Polymers and Synthesis

1. What is a peptide?
2. What is a protein?
3. How many amino acids are there in the body?
4. What is the general formula of an α-amino acid?
5. Draw the simplest amino acid.
6. Define a zwitterion.
7. Define isoelectric point.
8. Define amphoteric
9. What happens if the pH is more acidic than the isoelectric point?
10. What happens in the pH is more alkaline than the isoelectric point?
11. What do the prefixes di-, tri- and tetra- mean in a peptide?
12. Define condensation reaction.
13. Draw the two structural isomers of the dipeptides that can be produced when glycine and alanine undergo a condensation reaction and draw the non-organic compound that is formed in the reaction.
14. What is a polypeptide and how is it formed?
15. Define hydrolysis
16. What are the reagents and conditions for acid hydrolysis of proteins and polypeptides?
17. What charge do the amino acids formed from acid hydrolysis have and why?
18. What are the reagents and conditions for alkaline hydrolysis of proteins and polypeptides?
19. What form do amino acids take after alkaline hydrolysis?
20. Define stereoisomers
21. Define chiral carbon
22. Define optical isomer
23. Define enantiomer
24. When does optical isomerism occur?
25. In what way to optical isomers differ from each other?
26. How many optical isomers are formed for each chiral carbon?
27. Draw the two optical isomers of CH3CH2CH(NH2)CH3
28. Define racemic mixture and explain what effect it has on plan-polarised light.
29. All α-amino are optically active except for which one?
30. Why is optical activity important in biological systems?
31. Define condensation polymerisation and explain the requirements needed for it to occur.
32. Explain how the two common types of polyester form.
33. Define repeat unit
34. Draw a repeat unit of Terylene which is formed from ethane-1,2-diol and benzene-1,4-dicarboylic acid and draw the non-organic compound which is also formed.
35. Give a use of polyester.
36. Give one advantage and one disadvantage of polyester.
37. Draw 2 repeat units for poly(lactic acid) formed from lactic acid (2-hydroxypropanoic acid)
38. What is a polyamide?
39. Give examples of polyamides.
40. Explain how the two common types of polyamide form.
41. Draw a repeat unit of Nylon-6,6, formed from 1,6-diaminohexane and hexane-1,4-dioic acid and draw the non-organic product that is formed.
42. Draw the repeat unit for Kevlar which is formed from benzene-1,4-dioic acid and benzene-1,4-diamine.
43. What is Kevlar used for?
44. Define addition polymerisation and give the general equation.
45. How can you identify what type of polymerisation has occurred?
46. What are the reagents and conditions of alkaline hydrolysis of polyesters and what is formed?
47. What are the reagents and conditions of acid hydrolysis of polyesters and what is formed? How does the speed of the reaction compare with alkaline hydrolysis?
48. What are the reagents and conditions of alkaline hydrolysis of polyamides and what is formed?
49. What are the reagents and conditions of acid hydrolysis of polyamides and what is formed?
50. Give examples of two biodegradable polymers and explain their importance.
51. What are photodegradable polymers and how do they work?
52. What is organic synthesis?
53. Starting with a halogenoalkane, draw as many synthesis routes as possible.
54. Starting with benzene, draw as many synthesis routes as possible.
55. Starting with phenol, draw as many synthesis routes as possible.
56. What problem was caused by the drug thalidomide and why?
57. What problem was caused by Seldane and why?
58. What determines the pharmacological activity of a drug?
59. What are the benefits of producing a single isomer during drug synthesis?
60. How are optical isomers separated and what are the issues with this?
61. Describe how enzymes are used for making single optical isomers.
62. Describe how naturally occurring chiral molecules are used to make single optical isomers.
63. Describe how transition element complexes are used to make single optical isomers.
64. Why is Ibuprofen sold as a mixture of both its optical isomers?