

# POLYMERS 1

## MARK SCHEME

### Q1.

Question	Answer	Extra information	Marks
	they would melt or they have a low melting point	allow would lose their shape ignore soften	1
	because there are no cross links or there are weak intermolecular forces	accept there are weak bonds / forces between (polymer) chains	1
Total marks			2

### Q2.

Question	Answer	Extra information	Marks
	chains or large molecules with intermolecular forces or forces between chains that are weak and are easily overcome/ broken (when heated)	reference to incorrect bonding = max 3 reference to 'weak covalent bonds' = max 2 allow correctly drawn diagram for first two marking points e.g. (tangled) lines with no cross-links ignore layers allow bonds for forces accept no cross-links must relate to 2nd marking point accept molecules / chains can flow / move	1 1 1 1
Total marks			4

### Q3.

Question	Answer	Extra information	Marks
	any two from: <ul style="list-style-type: none"><li>• pressure</li><li>• temperature</li><li>• catalyst or initiator</li><li>• solvent</li></ul>	allow concentration	2
Total marks			2

**Q4.**

Question	Answer	Extra information	Marks
(i)	melt		1
(ii)	crosslinking or (covalent) bonds between polymers / chains	allow answers on diagram  allow bonds between layers do not allow intermolecular	1
Total marks			2

**Q5.**

Question	Answer	Extra information	Marks
(a)	giant lattices		1
(b)	heat / warm / increase the temperature	allow reduce pressure do not accept melt	1
Total marks			2

**Q6.**

Question	Answer	Extra information	Marks
	used plastic bottles are heated then moulded / extruded into a new shape / object because the polymer chains / molecules in the plastic have weak intermolecular forces that allow these polymer chains / molecules to become mobile when heated	accept used plastic bottles are melted	1
			1
			1
			1
Total marks			4

**Q7.**

Question	Answer	Extra information	Marks
	any one from: • different conditions • different catalyst • different pressure • different temperature	allow different concentration  do not accept different monomers	1
Total marks			1

**Q8.**

Question	Answer	Extra information	Marks
(i)	any two from: <ul style="list-style-type: none"> <li>• alkanes / butane (molecules) do not have a (carbon carbon) double bond / are saturated / have (carbon carbon) single bonds</li> <li>• alkenes / ethene (molecules) have (carbon carbon) double bonds or are unsaturated</li> <li>• alkenes / ethene molecules are able to bond to other molecules</li> </ul>	'they' must be clarified	2
(ii)	single bonds between carbon atoms  the -CH <sub>3</sub> group appears on each pair of carbons on the 'chain'	— C — C —  NB any double bonds = 0 marks	1  1
Total marks			4

**Q9.**

Question	Answer	Extra information	Marks
(i)	many ethene / molecules / monomers join to form a long hydrocarbon / chain / large molecule	accept double bonds open / break accept addition polymerisation ignore references to ethane correct equation gains 2 marks	1  1
(ii)	(can be deformed but) return to their original shape (when heated or cooled)	ignore 'it remembers its shape'	1
Total marks			3

**Q10.**

Question	Answer	Extra information	Marks
(a)	single bonds between C-H, C-Cl and C-C	do not accept symbols outside the bracket	1

(b)(i)	so that the amount of plasticiser / (sample of) PVC is the independent / only variable that affects the bending / flexibility of the samples	allow because different sizes would give different results accept because size is a control variable ignore references to reliability / precision etc	1
(ii)	to improve the reliability (of the investigation)	accept to calculate a mean accept to check for anomalous results or to check the range of results ignore accuracy / precision etc	1
(iii)	23	<b>correct answer with or without working = 2 marks</b>  if answer is incorrect allow $\frac{22 + 23 + 24}{3}$ <b>or 21 for 1 mark</b>	2
(iv)	(PVC) sample had been stretched / used / tested in first three tests	accept higher temperature allow worn or become weaker ignore (human) error ignore more flexible / softer ignore intermolecular forces	1
(c)	does not bend (easily / much) or it is not flexible or it is rigid	ignore non-biodegradable / low maintenance ignore sturdy / stronger / harder	1
Total marks			7