0515 P1&2 Mark Guides

1	B	11	C	21	A	31	D	41	C
2	A	12	C	22	B	32	A	42	A
3	D	13	C	23	C	33	B	43	B
4	A	14	B	24	A	34	A	44	D
5	D	15	D	25	D	35	C	45	C
6	D	16	A	26	A	36	B	46	B
7	C	17	B	27	B	37	C	47	A
8	A	18	A	28	C	38	D	48	A
9	B	19	D	29	C	39	B	49	C
10	A	20	A	30	C	40	A	50	C

1) a) Number of protons in the nucleus of an atom of element (1mrk)
li) Group I (1mrk) iii) period 3 (1mrks)
b) I) R (ii) S (iii) V (IV) T and U (1mrk each)
c) I) RNO_3 or $NaNO_3$..... (1mrk)
ii) R_2CO_3 or Na_2CO_3..... (1mrk)
d) Ionic or electrovalent (1mrk)

2a)
I) C or Na_2O 1mrks
ii) E or AL_2O_3 ..... 1mrks
iii) $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$ Equation (1mk) Balancing [1mk]
IV) B or SO_2 ..... (1mrk)
V) A or NaOH ..... (1mrk)
b) I) it is a substance which produces hydrogen ions (H^+) in aqueous solution (1mrk)
ii) This is because D is a weaker acid compared to G ..... (1mrk)
iii) $H_2SO_4 \rightarrow 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)}$ ..... (1mrk)
IV) Used in car batteries ..... 1mrk (Any other)

3a) A homologous series is a family of organic compounds with the same functional group hence the same chemical properties 1mrk
ii) Reagent: Bromine water or acidified potassium permanganate ..... 1mrk any
Observation decolourization (1mrk)
iii) C_nH_{2n} ..... (1mrk)
b) I) Ethanol 1mrk
C_2H_5OH 1mrk
ii) $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$ 1mrk
iii) Used in making perfumes or any 1mrk
C) Reagent water or H_2O (1mrk)
Reaction condition: concentrated sulphuric acid (1mrk)

4a)
i) this is because Hydrogen is discharged at the cathode leaving sodium ions (1mrk) and hydroxide ions discharged at the anode leaving chloride ions (Cl) (1mrk) The electrolyte becomes more and more concentrated.
ii) Colorless gas is produce (1mrk)
iii) $2H^+_{(aq)} + 2e \rightarrow H_{2(g)}$... (1mrk)
b) I) Q = It 1mrk
= 2x20x60 = 2400 C... 1mrk
ii) $\frac{2400}{96,000} = 0.025F$..... 1mrk
iii) 2F produces 22400 cm^3 therefore 0.025F produces $\frac{0.025 \times 22,400}{2} = 280cm^3$, expression (1mrk) answer (1mrk)
C) Used in extraction of metals (1mrk) or any

5) ai) Allotropy is the existence of an element in more than one form in the same physical state (1mrk)
ii) Diamond and graphite (1mrk) each
b) i) Solid Y is marble chips or any carbonate (1mrk)
ii) fused calcium chloride is a drying agent (1mrk) Removes moisture from the gas
iii) To remove any acid fumes ..... (1mrk)
iv) Downward delivery (1mrk) because it is dense than air (1mrk)
iv) Used in fire extinguishers (1mrk) It does not support combustio [1 mk] or it is heavy and falls like a blanket on fire

6a)
I) Fe^{2+} or iron (11) ions (1 mark)
ii) $Fe[OH]_2$ [1mk]
iii) $Fe^{2+} + 2OH^- \rightarrow Fe[OH]_2$ [1mk]
iv) Chloride ions or Cl^- [1mk]
i) $FeCl_2$ or iron [ii) chloride [1mk]
bi) Ca^{2+} or calcium ions [1mk]
ii) Sulphite ion or SO_3^{2-} ..... (1mrk)
iii) SO_2 or Sulphur dioxide gas (1mrk)
iv) Calcium Sulphite or $CaSO_3$ (1mrk)

C) i) ammonium ion or NH_4^+ (1mrk)
ii) Ammonium carbonate or $(NH_4)_2CO_3$ ... (1mrk)
d) i) iron filings and dust particles (1mrk)
ii) Iron filling is magnetic while dust is not (1mrk)
iii) Fractional distillation [1mk]
iv) Differences in boiling, points... (1mrk)
v) Groundnut from peeling .... (1mrk)
vi) Density ---- (1mrk)

e) Impure .... (1mrk)
Impurities increase boiling point ... (1mrk)

7) a)
I)

A volumetric flask

Diagram (1mrk)
Name (1mrk)

ii)

A pipette

Diagram (1mrk)
Label (1mrk)

b) Concentration = $\frac{\text{moles}}{\text{volume}(dm^3)}$ [1mk] = $\frac{10.6}{106} \times \frac{1000}{250}$ (1mrk)
= 0.4 mol dm^{-3} (1mrk)

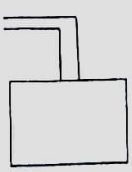
ii) Mean titre = $\frac{1^{st}\text{titre} + 2^{nd}\text{titre}}{2}$ (1mrk)
= $\frac{20.2+20.2}{2}$ = 20.2Cm^3

iii) $Na_2CO_3 + 2HCL \rightarrow 2NaCl + H_2O + CO2$ .... (1mrk)

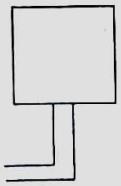
$\frac{\square\square\square A}{\square\square\square B} = \frac{2}{1}$ $\square_B = \frac{2\square\square\square_B}{\square_B}$ (1mrk)
$= \frac{2 \square 0.4 \square 25}{20.2}$ = 0.9 mol dm^{-3} (1mrk)

iv) Initial colour ..... Yellow (1mrk)
Final colour ..... Pink (1mrk)
c) Rinse the conical flask just with water (1mrk)
d) Base attacks cork or rubber (1mrk)

e)



SO_2 downward delivery
Diagram (1mrk)
Method of collection (1mrk)



H_2 upward delivery
Diagram (1mrk)
Method of collection (1mrk)

8) a) Isotopy:

This is the existence of different atoms of an element (1mrk) with same atomic number (1mrk) but different mass numbers [1mk] due to differences in the number of neutrons e.g. chlorine has 2 isotopy $^{35}_{17}$□□ and $^{35}_{17}$□□ (1mrk)

b) **Isomerism:** this is the existence of 2 or more compounds (1mrk) with same molecular formula (1mrk) but different structural formulae[1mk] e.g. butane has 2 isomers butane and 2 – methyl propane (1mrk)

c) **Allotropy:** this is the existence of an element (1mrk) in more than one form (1mrk) in the same physical state (1mrk) e.g. Carbon has 2 crystalline allotropes Diamond and Graphite (1mrk)

d) Neutralization reaction: this is the reaction between an acid (1mrk) and a base (1mrk) to produce a salt and water (1mrk) e.g.

$NaOH + HCl \rightarrow NaCl + H_2O$ (1mrk)

e) **Es**

terification reaction: this is the reaction between an alcohol (1mrk) and a carboxylic acid (1mrk) to produce an ester (1mrk) and water e.g. ethanol reacts with ethanoic acid to produce ethylethanoate and water (1mrk) or equation .

9) a) Bauxite (1mrk)

b) Aluminum is extracted from its ore bauxite by electrolysis (1mrk). Bauxite is impure Aluminium oxide and contains impurities like SiO_2 and Fe_2O_3 the bauxite is mixed with hot concentrated NaOH solution (1mrk). Sodium Aluminate is formed

$Al_2O_{3(S)} + 2\,NaOH_{(aq)} + 3H_2O_{(0)} \rightarrow 2NaAl(OH)_{4(aq)}$

The impurities do not react with NaOH and are filtered off (1mrk). As a sludge the filtrate, sodium aluminate is then seeded (1mrk) with bit of aluminium hydroxide solution (1mrk). This causes the precipitation of more aluminium hydroxide (1mrk)

$NaAL(OH)_{4(aq)} \rightarrow Al(OH)_{3(s)} + NaOH_{(aq)}$

The aluminium hydroxide precipitation is filtered, (1mrk) washed, and dried (1mrk). It is then heated strongly (1mrk) to remove water and to obtain pure aluminium oxide. The sodium hydroxide is used again for further precipitation (1mrk)

$2Al(OH)_{3(s)} \rightarrow AL_2O_{3(S)} + 3\,H_2\,O_{(C)}$

The pure Alumina has a very high melting temperature of 1200^0c which is not readily available, it is dissolved in molten cryolite (1mrk) which lowers the melting point and increase ionization (1mrk).

$AL_2O_{3(S)} \rightarrow 2AL^{3+}_{(aq)} + 30^{2-}_{(aq)}$

Electrolysis of the purified alumina is carried out in a shallow steel tank lined with carbon graphite which acts as the cathode (1mks). The anode is also made up of graphite. At the anode, oxygen is produced (1mks)

$20^{2-}_{(aq)} \rightarrow O_{2\,(g)} + 4é$

The oxygen readily burn away the anode hence the anode has to be replaced from time to time (1mrk). At the cathode, Aluminium is obtained and is tapped after (1mrk)

$Al^{st}_{(aq)} + 3é \rightarrow Al_{(s)}$ (1mrk)

C) Used in making overhead cables due to its low density (1mrk)
Used in making electronic cables because it is a good conductor of heat and electricity (1mrk) or any.

10)a) **Requirements:** ethanol, thin walled can, thermometer, i) $100cm^3$ of water, wind shield, spirit lamp, chemical balance, clamp and stand

$100cm^3$ of water is measured and poured into the clamped thin – walled can (1mrk) note the initial temperature [1mk]. The spirit lamp is half filled with ethanol (1mrk) and tightly closed (1mrk) since it is highly volatile. The spirit lamp with ethanol is weighed (1mrk) and its mass taken. It is lit (1mrk) and immediately (1mrk) placed under the metal can such that much of the flame is in contact with the can. The flame is shielded (1mrk) from air currents using the wind shield (1mrk) stir (1mrk) the water with the thermometer to ensure even distribution of heat (1mrk) while observing the temperature rise. When there is a reasonable rise in temperature of about 20^oc, the final temperature is taken (1mrk) and the flame immediately put off (1mrk). The Alcohol burner and content is then reweighed and its final mass recorded (1mrk).

Data collection

Initial temperature of water = $t_1{}^0$c
Final temperature of water = $t_2{}^0$c
Temperature rise = $(t_2 - t_1)^0$c (1mrk)
Mass of water in thin walled can = m_1g
Initial mass of spirit lamp and ethanol = m_2g
Final mass of spirit lamp and ethanol = m_3g
Mass of ethanol burnt = $(m_2 - m_3)_g$ (1mrk)

b) $\Delta H = MC\Delta T$
= 200 x 4.2 x 20 [1mk]
= 16,800J [1mk]

Number of mole sof ethanol = $\frac{1.4}{46} = 0.03$moles [1mk]

If 0.03moles evolves 16,800J of heat,
1mol will evolve $\frac{16,800}{0.03} = -560,000$J or -500kJ mol^{-1}[1mk]

Grade boundaries

70 – 100	-	A
55 – 69	-	B
40 – 54	-	C
30 – 39	-	ϕ
0 – 29	-	U