FROM MINERALS TO MEDICINES 17.1.01 so this is a bit "rough + ready" 7 2848

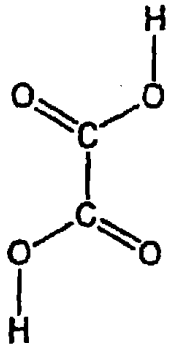
1 (a) (i) Dichlorodifluoromethane *(1 mark)* [1]

(ii) High volatility, or low boiling point *(1 mark)*. [1]

(iii) Blowing agents for *(1 mark)*; expanded plastics *(1 mark)*, or propellants *(1 mark)*; for aerosols *(1 mark)*; or solvents *(1 mark)*; for degreasing *(1 mark)*. [2]

(b) Breaks down to give chlorine atoms *(1 mark)*; which cause ozone depletion *(1 mark)*. [2]

(c) (i)



1 mark only if –COOH is used. [2]

(ii) Proton(s) or hydrogen ion(s) *(1 mark)*; are transferred from ethanedioic acid to sodium hydroxide *(1 mark)*. [2]

(d) (i) Covalent *(1 mark)*. [1]

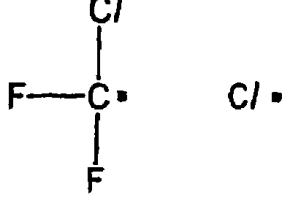
(ii) Ionic *(1 mark)*. [1]

(iii) Na shown as singly positive ions *(1 mark)*; F shown as singly negative ions *(1 mark)*;
Number of fluoride ions around one sodium = 6 *(1 mark)*;
Looks 3D diagram/cubic structure *(1 mark)*. [4]

(iv) 1. $C^{\delta+}$-$O^{\delta-}$ *(1 mark)*;
2. dipoles cancel out in linear molecule *(1 mark)*. [2]

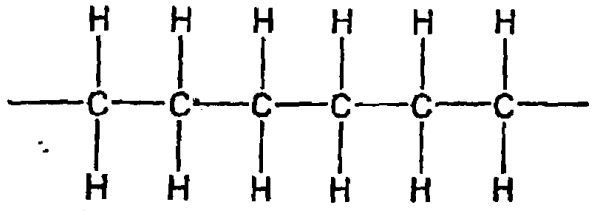
(v) Instantaneous dipole - induced dipole *(1 mark)*.
Accept Van der Waals. [1]

(e) (i) *1 mark for each one correct (allow if no electrons shown).*



2 (a) (i) Addition *(1 mark)*. [1]

(ii)



or $-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-$

1 mark only if terminal bonds are missing [2]

(b) It is a reactant, or it is used up in the reaction *(1 mark)*. [1]

(c) (i) Much branching occurs in ldpe *(1 mark)*;

hdpe more crystalline/more ordered structure/chains aligned in a regular way *(1 mark)*. [2]

(ii) Closer packing in hdpe means higher density *(1 mark)*;

stronger forces between chains in hdpe *(1 mark)*;

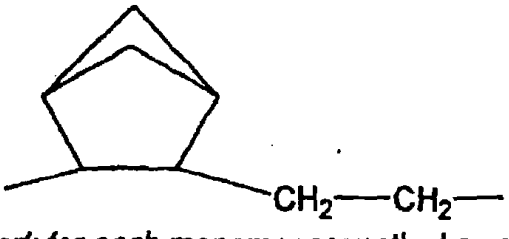
chains can not move over each other *(1 mark)*. [3]

(d) (i) Food wrap *(1 mark)*. [1]

(ii) Two or more monomers are combined *(1 mark)*. [1]

(e) (i) C_5H_8 *1 mark for correct number in each case* [2]

(ii)



1 mark for each monomer correctly drawn [2]

(iii) Orange/brown *(1 mark)*, to colourless *(1 mark)*. [2]

(iv) Br_2 *(1 mark), accept* Br^-. [1]

Total 18 marks

3 (a) (i) Constant concentration of reactants and products *(1 mark)*; forward and reverse reactions are taking place at the same time *(1 mark)*; at the same rate *(1 mark)*. [3]

(ii) The equilibrium position moves to the left *(1 mark)*. [1]

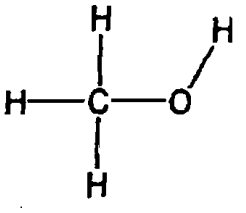
(ii) A high pH means a high concentration of hydroxide ion *(1 mark)*;
The equilibrium position moves to the right *(1 mark)*;
less chlorine will be present *(1 mark)*. [3]

(b) (i) 0; +1; -1 *(1 mark for each)*. [3]

(ii) Cl_2 *(1 mark)*. [1]

(c) (i) 1.0 ppm = 1.0×10^{-3} g in 1000 g, or equivalent understanding of ppm *(1 mark)*;
maximum mass = $1.0 \times 10^{-4} \times 1.0 \times 10^{-3}$ g *(1 mark)*;
= 1.0×10^{-7} g *(1 mark)*. [3]

(ii)



The hydroxyl may be shown as –OH.

[1]

(iii) Methanol *(1 mark)*. [1]

(iv) 1. Hydroxide ion *(1 mark)*. [1]

2. Correct shape for curve (1 mark);
Reactants higher than products and correctly labelled (1 mark);
Enthalpy change of reaction correctly labelled (1 mark);
Activation enthalpy correctly labelled(1 mark). [4]

(d) Acid neutralises alkali *(1 mark)*;
by Le Chatelier (or equivalent explanation) *(1 mark)*;
equilibrium position moves to the LHS of the equation *(1 mark)*;
chlorine is formed *(1 mark)*;
which is toxic to humans *(1 mark)*.

Quality of written communication (correct spelling, complete sentences not phrases, and a logical structure) *(1 mark)*. [6]

(e) (i) Use of burette for hydrochloric acid *(1 mark)*;
use of pipette to measure hypochlorite solution into conical flask *(1 mark)*;
addition of a few drops of indicator *(1 mark)*;
add solution from burette gradually until colour change at end point *(1 mark)*;
repeat titration (and take average of readings) *(1 mark)*.
Quality of written communication (correct spelling, complete sentences not phrases, and a logical structure) *(1 mark)*.
[6]

(ii) Indicator is bleached by hypochlorite *(1 mark)*. [1]

Total 34 marks

[2]

(ii) (Free) radical *(1 mark)*. [1]

(f) (i) Energy of C-Cl bond = $+346 \times 10^3 / 6.02 \times 10^{23}$ J per bond *(1 mark)*;
$= 5.75 \times 10^{-19}$ J *(1 mark)*. [2]

(ii) $\nu = 5.75 \times 10^{-19} / 6.63 \times 10^{-34}$ Hz *(1 mark)*;
$\nu = 8.67 \times 10^{14}$ Hz *(1 mark, allow 2or 3 sf)*. [2]

(iii) C-F bond is stronger than C-Cl bond *(1 mark)*. [1]

(g) (i) In troposphere (lower atmosphere) *(1 mark)*. [1]

(ii) *Any 3 points.* Absorbs (infrared) radiation *(1 mark)*; emitted by Earth *(1 mark)*; molecules vibrate faster/KE of molecules increases/molecules move faster *(1 mark)*; atmosphere gets hotter *(1 mark)*. [3]

Total 31 marks

4 (a) (i) Colourless/yellow *(1 mark)*; to purple *(1 mark)*. [2]

(ii) It contains a phenolic –OH group *(1 mark)*. [1]

(b) Vacuum filtration flask with side-arm *(1 mark)*;
Buchner funnel with paper *(1 mark)*;
arrow to water pump *(1 mark)*;
no leaks in apparatus *(1 mark)*. [4]

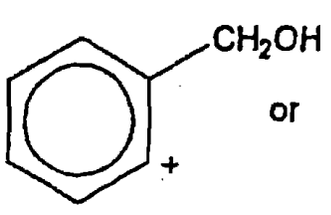
(c) (i) Hydrogen bonding *(1mark)*. [1]

(ii) Interaction shown between O of water and H of acid or phenol, or H of water and an O of acid or phenol *(1 mark)*; -O-H group and O atom in line *(1 mark)*; shape of water correct *(1mark)*. [3]

(d) (i) 124 is the highest mass where there is a peak, or 124 is the molecular ion peak *(1 mark)*. [1]

(ii)

1. $C_6H_4^+$

2. 

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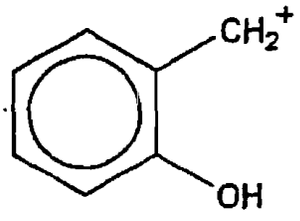

1 mark for correct molecular formula in 1; 1 mark if structure of 2 is correct; 1 mark if both are shown as positive ions. [3]

(iii) 1680-1750 cm^{-1} *(1 mark)*; carbonyl or C=O *(1 mark)*. [2]

(iv) (Warm) with acidified *(1 mark)*;
(potassium or sodium) dichromate *(1 mark)*; turns green *(1 mark)*. [3]

(e) *Two points from:*
Toxicity; trials with animals; stability on storage; trials with humans to determine any side-effects; size of overdose. [2]

Total 22 marks

5 (a) (i) $Ag^+(aq) + I^-(aq) \rightarrow AgI(s)$

1 mark for equation, 1 mark for state symbols. [2]

(ii) From equation: *(note ecf)* moles of iodide ion = moles of silver ion required *(1 mark, can be inferred)*;

moles of silver ion needed = $8.00 \times 10^{-4} \times 1.00$ mol *(1 mark)*;

volume of $AgNO_3$ = $8.00 \times 10^{-4} \times 1.00/0.100$ dm^3 *(1 mark)*;

= 8.00×10^{-3} dm^3 *(1 mark, 2 or 3 sf)*. [3]

(iii) Moles of silver iodide = $8.00 \times 10^{-4} \times 1.00$ mol *(1 mark, note ecf from parts (i) and (ii)) (note ecf)*;

mass of silver iodide = $8.00 \times 10^{-4} \times 1.00 \times 235$g = 0.188g *(1 mark)*. [2]

(b) (i) Convert it to silver nitrate (and recycle) *(1 mark)*. [1]

(ii) Iron(II) chloride (allow Iron(III) chloride, or iron chloride) *(1 mark)*. [1]

(iii) **Stage 2** $Fe + 2Ag^+ \rightarrow Fe^{2+} + 2Ag$ *(1 mark balancing)* *(1 mark)*

Stage 3 $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ *(1 mark balancing)* *(1 mark)*.

(1 mark each for circling Ag^+ and Cl_2*)* [6]

Total 15 marks