.89/12 : 11.1/1 = 7.41 : 11.1 **(1)**
empirical formula = C_2H_3 **(1)**
relative mass of C_2H_3 = 27.
$M_r = 2 \times 29$ so molecular formula = C4H6 **(1)**
X reacts with 2 mol H_2 so there are 2 double bonds **(1)**

Possible structure = 1,3-butadiene /

 (1)

[5]