

External assessment 2023

Multiple choice question book

Chemistry

Paper 1

General instruction

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Section 1

Instruction

- Respond to these questions in the question and response book.
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Question 1

In a chemical equation at equilibrium, a reversible arrow (\rightleftharpoons) symbolises that

- (A) the forward reaction has stopped but can be reversed.
- (B) the moles of reactants and products present are equal.
- (C) half of the reactants have been converted into products.
- (D) the concentration of reactants and products remains constant.

Question 2

Determine which expression represents the hydrogen ion (H^+) concentration at a pH of 8.4.

- (A) $1 \times 10^{-8.4}$
- (B) $1 \times 10^{-5.6}$
- (C) $1 \times 10^{-0.9}$
- (D) $1 \times 10^{-0.8}$

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Question 3

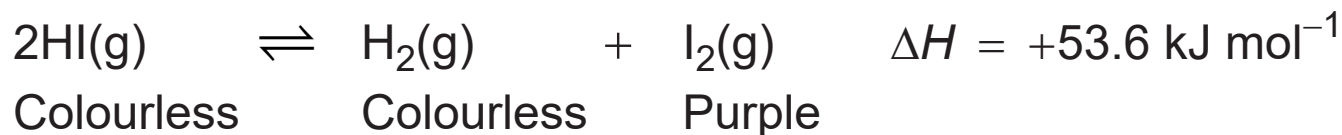
Two 0.1 M acidic solutions, X and Y, are 100% dissociated. Solution X has an electrical conductivity approximately twice that of solution Y. Identify solutions X and Y.

	Solution X	Solution Y
(A)	HCl	CH ₃ COOH
(B)	HNO ₃	H ₂ SO ₄
(C)	H ₃ PO ₄	HNO ₃
(D)	H ₂ SO ₄	HCl

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Questions 4–5

Questions 4–5 refer to the decomposition of hydrogen iodide gas (HI) to produce hydrogen gas (H₂) and iodine gas (I₂) in a sealed 1-litre container.



Question 4

Identify which change would shift the system from light purple to dark purple.

- (A) adding HI(g)
- (B) adding a catalyst
- (C) decreasing the temperature
- (D) increasing the concentration of H₂(g)

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Question 5

Determine the equilibrium expression (K_c) for the reaction.

$$(A) \quad K_c = \frac{[H_2][I_2]}{2[HI]}$$

$$(B) \quad K_c = \frac{[H_2][I_2]}{[HI]^2}$$

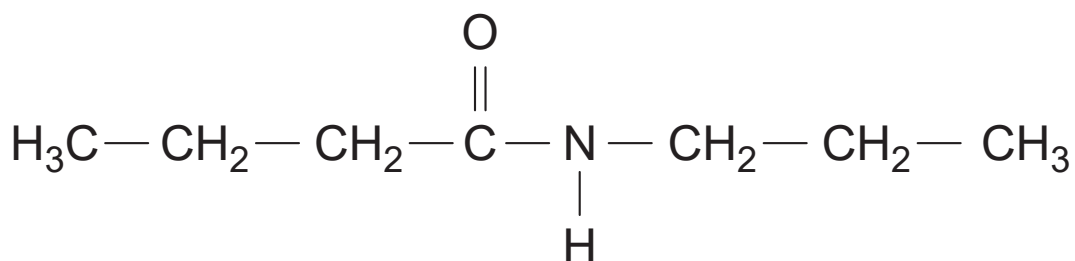
$$(C) \quad K_c = \frac{2[H]2[I]}{2[HI]}$$

$$(D) \quad K_c = \frac{2[H]2[I]}{[HI]^2}$$

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Question 6

Identify the reactants that undergo a condensation reaction to produce the molecule shown.



- (A) 1-butanol and propanamine
- (B) 1-propanol and butanamine
- (C) butanoic acid and propanamine
- (D) propanoic acid and butanamine

Question 7

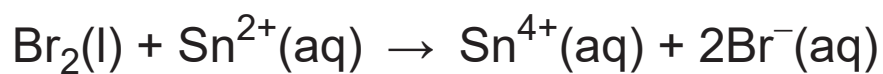
Determine which half-cell produces the largest potential difference when joined with a $\text{Zn(s)} \mid \text{Zn}^{2+}(\text{aq})$ half-cell to form a galvanic cell.

- (A) $\text{Mg(s)} \mid \text{Mg}^{2+}(\text{aq})$
- (B) $\text{Cu}^{2+}(\text{aq}) \mid \text{Cu(s)}$
- (C) $\text{H}^+(\text{aq}) \mid \text{H}_2(\text{g})$
- (D) $\text{F}_2(\text{g}) \mid \text{F}^-(\text{aq})$

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Question 8

Identify the species being reduced in the equation.

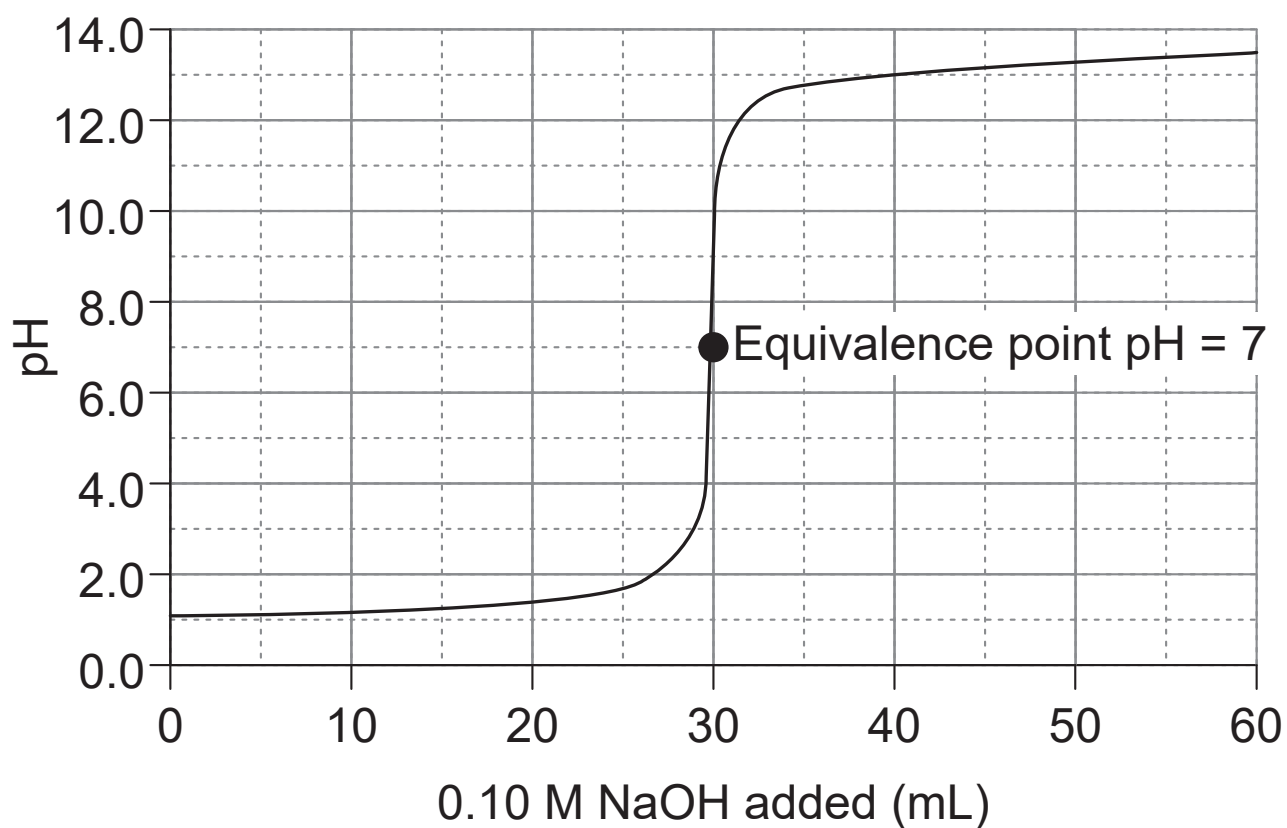


- (A) $\text{Br}_2(\text{l})$
- (B) $\text{Br}^{-}(\text{aq})$
- (C) $\text{Sn}^{2+}(\text{aq})$
- (D) $\text{Sn}^{4+}(\text{aq})$

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Questions 9–10

Questions 9–10 refer to the titration curve shown, which is produced when 60.00 mL of an unknown monoprotic acid solution is titrated with 0.10 M NaOH(aq).



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Question 9

Compared to 0.10 M NaOH, the unknown monoprotic acid is more

- (A) dilute and weak.
- (B) dilute and strong.
- (C) concentrated and weak.
- (D) concentrated and strong.

Question 10

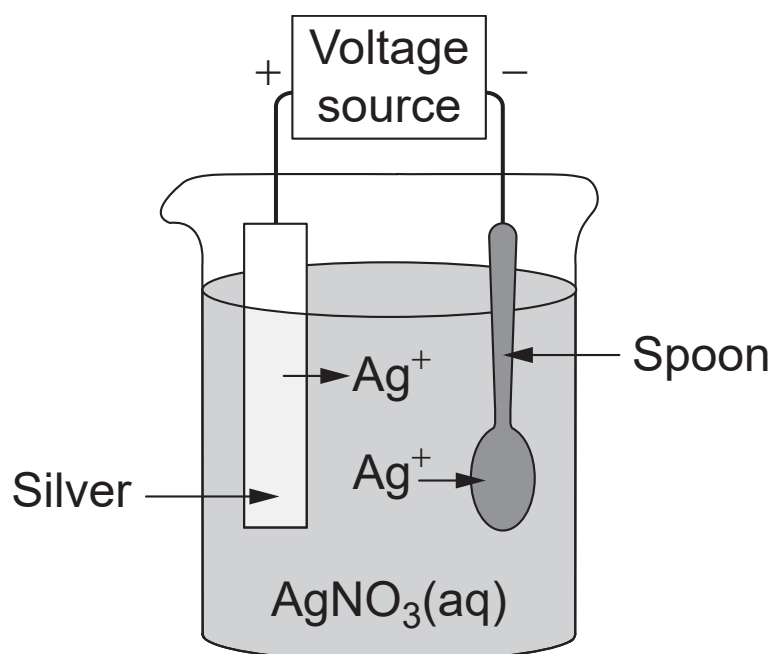
Determine the concentration of the unknown acid.

- (A) 0.05 M
- (B) 0.10 M
- (C) 0.20 M
- (D) 0.30 M

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Question 11

The plating of silver is conducted during the operation of the electrochemical cell shown.



Determine which statement is true for this electrochemical cell.

- (A) The spoon acts as the cathode.
- (B) The silver electrode has a negative charge.
- (C) The silver ions in the solution are oxidised at the spoon.
- (D) The electrons flow from the spoon to the silver electrode.

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Question 12

Enzymes are classified as

- (A) carbohydrates.
- (B) proteins.
- (C) starches.
- (D) lipids.

Question 13

Identify the reaction used to produce methanol and triglycerides.

- (A) oxidation
- (B) substitution
- (C) saponification
- (D) transesterification

Question 14

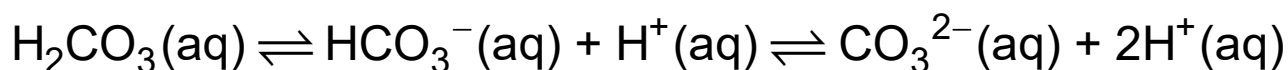
Identify which molecule has the lowest boiling point.

- (A) butanone
- (B) hexanone
- (C) pentanone
- (D) propanone

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Question 15

Predict how a buffer solution, consisting of carbonic acid (H_2CO_3) and hydrogen carbonate ions (HCO_3^-), would react to resist a change in pH when a small amount of hydrochloric acid is added.



- (A) Equilibrium shifts to the right and the $[\text{H}^+](\text{aq})$ increases.
- (B) Equilibrium shifts to the left and the $[\text{CO}_3^{2-}](\text{aq})$ increases.
- (C) Equilibrium shifts to the left and the $[\text{H}_2\text{CO}_3](\text{aq})$ increases.
- (D) Equilibrium shifts to the right and the $[\text{HCO}_3^-](\text{aq})$ increases.

Question 16

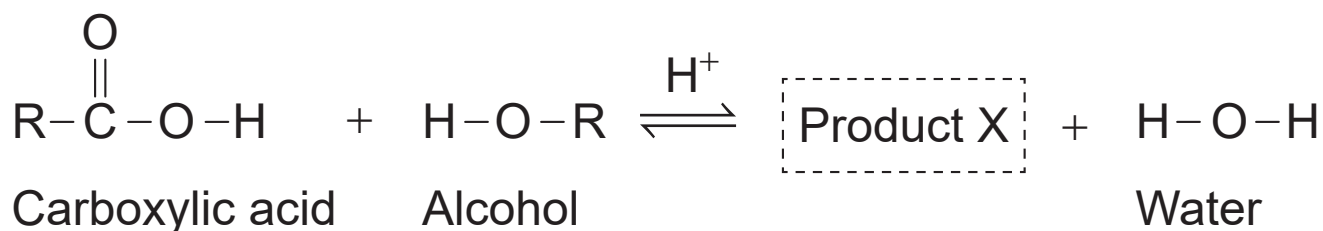
Haloalkanes undergo a substitution reaction with cyanide (CN^-) in ethanol to produce

- (A) alkanes.
- (B) amines.
- (C) nitriles.
- (D) esters.

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Questions 17–18

Questions 17–18 refer to the reaction shown.



Question 17

Determine the functional group present in Product X.

- (A) ester
- (B) ketone
- (C) alcohol
- (D) aldehyde

Question 18

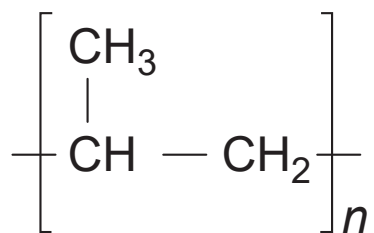
Identify the reaction used to produce X.

- (A) addition
- (B) hydration
- (C) condensation
- (D) hydrogenation

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Question 19

Identify the polymer shown.

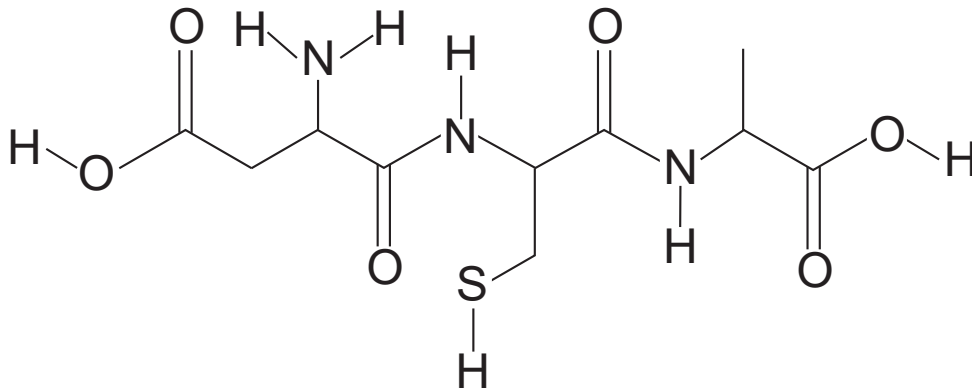


- (A) polyethene
- (B) polypeptide
- (C) polypropene
- (D) polysaccharide

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Question 20

The structural formula for a polypeptide is shown.



Identify the three amino acids present from left to right.

- (A) Arg, Cys, Met
- (B) Asp, Cys, Ala
- (C) Glu, Cys, Asp
- (D) Ile, Cys, Gly

References

Question 11

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