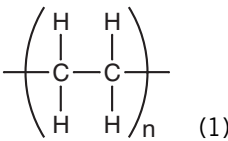
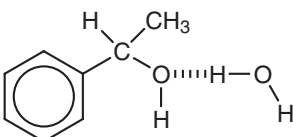
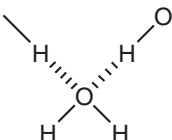
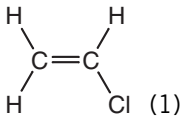
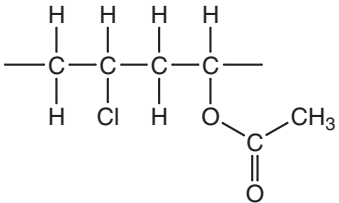


Answers to The Polymer Revolution End of Unit Test

Q	Answer with marks	Marking suggestions
1(a)		Brackets and 'n' not essential
1(b) (i)	It is decolorised (1)	
1(b) (ii)	Carbocation (1)	
1(b) (iii)	The carbocation can be attacked either by Br ⁻ forming 1,2-dibromo-1-phenylethane (1); or by Cl ⁻ (1); forming 1-chloro-2-bromo-1-phenylethane (1)	Or formulae instead of names
1(c) (i)	In large areas (1); the chains are regularly packed together (1)	
1(c) (ii)	The irregular chains (1); cannot line up easily (1)	
1(c) (iii)	Isotactic – two properties from: more rigid/brittle; stronger; denser (1) properties explained in terms of closer packing; chains less able to move over one another or more (attractive) forces (between chains) (1)	Or other way round in terms of less brittle behaviour of atactic form
1(c) (iv)	Instantaneous dipole-induced dipole (1)	
1(d)	Catalysts based on organo-metallic compounds (1); they control the growth of polymers (1); making it possible for chemists to make polymers with precise properties (1)	Allow 'stereoregular growth' or words to that effect for the second mark
1(e)	Name (1); brief details (1) eg poly(ethene); attempting to make ethene react with another substance or hdpe; traces of transition metal compounds or conducting polymers; too much catalyst used	

Q	Answer with marks	Marking suggestions
2(a) (i)	Electrophilic (1); addition (1)	
2(a) (ii)	Hydrogen bromide (1); polar solvent/room temperature (1)	
2(a) (iii)	Water (1); phosphoric acid (catalyst) (1); high temperature and pressure (1) or Concentrated (1); sulphuric acid (1); followed by addition of water (1)	
2(b) (i)	 (1) hydrogen bond between H and O (1) rest of detail correct	Allow, of course, hydrogen bond between H of alcohol and O of water.
2(b) (ii)	 (1) two hydrogen bonds from each oxygen to hydrogens on other molecules (1) tetrahedral arrangement around central O	
2(b) (iii)	only one hydrogen bond per molecule in 1-phenylethanol/two hydrogen bonds per molecule in water/1-phenylethanol has large hydrocarbon part which cannot form hydrogen bonds (1); addition of 1-phenylethanol would disrupt (stronger) hydrogen bonding in water (1)	

Q	Answer with marks	Marking suggestions
3(a) (i)	 (1)	
3(a) (ii)	Chloroethene (1)	
3(b) (i)	A is <i>cis</i> - (1); B is <i>trans</i> - (1); 1,2-dichloroethene (1)	Allow small mistakes with dashes and commas
3(b) (ii)	No double bonds (1); which restrict rotation (1)	Or alternative in terms of 'single bonds only'
3(b) (iii)	Electrons not equally shared (1); chlorine more negative than carbon (1)	Do not allow 'chlorine more electronegative'
3(b) (iv)	Isomer A has dipole/Isomer B does not (1); A has two chlorines on same side (1). In B the effects/dipoles due to the chlorine atoms cancel out (1)	
3(b) (v)	A will have a higher melting/boiling point than B (1); A has stronger intermolecular forces/ A has permanent dipole–permanent dipole forces and instantaneous dipole–induced dipole forces; B only has the latter (1)	Allow vice versa in terms of A
3(c) (i)	Co-polymer (1)	
3(c) (ii)	 (1) detail of ester correct (1) rest of molecule correct	Score independently
3(c) (iii)	Instantaneous dipole–induced dipole (1); permanent dipole–permanent dipole (1); latter stronger (1)	
3(c) (iv)	Permanent dipole–permanent dipole (1)	
3(c) (v)	Chains can move over each other more easily (1); because – <i>two from</i> (2): larger side-groups; push apart the chains; which reduces the intermolecular forces	
3(c) (vi)	Thermoplastic/thermosoftening (1)	
3(c) (vii)	Thermoset(ting) (1); chains/all atoms joined together by strong bonds/forces (1); which are covalent bonds (1)	