HYSS Prelim 2023 4NA Science Chemistry Mark scheme

Paper 3

i apoi o									
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Α	Α	В	D	Α	Α	С	Α	В	Α
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
В	С	С	Α	D	В	Α	В	С	С

Paper 4							
Qn	Section A						
1a	E120, E121 and E150						
1b	E121 that is more soluble in the solvent (will move further up the filter						
10	Pen conta	ins dves which	ch may/can di	ssolve in the	solvent This wi	II 1	
10	interfere wi	th the the resu	lts on the chro	matogram.			
	(Accept also: Pencils cannot dissolve in the solvent used in the						
	experiment.)						
					Tota	I 3	
2a						3	
		number of	number of	mass	electronic		
	particle	protons	neutrons	number	configuration		
	A	6	6	12	2, 4		
	В	15	16	31	2,8,5		
	C	6	8	14	2, 4		
		44	10		2.0.4		
		11	12	23	2, 8, 1		
	1M for each horizontal row that is entirely correct.						
b	A and C					1	
С	Carbon					1	
					Tota	II 5	

3a	180;	1
	CaCO₃	1
b	Mass of CaCO ₃	1
	= 0.2 X 100 g	
	= 20 g [1]	
	Total	3
4a	haematite / iron ore and coke	1
	reject Iron(III) oxide, carbon	
b	To remove (acidic) impurities such as silicon dioxide	1
С	$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$	1
	Total	3

Section B

5ai	S, U, X, T	1
aii	Electrolysis	1
	R: Electricity	
aiii	$Zn + H_2O \rightarrow ZnO + H_2$	1
	(ignore state symbols)	
b	The <u>unreactive</u> metals were discovered earliest because they are found in <u>uncombined state/ as elements</u> in the ground.	2
	Moderately reactive metals are easy to extract as these metal compounds <u>can be reduced by C or by strong heating</u> .	
	Metals that are more reactive <u>tend to form (very) stable compounds and</u> <u>have to be extracted by electrolysis</u> . Hence, these metals are discovered later.	
	Any 2 points.	
	Many students do not answer the question and/or concept. Common wrong answers include "metals are discovered earlier because they are more common/abundant".	
сі	1m - correct points plotted 1m - straight line drawn	2
cii	Melting point of potassium: (ans must be read off the graph)	1
	Total	8

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6a	Y	1
b	WZ ₂ (reject ans that are non expressed as W and Z)	1
ci	It has <u>7</u> outermost/valence electrons.	1
	It has 4 electronic shells.	1
Cii	Note: This question is very poorly done. Question clearly asked for a molecule (i.e more than one atom)	1
di	Sodium atom/ Na $(2,8,1)$ loses <u>1</u> valence electron to form sodium ion/Na+ $(2,8)$ /achieve a complete valence shell. Chlorine atom/ Cl $(2,8,7)$ gains <u>1</u> valence electron to form chloride ion/Cl- $(2,8,8)$ achieve a complete valence shell.	2
dii	In the solid state, there are <u>no mobile ions</u> to conduct electricity as they are <u>held in fixed positions</u> in the giant ionic latttice structure. OR In the liquid/aqueous state, there are <u>mobile ions</u> to conduct electricity as the ions are <u>no longer held in fixed positions</u> in the giant ionic latttice structure.	1
	Total	8
	Total	U

7a	Fractional distillation	1
b	X, W, Z, Y	1
С	Diesel	1
di	Incomplete combustion of carbon-containing fuels.	1
dii	Carbon monoxide lowers the ability of red blood cell in transporting oxygen leading to breathing difficulties and even death.	1
ei	P: water; Q: carbon dioxide; R: limewater/calcium hydroxide	2
	2 correct: 1 M	
	3 correct: 2 M	
eii	White precipitate is formed.	1
	Total	8