SEC 3E CHEMISTRY 6092

TERM 3 WA3 MARK SCHEME

Question	1	2	3	4	5
Answer	A	B	C	D	D

<table>
<tr><td colspan="4">SECTION B & C [30 marks]</td><td></td></tr>
<tr><td>6</td><td>(a)</td><td></td><td>A strong acid ionises completely (in water) whereas a weak acid ionises partially (in water).</td><td>2</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td><table>
<tr><td>element</td><td>C</td><td>H</td><td>O</td></tr>
<tr><td>mass</td><td>0.96 g</td><td>0.16 g</td><td>1.28 g</td></tr>
<tr><td>A_r</td><td>12</td><td>1</td><td>16</td></tr>
<tr><td>moles</td><td>0.08</td><td>0.16</td><td>0.08</td></tr>
<tr><td>simplest ratio</td><td>1</td><td>2</td><td>1</td></tr>
</table>empirical formula is CH_2O</td><td>1

1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$(CH_2O)_n = 60$
$30n = 60$
$n = 2$
molecular formula is $C_2H_4O_2$</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td></td><td>5</td></tr>
<tr><td>7</td><td>(a)</td><td></td><td>silver nitrate / silver sulfate (any soluble silver salt)
nitric acid
sulfuric acid / sodium sulfate / potassium sulfate (any soluble sulfate)
sodium hydroxide / sodium carbonate
sulfuric acid / sodium sulfate / potassium sulfate (any soluble sulfate)</td><td>5</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>potassium nitrate and sodium chloride (both correct to score)</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>silver chloride, barium sulfate, lead sulfate (two correct to score)</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Mass of SO_4^{2-} ions in $BaSO_4$ = 96 / 233 × 1000 g = 412 g or 0.412 kg (1)
Mass of SO_4^{2-} ions in $PbSO_4$ = 96 / 303 × 1000 g = 317 g or 0.317 kg (1)
OR
Moles of $BaSO_4$= 1000 / 233 = 4.29
Moles of $PbSO_4$ = 1000 / 303 = 3.30 (1)
Since 1 mole of $BaSO_4$ and 1 mole of $PbSO_4$ each contains 1 mole of SO_4^{2},
there are 4.29 moles of SO_4^{2-} ions in 1000 g of $BaSO_4$, compared to 3.30 moles of SO_4^{2-} ions in 1000 g of $PbSO_4$. (1)</td><td>2</td></tr>
<tr><td></td><td>(d)</td><td></td><td>Any one of the following:
$Ag^+ + Cl^- \rightarrow AgCl$
$Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$
$Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$
$2H^+ + CO_3^{2-} \rightarrow CO_2 + H_2O$
$H^+ + OH^- \rightarrow H_2O$</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td></td><td>10</td></tr>
<tr><td>8</td><td>(a)</td><td></td><td>From the data provided, the soil pH is observed to be between 4 – 4.5. (1)
Only hydrangea blue will grow optimally at this pH. (1)
Determines correct soil pH resulting in identification of suitable plant (award 2)
Identifies correct plant OR Determines correct soil pH (award 1)</td><td>2</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Moles of $CaCO_3$ needed = 10500 / 2 = 5250 (1)
Mass of $CaCO_3$ needed = 5250 × 100 = 525000 g (1) No units -1</td><td>2</td></tr>
<tr><td></td><td></td><td></td><td></td><td>4</td></tr>
<tr><td>9</td><td>(a)</td><td></td><td>because the charges on the metal ions / the formulae of the hydroxides are different</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>$RbOH + HCl \rightarrow RbCl + H_2O$</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$Sr(OH)_2 + 2HCl \rightarrow SrCl_2 + 2H_2O$</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>$MCO_3 \rightarrow MO + CO_2$</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$MCO_3 + 2HCl \rightarrow MCl_2 + H_2O + CO_2$</td><td>1</td></tr>
<tr><td></td><td>(d)</td><td></td><td>moles of CO_2 = 2.57 / 44 = 0.0584 (1)
moles of MCO_3 = 0.0584 (1) (can be implied)
M_r of MCO_3 = 4.86 / 0.0584 = 83.2 (1)
A_r of M = 83.2 – 12 – 48 = 23.2</td><td></td></tr>
</table>

			M is magnesium (1), (as M is a Group II metal)	**4**
	(e)	**(i)**	$M(OH)_2 + H_2SO_4 \rightarrow MSO_4 + 2H_2O$	**1**
		(ii)	$MCO_3 + 2HNO_3 \rightarrow M(NO_3)_2 + H_2O + CO_2$	**1**
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