Acids, Bases and Buffers (MCQ)

1. 20 cm^3 of 0.10 mol dm^{-3} hydrochloric acid is added to 10 cm^3 of 0.10 mol dm^{-3} sodium hydroxide.

What is the pH of the resulting mixture?

A 1.00
B 1.18
C 1.30
D 1.48

Your answer ☐ **[1]**

2. Phosphoric acid is a tribasic acid.

What is the mass of $Ca(OH)_2$ that completely neutralises 100 cm^3 of 0.100 mol dm^{-3} phosphoric acid?

A 0.49 g
B 0.74 g
C 1.11 g
D 2.22 g

Your answer ☐ **[1]**

3. The equation shows the dissociation of the acid H_3AsO_4 in water.

$H_3AsO_4 + H_2O \rightleftharpoons H_2AsO_4^- + H_3O^+$

Which pair is a conjugate acid–base pair?

A H_3AsO_4 and H_2O
B $H_2AsO_4^-$ and H_3O^+
C H_3AsO_4 and H_3O^+
D H_3O^+ and H_2O

Your answer ☐ **[1]**

4. A buffer solution is prepared by mixing 200 cm^3 of 2.00 mol dm^{-3} propanoic acid, CH_3CH_2COOH, with 600 cm^3 of 1.00 mol dm^{-3} sodium propanoate, CH_3CH_2COONa.

K_a for $CH_3CH_2COOH = 1.32 \times 10^{-5}$ mol dm^{-3}

What is the pH of the buffer solution?

A 4.58
B 4.70
C 5.06
D 5.18

Your answer ☐ **[1]**

5. **HA** and **HB** are two strong monobasic acids.
25.0 cm^3 of 6.0 mol dm^{-3} **HA** is mixed with 45.0 cm^3 of 3.0 mol dm^{-3} **HB**.

What is the $H^+(aq)$ concentration, in mol dm^{-3}, in the resulting solution?

A 1.9
B 2.1
C 4.1
D 4.5

Your answer ☐ **[1]**

6. A 0.040 mol dm^{-3} solution of a weak monobasic acid is 1.0% dissociated.

What is the value of K_a for the acid?

A 2.0×10^{-7} mol dm^{-3}
B 4.0×10^{-6} mol dm^{-3}
C 4.0×10^{-4} mol dm^{-3}
D 4.0×10^{-2} mol dm^{-3}

Your answer ☐

[1]

7. Which statement is correct for a neutral solution at any temperature?

A. $K_w = 1.00 \times 10^{-14}$ mol^2 dm^{-6}
B. The solution contains only H_2O
C. $[H^+] = [OH^-]$
D. pH = 7

Your answer ☐

[1]

8. A buffer solution is based on methanoic acid, HCOOH ($K_a = 1.70 \times 10^{-4}$ mol dm^{-3}) and methanoate ions, $HCOO^-$.

In the buffer solution, the HCOOH concentration is half the $HCOO^-$ concentration.

What is the pH of the buffer solution?

A. 2.47
B. 3.07
C. 3.47
D. 4.07

Your answer ☐

[1]

9. A solution of propanoic acid, CH_3CH_2COOH, has a pH of 2.89 at 25 °C.

What is $[H^+]$ in this solution?

A. 1.7×10^{-6} mol dm^{-3}
B. 4.6×10^{-4} mol dm^{-3}
C. 1.3×10^{-3} mol dm^{-3}
D. 0.46 mol dm^{-3}

Your answer ☐

[1]

END OF QUESTION PAPER

Mark scheme – Acids, Bases and Buffers (MCQ)

Question			Answer/Indicative content	Marks	Guidance
1			**D**	1 (AO 2.2)	
			Total	**1**	
2			**C**	1 (AO 2.2)	
			Total	**1**	
3			D	1 (AO 1.2)	
			Total	**1**	
4			**C**	**1 (AO 2.6)**	**Examiner's Comments** This relatively difficult pH calculation was readily done successfully by higher ability candidates, but lower ability candidates found it difficult, with answer B proving a popular choice.
			Total	**1**	
5			**C**	1	**ALLOW** 4.1 in the box
			Total	**1**	
6			**B**	1	
			Total	**1**	
7			C	1	
			Total	**1**	
8			D	1	
			Total	**1**	
9			C	1	
			Total	**1**	