Unit 3
CHEMISTRY
Answers

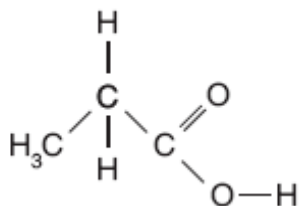**Section A – Multiple choice questions (20 marks)**

1. A	6. B	11. D	16. D
2. A	7. C	12. B	17. A
3. D	8. B	13. D	18. C
4. A	9. D	14. C	19. B
5. B	10. B	15. D	20. C

Section B – Written questions (48 marks)

Question 1.

(a) ester

(b) $C_4H_{10}O(l) + C_3H_6O_2(l) \rightarrow C_7H_{14}O_2(l)$ $H_2O(l)$

(c) $CH_3CH_2COOCH_2CH_2CH_2CH_3$

(d)

(e) condensation or esterification reaction

(f) hydrolysis

(g) isomers

Question 2.

(a) D

(b) percentage of C $= \dfrac{6}{6 + 10 + 6 + 9} \times 100\%$

$= 19\%$

(c) change of operating conditions such as type of solvent, pressure, temperature etc.

(d) Biological molecules are likely to be heat sensitive.

(e) A and B peaks because they have similar retention times

(f) 'spiking' or adding amyl nitrate to the original sample and observing change or appearance of peaks

(g) GC to separate mixtures into pure component peaks for a more informative MS

7 marks

Question 3.

(a) Calculate the mass of nickel salt needed.

Carefully transfer the weighed salt to a volumetric flask that has been rinsed with deionised water.

Dissolve the salt in a small amount of deionised water, make up to the mark and shake.

(b) $n = c \times V$

$n = 0.100 \times 100.00 \times 10^{-3} = 0.001\ 00$ mol

$m = n \times M = 0.001\ 00$ mol $\times 182.71$ g mol^{-1}

$m = 0.183$ g
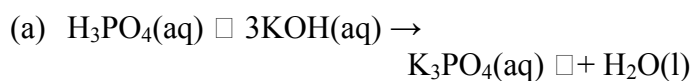
(c) Change the hollow cathode tube from sodium to nickel.

(d) AAS uses lamps which detect only specific metals so there will be no interference due to the presence of other metals in the determination.

(e) mass of nickel $= 300 \times 0.100$ mg

$= 0.0300$ g

(f) percentage of nickel $= \dfrac{0.0300}{3.600} \times 100\%$

$= 0.833\%$

6 marks

Question 4.

(a) $H_3PO_4(aq)$ $3KOH(aq) \rightarrow$

$K_3PO_4(aq)$ $+ H_2O(l)$

(b) $n = c \times V = 0.0887 \text{ mol L}^{-1} \times 22.34 \times 10^{-3} \text{ L}$

$= 1.98 \times 10^{-3} \text{ mol}$

(c) $n(H_3PO_4) = \dfrac{1}{3} \times n(KOH)$

$= 6.61 \times 10^{-4} \text{ mol}$

(d) $c = \dfrac{n}{V} = \dfrac{6.61 \times 10^{-4}}{20.00 \times 10^{-3}}$

$= 0.0330 \text{ mol L}^{-1}$

therefore original concentration

$= 0.0330 \times \dfrac{250}{25} = 0.330 \text{ mol L}^{-1}$

(e) 32.4 g L–1

5 marks

Question 5.

(a) IR or NMR etc.

(b) $CH_3CH_2CH_2CH_3$ and $(CH_3)_2CHCH_3$

(c) alkanes

(d) $C_4H_{10}(g) + Cl_2(g) \rightarrow C_4H_9Cl(g) + HCl(g)$

4 marks

Question 6.

Molecule	Corresponding NMR
CH_2FCH_2Cl	A
CH_3COOCH_3	B
$(CH_3)_2CHCl$	D
CH_3CH_2OH	C

4 marks

Question 7.

(a) 1-chloropropane or 2-chloropropane

(b) This compound has isomers.

(c) $C_2H_4(g) + HCl(g) \rightarrow C_2H_5Cl(g)$

(d) $C_2H_5Cl(g) + NaOH(aq) \rightarrow C_2H_5OH(aq) +$

$NaCl(aq)$

(e) substitution or hydrolysis

5 marks

Question 8.

(a) 1. pentane   2. ethanol   3. methanoic acid

(b) molecule B

(c) molecules B and C

(d) molecule E

(e) any substitution reaction with products such as $CH_3CH_2CH_2CH_2Cl$

(f) molecule E

(g) molecule F

(h) molecules B and C

10 marks

Notes: