

Q1.What is the pH of a $0.020 \text{ mol dm}^{-3}$ solution of a diprotic acid which is completely dissociated?

- A 1.00
- B 1.40
- C 1.70
- D 4.00

(Total 1 mark)

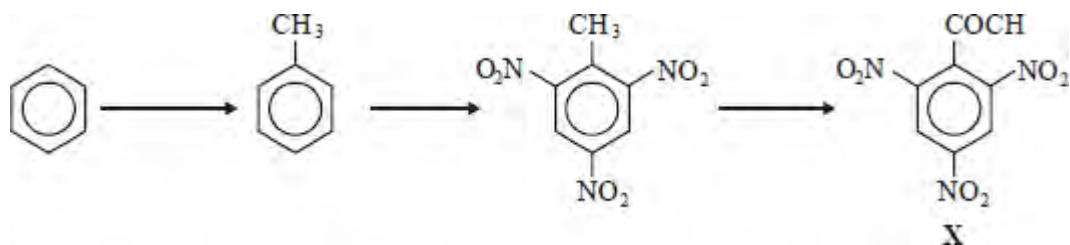
Q2.The acid dissociation constant, K_a , of a weak acid HA has the value $2.56 \times 10^{-4} \text{ mol dm}^{-3}$.

What is the pH of a $4.25 \times 10^{-3} \text{ mol dm}^{-3}$ solution of HA?

- A 5.96
- B 3.59
- C 2.98
- D 2.37

(Total 1 mark)

Q3. This question is based on the reactions and compounds shown in the scheme below.



A $0.100 \text{ mol dm}^{-3}$ solution of **X** is found to have a pH of 2.50. The value of K_a in mol dm^{-3} is

- A** 3.16×10^{-2}
- B** 3.16×10^{-3}
- C** 1.00×10^{-4}
- D** 1.00×10^{-5}

(Total 1 mark)

Q4. Use the information about the following solutions to answer the question below.

Solution F: This is a mixture of 1 mol of propanoic acid, 1 mol of methanol and 2 mol of water.

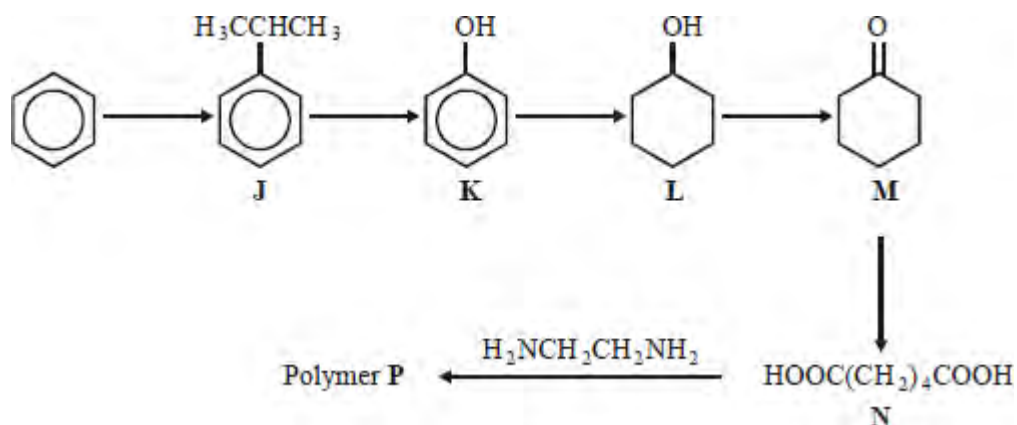
Solution G: This was originally the same mixture as solution **F** but it has been left to reach equilibrium.

Compared to the pH of solution **F**, the pH of solution **G** will be

- A** considerably lower.
- B** slightly lower.
- C** slightly higher.
- D** exactly the same.

(Total 1 mark)

Q5. This question is about the following reaction scheme which shows the preparation of polymer P.



K is a weak acid with a pK_a of 9.95. The pH of a 0.10 mol dm^{-3} solution of K is

- A 4.48
- B 4.98
- C 5.48
- D 5.98

(Total 1 mark)

Q6. In which one of the following reactions is the role of the reagent stated correctly?

	Reaction	Role of reagent
A	$\text{TiO}_2 + 2\text{C} + 2\text{Cl}_2 \rightarrow \text{TiCl}_4 + 2\text{CO}$	TiO_2 is an oxidising agent
B	$\text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{NO}_3^+ + \text{HSO}_4^-$	HNO_3 is a Brønsted-Lowry acid
C	$\text{CH}_3\text{COCl} + \text{AlCl}_3 \rightarrow \text{CH}_3\text{CO}^+ + \text{AlCl}_4^-$	AlCl_3 is a Lewis base
D	$2\text{CO} + 2\text{NO} \rightarrow 2\text{CO}_2 + \text{N}_2$	CO is a reducing agent

(Total 1 mark)

Q7. Use the information below to answer this question.

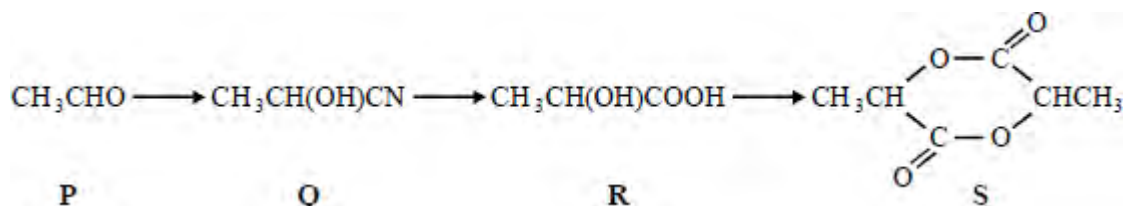
A saturated solution of magnesium hydroxide, $\text{Mg}(\text{OH})_2$, contains 0.1166 g of $\text{Mg}(\text{OH})_2$ in 10.00 dm^3 of solution. In this solution the magnesium hydroxide is fully dissociated into ions.

Which one of the following is the pH of a solution of magnesium hydroxide containing $4.0 \times 10^{-5} \text{ mol dm}^{-3}$ of hydroxide ions at 298 K?
($K_w = 1.0 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ at 298 K)

- A 9.6
- B 9.5
- C 8.6
- D 8.3

(Total 1 mark)

Q8. This question refers to the reaction sequence below.

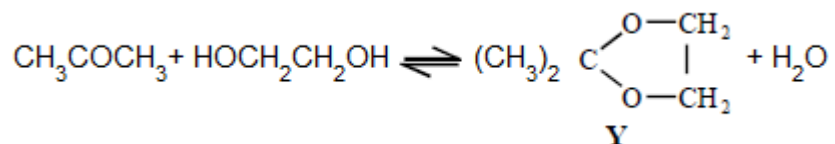


HCN is a weak acid with a $\text{p}K_a$ value of 9.40. If a $0.010 \text{ mol dm}^{-3}$ solution of HCN was used in the first step, the concentration of cyanide ions, in mol dm^{-3} , would be

- A 2.0×10^{-6}
- B 6.4×10^{-5}
- C 2.0×10^{-5}
- D 3.1×10^{-1}

(Total 1 mark)

Q9. This question is about the reaction between propanone and an excess of ethane-1,2-diol, the equation for which is given below.



In a typical procedure, a mixture of 1.00 g of propanone, 5.00 g of ethane-1,2-diol and 0.100 g of benzenesulphonic acid, $\text{C}_6\text{H}_5\text{SO}_3\text{H}$, is heated under reflux in an inert solvent. Benzenesulphonic acid is a strong acid.

If 0.100 g of the strong monoprotic acid, benzenesulphonic acid, was dissolved in 100 cm^3 of water, the pH of the solution would be

- A 0.20
- B 1.20
- C 2.20
- D 3.20

(Total 1 mark)

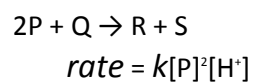
Q10. An aqueous solution contains 4.0 g of sodium hydroxide in 250 cm^3 of solution.
($K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$)

The pH of the solution is

- A 13.0
- B 13.3
- C 13.6
- D 13.9

(Total 1 mark)

Q11.The equation and rate law for the reaction of substance P with substance Q are given below.



Under which one of the following conditions, all at the same temperature, would the rate of reaction be slowest?

	[P] / mol dm ⁻³	pH
A	0.1	0
B	1	2
C	3	3
D	10	4

(Total 1 mark)

Q12.Addition of which one of the following to 10 cm³ of 1.0 M NaOH would result in the pH being halved?

- A** 10 cm³ of water
- B** 100 cm³ of water
- C** 5 cm³ of 1.0 M HCl
- D** 10 cm³ of 1.0 M HCl

(Total 1 mark)

Q13. A solution of sodium ethanoate has a pH of 8.91 at 25 °C. The hydrogen ion and hydroxide ion concentrations in this solution are

- A $[H^+] = 1.00 \times 10^{-9} \text{ mol dm}^{-3}$ $[OH^-] = 1.00 \times 10^{-5} \text{ mol dm}^{-3}$
- B $[H^+] = 1.00 \times 10^{-9} \text{ mol dm}^{-3}$ $[OH^-] = 8.13 \times 10^{-6} \text{ mol dm}^{-3}$
- C $[H^+] = 1.23 \times 10^{-9} \text{ mol dm}^{-3}$ $[OH^-] = 1.00 \times 10^{-5} \text{ mol dm}^{-3}$
- D $[H^+] = 1.23 \times 10^{-9} \text{ mol dm}^{-3}$ $[OH^-] = 8.13 \times 10^{-6} \text{ mol dm}^{-3}$

(Total 1 mark)

Q14. A weak acid HA dissociates in aqueous solution as shown below



Which one of the following changes will result in a decrease in the pH of an aqueous solution of the acid?

- A addition of a little aqueous sodium hydroxide solution
- B raising the temperature of the solution
- C dissolving a little of the sodium salt, NaA, in the solution
- D adding a platinum catalyst to the solution

(Total 1 mark)

Q15. The pH of 0.001 M NaOH at 25°C is

- A 13
- B 11
- C 9
- D 3

(Total 1 mark)

Q16. Which one of the following could be true in an aqueous solution of sodium hydroxide?

- A** $[H^+] = [OH^-]$
- B** $pH = -\log_{10} [OH^-]$
- C** $pH = 1.2$
- D** $pH = 12.8$

(Total 1 mark)

Q17. Which one of the following is the change in units of pH which occurs when 10.0 cm^3 of a 1.0 M solution of a strong monoprotic acid are made up to 1.0 dm^3 with water?

- A** 1
- B** 2
- C** 3
- D** 5

(Total 1 mark)