CCSS: 2019 Sec 4 and 5 Preliminary Examinations 2019

Paper 1

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	A	C	C	B	A	A	C	B
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
D	C	C	D	C	C	A	D	B	B

Paper 3

Section A

1	(a)	85	[1]
	(b)	Particle B is in Group VII which is a non-metal, which takes in one electron	
		to form negative ions with noble gas structure.	[1]
	(c)	C and E	[1]
2	(a)	Magnesium sulfide has a high melting and boiling point/ able to conduct	
		electricity in molten and aqueous state/ soluble in water, insoluble in	
		organic solvents.	[2]
		(Any of the 2 above)	
	(b)	Magnesium atom will give out two electrons to form a positive magnesium	
		ion. [1]	
		Sulfur atom will take in two electrons to form a negative sulfide ion to obtain a noble gas structure. [1]	[2]

3			sodium carbonate solution	sodium sulfate solution		
		Barium chloride solution	white precipitate of barium carbonate	**white precipitate of barium sulfate**		
		Calcium chloride solution	**white precipitate of calcium carbonate**	white precipitate of calcium sulfate		
		Potassium chloride solution	**No precipitate**	No preciptate		[3]

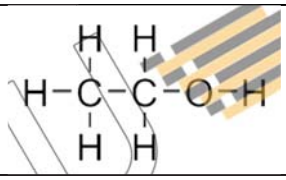
	(b)	1 $Pb(NO_3)_2$ (aq) + 2 KBr (aq) → $PbBr_2$ (s) + 2KNO_3 (aq)	[2]
		[1] For balanced chemical equation	
		[1] For correct state symbols	
	(c)	(i) To remove potassium nitrate solution from lead (II) bromide.	[1]
		(ii) To wash away any potassium nitrate or impurities that may still	
		remain on lead(II) bromide.	[1]
4	(a)	Add sodium hydroxide and warm. If the gas produced turns moist	
		red litmus blue, ammonia gas is produced. Therefore, ammonium ions are	
		present in ammonium nitrite.	[2]

	(b)	(i)	25/1000 x 0.500 = 0.0125 moles	[1]
	(b)	(ii)	NH_4NO_2 (aq) → N_2 (g) + $2H_2O$ (l)	[1]
			1 mole 1 mole	
			1 mol = 24 dm^3 0.0125 mol x dm^3	[1]
			x = 0.3 dm^3	
			Volume of nitrogen = 0.300 dm^3 (3 sf) (No units, no marks)	
	(b)	(iii)	Relative molecular mass of NH_4NO_2	
			= 14 + 4 + 14 + 32 = 64	[1]
			Concentration = 64 x 0.500 = 32g/ dm^3	[1]
			*Working must be shown for the marks to be awarded.	
	(c)	(i)	Ammonium hydroxide and nitric acid	[1]
		(ii)	Titration method	[1]
	(d)	(i)	NH_4NO_3 → N_2O + $2H_2O$	[1]
		(ii)	Add sodium hydroxide, aluminium foil to the solution. Warm gently.	
			Warm gently. [1]	
			If gas produced turns moist red litmus paper blue, ammonia gas is	
			produced. Nitrate ion is present. [1]	[2]
5	(a)		They have seven valence electrons.	[1]
	(b)		As the elements goes down the group, the reactivity of the elements	
			decreases. [1]	
			As the elements goes down the group, the atomic size of the element	
			becomes bigger. [1]	
			Therefore, there is less tendency for the nucleus to gain or attract	
			electrons to form negative ions. [1]	[3]
6	(a)	W:	Silver, Ag	
		X:	Silver iodide, AgI	
		Y:	Sodium iodide, NaI	
		Z:	Iodine, I_2	[4]
	(b)	2 NaI (aq) + Cl_2(g) → 2 NaCl(aq) + I_2 (aq)		[2]
		[1]: Balanced chemical equations		
		[1]: Correct state symbols		
7	(a)	Carbon dioxide is formed when coke is burnt in hot air [1]		
		and when limestone is decomposed at high temperature. [1]		[2]
		Fe_2O_3 + 3CO → 2Fe + $3CO_2$		
	(b)	(i)	+3	[1]
		(ii)	The oxidation state of iron has decreased and thus, it is reduced. [1]	
			The oxidation state of iron has decreased from +3 in iron (III) oxide to	

			0 in iron. [1]	[2]
	(c)	Hot air contains 78% of nitrogen gas which remains unreacted in the blast		
		furnace when all the oxygen is reacted with coke.		[1]
8	(a)	The compound contains carbon carbon double bond.		[1]
	(b)	Bubble the compound through reddish-brown bromine solution. [1]		
		Reddish brown bromine solution is decolourised. [1]		[2]

Section B

9	(a)	(i)	Copper is less reactive than iron and loses electrons less readily. [1]	
			Therefore, copper is unable to react and displace iron from aqueous iron(II)	
			sulfate. [1]	[2]
		(ii)	$Mg(s) + Fe^{2+}(aq) \rightarrow Mg^{2+}(aq) + Fe(s)$	[1]
		(iii)	Green solution fades and might turn colourless. [1]	
			Grey solid deposits formed. [1]	
			Magnesium dissolves and becomes smaller in size. [1]	
			(Any two)	[2]
	(b)	Purple acidified potassium manganate(VII) solution turns colourless / decolourises.		[1]
	(c)	Add aqueous sodium hydroxide to the solution.		
		Green precipitate formed if Fe^{2+} ions are present. [1]		
		Add dilute nitric acid, followed by aqueous barium nitrate to the solution		
		White precipitate formed if SO_4^{2-} ions are present. [1]		[2]
	(d)	Aqueous iron(II) sulfate can conduct electricity [1]		
		due to the presence of free mobile ions (Fe^{2+} and SO_4^{2-}) to carry		
		charges.[1]		[2]
10	(a)	(i)	Chemical formula of two elements found in air: N_2, O_2, Ar, Ne (Any two) / Chemical fomula of two compounds found in air: CO_2, H_2O	[2]
		(ii)	A compound is made up of two or more different elements chemically	
			combined but an element is made up of only one type of atoms.	[1]
			A compound can only be broken down into simpler type of matter	
			by chemical means but elements cannot be broken down into	
			simpler matter by physical or chemical means	[1]
		(iii)	150-125 =25cm^3 [1]	
			(25/150)x 100=16.7% [1]	[2]

	(b)	(i)	Carbon monoxide will bind more strongly with haemoglobin [1] than	
			oxygen preventing the oxygen from being absorb to the body which	
			causes death. [1]	[2]
		(ii)	In the car engine when the fuel undergoes incomplete	
			combustion [1] because of insufficient supply of oxygen, [1]	
			carbon monoxide is produced.	[2]
11	(a)	(i)	Members of the same homologous series have similar chemical	
			properties [1]	
			The members display a gradual change in their physical	
			properties as the number of carbon atoms increases in their	
			molecules. [1]	[2]
		(ii)	$C_nH_{2n+1}OH$	[1]
	(b)	(i)	<table><tr><th>Name of X</th><th>Structural formula of X</th><th>Chemical formula of X</th></tr><tr><td>ethanol</td><td>  </td><td>C_2H_5OH</td></tr></table>	[2]
		(ii)	CH_3CH_2OH (*l*) + 2[O] → CH_3COOH (aq) + H_2O (*l*)	[1]
		(iii)	Yeast is added to a solution of glucose in a conical flask. [1]	
			Temperature of the mixture is kept at 37°C [1]	
			The conical flask is connected through a delivery tube to a test tube	
			with limewater to prevent oxygen in air from entering the conical	
			flask.[1]	[3]
		(iv)	X can be burnt exothermically to produce heat to power the vehicles.	[1]