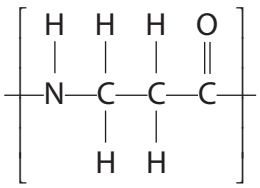
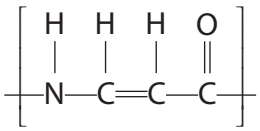
1 The repeat unit for poly(propenamide) is

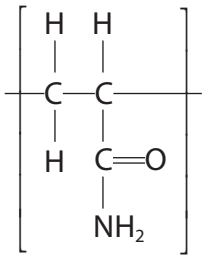
☒ **A**



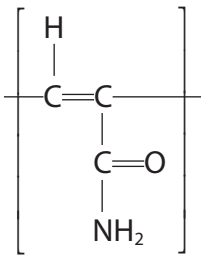
☒ **B**



☒ **C**



☒ **D**



(Total for Question = 1 mark)

2 The structures of three amino acids are shown in the table.

Amino acid	Structure
cysteine	$HSCH_2CH(NH_2)COOH$
glycine	H_2NCH_2COOH
threonine	$CH_3CH(OH)CH(NH_2)COOH$

The tripeptide glycine-cysteine-threonine is

☒ **A** $H_2NCH_2CONHCH(CH(OH)CH_3)CONHCH(CH_2SH)COOH$

☒ **B** $H_2NCH_2CONHCH(CH_2SH)CONHCH(CH(OH)CH_3)COOH$

☒ **C** $H_2NCH(CH(OH)CH_3)CONHCH(CH_3SH)CONHCH_2COOH$

☒ **D** $H_2NCH(CH_2SH)CONHCH_2$ $CONHCH(CH(OH)CH_3)COOH$

(Total for Question = 1 mark)

3 The amino acid alanine, $H_2NCH(CH_3)COOH$, exists as a solid at room temperature.

The most important reason for this is that it

☒ **A** exists as a zwitterion.

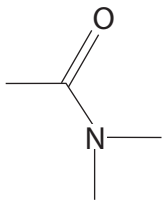
☒ **B** forms hydrogen bonds.

☒ **C** is amphoteric.

☒ **D** has strong London forces.

(Total for Question = 1 mark)

4 The skeletal formula of an organic compound is shown below.



This compound is

☒ **A** an amino acid.

☒ **B** an amide.

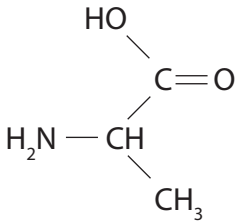
☒ **C** a primary amine.

☒ **D** a secondary amine.

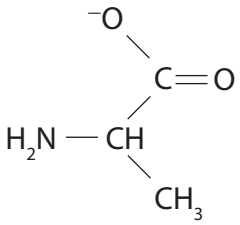
(Total for Question = 1 mark)

5 In an aqueous solution with a pH of 7, the amino acid alanine exists mainly as

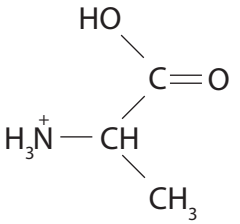
☒ **A**



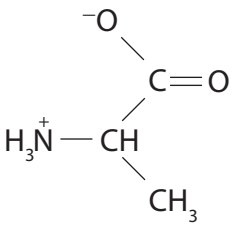
☒ **B**



☒ **C**



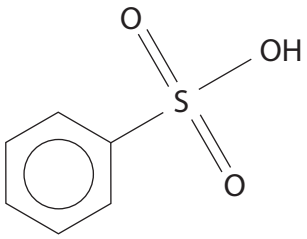
☒ **D**



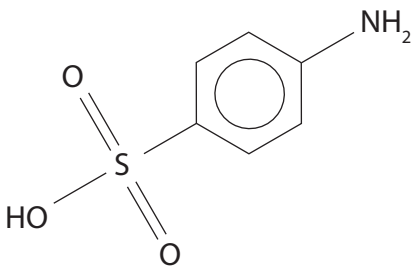
(Total for Question = 1 mark)

6 Excess dilute sulfuric acid is added to phenylamine. What is the product of the reaction?

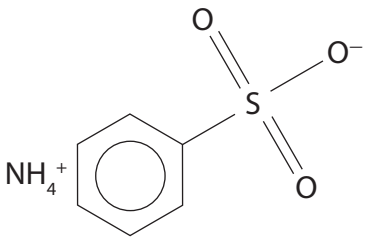
☒ **A**



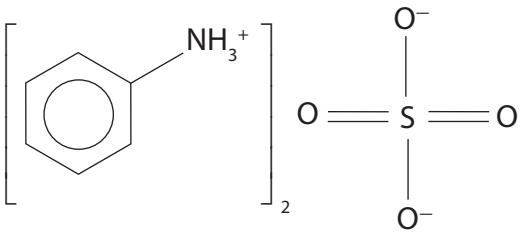
☒ **B**



☒ **C**



☒ **D**



(Total for Question = 1 mark)

7 Butylamine (T_b = 77.8 °C) has a higher boiling temperature than propylamine (T_b = 47.7 °C). This is because the

☒ **A** hydrogen bonds of butylamine are stronger than the hydrogen bonds of propylamine.

☒ **B** London forces of butylamine are stronger than the hydrogen bonds of propylamine.

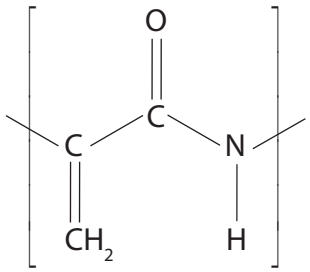
☒ **C** London forces of butylamine are stronger than the London forces of propylamine.

☒ **D** C—H bonds of butylamine are stronger than the C—H bonds of propylamine.

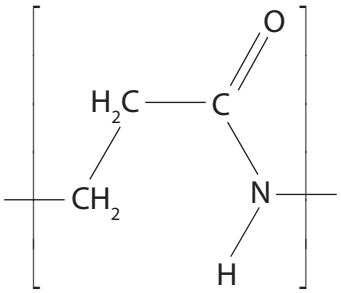
(Total for Question = 1 mark)

8 The monomer of the addition polymer poly(propenamide) is $CH_2{=}CHCONH_2$. The repeat unit of the polymer is

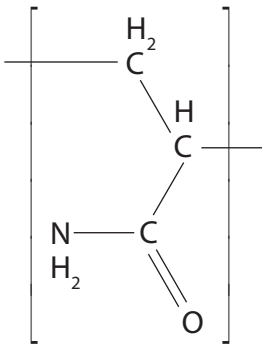
☒ **A**



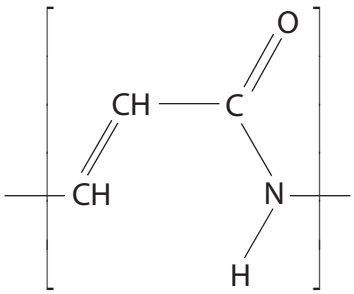
☒ **B**



☒ **C**



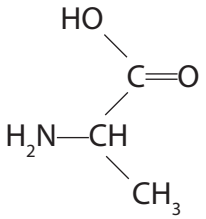
☒ **D**



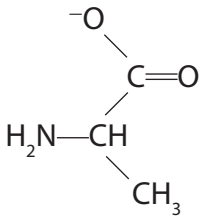
(Total for Question = 1 mark)

9 In an aqueous solution with a pH of 12, the amino acid alanine exists mainly as

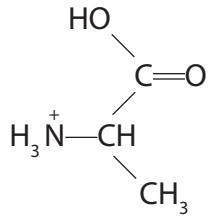
☒ **A**



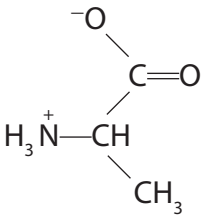
☒ **B**



☒ **C**

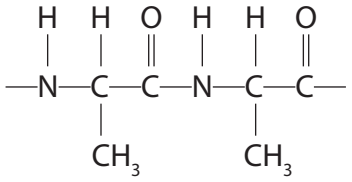


☒ **D**



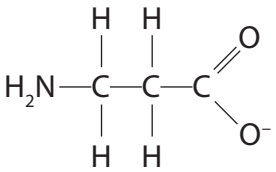
(Total for Question = 1 mark)

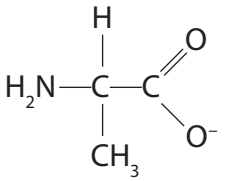
10 A section of the polypeptide made from a single amino acid is shown below.

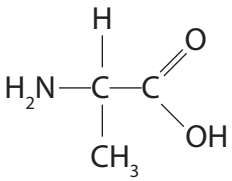


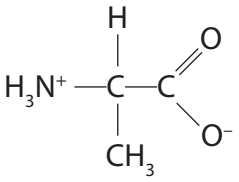
The polypeptide was heated with excess dilute sodium hydroxide solution until no further change took place.

Which of the following products is formed?

☒ **A** 

☒ **B** 

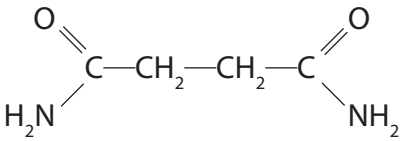
☒ **C** 

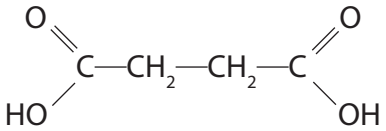
☒ **D** 

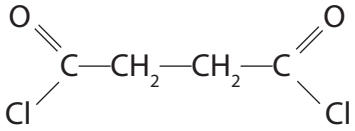
(Total for Question = 1 mark)

11 Which of the following pairs of compounds could form a polyamide?

☒ **A** $Cl—CH_2—CH_2—Cl$ and $H_2N—CH_2—CH_2—NH_2$

☒ **B** $HO—CH_2—CH_2—OH$ and 

☒ **C**  and $CH_3—CH_2—NH_2$

☒ **D**  and $H_2N—CH_2—CH_2—NH_2$

(Total for Question = 1 mark)

12 Methylamine, CH_3NH_2, is **very** soluble in water. This is because it

☒ **A** forms hydrogen bonds with water.

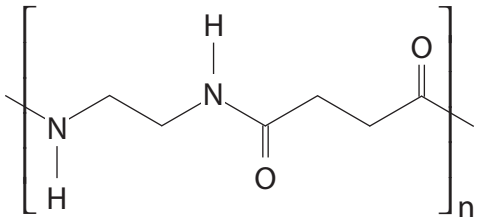
☒ **B** forms London forces with water.

☒ **C** exists mainly as ions in aqueous solution.

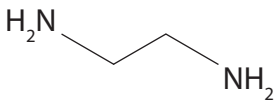
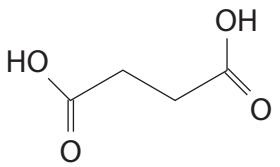
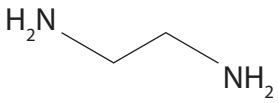
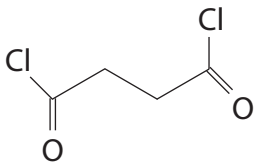
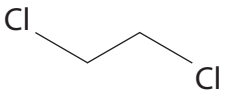
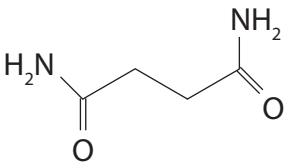
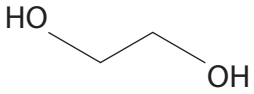
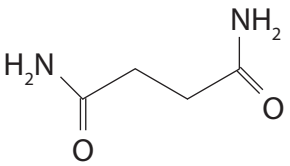
☒ **D** exists as a zwitterion.

(Total for Question = 1 mark)

13 The structure below shows the repeating pattern of a polymer.



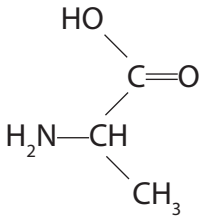
Which of the following pairs of compounds could react **rapidly** to form this polymer?

☒ **A**		
☒ **B**		
☒ **C**		
☒ **D**		

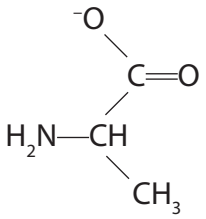
(Total for Question = 1 mark)

14 Which of the following structures best represents the amino acid, alanine, in an aqueous solution with a pH of 12?

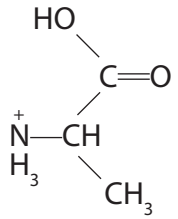
☒ **A**



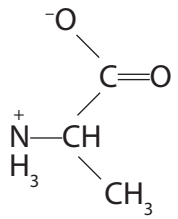
☒ **B**



☒ **C**



☒ **D**



(Total for Question = 1 mark)

15 Which of the following is true for **all** amino acids?

All amino acids

☒ **A** exist as optical isomers.

☒ **B** are neutral in solution.

☒ **C** are essential to life.

☒ **D** are crystalline solids at room temperature.

(Total for Question = 1 mark)

16 In order to make $CH_3CH_2CONHCH_3$, you could use

☒ **A** $CH_3CH_2COOCH_3 + NH_3$

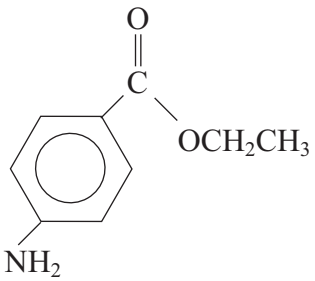
☒ **B** $CH_3CH_2COCl + CH_3NH_2$

☒ **C** $CH_3CH_2COO^-Na^+ + CH_3NH_2$

☒ **D** $CH_3CH_2CONH_2 + CH_3NH_2$

(Total for Question 1 mark)

17 Benzocaine is used as a local anaesthetic.



Separate samples of a solution of benzocaine are added to 2,4-dinitrophenylhydrazine, hot aqueous sodium hydroxide, and dilute hydrochloric acid.

Which chemicals react with benzocaine?

☒ **A** All three

☒ **B** Only sodium hydroxide and hydrochloric acid

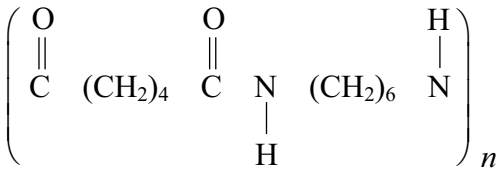
☒ **C** Only hydrochloric acid

☒ **D** Only sodium hydroxide

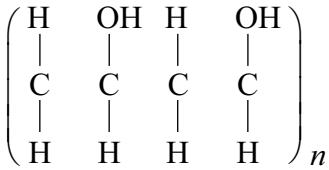
(Total for Question 1 mark)

18 Four polymers labelled **A to D** have the following formulae:

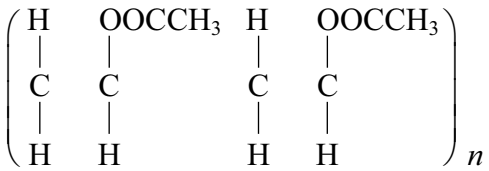
A



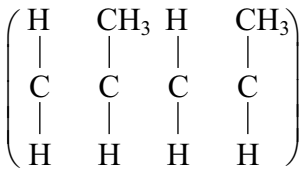
B



C



D



(a) Which polymer is most soluble in hot water?

(1)

☒ **A**

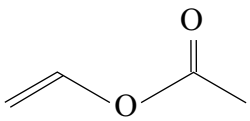
☒ **B**

☒ **C**

☒ **D**

(b) Which polymer is formed from the monomer shown below?

(1)



☒ **A**

☒ **B**

☒ **C**

☒ **D**

(c) Which polymer is a condensation polymer?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(Total for Question 3 marks)

19 Ammonia (NH_3), butylamine ($CH_3CH_2CH_2CH_2NH_2$) and phenylamine ($C_6H_5NH_2$) all form alkaline solutions in water. The order of **increasing** pH of equimolar solutions is

☒ **A** $C_6H_5NH_2 < CH_3CH_2CH_2CH_2NH_2 < NH_3$

☒ **B** $NH_3 < CH_3CH_2CH_2CH_2NH_2 < C_6H_5NH_2$

☒ **C** $C_6H_5NH_2 < NH_3 < CH_3CH_2CH_2CH_2NH_2$

☒ **D** $CH_3CH_2CH_2CH_2NH_2 < NH_3 < C_6H_5NH_2$

(Total for Question 1 mark)

20 Amino acids are crystalline solids with a high melting temperature because

☒ **A** each molecule has a large number of electrons.

☒ **B** each molecule forms hydrogen bonds at both ends.

☒ **C** a proton is transferred from one end of the molecule to the other.

☒ **D** their shape allows the molecules to pack close together.

(Total for Question 1 mark)

21 An organic compound **X** is much more soluble in dilute hydrochloric acid than in water. Compound **X** forms a coloured complex with aqueous copper(II) ions.

Compound **X** could be

☒ **A** C_6H_5COOH

☒ **B** $C_6H_5NO_2$

☒ **C** $C_6H_5NH_2$

☒ **D** C_6H_5OH

(Total for Question = 1 mark)

22 1-butylamine, $CH_3CH_2CH_2CH_2NH_2$, reacts with ethanoyl chloride to form

☒ **A** $CH_3CH_2CH_2CH_2NH_3^+Cl^-$

☒ **B** $CH_3CH_2CH_2CH_2NHCOCH_3$

☒ **C** $CH_3CH_2CH_2CH_2NHCH_2CH_3$

☒ **D** $CH_3CH_2CH_2CH(COCH_3)NH_2$

(Total for Question = 1 mark)

23 Glycine, H_2NCH_2COOH, is a solid that has a melting temperature of about 250 °C, and it is very soluble in water. This is because of the

☒ **A** formation of intermolecular hydrogen bonds in the solid and hydrogen bonds with water.

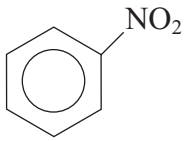
☒ **B** formation of $H_3N^+CH_2COO^-$ ions which interact strongly with each other in the solid and with water.

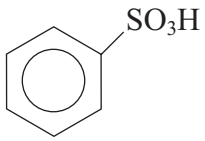
☒ **C** dissociation of the molecule to form $H_2NCH_2COO^-$ and H^+ ions in the solid and the solution.

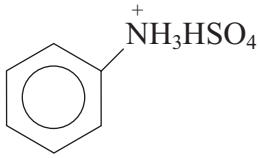
☒ **D** protonation of the molecule to form $H_3N^+CH_2COOH$ ions in both the solid and the solution.

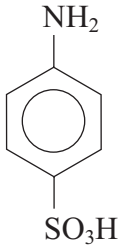
(Total for Question = 1 mark)

24 Which of the following products is formed when phenylamine (aniline) is reacted with **dilute** sulfuric acid?

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

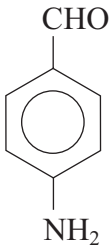
(Total for Question 1 mark)

25 An organic compound, **X**, shows the following properties:

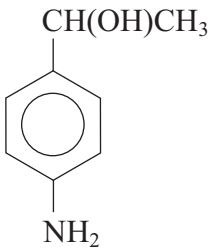
- Oxidation of compound **X** produces a substance that reacts with 2,4-dinitrophenylhydrazine to give a yellow precipitate but does **not** react with Fehling's or Benedict's solution.
- Compound **X** reacts with ice-cold nitrous acid to form a compound that gives a yellow precipitate with an alkaline solution of phenol.

What is the formula of compound **X**?

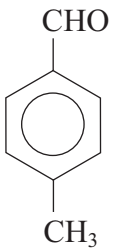
☒ **A**



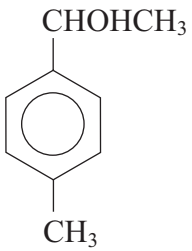
☒ **B**



☒ **C**

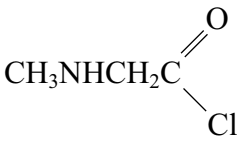


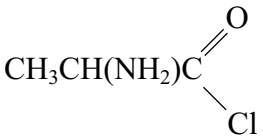
☒ **D**

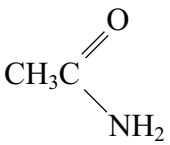


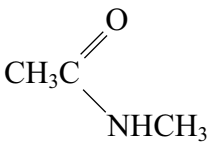
(Total for Question 1 mark)

26 The organic product of the reaction between ethanoyl chloride and methylamine has the formula

☒ **A** 

☒ **B** 

☒ **C** 

☒ **D** 

(Total for Question 1 mark)

27 In the solid state, the amino acid serine exists in the form

☒ **A** $H_3N^+CH(CH_2OH)COOH$

☒ **B** $H_3N^+CH(CH_2OH)CO_2^-$

☒ **C** $H_2NCH(CH_2OH)COOH$

☒ **D** $H_2NCH(CH_2OH)CO_2^-$

(Total for Question 1 mark)

28 The best method for separating a mixture of amino acids in solution is

☒ **A** distillation.

☒ **B** solvent extraction.

☒ **C** chromatography.

☒ **D** recrystallization.

(Total for Question 1 mark)

29 Which of these compounds will **not** form an amide in a reaction with ethanoyl chloride?

☒ **A** NH_3

☒ **B** $CH_3CH_2NH_2$

☒ **C** $CH_3CH_2NH(CH_3)$

☒ **D** $CH_3CH_2N(CH_3)_2$

(Total for Question 1 mark)

30 Which of the following reagents could be used to produce propanamide, $CH_3CH_2CONH_2$?

☒ **A** Ammonia and 1-chloropropane

☒ **B** Ammonia and propanoyl chloride

☒ **C** Methylamine and 1-chloropropane

☒ **D** Methylamine and propanoyl chloride

(Total for Question = 1 mark)