<table>
<tr><th colspan="3">Question</th><th>Expected Answer</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>
<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>
</td><td>3</td><td>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</td></tr>
<tr><td></td><td>(a)</td><td>(ii)</td><td>milk is already, cloudy / an emulsion / white / AW ;</td><td>1</td><td>ACCEPT idea of difficulty in detecting change because of the appearance of milk</td></tr>
<tr><td></td><td>(a)</td><td>(iii)</td><td>(one) glycerol / glyceride ;
3 fatty acids ;

ester bond (between glycerol and fatty acid) ;</td><td>3</td><td>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</td></tr>
</table>

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 ;		*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
		3 max	

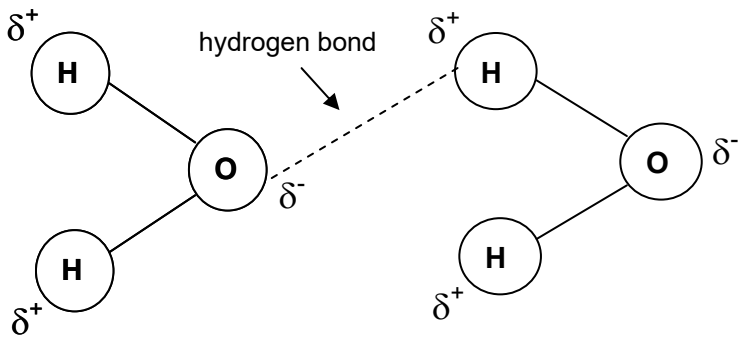
blood cholesterol (mmol dm^{-3})	deaths per 10 000	
	women	men
3.6	13.2 - 14.1	31.2 - 32.1
4.3	15.0 - 15.9	26.0 - 26.9
4.8	14.0 - 14.9	24.0 - 24.9
5.2	15.1 - 16.0	24.6 - 25.5
5.7	17.4 - 18.3	25.8 - 26.7
6.2	17.8 - 18.7	33.2 - 34.1
6.7	23.5 - 24.3	31.3 - 32.2
7.3	22.0 - 22.9	44.1 - 45.0
8.2	31.7 - 32.6	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)	<u>overweight</u> / borderline <u>overweight</u> **;**	**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 / hypertension ; **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)			**AWARD** 1 mark per correct row Comparative statements must be made in a row

	glycogen		
1	carbohydrate / polysaccharide	protein / polypeptide	;
2	(alpha) glucose (units)	amino acid (units)	;
3	identical units	different amino acid units	;
4	glycosidic, bonds / links	peptide, bonds / links	;
5	branched	unb / linear	;
6	non-helical		;
7	one chain (per molecule)	three chains (per molecule)	;
8	no cross links	cross links (between chains)	;
9	contains C H O	contains C H O N	;

				3 max	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**	