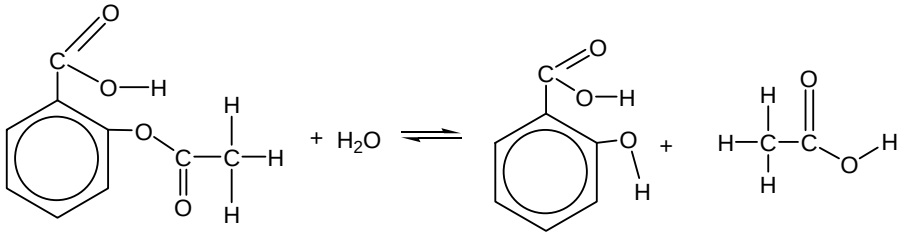
Innova JC Preliminary Examination H2 Chemistry
Paper 2 Mark Scheme

1 (a) (i) Paracetamol is more toxic as less Paracetamol taken would result in the same toxicity.

(ii) Mass of Aspirin taken that would be toxic = 1100 x 50 = 55000 mg
Minimum number of Aspirin tablets = 55000/ 325 = 169.23
= 170

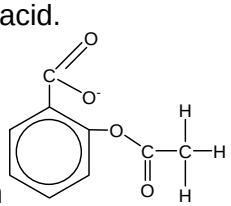
(b) (i) It will decompose in moist conditions (undergo hydrolysis).

(ii) Acidic hydrolysis
Dilute HCl and heat.



(iii) Add aq Br_2 to both compounds separately.
salicylic acid: reddish brown aq Br_2 will decolourise.
aspirin: reddish brown aq Br_2 will not decolourise.

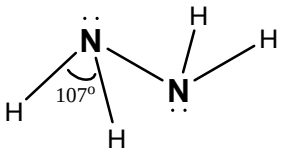
(iv) Aspirin is a stronger acid than acetic acid.

The negative charge on the anion  is delocalised into the benzene ring, stabilises it.

(c) (i) Standard enthalpy change of combustion of salicylic acid is when one mole of salicylic acid is completely burnt in oxygen at standard conditions of 298 K and 1 atm.

(ii) Heat absorbed by bomb calorimeter = 13.62 x 2.5 = 34.05 kJ
Amt of salicylic acid = 34.05 /(3.00 x 10^3) = 0.01135 mol
Mass of salicylic acid = 0.01135 x 138 = 1.5663 g
Mass of boric acid = 3.56 – 1.5663 = 1.9937 g
Mass percentage of boric acid = 1.9937 /3.56 x 100% = 56.0 %

2 (a)



Trigonal pyramidal

(b) (i) PV = nRT

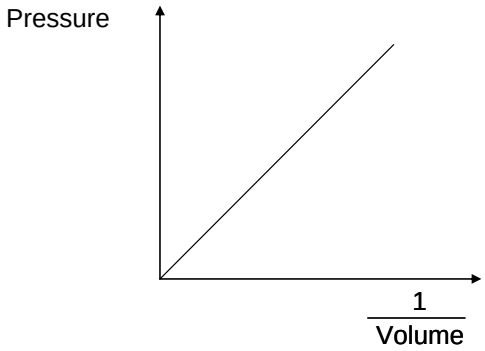
$1.5 \times 10^5 \times V = 1 \times 8.31 \times 300$

$V = 0.0166\ m^3$ (or $16.6\ dm^3$)

(ii) This is due to the presence of H bonding between the hydrazine molecules**,** therefore intermolecular forces of attraction becomes significant.

(iii) High temperature, low pressure.

(iv)



(c) **(i)** Hydrazine has an available lone pair of electrons on the N-atom, hence able to accept protons.

(ii) $K_b = \frac{[OH^-][N_2H_5^+]}{[N_2H_4]}$

(iii) $K_b = \frac{10^{-14}}{3.33 \times 10^{-9}} = 3.00 \times 10^{-6}$

$K_b = 3.00 \times 10^{-6} = \frac{[OH^-][N_2H_5^+]}{[N_2H_4]}$

$[OH^-] = 7.775 \times 10^{-4}$

pOH = 3.11 pH = 10.9

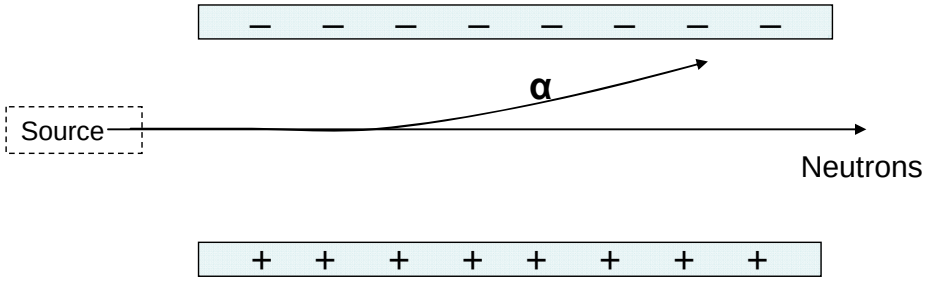
(d) $pOH = pK_b + \log_{10} \frac{[salt]}{[base]}$

14 – 10 = -lg (3.00×10^{-6}) + $\log_{10} \frac{[salt]}{(0.2)}$

$[salt] = 6.01 \times 10^{-3}$ moldm^{-3}

3 **(a)** **(i)** Number of protons : ……31……
Number of neutrons: ……37……..

(ii)

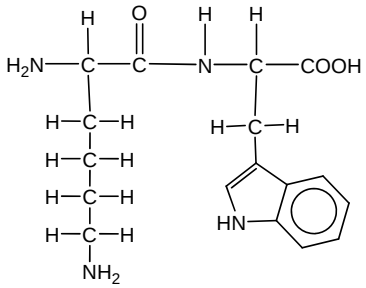


The deflection remains the same at 3^o

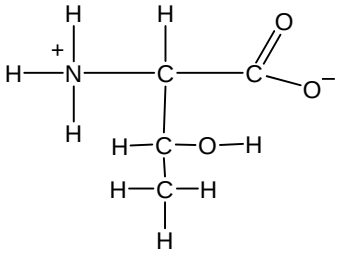
(b) **(i)** Gallium oxide has a giant ionic structure with strong electrostatic forces of attraction between the oppositely charged ions. Whereas, gallium chloride has a simple molecular structure with weak van der waals forces of attraction between the molecules. Hence, less energy is required to break the weak van der waals forces of attraction between gallium chloride molecules, the melting point of gallium chloride is lower.

(ii) Ga_2O_3 (s) + 2NaOH(aq) + H_2O → 2NaGa$[OH]_4$ (aq)
$GaCl_3$ (s) + $6H_2O$ → $[Ga(H_2O)_6]^{3+}$ (aq) + $3Cl^-$ (aq)
$[Ga(H_2O)_6]^{3+}$ (aq) → $[Ga(H_2O)_5(OH)]^{2+}$ (aq) + H^+ (aq)

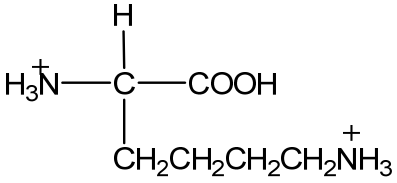
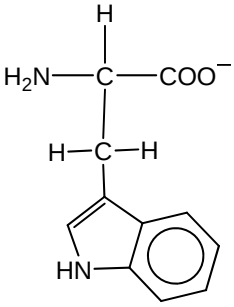
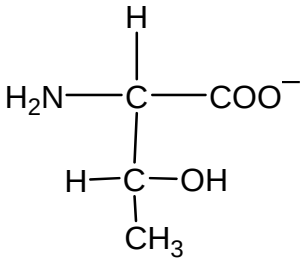
4 **(a)**



(b)



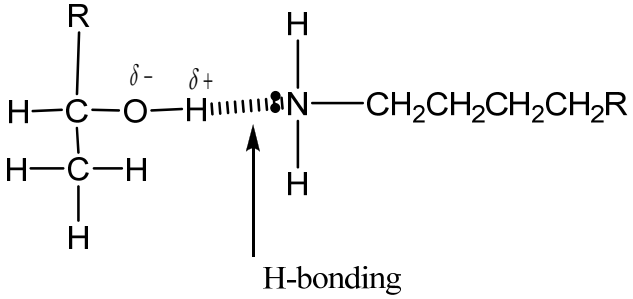
(c) **(i)**

Position	Structure at pH = 7.00
A	
B	
C	

[3]

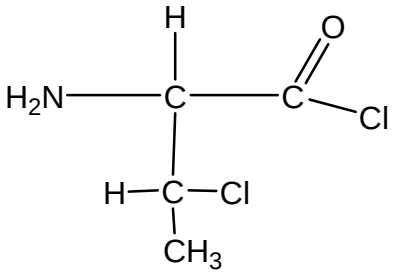
(d) **(i)** hydrogen bonding

(ii)

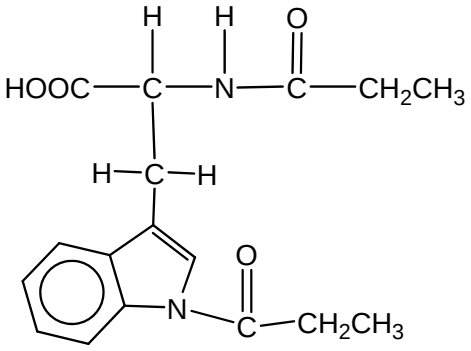


(e) Lysine is more basic than tryptophan.

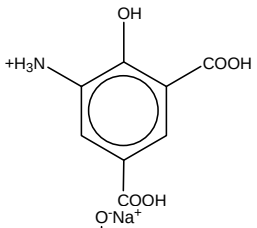
(f) **(i)**



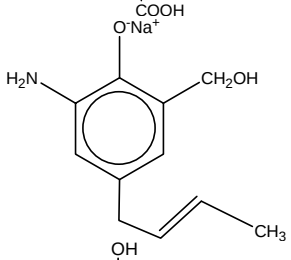
(ii)



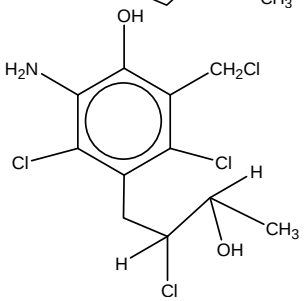
5 **(a)** **(i)**



(ii)



(iii)



(b) Reagent(s) and Condition(s): ……. Na metal ……..
Observations for :

Compound Y: …… no effervescence observed.
Compound X: …… effervescence of hydrogen gas observed and it will extinguished burning splint with a 'pop' sound.……

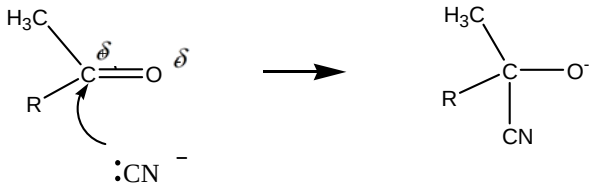
(c)

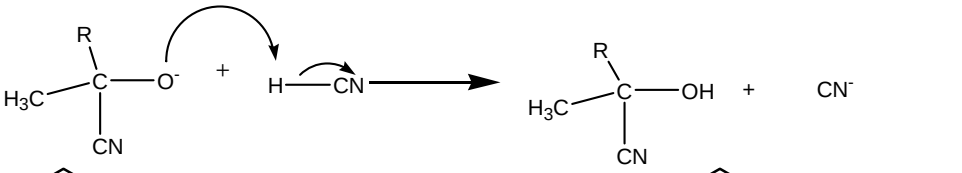
Step …**I**…

Explanation: NH_3 is not an electrophile/ it is not electron deficient/ is a nucleophile

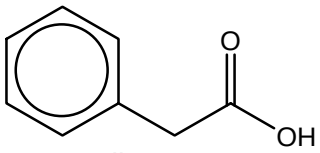
(d)

$$HCN \rightleftharpoons H^+ + CN^-$$

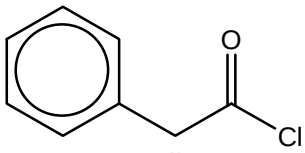




(e) (i)



Intermediate A



Intermediate B

(ii) Step **I**
Reagents and Conditions: …… aqueous I_2, NaOH (aq), reflux ……

Step **II**
Reagents and Conditions: …… HCl(aq)…….

Step **III**
Reagents and Conditions: ……. NH_3 heat in a sealed tube

End of Paper