Question			Expected Answer	Mark	Additional Guidance
1	(a)	(i)	<table><tr><th>reagent</th><th>observation</th><th>molecule</th><th>present or absent</th></tr><tr><td>ethanol and water</td><td>white emulsion</td><td>lipid</td><td>present</td></tr><tr><td>Benedict's solution</td><td>brick-red precipitate</td><td><u>reducing</u> sugar / lactose / glucose / galactose / monosaccharides</td><td>present ;</td></tr><tr><td>biuret I and II</td><td>lilac colour</td><td>protein / named milk protein</td><td>present ;</td></tr><tr><td>iodine solution</td><td>yellow / brown</td><td>starch / amylose</td><td>absent ;</td></tr></table>	3	One mark per correct row. **IGNORE** 'yes', 'no' and ticks and crosses **DO NOT CREDIT** if anything incorrect is written in any box in the molecule column. e.g. 'starch or cellulose' = 0 mark **ACCEPT** maltose **DO NOT CREDIT** sucrose **ACCEPT** casein / lactoglobulin / lactalbumin / polypeptide **IGNORE** amylopectin
	(a)	(ii)	milk is already, cloudy / an emulsion / white / AW **;**	1	**ACCEPT** idea of difficulty in detecting change because of the appearance of milk
	(a)	(iii)	(one) glycerol / glyceride **;** 3 fatty acids **;** ester bond (between glycerol and fatty acid) **;**	3	**ACCEPT** marking points from clearly labelled diagram but **DO NOT CREDIT** if contradicted in text. **IGNORE** individual atoms on diagram and look for correct position of labels **MAX 2** if phosphate group included (as could be confused with phospholipid) **ACCEPT** on diagram if 3 shown and at least one labelled **ACCEPT** triglycerides are esters

Question			Expected Answer	Mark	Additional Guidance
	(b)				**MARK THE FIRST RESPONSE ON EACH NUMBERED LINE**
		1	(thermal) insulation **;**		***1*** **ALLOW** 'warmth'
		2	energy, store / source / release **;**		***2*** **CREDIT** answers that refer to the idea of lipid as a respiratory substrate but **DO NOT CREDIT** 'for respiration' unqualified **IGNORE** 'fat contains energy' without further qualification **DO NOT CREDIT** refs to producing energy or to quick energy release **ACCEPT** 'provides energy'
		3	protection **;**		
		4	membranes / phospholipid bilayer / control entry and exit into cells **;**		***4*** **CREDIT** ref to cholesterol in membranes
		5	(steroid) hormones / named steroid hormone **;**		
		6	buoyancy **;**		
		7	waterproofing **;**		
		8	source of water (from respiration) **;**		
		9	(electrical insulation) in myelin / around neurones / around axons / around dendrons **;**		***9*** **CREDIT** nerve fibres / saltatory conduction **IGNORE** nerves
		10	aid, absorption / storage / production, of, fat soluble / A / D / E / K, vitamins **;**	**3**	
	(c)	**(i)**	saturated **;** (fatty acids have) no / fewer, double bonds **;** solid at room temperature **;**	**1 max**	Assume answers refer to animal fats unless otherwise stated **ACCEPT** reverse argument **IGNORE** ref to fats and oils (as stated in question) **ACCEPT** 'fatty acids are not kinked' **ACCEPT** reasonable temperature quoted

Question		Expected Answer	Mark	Additional Guidance
(c)	(ii)			
	1	(death rate for) men greater (at any concentration) / AW ;		*1* **ACCEPT** ora
	2	(death rates) rise with increasing cholesterol / AW ;		*2* **ACCEPT** 'positive correlation' (between death and cholesterol)
	3	death rate for men, initially / AW, falls ;		*3* **ACCEPT** 4.8 or below as 'initially'.
	4	steep(er) / AW, rise (in, males / both) at higher cholesterol levels ;		*4* Answers must refer to latter part of graph only (5.7 or above). **ACCEPT** difference (between sexes) greater at high concentration
	5	comparative figures with unit for (blood) cholesterol to support any of the above points ;	3 max	*5* There are 3 ways of getting this mark: • values for both sexes at single concentration • two values for single sex at two concentrations • subtraction / calculation, that shows comparison **IGNORE** terms like 'about' See table for acceptable examples of x and y values – if intermediate chol sterol values are used, refer to the graph for the data

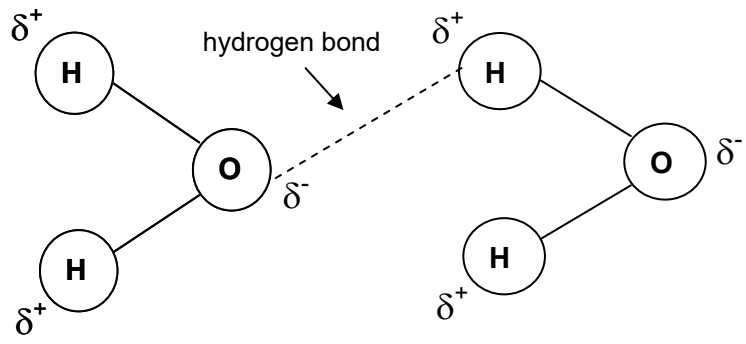
blood cholesterol (mmol dm^{-3})	deaths per 10 000	
	women	men
3.6	13.2 - 14.1	31.2 - 32.1
4.3	15.0 - 15.9	26.0 - 26.9
4.8	14.0 - 14.9	24.0 - 24.9
5.2	15.1 - 16.0	24.6 - 25.5
5.7	17.4 - 18.3	25.8 - 26.7
6.2	17.8 - 18.7	33.2 - 34.1
6.7	23.5 - 24.3	31.3 - 32.2
7.3	22.0 - 22.9	44.1 - 45.0
8.2	31.7 - 32.6	59.5 - 60.4

Must include (blood) cholesterol units **Any figure within a particular range is acceptable**

Question			Expected Answer	Mark	Additional Guidance
	(c)	(iii)			**Mark first two in list**
		1	coronary heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina **;**		***1*** **DO NOT CREDIT** heart disease alone or 'conary' **ACCEPT** hypertension / high blood pressure
		2	atherosclerosis / atheroma **;**		***2*** **DO NOT CREDIT** arteriosclerosis
		3	stroke **;**		
		4	Type 2 diabetes **;**		
				2	
			Total	**16**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)		obese ; iron ; haemoglobin ;	3	
	(b)		24.7 ; ;	2	If answer incorrect or to the wrong number of dp, then **ALLOW** one mark for working: $69 \div 1.67^2$ 24.74 = one mark **IGNORE** 25 and look for working mark If units are given, they **must** be kg m^{-2} (or kg/m^2) Max 1 for incorrect units
	(c)	(i)	overweight / borderline overweight ;	1	**DO NOT CREDIT** if more than one answer given
	(c)	(ii)	**1** very close to border / AW ; **2** graph does not distinguish between male and female ; **3** does not measure actual fat / AW ; **4** has, more / less, muscle / bone (than normal) **OR** (does not take into account) muscle / bone, mass / density / weight ; **5** muscle / bone, heavier / denser, than fat / AW ; **6** pregnant ;	2 max	**1 DO NOT CREDIT** mistake reading graph **4** Must refer to idea of amount of muscle / bone being different from normal. **DO NOT CREDIT** muscle / bone unqualified **CREDIT** has osteoporosis as ref. to different bone density

Question			Expected Answers	Marks	Additional Guidance
	(d)		**1** coronary heart disease / CHD / atherosclerosis / angina / coronary thrombosis / myocardial infarction / heart attack / cardiac arrest / cardiovascular disease / stroke **;** **2** (osteo)arthritis **;** **3** (Type 2) diabetes **;** **4** high blood pressure / <u>hyper</u>tension **;** **5** gallstones **;** **6** cancer **;**	**2 max**	**1 DO NOT CREDIT** heart disease alone / arteriosclerosis **2 DO NOT CREDIT** rheumatoid arthritis **3 DO NOT CREDIT** Type 1 diabetes **6 ACCEPT** any type of cancer
			Total	**10**	

Question			Expected Answers	Marks	Additional Guidance
3	(a)		**1** hydrogen bond represented as, horizontal / vertical, dashed line between **O** on one molecule and **H** on the adjacent molecule **;** **2** hydrogen / **H**, bond label (on any drawn bond between 2 molecules) **;** **3** (delta positive) δ^+ on **each** drawn **H** **and** (delta negative) (2) δ^- on **each** drawn **O** **;**	**3**	 **1** **DO NOT CREDIT** if >1 H bond is drawn between the same two molecules **3** if both molecules drawn, δ^+ and δ^- on **all** atoms. **ACCEPT** d (lower case) for δ

Question	Expected Answers	Marks	Additional Guidance
(b)	*ice floats*		
P1	(ice less dense because) molecules spread out **;**		
P2	molecules form, crystal structure / lattice / AW **;**		
P3	ice forms insulating layer / clearly described **;**		**P3** e.g. acts as a barrier to the cold
P4	water (below ice), does not freeze / still liquid / remains water / kept at higher temperature **;**		
S1	organisms do not freeze **;**		**S1 DO NOT ACCEPT** die (because 'survival' stated in stem)
S2	animals / organisms, can still, swim / move **;**		
S3	allows, currents / nutrients, to circulate **;**		
	solubility		
P5	ions / named ion, polar / charged **;**		
P6	ions /named ion, attracted to / bind to / interact with, water;		
S4	(named) organisms / plants / animals, uptake / AW, minerals / named mineral / nutrients **;**		**S4 ACCEPT** obtain / enters / goes in / gets
S5	correct use of named, mineral / nutrient, in organism **;**		**S5** needs to be more specific than 'for growth / metabolism' suitable examples include but are not limited to: nitrates for amino acids / protein / (named) nucleic acid / phosphate for ATP / phospholipids / plasma membrane / magnesium for chlorophyll etc

			temperature stability		
		P7	many / stable, (hydrogen) bonds between molecules **;**		**P7** Many hydrogen bonds between molecules = 2 marks (gets P7 and H)
		P8	at lot of energy to, force apart molecules / break bonds **;**		**P8** **ACCEPT** heat as alternative to energy
		P9	high (specific) heat capacity **;**		**P9** **DO NOT CREDIT** latent heat capacity
		S6	temperature does not change much / small variation in temperature **;**		**S6** could refer to organisms **or** surrounding water **ACCEPT** stays cool in summer / stays warm in winter **DO NOT CREDIT** constant alone
		S7	effect of temperature on **,** enzymes / metabolic rate **;**		**S7** **ACCEPT** any reference to temperature affecting enzyme activity / metabolic rate
		S8	gases remain soluble **;**		
		H	*Award once in any section* hydrogen bonds **;**	**7 max**	**DO NOT CREDIT** if in incorrect context (e.g. they are strong bonds)
			QWC - Award if you see a P mark **and** an S mark within the **same** section **;**	**1**	Look for the **S** mark first, then award QWC if there is a **P** mark **in the same section** in the mark scheme
	(c)		hydrolysis / hydrolytic **;** hydrophilic **;**	**2**	**ACCEPT** phonetic spelling throughout **IGNORE** head
			Total	**13**	

Question			Expected Answers	Marks	Additional Guidance
4	(a)	(i)	L **;** M **;** J **;**	**3**	If 2nd letter given, no mark
	(a)	(ii)	**1** peptide bond **;** **2** between, amine / **J** group (of one amino acid) and carboxyl / **L** group (of another) **;** **3** H (from amine group) combines with OH (from carboxyl group) **;** **4** condensation reaction **OR** water, lost / eliminated / produced / created / AW **;** **5** covalent **;**	**3 max**	**CREDIT** answers from clearly drawn diagrams with bonds labelled **1 ACCEPT** peptide link
	(b)		**1** some R groups, attract / repel **;** **2** disulfide, bridges / bond **;** **3** between, cysteine / SH / S (atoms) **;** **4** hydrogen / H, bonds **;** **5** ionic bonds between, oppositely charged / + and -, R groups **;** **6** hydrophilic R groups, on outside of molecule / in contact with water (molecules) **;** **7** hydrophobic R groups, on inside of molecule / shielded from water (molecules) **;**	**4 max**	**4 DO NOT CREDIT** in context of **secondary** structure

Question			Expected Answers	Marks	Additional Guidance
	(c)	(i)	<table><tr><th></th><th>glycogen</th><th></th><th></th></tr><tr><td>1</td><td>carbohydrate / polysaccharide</td><td>protein / polypeptide</td><td>;</td></tr><tr><td>2</td><td>(alpha) glucose (units)</td><td>amino acid (units)</td><td>;</td></tr><tr><td>3</td><td>identical units</td><td>different amino acid units</td><td>;</td></tr><tr><td>4</td><td>glycosidic, bonds / links</td><td>peptide, bonds / links</td><td>;</td></tr><tr><td>5</td><td>branched</td><td>unb / linear</td><td>;</td></tr><tr><td>6</td><td>non-helical</td><td></td><td>;</td></tr><tr><td>7</td><td>one chain (per molecule)</td><td>three chains (per molecule)</td><td>;</td></tr><tr><td>8</td><td>no cross links</td><td>cross links (between chains)</td><td>;</td></tr><tr><td>9</td><td>contains C H O</td><td>contains C H O N</td><td>;</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	3 max	**AWARD** 1 mark per correct row Comparative statements must be made in a row **2 DO NOT CREDIT** beta **5 ALLOW** straight **7 DO NOT CREDIT** strands **9 IGNORE** S (for collagen)
	(c)	(ii)	(high tensile) strength / strong **;** does not stretch / is not elastic **;** insoluble **;** flexible **;**	2 max	Mark the 1st answer on each numbered line **IGNORE** fibrous / tough
			Total	**15**	