Marking Scheme
Sec 4 Chemistry (Pure) WA2 2024

Mark scheme will use these abbreviations	
/	alternatives
+	statements on both sides of the + are needed for that mark
R	reject
A	accept (for answers correctly cued by the question)
Ig	ignore as irrelevant
ref	with reference to
ecf	error carried forward
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point
ORA	or reverse argument
OWTTE	or words to that effect
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context

Section A – MCQ

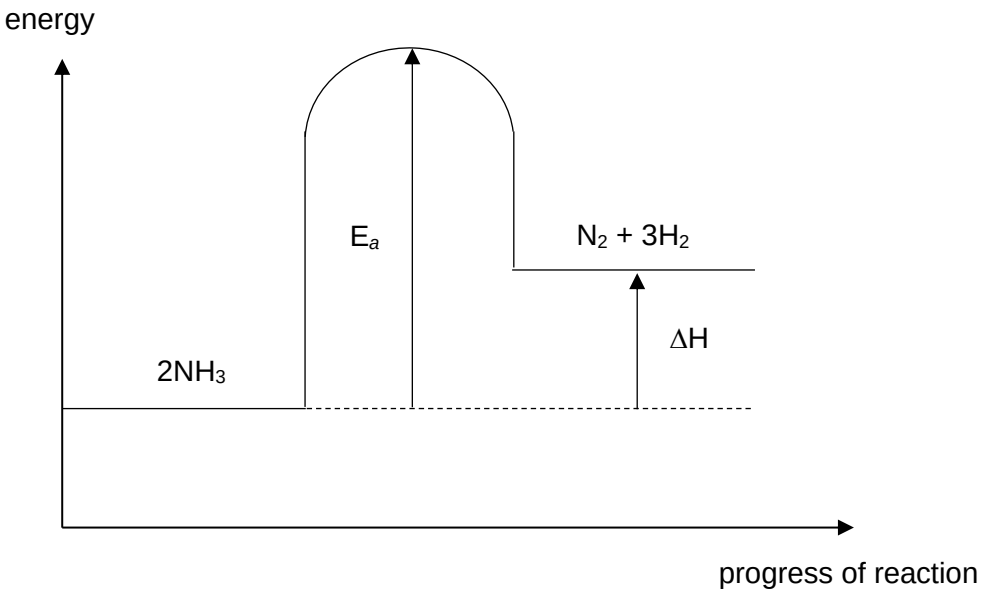
1	2	3	4	5
A	C	D	D	C

Section B – Structured Questions

Qn	Marking Scheme	Marks
6a	Na and K	1
6b	Br	1
6c	F	1
6d	Ti and Ni **Overall minus 1 mark if the chemical name was used instead.**	1
		[Total: 4]
7ai	<table><tr><th>experiment</th><th>is there corrosion observed on iron metal?</th><th>what is observed on surface of the iron metal?</th></tr><tr><td>**A**</td><td>yes</td><td>red-brown deposits</td></tr><tr><td>**B**</td><td>no</td><td>no red-brown deposits formed A: no deposit, no visible change, no change, no reaction/nothing</td></tr><tr><td>**C**</td><td>yes</td><td>red-brown deposits formed</td></tr></table> **Any 2 correct 1 mark**	1 1
7aii	1. Experiment B. Method: Sacrificial protection. 2. Zn is more reactive than Fe. Hence, it corrodes preferentially / reacts more readily / loses electrons more readily / reacts in place of iron. If Experiment B is not stated, students must mention the Zn/Fe combination in their answers to be awarded the full mark. R: Galvanising.	1 1
7b	1. The oxidation state of iron increases from 0 (in Fe) to +2 in ($FeSO_4$) hence oxidation occurs. 2. At the same time, the oxidation state of copper decreases from +2 (in $CuSO_4$) to 0 (in Cu), hence reduction occurs. 1m – increase or decrease in oxidation states 1m – correct calculation of oxidation states	1 1

		[Total: 6]

Section C – Free Response Questions

Qn	Marking Scheme	Marks
8a	1. The total energy <u>absorbed to break the bonds</u> (in H_2 and N_2) 2. <u>is less than [1]</u> 3. the total <u>energy released to form the bonds</u> (in NH_3) **ORA**	1&3: 1m
8b	 Shape – 1m Axis and chemical symbols – 1m Correct E_a and ΔH – 1m (ECF from shape)	3
		[Total: 5]
9ai	Energy and wavelength are inversely proportional / As wavelength increases, energy decreases.	1
9aii	1. Similarity: colours produced in both fireworks and neon signs are <u>due to the electrons being 'excited' / promoted to higher energy level /</u> <u>'jumping' from ground state to a higher energy level</u> (and falling back down, releasing energy as light). 2. Difference: <u>Heat</u> is used to excite the electrons in fireworks, while in neon signs, <u>electricity</u> is used instead. R: If answers do not describe how the colours are formed.	1 1
9aiii	Yes (must state but no marks) 1. Down the group, the wavelengths of the emission spectral lines <u>generally decreases.</u> 2. This can be seen from the wavelengths of helium between 667 – 706nm to that of xenon which have emission spectral lines of 459 – 585nm. (quote values) OR A: No there is no trend + explanation of why there is no trend, with correct data quoted. Data quoted can either be colour or values.	1 1
9bi	$3.32 \times 10^{-19} = \frac{(6.63\times10^{-34})(3.00\times10^{8})}{\lambda}$ $\lambda = 5.99 \times 10^{-7}$ m = 599 nm	1
9bii	Orange (Allow ECF) R: if no calculation but correct identification of colour.	1

9ci	1. Blue fireworks are typically made up of copper compounds and copper is an unreactive metal. 2. it decomposes readily, making it unstable to heating. R: if just mention unstable without explanation because it is stated in the passage.	1 1
9cii	Any strontium and copper compound	1
		[Total: 10]