**Chemistry**

**Standard level**

**Paper 1A**

Practice paper

**Topic: Acid/Base Chemistry**

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**Standard level**

**Paper 1A**

Specimen paper

45 minutes

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## Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all questions.
- For each question, choose the best answer.
- A clean copy of the chemistry data booklet is required.
- The maximum mark for this paper is [20 marks].

## Section A

1. According to the Brønsted-Lowry theory, an acid is a:
   A. Proton acceptor
   B. Proton donor
   C. Electron pair acceptor
   D. Electron pair donor

2. Which of the following pairs are conjugate acid-base pairs?
   A. $H_3O^+$ and $OH^-$
   B. $H_2SO_4$ and $SO_4^{2-}$
   C. $NH_4^+$ and $NH_3$
   D. $H_2O$ and $O^{2-}$

3. What is the conjugate base of the $HCO_3^-$ ion?
   A. $H_2CO_3$
   B. $CO_3^{2-}$
   C. $OH^-$
   D. $CO_2$

4. Which of the following represents a strong acid?
   A. $CH_3COOH$
   B. $H_2O$
   C. $HNO_3$
   D. $NH_3$

5. An aqueous solution has a pH of 3. What is the hydrogen ion concentration, $[H^+]$, in mol $dm^{-3}$?
   A. $1 \times 10^{-3}$
   B. $1 \times 10^{3}$
   C. $1 \times 10^{-11}$
   D. $1 \times 10^{11}$

6. If the $[H^+]$ of a solution is multiplied by 100, the pH of the solution will:
   A. Increase by 2
   B. Decrease by 2
   C. Increase by 100
   D. Decrease by 100

7. Which pure substance will not conduct electricity but will conduct well when dissolved in water?

A. Solid copper
B. Hydrogen chloride gas
C. Liquid bromine
D. Silicon dioxide

8. Equal volumes of 0.10 mol $dm^{-3}$ HCl and 0.10 mol $dm^{-3}$ $CH_3COOH$ are compared. Which statement is correct?
A. $CH_3COOH$ requires more volume of NaOH to neutralize it.
B. Both solutions contain the same concentration of $H^+$ ions.
C. HCl is completely dissociated in water.
D. $CH_3COOH$ is a better electrical conductor.

9. Which gas is responsible for ocean acidification?
A. $O_2$
B. $N_2$
C. $CO_2$
D. Ar

10. Which is a characteristic property of bases?
A. They turn blue litmus red.
B. They react with most metals to produce hydrogen gas.
C. They react with acids to form a salt and water only.
D. They have a pH less than 7 at 298 K.

11. A 10.0 $cm^3$ sample of an acid of pH 2 is diluted to 1000 $cm^3$ with water. What is the new pH of the solution?
A. 3
B. 4
C. 5
D. 6

12. What is the pH of a 0.010 mol $dm^{-3}$ solution of KOH(aq) at 298 K? ($K_w = 1.0 \times 10^{-14}$)
A. 2
B. 10
C. 12
D. 14

13. Which of the following species cannot act as a Lewis base?
A. $NH_3$
B. $H_2O$

C. $BF_3$
D. $Cl^-$

14. When $H_2O$ acts as a Brønsted-Lowry base, the conjugate acid formed is:
A. $OH^-$
B. $H_3O^+$
C. $O^{2-}$
D. $H_2$

15. Two acids, X and Y, have equal concentrations. Acid X has a higher electrical conductivity than Acid Y. Which statement must be true?
A. X is a stronger acid than Y.
B. X has a higher pH than Y.
C. X is dibasic, and Y is monobasic.
D. X neutralizes more base than Y.

16. Which properties are characteristic of a strong acid?
I. High electrical conductivity
II. Rapid reaction with magnesium
III. Completely dissociates in aqueous solution
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

17. Which of the following can act as Brønsted-Lowry bases?
I. $H_2O$
II. $NH_3$
III. $H_3O^+$
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

18. Which statements about pH are correct?
I. A solution with pH 3 is ten times more acidic than a solution with pH 4
II. pH + pOH = 14 at 298 K
III. The pH of a strong base is always exactly 14
A. I and II only
B. I and III only
C. II and III only

D. I, II and III

19. Which environmental problems are caused by acid deposition?
I. Leaching of toxic metals into lakes
II. Corrosion of limestone buildings
III. Depletion of the ozone layer
A. I and II only
B. I and III only
C. II and III only
D. I, II and III

20. Which combinations will neutralize to form a salt and water only?
I. Nitric acid and potassium hydroxide
II. Sulfuric acid and copper(II) oxide
III. Hydrochloric acid and sodium carbonate
A. I and II only
B. I and III only
C. II and III only
D. I, II and III