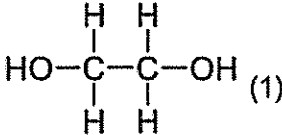
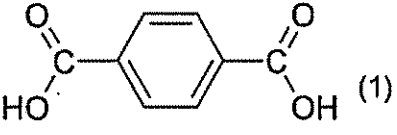
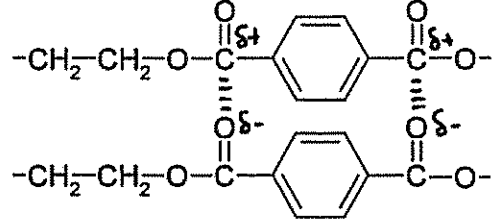
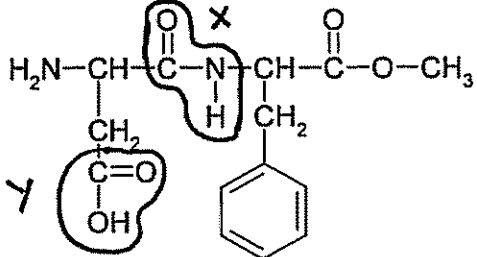
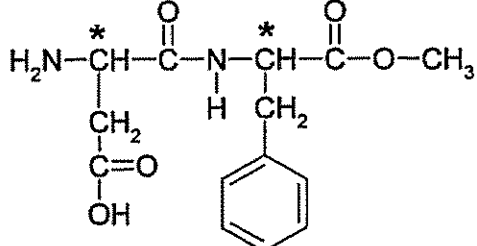
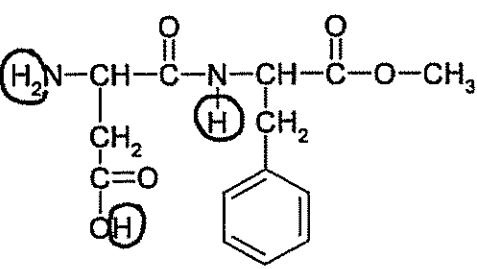
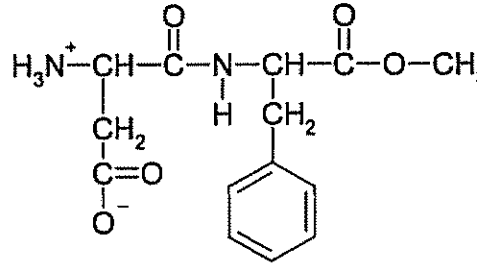
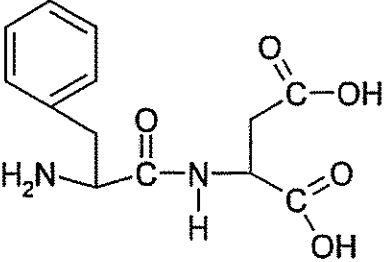
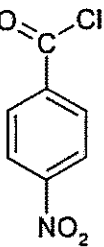
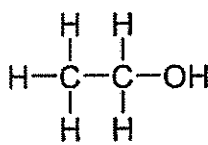


Question	Expected Answers	Marks
1(a)	to prevent oxidation of food/food decomposition/food spoilage/food contamination; to prevent escape of CO ₂ /gas escaping;	1
1(b)	ester;	1
1(c)	many / lots of; (accept <u>long</u> chain molecule) molecules/units / monomers joined together; small molecule / water is eliminated;	3
1(d)	<p style="text-align: center;">Monomer A</p>  <p style="text-align: center;">Monomer B</p>  <p>acid groups in the No ambiguous attachments</p> <p style="text-align: center;">allow 1 mark if 2 carboxylic (not full structural) are shown correct position.</p>	3
1(e)(i)	permanent dipole - (permanent) dipole forces (must have idea of between chains)	1
1(e)(ii)	<p>δ⁻ on O on C=O on one chain; δ⁺ on C of carbonyl group; attraction shown clearly between <u>these atoms</u> on separate chains;</p>  <p>Ignore extra correct charges</p>	3
1(f)	<p>4from: chains are more linear in PET; therefore able to pack more <u>closely</u> together/ more points of contact; PET is more crystalline/packed more regularly/more aligned/more ordered; Stronger/more intermolecular forces/increased van der Waals forces in PET (NOT BONDS); more energy needed or more difficult to separate the chains / overcome intermolecular forces/ cause chains to slide over each other (when PET melts) ORA (ignore reference to branched chains in polymer X) (heat and energy interchangeable – not melts)</p>	4
		Total:16

Question	Expected Answers	Marks
2(a)	3 from: dissolve/ forms a solution; in <u>minimum owtte</u> amount ;of hot methanol (not reflux/distill/to evaporate) cool to recrystallise; 1 from: filter/dry/ wash; <i>QWC: Min. of 2 sentences/ bullet points with 2 of the following processes correctly used: dissolve, filter, solvent/methanol, solution.</i>	4(+1)
2(b)	 <p>Correctly labelled (ie no labels scores 1)</p>	2
2(c)(i)		2
2(c)(ii)	<u>four different</u> groups attached to the carbon atom	1
2(d)	 <p>Deduct 1 mark for each additional H circled above 3. (max 3)</p>	3
2(e)	 <p>Correct zwitterion without charges scores 1 (accept condensed formula for carboxylate ion) Proton must be transferred to and from correct functional groups</p>	2
2(f)	reflux/heat/warm (not high temperature/boil); with <u>moderately concentrated</u> /(4M-6M) hydrochloric acid/sodium hydroxide/ sulphuric acid/ acid/alkali; (not nitric acid)	2

2(g)	amide link correct; rest of molecule;  any structure shown i.e. structural or skeletal	2
	Total: 19	

Question	Expected Answers	Marks
3(a)(i)	Compound X is C_2H_5OH (1) Other product is H_2O (1)	2
3(a)(ii)	concentrated sulphuric acid allow formula	1
3(b)	structural formula of acyl chloride group; rest of molecule; (no ambiguous attachments) <div style="text-align: center;">  </div>	2
3(c)(i)	$R-CH_3 = 1.2;$ $R-OH = 2.7 ;$ $R-CH_2-O = 3.8 ;$ must have R group	3
3(c)(ii)	full structural formula of ethanol ; (no ambiguous attachments) <div style="text-align: center;">  </div>	1
	Total: 9	

Question	Expected Answers	Marks
4(a)(i)	correctly plotted data (2) (all points should be +/- 1 scale division), 1 incorrect point ((1); smooth curve;	3
4(a)(ii)	each half life correctly drawn and clearly labelled = 1 mark (2 max) (two half lives correctly drawn without labels scores 1) Half life clearly labelled in words or letters showing the correct horizontal portion	2
4(a)(iii)	1800-2200s	2
4(a)(iv)	first order wrt sucrose; half lives (almost) constant; ecf from (a)(iii) half lives not constant; therefore not first order (no ecf to 4b); (half lives must be present in (a)(iii) to get reason mark) (values should be different by ≥ 100 to score different mark)	2
4(a)(v)	draw a <u>tangent</u> to the curve <u>at t=0s</u> owtte; find the gradient ie concentration+time; not just line	2
4(b)	rate = $k[H^+]$ [sucrose]; 1 mark for each correct component of RHS ecf if zero or second order wrt sucrose in (a)(iv)	3
4(c)	rate would halve	1
		Total:15

5(a)	different sized atoms ; interrupt orderly arrangement of atom in metal lattice/less regular lattice; layers of atoms prevented from slipping; (Marks can be awarded for clearly annotated diagram) (Diagram showing different sized atom scores 1)	3
5(b)	4 from: make up solutions of known concentrations; range/different concentrations; range in correct region; choose filter/ set colorimeter at the correct wavelength; zero with water; measure <u>absorbance/transmittance</u> ;	4
5(c)(i)	$2.65 \times 10^{-2} - 2.70 \times 10^{-2} (\text{mol dm}^{-3})$	1
5(c)(ii)	$2.65 \times 10^{-2} \times 63.5(1) = 1.68\text{g in } 1\text{dm}^{-3}$; ecf $2.70 \times 10^{-2} \times 63.5 = 1.71\text{g}$ answer ± 10 (1) $0.168\text{g} - 0.171\text{g in sample (1)}$ 2/3sf	3
5(c)(iii)	$\frac{0.168}{0.200} \times 100 = 84.0\%$ - $\frac{0.171}{0.200} \times 100 = 85.5\%$ allow ecf only if < 100%	1
		Total 12

Question	Expected Answers	Marks
6(a)(i)	$\text{Cu}^{2+} + \text{Zn} \rightarrow \text{Zn}^{2+} + \text{Cu}$	1
6(a)(ii)	1.1V	1
6(b)(i)	$3d^{10}; 4s^1$; (allow 1 mark for $3d^9; 4s^2$)	2
6(b)(ii)	9	1
6(c)	(central) metal ion; (ignore atom) surrounded by/bonded to ligands/ negatively charged ions/molecules with lone pairs;	2
6(d)	4 from: <u>ligands</u> cause splitting of sub shell into two <u>energy levels</u> ; d orbitals partially filled; electron is promoted/excited from lower energy level to a higher energy level difference in energy corresponds to visible region of EMS/ <u>light</u> (energy) is absorbed; light not absorbed/transmitted/reflected gives colour;	4
6(e)	Equilibrium lies neither to the left or right; AW	1
6(f)	$K_c = \frac{[\text{CuCl}_4(\text{H}_2\text{O})_2]^{2-} \cdot 1 \cdot [\text{H}_2\text{O}]^4}{[\text{Cu}(\text{H}_2\text{O})_6]^{2+} [\text{Cl}^-]^4}$ top component=1 bottom component =1 K_c & powers =1	3
6(g)(i)	solution would turn <u>pale blue</u> ; stability constant is greater for <u>edta⁴⁻ complex</u> / <u>edta⁴⁻ complex</u> is more stable than $[\text{CuCl}_4(\text{H}_2\text{O})_2]^{2-}$;	2
6(g)(ii)	solution would remain pale blue/ no colour change; stability constant for <u>ammonia complex</u> is smaller/ <u>ammonia complex</u> is less stable than <u>edta⁴⁻ complex</u> ;	2
		Total 19