MEMO

Qu 1

1.1 A ✓✓ each

1.2 C
C
1.3 C

1.4 A

1.5 B

1.6 B

1.7 A

1.8 C

1.9 B

1.10 D

Qu 2

2.1 The reaction rate of a catalysed reaction is greater✓than that of an uncatalysed reaction.✓ (2)

2.2 Time✓ (1)

2.3 Volume of oxygen (Accepted absence and presence of <u>catalyst</u>)✓ (1)

2.4 These are the variables that need to be kept constant so that they do not influence the outcome of the experiment. ✓✓When controlled they ensure a fair test. (2)

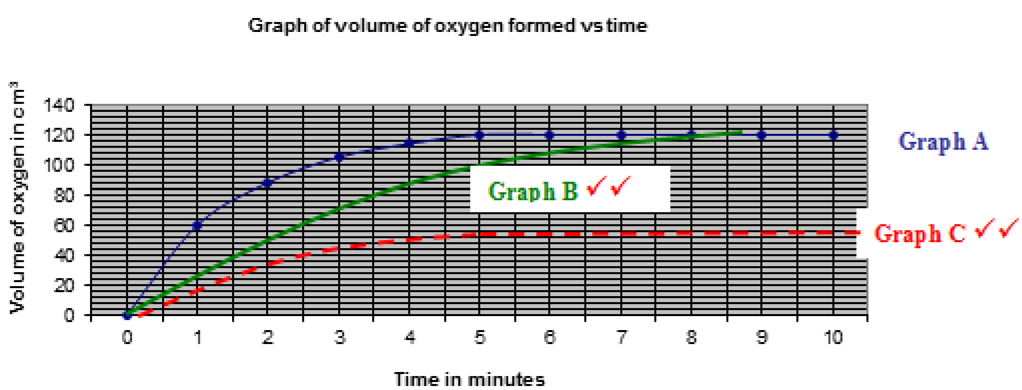
2.5 Same concentration of H_2O_2 (aq)
Same apparatus
Temperature *(Any 3)*✓✓✓ (3)

2.6 Time delay in starting due to having to place stopper.✓2nd person could start or practice process.✓
Delay in reading gas syringe.✓Repeat and average readings✓
Accept other feasible errors.. (4)

2.7 There is a huge increase in the amount of bubbles formed.✓✓ (2)

2.8 A catalyst is a substance that increases the rate of a chemical reaction without being chemically changed in the reaction. *It lowers the activation energy needed for the reaction.* ✓✓ (2)

2.9



(4)

2.10 As the reaction proceeds, the concentration of the H_2O_2(aq) decreases✓the rate of the reaction will decrease due to fewer collisions per unit time.✓(*one mark if rate of reaction indicated by the gradient decrease)*. (2)

2.10 5 minutes✓ (1)

Qu 3

3.1 If a system that is in equilibrium is disturbed, the equilibrium position will change in order to oppose the disturbing influence and re-establish equilibrium. ✓✓✓(3)

3.2 Rate of the forward reaction equals the rate of the reverse reaction ✓✓ (2)

3.3
A remains constant ✓
B remains constant
C increases
D increases
E increases
F increases
G decreases
H remains constant
I increases (9)

3.4.1 $Kc = \frac{[N_2O].[O_2]}{[NO_2].[NO]}$ ✓ $= \frac{0{,}18 \times 0{,}38}{0{,}06 \times 0{,}29}$ ✓✓ = 3,93 ✓ (4)

3.4.2 Temperature ✓ (1)

3.4.3 Kc only affected by a change in temperature. ✓
Decrease in temp favours exothermic reaction which is the reverse reaction ✓
[Reactants] increases ∴ Kc decreases (2)

3.5 3.5.1 Water has a very low ability✓to ionize. (1)

3.5.2 K_c or K_w values change✓at different temperatures.✓ (2)

3.5.3 $[H_3O^+] = 1 \times 10^{-7}$ $mol.dm^{-3}$✓✓ (2)

Qu 4

4.1 Temperature of 25 ^{o}C / 298 K ✓

Concentration of 1 mol.dm^{-3} ✓ (2)

4.2 Zinc sulphate / $ZnSO_4$ ✓ or any soluble zinc salt (1)

4.3 Zinc / Zn ✓ If Zn^{2+} (zero marks) (1)

4.4 $E^{o}_{cell} = E^{o}_{cathode} - E^{o}_{anode}$ ✓

$1,72$ ✓ $= E^{o}_{cathode} - (-0,76)$ ✓

$E^{o}_{cathode} = 1,72 - 0,76 = 0,96$ V ✓

∴ The substance is NO(g) ✓ Also accept NO_3^- and HNO_3 (5)

4.5 Zn/Zn^{2+} // NO_3^-, H^+/NO,Pt ✓✓✓ [Can ignore H^+ and Pt] (4)

4.6 Chemical to electrical ✓ (1)

4.7 DECREASES ✓ (1)

4.8 Net cell reaction is: $Zn + NO_3^- \rightarrow Zn^{2+} + NO$

Increase in $[Zn^{2+}]$ decreases the tendency of net cell reaction to proceed from L to R ✓✓ Any change that decreases this tendency decreases emf ✓ (3)

OR

According to LCP, if $[Zn^{2+}]$ increases, reaction shifts to left. ✓
The tendency of the net cell reaction to proceed from L to R decreases ✓
Any change that decreases this tendency decreases emf ✓

4.9.1 0 V ✓ (1)

4.9.2 The electrodes (or anode and cathode) have the same emf ✓
∴ $E^{o}_{cell} = E^{o}_{cathode} - E^{o}_{anode} = 0$ V ✓ (2)

4.9.3 NO ✓ (1)

4.9.4 The Zn^{2+} ions in the electrolyte oxidize Zn to Zn^{2+} (in anode half cell)
The Zn reduces Zn^{2+} ions to Zn
An equilibrium is established: $Zn \rightleftharpoons Zn^{2+} + 2\bar{e}$ ✓ (3)

[24]

Qu 5

5.1 Current✓ (1)

5.2 Must both be 1.5 V AA batteries✓ Accept temperature (1)

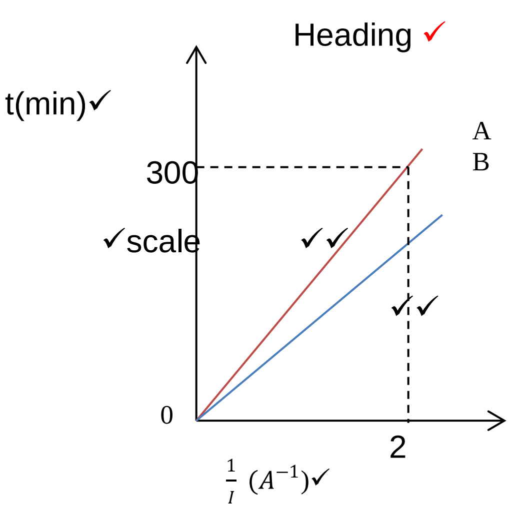
5.3

			Battery A	Battery B
	Current drawn, I (A)	Inverse of current, $^1/_I$ (A^{-1})	Time of operation, t (min)	Time of operation, t (min)
Animal light	0,5	2	305	264
Small gift torch	1	1	160	132
Dancing Santa	1,5	0,67	90	88
Toothbrush	2	0,5	70	66

(2)

5.4 Note: Battery A data is on either side of a straight line.

Battery B data is on a straight line.



(8)

5.5 Battery A: gradient = $\frac{300min}{2A^{-1}}$ ✓✓ $= 150A.\min$ ✓ $\times \left(\frac{1h}{60min}\right) \times \left(\frac{1mA}{10^{-3}A}\right)$ ✓ $= 2500mA.h$ ✓ (5)

5.6.1 contain a moist paste✓ (1)

5.6.2 basic/alkaline electrolyte✓ as opposed to acidic✓ (NH_4Cl) electrolyte in Leclanché. (2)

5.6.3 Alkaline must contain more electrolyte✓ ∴ it must either be more concentrated or the electrodes inside the casing must be smaller to enable more to fit in.✓ (2)

5.7.1 OH^- ✓ (1)

5.7.2 $Zn + 2\ MnO_2 \rightarrow ZnO + Mn_2O_3$✓✓ (2)

5.8 The expensive batteries are rechargeable✓ (secondary) batteries while the dry cells used by the girls are primary batteries which cannot be recharged.✓ (2)

5.9 Toothbrush✓ – draws a bigger current and used at least twice a day ∴ makes economic sense to use rechargeable batteries because you would need to replace the primary battery often.✓ (2)

5.10The cost of the batteries required often exceeds the cost of the toy they are used in and needs to be taken into consideration.✓✓ (or other logical conclusion?) (2)

Qu 6

6.1

$2Cℓ^- + \rightarrow Cℓ_2 + 2e^-$ ✓

2H2O + 2e(→ H2 + $2OH^-$ ✓ (4)

6.2

Eθcell = Eθcathode - Eθanode
= -0,83 – (1,36) ✓
= -2,19 V ✓
The negative value for E^{θ}_{cell} indicates that the reaction is not spontaneous. ✓ (5)

6.3

Chlorine gas: making PVC or another appropriate use ✓
Hydrogen gas: making ammonia or another appropriate use ✓
Sodium hydroxide: making soap or another appropriate use ✓ (6)

6.4

The mercury cathode process results in losses of mercury into the environment which are problematic as mercury is highly toxic to all forms of life. ✓
The diaphragm cell uses asbestos which is harmful to humans causing cancer of the respiratory tract and lungs. ✓

(4)

[19]

Qu 7

7.1 7.1.1 C✓

7.1.2 A✓

7.1.3 D✓

7.1.4 B✓ (4)

7.2 7.2.1 CH_4 ✓ + $C\ell_2$✓ → $CH_3C\ell$✓ + $HC\ell$✓ [In structural formula!] (4)

7.2.2 1-Chloro propane ✓✓ (2)

7.2.3 ethene✓ (1)

7.2.4 $CH_3CH_2CH_2C\ell$ + H_2O✓ → $CH_3CH_2CH_2OH$✓ + $HC\ell$✓

[In structural formula!] (3)

7.3 7.3.1 The electron pair is not shared equally✓ – O is more electronegative✓than H and attracts the shared pair stronger to make the bond polar. (2)

7.3.2 O_2 molecules are kept together by weak van der Waals forces✓while methanol molecules have stronger hydrogen bonds✓keeping them together and therefore the higher boiling point.✓ (3)

7.4 7.4.1 Compounds having the same molecular✓formula but a different structural formula.✓
A series of similar compounds✓which have the same functional group✓and whose consecutive members differ by $–CH_2$.✓ (4)

7.4.2 3-methyl but-1-ene✓✓✓ (3)

7.5 7.5.1 3-bromo-3-methyl pentane✓✓ (2)

7.5.2 Elimination or dehydrohalogenation✓✓ (2)

30 marks

Qu 8

8.1
O
||
– C – O – ✓✓ (2)

8.2 1,2,3 – propantriol✓✓ (2)

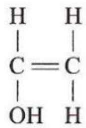
8.3 Pleasant / sweet smells✓✓ (2)

8.4 warm✓concentrated sulphuric acid✓ (2)

8 marks

Qu 9

9.1 Long chains of monomers covalently bonded together.✓✓ (2)

9.2 

✓✓ (2)

9.3 4✓✓ (2)

9.4 addition✓✓polymerization (2)

9.5 9.5.1 thermoplastics✓✓ (2)

9.5.2 light weight, strong, unaffected by water, thermal insulators etc.✓✓ …(2)

9.5.3 not biodegradable✓✓ …(2)

9.5.4 clear stand✓motivation✓✓ …(3)

17 marks