

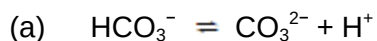
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Mark Schemes

Q1.



or



Must have equilibrium sign but mark on to (b)

Ignore state symbols

1

(b) Acid: Increase in concentration of H^+ ions, equilibrium moves to the left.

Allow H^+ ions react with carbonate ions (to form HCO_3^-)

1

Alkali: OH^- reacts with H^+ ions, equilibrium moves to the right (to replace the H^+ ions)

1

Concentration of H^+ remains (almost) constant

1

[4]

Q2.

- (a) (only) slightly or partially dissociated / ionised

Ignore 'not fully dissociated'.

Allow low tendency to dissociate or to lose / donate a proton.

Allow shown equilibrium well to the left.

Otherwise ignore equations.

1



OR



OR



OR



Must be propanoic acid, allow $\text{C}_2\text{H}_5\text{COOH}$.

Not molecular formulae.

Allow multiples.

Ignore reversible sign.

Not H_2CO_3 .

1

(c) $[\text{OH}^-] = 2 \times 0.0120 = 0.0240$ M1

Correct answer for pH with or without working scores 3.

1

$$[\text{H}^+] = \frac{1 \times 10^{-14}}{0.0240} = 4.166 \times 10^{-13} \text{ OR } \text{pOH} = 1.62 \quad \text{M2}$$

If $\times 2$ missed or used wrongly can only score M3 for correct calculation of pH from their $[\text{H}^+]$.

1

$\text{pH} = 12.38$ M3

Lose M3 if not 2 decimal places: 12.4 scores 2.

12.08 scores 1 (missing $\times 2$) ; 12.1 scores 0.

11.78 scores 1 (dividing by 2) 11.8 scores 0.

1

(d) (i) $K_a = \frac{[\text{H}^+][\text{C}_6\text{H}_5\text{COO}^-]}{[\text{C}_6\text{H}_5\text{COOH}]}$

Ignore () here but brackets must be present.

Must be correct acid and salt.

If wrong, mark part (ii) independently.

1

(ii) M1 $K^a = \frac{[\text{H}^+]^2}{[\text{C}_6\text{H}_5\text{COOH}]}$ OR with numbers

Correct answer for pH with or without working scores 3.

Allow HX, HA and ignore () here.

May score M1 in part (i).

1

M2 $[H^+] = \sqrt{(6.31 \times 10^{-5} \times 0.0120)}$ or $\sqrt{(K_a \times [C_6H_5COOH])}$
 $(= \sqrt{7.572 \times 10^{-7}} = 8.70 \times 10^{-4})$

pH = 6.12 may score 2 if correct working shown and they show the square root but fail to take it.

But if no working shown or wrong $K^a = \frac{[H^+]}{[C_6H_5COOH]}$

used which also leads to 6.12, then zero scored.

1

M3 pH = 3.06

Must be 2 decimal places ie 3.1 loses M3.

1

(iii) M1 $[H^+] = 10^{-4.00} = 1.00 \times 10^{-4}$

Correct answer for mass with or without working scores 5.

Allow 1×10^{-4} .

1

M2 $[X^-] = \frac{K_a \times [HX]}{[H^+]}$

Ignore () here.

If $[HX] / [X^-]$ upside down, can score M1 plus

M4 for 5.26×10^{-7} .

1

M3 $= \frac{6.31 \times 10^{-5} \times 0.0120}{1.00 \times 10^{-4}}$

And M5 for 7.57×10^{-5} g.

1

M4 $= 7.572 \times 10^{-3}$

1

M5 Mass $(C_6H_5COONa) = 7.572 \times 10^{-3} \times 144 = 1.09$ g
or 1.1 g

Wrong method, eg using $[H^+]^2$ may only score M1 and M5 for correct multiplication of their M4 by 144

(provided not of obviously wrong substance).

1

(e) M1 CO_2

Allow NO_x and SO_2 .

1

M2 pH (It) falls / decreases

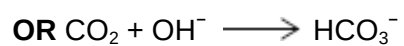
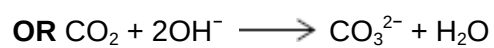
If M1 wrong, no further marks.

1

M3 mark M2 & M3 independently

acidic (gas)

OR reacts with alkali(ne solution) / OH^-



Not forms H_2CO_3 H_2SO_3 H_2SO_4 etc OR H^+ ions.

1

[17]