CSE CENTRE FOR STRATEGIC EDUCATION
Leading educational thinking and practice

IARTV

CSE – MAY 2009

YEAR 12 CHEMISTRY

Written test 1

ANSWERS & SOLUTIONS BOOK

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SECTION A – Multiple choice questions (20 marks)

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

SECTION B – Short answer questions (53 marks)

Question 1 (13 marks)

a. $CO_2(g) + Ba(OH)_2(aq) \rightarrow BaCO_3(s) + H_2O(l)$

1 mark

b. $Ba(OH)_2(aq) + 2HCl(aq) \rightarrow BaCl_2(aq) + 2H_2O(l)$

1 mark

c. $n(Ba(OH)_2) = c \times V = 0.108 \times 0.100 = 0.0108$ mol

1 mark

d. $n(HCl) = c \times V = 0.0968 \times 0.02680 = 2.594 \times 10^{-3}$ mol

1 mark

e. $n(Ba(OH)_2) = ½\, n(HCl) = ½ \times 2.594 \times 10^{-3} = 1.297 \times 10^{-3}$ mol

1 mark

f. $n(Ba(OH)_2)$ reacted $= 0.0108 - 1.297 \times 10^{-3} = 9.503 \times 10^{-3}$ mol
$n(CO_2) = n(Ba(OH)_2) = 9.503 \times 10^{-3}$ mol in 500 L of air

2 marks

g. $V(CO_2) = n(CO_2) \times 24.5 = 0.233$ L at SLC

1 mark

h. v/v% $= 0.233/500 \times 100 = 0.0466\%$

1 mark

i. $(BaCO_3) = 1.550 / 197.3 = 0.007856$ mol $= n(CO_2)$
$(CO_2) = n(CO_2) \times 24.5 = 0.007856 \times 24.5 = 0.193$ L
v/v% $= 0.193 /500 \times 100 = 0.0385\%$

3 marks

j. Incomplete precipitation, precipitate loss during washing, precipitate lost during filtration etc
Allow consequential mark for paper and precipitate not dried to constant mass if **i.** > **h.**

1 mark

Question 2 (4 marks)

a. $2Li(s) + 2H_2O(l) \rightarrow 2LiOH(aq) + H_2(g)$

1 mark

b. $n(LiOH) = 2.50 / 6.9 = 0.362$ mol

$c = n/V = 0.362 / 0.100 = 3.62$ mol L^{-1}

2 marks

c. $g/L = c \times Mr = 3.623 \times 23.9 = 86.6$ g L^{-1}

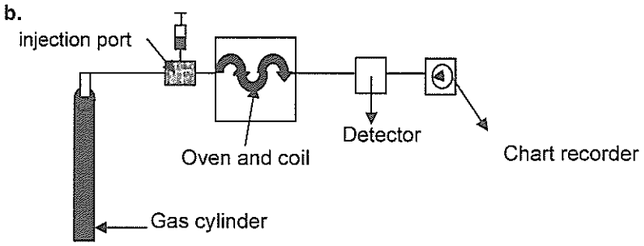
1 mark

Question 3 (8 marks)

a. Paper is made of cellulose which is a polymer of glucose. A polar organic molecule with dipole-dipole (and possibly H-bonding) attractions will adsorb to a greater extent to the paper.

1 mark

b.



3 marks

c. Methanol will be detected first followed by ethanol and then ethane-1,2-diol. Separation reflects differences in relative molecular mass.

2 marks

d. Glucose is thermally unstable and will decompose.

1 mark

e. Operating conditions such as eluent pressure and operating temperature can vary and this will change retention times.

1 mark

Question 4 (7marks)

a. Peaks due to isotopes such as ^{13}C or ^{18}O or ^{2}H etc

1 mark

b. Peak 31 corresponds to fragment CH_2OH^+

1 mark

c. Propan-1-ol because of peaks 43 $CH_3CH_2CH_2^+$, 31 CH_2OH^+ etc and no peak at 45 $COOH^+$

1 mark

d. A carbonyl stretch between 1670 and 1750 cm^{-1} and different OH frequency for alcohol compared to carboxylic acid frequency

1 mark

e. Triplet at about a shift of 1 ppm

2 marks

f. 3 peaks

1 mark

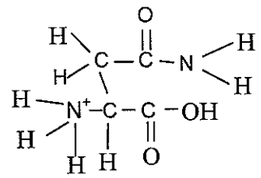
Question 5 (7 marks)

Semi-structural formula of all the reactant(s) needed for the reaction	Semi-structural formula of organic product	Name of organic product	Type of reaction
$CH_2=CH_2$ + H_2O	**CH_3CH_2OH**	ethanol	addition
CH_3CH_3 + $Br_2 \rightarrow$	**CH_3CH_2Br or other**	**bromoethane or other**	**substitution**
$CH_3CH_2CH_2OH + Cr_2O_7^{2-}/H^+ \rightarrow$	**CH_3CH_2COOH**	**propanoic acid**	**oxidation**
$CH_2=CHCl$	$-(CH_2CHCl)_n-$	polyvinyl chloride	**addition or polymerisation**
$CH_3CH_2CH_2Cl$ + $NH_3 \rightarrow$	$CH_3CH_2CH_2NH_2$	1-aminopropane	**substitution**
CH_3OH + HCOOH	$HCOOCH_3$	**methyl methanoate**	condensation or esterification
$(CH_3)_2CH=CH_2$	**$CH(CH_3)_3$**	2-methylpropane	hydrogenation

1 mark for each line correct

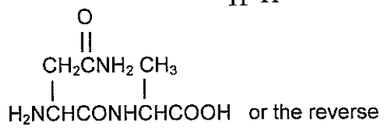
Question 6 (7 marks)

a.



1 mark

b.



or the reverse

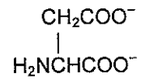
1 mark

c.

Structure	Type(s) of bonding
Primary	Covalent or peptide
Secondary	H-bonding
Tertiary	H-bonding, dipole-dipole, disulfide, ion-dipole etc

3 marks

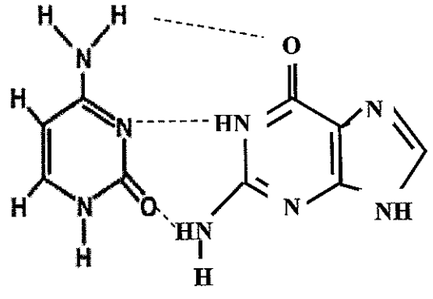
d.



2 marks

Question 7 (7 marks)

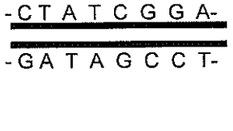
a.



2 marks

b.

Strand i



1 mark

c.

Strand ii

Any answer with more than 4 GC base pairs

1 mark

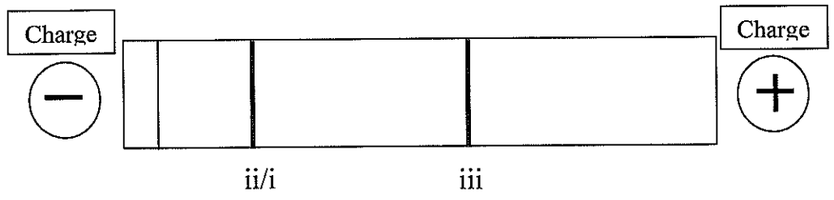
d.

Strand iii

Strand iii must be shorter than strand i.

1 mark

e.



2 marks