

**THE UNIFIED TRIAL EXAMINATION (2025)**  
**KUEN CHENG HIGH SCHOOL**

*Senior Middle Level*

**CHEMISTRY**  
(SE11)

**PAPER 1 MULTIPLE-CHOICE QUESTIONS**

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Date : 11 September 2025  
Time: 8.15 – 9.15 am  
(1 Hour)

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**INSTRUCTIONS TO CANDIDATES**

1. This subject comprises two papers:  
**Paper 1:** Multiple-choice Questions (30%),  
**Paper 2:** Subjective Questions (70%).
2. Complete **Paper 1** within 1 hour allocated. After a 15-minute interval, proceed to complete **Paper 2** within the 2 hours allocated.
3. Attempt all **30 questions** in **Paper 1**. For each question, select the **correct** or the **best answer** and blacken the square corresponding to the same letter of the alphabet as the answer you have selected. Mark the answers with a **5B** pencil on the answer sheet, "O" card.
4. The prescribed electronic calculators may be used.
5. Periodic Table Sheet is on **page 2**.
6. **Paper 1** consists of eleven printed pages and one blank page.

**Do Not Turn Over This Page Until You Are Told To Do So**

(Candidate's Name: \_\_\_\_\_ Index Number: \_\_\_\_\_)

**[CONFIDENTIAL]**

**[Turn over**

## Periodic Table Of Elements

- 1 In this question, you should assume air contains 21% oxygen,

What is the minimum volume of air required to ensure complete combustion of 10 mL of butane gas under room conditions? (*Given that, 1 mol of gas occupies 24 L at room conditions*)

- A 14 mL      B 27 mL      C 65 mL      D 310 mL

- 2 Laughing gas is a compound formed from nitrogen and oxygen in which there are 1.75 g of nitrogen to 1.00 g of oxygen. Below are given the compositions of several nitrogen-oxygen compounds. Which of these is laughing gas?

- A 6.35 g nitrogen, 7.26 g oxygen      B 4.63 g nitrogen, 10.58 g oxygen  
 C 8.84 g nitrogen, 5.05 g oxygen      D 9.62 g nitrogen, 16.50 g oxygen

- 3 The table gives the successive ionisation energies of an element X.

	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
Ionisation energy/ kJ mol <sup>-1</sup>	950	1800	2700	4800	6000	12300

What could be the formula of a chloride of X?

- A XCl      B XCl<sub>2</sub>      C XCl<sub>3</sub>      D XCl<sub>4</sub>

- 4 The ion X<sup>2+</sup> has the same electronic configuration as the atom Kr.

What is the electronic configuration of an atom of X?

- A 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>10</sup> 4s<sup>2</sup> 4p<sup>6</sup>      B 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 3d<sup>10</sup> 4s<sup>2</sup> 4p<sup>6</sup> 5s<sup>2</sup>  
 C 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 4s<sup>2</sup> 4p<sup>6</sup> 4d<sup>10</sup>      D 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup> 4s<sup>2</sup> 4p<sup>6</sup> 4d<sup>10</sup> 5s<sup>2</sup>

- 5 The melting points of the Period 3 elements sodium to aluminium are shown in the table.

Element	Na	Mg	Al
Melting point/ K	371	923	932

Which factor explains the increase in melting points from sodium to aluminium?

- A the changes in first ionisation energy from sodium to aluminium  
 B the increase in electronegativity from sodium to aluminium  
 C the increase in the A<sub>r</sub> of the elements from sodium to aluminium  
 D the increase in the number of outer electrons in each atom from sodium to aluminium

- 6 These compounds have the physical properties shown in the table.

Compound	P	Q	R
Melting point/ °C	2852	993	-119
Boiling point/ °C	3600	1695	39
Conductivity (solid)	poor	poor	Poor
Conductivity (liquid)	good	good	Poor
Conductivity (aqueous)	insoluble	good	insoluble

What might be the identities of P, Q, and R?

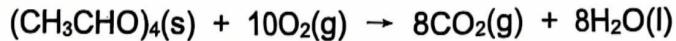
	P	Q	R
A	MgO	KCl	NH <sub>3</sub>
B	MgO	NaF	C <sub>2</sub> H <sub>5</sub> Br
C	SiO <sub>2</sub>	KCl	C <sub>2</sub> H <sub>5</sub> Br
D	SiO <sub>2</sub>	NaF	HCl

- 7 A 10.0 mL bubble of an ideal gas is formed on the sea bed where it is at a pressure of 2020 kPa. Just below the sea surface, the pressure is 101 kPa and the temperature is the same as the sea bed.

What is the volume of the bubble when it rises to just below the sea surface?

- A 10 mL      B 20.2 mL      C 200 mL      D 2020000 mL

- 8 Metaldehyde, (CH<sub>3</sub>CHO)<sub>4</sub>, is used as a solid fuel for camping stoves. The equation for the complete combustion of metaldehyde is shown.

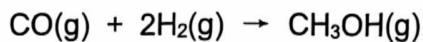


$\Delta H_c^\theta$  = standard enthalpy change of combustion

Which expression will give a correct value for the enthalpy change of formation of metaldehyde?

- A  $\Delta H_c^\theta$ (metaldehyde) - [8 ×  $\Delta H_c^\theta$ (carbon) + 8 ×  $\Delta H_c^\theta$ (hydrogen)]  
 B  $\Delta H_c^\theta$ (metaldehyde) - [8 ×  $\Delta H_c^\theta$ (carbon) + 16 ×  $\Delta H_c^\theta$ (hydrogen)]  
 C [8 ×  $\Delta H_c^\theta$ (carbon) + 8 ×  $\Delta H_c^\theta$ (hydrogen)] -  $\Delta H_c^\theta$ (metaldehyde)  
 D [8 ×  $\Delta H_c^\theta$ (carbon) + 16 ×  $\Delta H_c^\theta$ (hydrogen)] -  $\Delta H_c^\theta$ (metaldehyde)

- 9 Methanol may be prepared by the reaction between carbon monoxide and hydrogen.



The relevant average bond energies are given below.

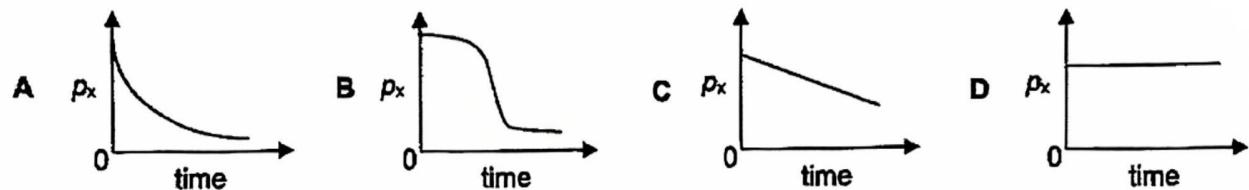
$E(\text{C}\equiv\text{O})$ :	1077 kJ mol <sup>-1</sup>
$E(\text{C}-\text{O})$ :	360 kJ mol <sup>-1</sup>
$E(\text{C}-\text{H})$ :	410 kJ mol <sup>-1</sup>
$E(\text{H}-\text{H})$ :	436 kJ mol <sup>-1</sup>
$E(\text{O}-\text{H})$ :	460 kJ mol <sup>-1</sup>

What is the enthalpy change of this reaction?

- A -537 kJ mol<sup>-1</sup>    B -101 kJ mol<sup>-1</sup>    C +101 kJ mol<sup>-1</sup>    D +537 kJ mol<sup>-1</sup>

- 10 An excess of H<sub>2</sub> gas is reacted with Cl<sub>2</sub> gas in a 1 L vessel at constant temperature. The reaction is catalysed by UV light and is found to be zero order with respect to Cl<sub>2</sub>.

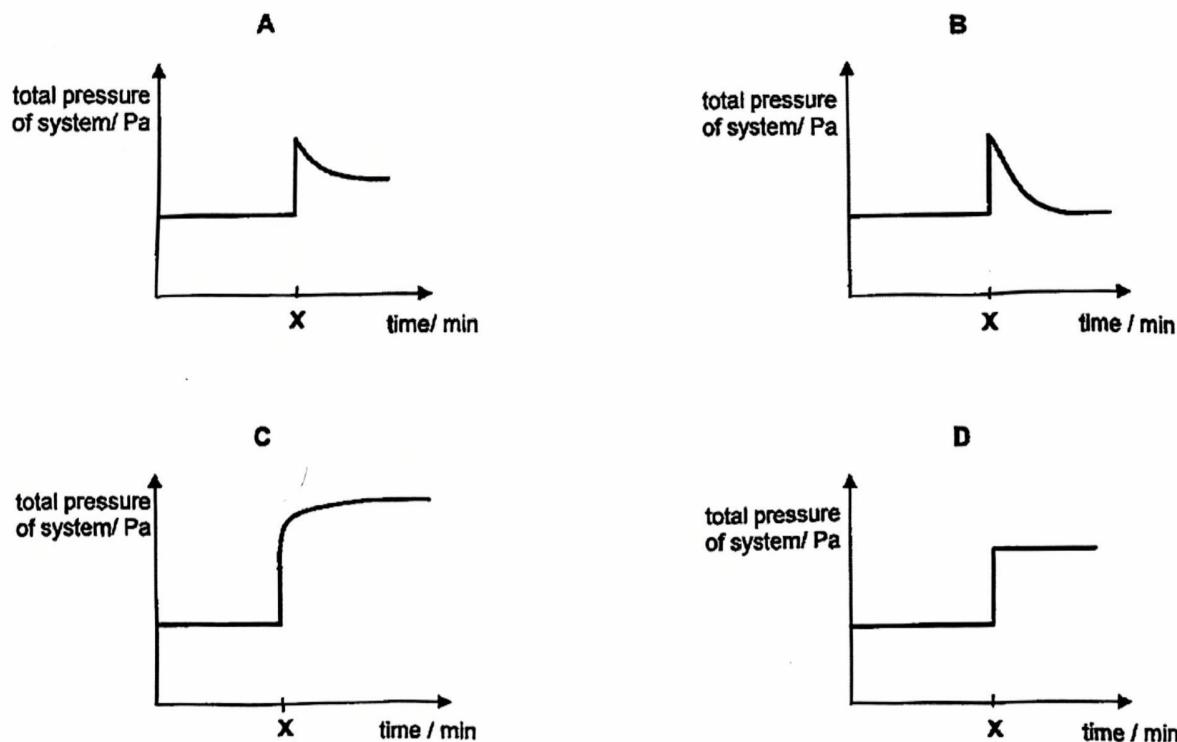
Which diagram represents the variation of the partial pressure of Cl<sub>2</sub> gas, p<sub>x</sub>, with time?



- 11 E and F react in a closed vessel to form G as shown.

At time X min, 1 mol of inert gas P is added at constant volume.

Which of the following graphs represents the variation of total pressure of the system with time?



- 12 The table below describes some indicators.

Indicator	Colour in acid	Colour in alkali	pK <sub>a</sub>	Range of pH for colour change
Methyl orange	Red	Yellow	3.7	3.2 – 4.4
Thymol blue	Yellow	Blue	8.9	8.0 – 9.6

For the titration of NaOH(aq) against HCOOH(aq), which row shows the most suitable indicator and the corresponding colour change?

	Indicator	Colour change
A	Methyl orange	Red to orange
B	Methyl orange	Yellow to orange
C	Thymol blue	Yellow to green
D	Thymol blue	Blue to green

- 13 A solution contains two anions with the following concentrations.

Anion	Concentration/ mol L <sup>-1</sup>
CrO <sub>4</sub> <sup>2-</sup>	0.200
Cl <sup>-</sup>	0.0100

Aqueous AgNO<sub>3</sub> is slowly added to the solution.

Which is the first compound to precipitate, and what concentration of Ag<sup>+</sup> is necessary to begin its precipitation?

(Given that, K<sub>sp</sub>(Ag<sub>2</sub>CrO<sub>4</sub>) = 1.20 × 10<sup>-12</sup> mol<sup>3</sup> L<sup>-3</sup>, K<sub>sp</sub>(AgCl) = 1.80 × 10<sup>-10</sup> mol<sup>2</sup> L<sup>-2</sup>)

	First precipitate formed	[Ag <sup>+</sup> ]/ mol L <sup>-1</sup>
A	Ag <sub>2</sub> CrO <sub>4</sub>	6.00 × 10 <sup>-12</sup>
B	Ag <sub>2</sub> CrO <sub>4</sub>	2.45 × 10 <sup>-6</sup>
C	AgCl	1.34 × 10 <sup>-5</sup>
D	AgCl	1.80 × 10 <sup>-8</sup>

- 14 When 8 A of electricity is passed through molten aluminium oxide using inert electrodes for 100 minutes, what is the closest volume of gas released at STP? (Given that, 1 mol of gas at STP = 22.4 L, Faraday constant = 96500 C mol<sup>-1</sup>)

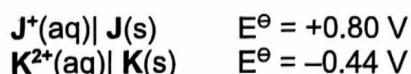
A 2.8 L

B 5.6 L

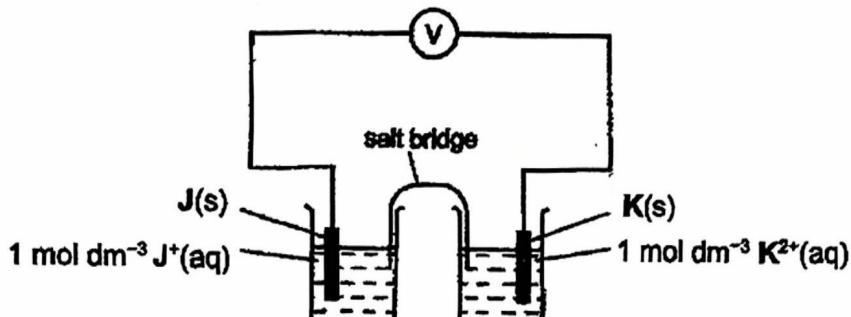
C 8.4 L

D 11.2 L

- 15 The standard electrode potentials for metals J and K are given below.



The electrochemical cell shown in the diagram below is set up.



Which of the following statements is/are correct description of this cell?

- 1 The e.m.f. of the cell is +1.24 V
  - 2 The anions from the salt bridge will enter the  $\text{K}^{2+}(\text{aq}) \mid \text{K(s)}$  half-cell.
  - 3 The e.m.f of the cell will decrease when the concentration of  $\text{K}^{2+}$  ions increases.
- A 1, 2, and 3      B 1 and 2 only      C 1 only      D 2 and 3 only

- 16 The radioactive isotope iodine-131 has a half-life of 8.0 days. A hospital receives a 100.0 mg sample. How much iodine-131 remains after 26 days?

- A 21.0 mg      B 12.5 mg      C 10.5 mg      D 6.25 mg

- 17  $\text{SiO}_2$ ,  $\text{P}_4\text{O}_{10}$ ,  $\text{SO}_2$  and  $\text{Cl}_2\text{O}_7$  are oxides which are?

- |                      |                       |
|----------------------|-----------------------|
| A ionic and acidic   | B ionic and basic     |
| C covalent and basic | D covalent and acidic |

- 18 What can be added to a mixture of  $\text{MgO}$  and  $\text{Al}_2\text{O}_3$  to separate them by filtration?

- 1 water
  - 2  $\text{HCl}(\text{aq})$
  - 3  $\text{NaOH}(\text{aq})$
- A 1, 2 and 3      B 1 and 2 only      C 2 and 3 only      D 3 only

- 19 Which of the following statements is not true for the aluminium metal?

- A It dissolves in hot, dilute hydrochloric acid  
 B Nitric(V) acid does not react with aluminium.  
 C Aluminium is amphoteric and dissolves in hot sodium hydroxide solution.  
 D Aluminium reacts with hot, concentrated nitric(V) acid and gives off hydrogen gas.

- 20 Why does graphite conduct electricity in the direction parallel to the hexagonal planes but not in the direction perpendicular to these planes?
- A The delocalised orbitals in graphite are parallel to the hexagonal planes and are not perpendicular to them.  
 B  $sp^2$  hybridisation only allows the flow of electrons parallel to the hexagonal planes.  
 C The valence electrons only move horizontally and not vertically.  
 D The bond angle of  $120^\circ$  does not allow the conducting of electricity perpendicular to the hexagonal planes.

- 21 Ammonia gas,  $\text{NH}_3$ , and hydrogen sulfide gas,  $\text{H}_2\text{S}$ , react together to form the salt ammonium sulfide,  $(\text{NH}_4)_2\text{S}$ . Ammonium sulfide dissolves in water to produce an orange alkaline solution.



The addition of  $\text{NaOH}(\text{aq})$  to this solution produces a gas X.

The addition of  $\text{HCl}(\text{aq})$  to a separate portion of this solution produces a gas Y.

What are the identities of X and Y?

	X	Y
A	$\text{H}_2\text{S}$	$\text{H}_2\text{S}$
B	$\text{H}_2\text{S}$	$\text{NH}_3$
C	$\text{NH}_3$	$\text{H}_2\text{S}$
D	$\text{NH}_3$	$\text{NH}_3$

- 22 The following table shows the results of two experiments involving Group 17 halides,  $\text{X}^-$  and  $\text{Y}^-$ .

Experiment	Deduction
Halogen $\text{Z}_2$ added to $\text{X}^-$	$\text{X}_2$ formed
Halogen $\text{Z}_2$ added to $\text{Y}^-$	$\text{Y}_2$ not formed

Which row shows the halogens in decreasing order of oxidising strengths?

- A  $\text{Y}_2, \text{Z}_2, \text{X}_2$       B  $\text{Y}_2, \text{X}_2, \text{Z}_2$       C  $\text{X}_2, \text{Z}_2, \text{Y}_2$       D  $\text{X}_2, \text{Y}_2, \text{Z}_2$

- 23 Which statement is true concerning transition metals?

- A Only these metals can form more than one valency (oxidation state).  
 B Only these metals can form complex ions.  
 C Only these metals can produce anhydrous chlorides with covalent bonds.  
 D Only these metals can give coloured ions in aqueous solutions.

- 24 In this question, structural isomerism and stereoisomerism should be considered.

How many isomeric aldehydes have the formula C<sub>5</sub>H<sub>10</sub>O?

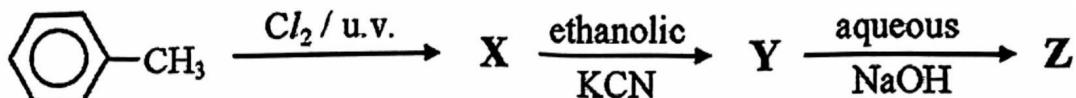
A 3

B 4

C 5

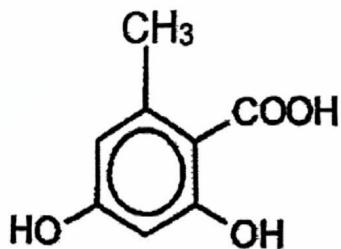
D 6

- 25 What is the product Z obtained by completely hydrolysing Y in the reaction sequence:



- A CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>COONa  
 B C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>CONH<sub>2</sub>  
 C C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>COONH<sub>4</sub>  
 D C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>COONa

- 26 Orsellinic acid is found in some species of fungus.



orsellinic acid

0.1 mol of orsellinic acid is reacted with excess Na<sub>2</sub>CO<sub>3</sub>(aq), and the gaseous product formed is passed through a bottle of excess concentrated NaOH.

What is the increase in mass in the bottle of concentrated NaOH?

A 1.1 g

B 2.2 g

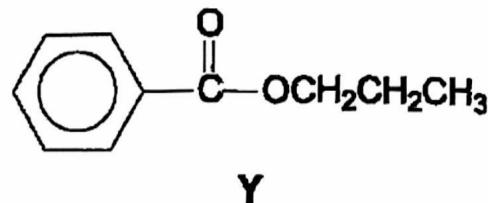
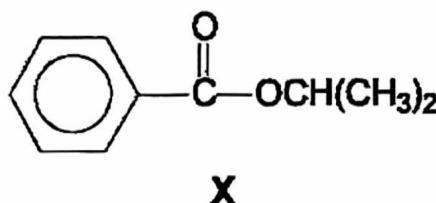
C 4.4 g

D 6.6 g

- 27 Which statements regarding ethanoic acid are true?

- A It reacts with hydrogen chloride to form ethanoyl chloride.  
 B It can be reduced to ethanol with hydrogen gas in the presence of Pt.  
 C It does not form a yellow precipitate when warmed with alkaline aqueous iodine.  
 D It reacts with phenol in the presence of concentrated sulfuric acid to form phenyl ethanoate.

- 28 Which of the following describes the correct chemical test and observations to differentiate between compounds X and Y?



	<b>Test</b>	<b>Observations</b>
A	Tollens' reagent, warm	Silver mirror will be observed for Y
B	Fehling's solution, warm	Red-brown precipitate will be observed for X
C	Aqueous alkaline I <sub>2</sub> , warm	Yellow precipitate will be observed for X
D	Acidified K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> , warm	Orange solution turns green when observed for X

- 29 An unknown organic compound has the molecular formula C<sub>5</sub>H<sub>12</sub>O. It was subjected to the following chemical tests.

<b>Test</b>	<b>Observations</b>
Alkaline aqueous iodine, warm	Yellow precipitate is seen.
Hot acidified KMnO <sub>4</sub>	Purple solution decolourises

Two students saw the tests and each commented.

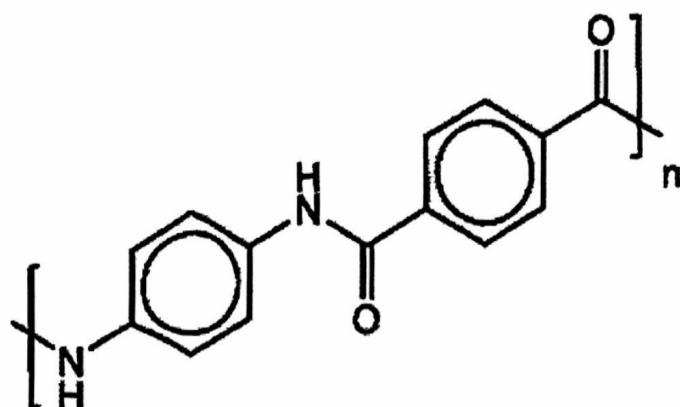
**Student A:** "The compound is a secondary alcohol."

**Student B:** "The compound is pentan-2-ol."

Which students are correct?

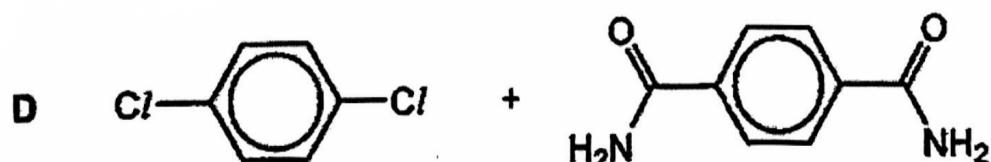
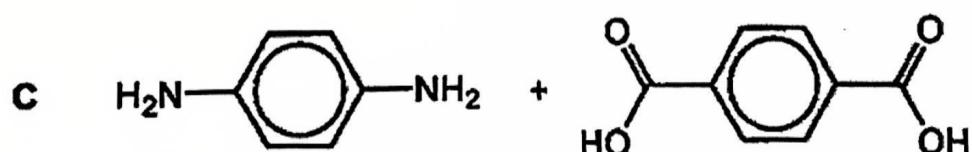
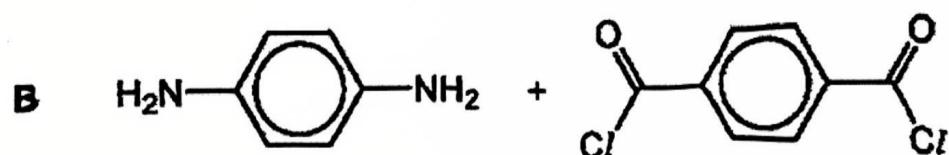
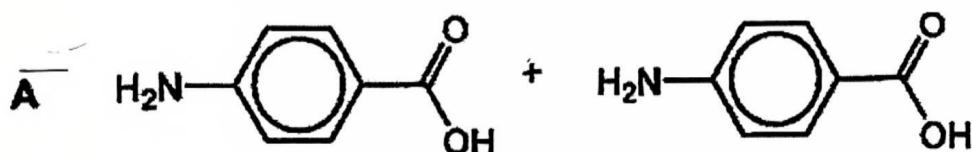
	<b>Student A</b>	<b>Student B</b>
A		
B	X	
C		X
D	X	X

- 30 Kevlar is a lightweight and strong material, used to make tyres and bulletproof vests. Its structure is given below.



**Kevlar**

Which pair of monomers produces Kevlar in the greatest yield?



– END OF QUESTIONS –