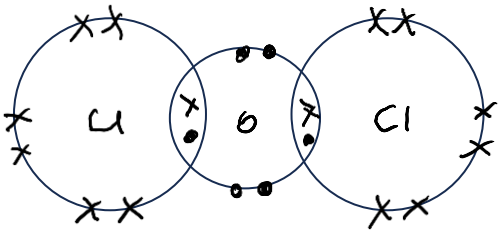
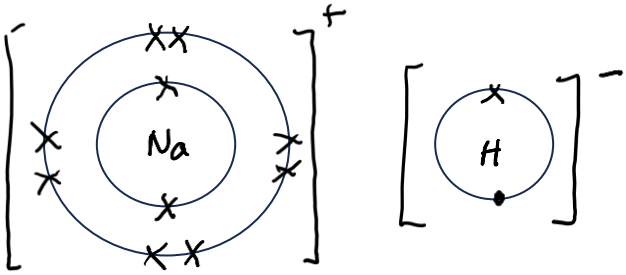
2024 SMSS Sec 3 Chemistry EOY Exam Marking Scheme

Paper 1 MCQ (20 marks)

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

Paper 2 (65 marks)

No	Answers	marks
1	**(a)** carbon monoxide	[1]
	(b) water / carbon monoxide	[1]
	(c) copper(II) oxide and sulfuric acid/hydrochloric acid	[1]
	(d) lithium and bromine/iodine	[1]
	(e) silicon dioxide / methane / silicon (Any two)	[1]
	A: answer using formulae/symbols, provided correct e.g. I_2 and Br_2)	
2	**(a)** Blue dye and yellow dyes have R_f value of 0 (or *almost 0).	[1]
	No or *little separation of the two dyes occurred.	[1]
	* ECF allowed	
	(b) 64% of ethanol and 36% of water	[1]
	(c) R_f value of blue dye is 0.7 (no units)	[1]
	Let distance travelled by blue dye be x cm^3	
	x ÷ 10.0 = 0.7	
	x = 7.0	
	Distance travelled by blue dye is **7.0 cm^3** (to 1 d.p.)	[1]
3	**(a)** Same number of protons but different number of neutrons.	[1]
	Both have 92 protons.	[1]
	Uranium-235 has 143 neutrons while uranium-238 has 146 neutrons	[1]
	Accept: same proton number but different nucleon number	
	(b) Average atomic mass = $\frac{(0.7 \text{ X } 235)+(99.3 \text{ X } 238)}{100}$	[1]
	= **238** (to 3 s.f.) no units	[1]
	(c) Helium / He	[1]
	Penalise max of 1 m for wrong units and sign figs / dec pl for Q2 and Q3	

4(a)	 correct shared electron pairs correct unshared electrons	**[1]** **[1]**
4(b)	**(i)** False **(ii)** True **(iii)** False Award 2 m if answers are **T, F, T**	**[1]** **[1]** **[1]**
5 (a)	 correct charges correct electronic arrangement No full marks if only valence e are shown	**[1]** **[1]**
5(b)	**(i)** $NaH + H_2O \rightarrow NaOH + H_2$ **(ii)** green to purple/violet (Reject: blue) **(iii)** No. of mole of NaH $= \frac{0.24}{24} = 0.01$ No. of mole of $H_2O = \frac{1.8}{18} = 0.1$ One or/and both steps (1 mol of NaH react with 1 mol of H_2O) **Thus NaH is the limiting reactant** No. of mole of NaOH formed = 0.01 Mass of NaOH = 0.01 X 40 g = **0.400 g** (to 3 s.f.) Note: No ECF within parts	**[1]** **[1]** **[1]** **[1]** **[1]**
6(a)	Pure ethanedioic acid does not contain mobile charged particles / ions / contain only molecules with no charge. In water, the acid dissociates/ionizes to form **mobile** ions which are charge carriers / conduct electricity. Idea that mobile ions are present in aqueous acid but not pure acid. Idea that dissociation of acids to form ions occur only when there is water.	**[1]** **[1]**

6(b)	**(i)** From the graph, volume of HC*l* needed is 25.00 cm^3 No. of mole of NaOH = 0.200 mol/dm^3 X 0.02 dm^3 = 0.004 mol No. of mole of HC*l* reacted = 0.004 mol Concentration of HC*l* = (0.004 ÷ 0.025) = **0.160 mol/dm^3** (to 3 s.f.) **(ii)** pH 9 **(ii)** bromothymol blue and phenolphthalein	**[1]** **[1]** **[1]** **[1]**
	Penalise max of 1 m for wrong units and sign figs / dec pl for Q5(b) and Q6(b)	
7(a)	Add water to substance **X**. Filter the mixture.	**[1]** **[1]**
7(b)	**S**: hydrogen / H_2 **V**: calcium iodide / CaI_2 **W:** zinc / Zn	**[1]** **[1]** **[1]**
7(c)	Ag^+ (aq) + Cl^- (aq) → AgC*l* (s) (state symbols are not required)	**[1]**
8(a)	**(i)** +7 **(ii)** +2	**[1]** **[1]**
8(b)	Purple acidified potassium manganate(VII) solution turns colourless. Effervescence observed.	**[1]** **[1]**
8(c)	H_2O_2 is oxidized. The oxidation number of oxygen/O increases from -1 (in H_2O_2) to 0 (in O_2).	**[1]** **[1]**
9(a)	Purple / violet Cl_2 + 2KI → 2KC*l* + I_2	**[1]** **[1]**
9(b)	**(i)** iodine **(ii)** Iodine is less reactive than bromine. Iodine is not able to displace bromine from potassium bromide / No displacement reaction occurred.	**[1]** **[1]** **[1]**
9(c)	At^-	**[1]**
10(a)	Air / oxygen and water (vapour)	**[1]**
10(b)	Metal **Q** is less reactive than iron. Metal **Q** is not able to offer sacrificial protection to iron / accelerate the rusting of iron.	**[1]** **[1]**
10(c)	(i) to remove the surface oxide layer (ii) no blue patch will be observed around the iron nails.	**[1]** **[1]**

11(a)	5065	**[1]**
11(b)	Low carbon steel Low carbon steel is used to make car bodies as it has the highest / very high malleability hence it can be easily moulded into shapes of car bodies. High carbon steel High carbon steel is used to make wire ropes for suspension bridges as it has the highest / very high tensile strength hence it can support the weight of the suspension bridge without breaking.	**[1]** **[1]**
11(c)	**(i)** high carbon steel **(ii)** • More carbon atoms which have different size from iron atoms • Disrupt the orderly arrangement of atoms more. • Greater force is required to slide the layers of atoms over one another in high carbon steel Note: Maximum 2m if idea of "more" is absent.	**[1]** **[1]** **[1]** **[1]**