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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2014

MEMORANDUM

SUBJECT:	**PHYSICAL SCIENCE P2 (10842)**

GAUTENG DEPARTMENT OF EDUCATION

PREPARATORY EXAMINATION

PHYSICAL SCIENCE
(Second Paper)

MEMORANDUM

QUESTION 1/*VRAAG 1*

1.1 B✓✓ (2)

1.2 A✓✓ (2)

1.3 C✓✓ (2)

1.4 D✓✓ (2)

1.5 D✓✓ (2)

1.6 C✓✓ (2)

1.7 C✓✓ (2)

1.8 B✓✓ (2)

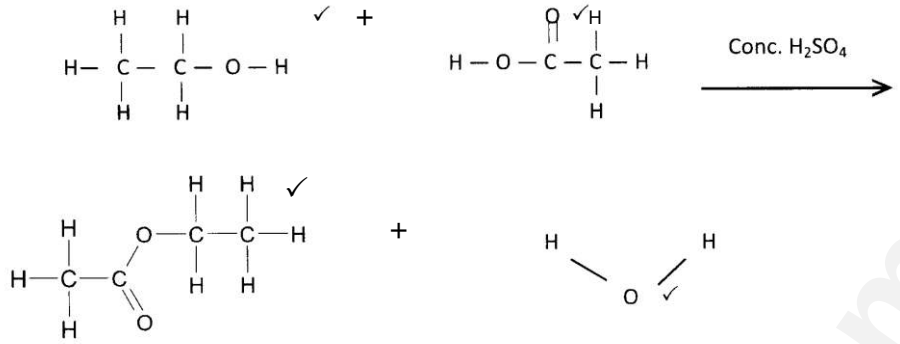
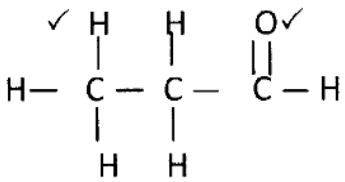
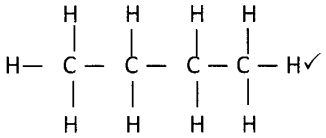
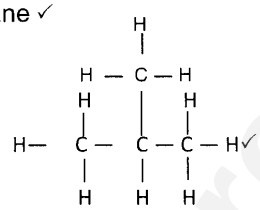
1.9 C✓✓ (2)

1.10 A✓✓ (2)

[20]

QUESTION 2/*VRAAG 2*

2.1.1	Ketone✓	(1)
2.1.2	D✓	(1)
2.1.3	Chloroethane✓	(1)
2.1.4	Ethanoic acid✓	(1)

2.1.5		(4)
2.1.6		(2)
2.1.7	$C_3H_8 + 5O_2$✓(reactants) ⟶ $3CO_2 + 4H_2O$✓ (products)✓balancing	(3)
2.1.8	Combustion✓/oxidation	(1)
2.2.1	Chain isomers are compounds with the same molecular formula✓ but the carbon atoms in the chain change position✓ to form different arrangements/structural formulae.	(2)
2.2.2	 butane ✓  methylpropane✓	(4)
2.2.3	Butane✓	(1)
2.2.4	Butane is less branched/ has a longer chain/ has a larger surface area. ✓ There are stronger intermolecular forces/ Van der Waals forces between the molecules. ✓ More energy needed to overcome intermolecular forces.✓ **OR** 2-methyl propane is more branched/ more spherical/ has a shorter chain/ has a smaller surface area.✓ Weaker intermolecular forces/ Van der Waals forces.✓ Less energy needed to overcome intermolecular forces.✓	(3)

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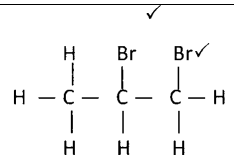
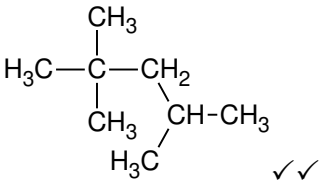
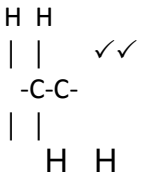
QUESTION 3/*VRAAG 3*

3.1.1	Addition/ Halogenation/ Bromination✓	(1)
3.1.2		(2)
3.1.3	Yes✓	(1)
3.2.1	Addition/ Hydration✓	(1)
3.2.2.	Propan – 2 – ol✓✓	(2)
3.2.3	Alcohol/Alkanol✓	(1)
3.3.1	Cracking is the breaking up of large organic molecules into smaller useful molecules.✓✓	(2)
3.3.2		
	 ✓✓	(2)
3.4.1	 ✓✓	(2)
3.4.2	B✓	(1)
3.4.3	Plastic bags, squeeze bottles, cling wrap, bullet-proof vests.✓	(1)

[16]

QUESTION 4/*VRAAG 4*

4.1	temperature✓	(1)
4.2	Rate of reaction✓	(1)
4.3	Rate = gradient of graph✓= 60-0/30-0✓= 2 $cm^3 \cdot s^{-1}$✓	(3)
4.4	Less than ✓	(1)
4.5	The rate of change (or gradient) is less✓	(1)
4.6	decrease ✓	(1)
4.7	As the surface area increases, there are <u>more particles</u> available for reacting.✓ Thus there will be more collisions per second, and thus a <u>greater number of effective collisions per second</u>✓ <u>and thus the reaction rate will increase.</u>✓	(3)

4.8	n(Mg) = m/M = 20/24✓ = 0,833 moles n (H_2SO_4) =c x V =1 x0,1 =0,1 moles 0,1 moles of Mg will react with 0,1 moles of sulphuric acid✓ n_{Mg} left = 0,83-0,1 moles✓= 0,733 moles thus mass of Mg = n x M = 0,733 x 24 ✓= 17,6 g✓ **Alt. Method** 24 g Mg ✓reacts with 1 mol H_2SO_4 ∴ xg →✓ 0,1 mol x = 2,4 g✓ mass left = 20-2,4✓ = 17,6 g✓ **Option 1** ✓ mass → mole ✓ relationship ✓ xg-0,1 mole } to obtain 2,4 g ✓ subtraction ✓ answer **Option 2** ✓ mole → mole ✓ relationship ✓ subtraction ✓ substitution ✓ answer	(5)
4.9	A substance that increase the rate of a chemical reaction without undergoing permanent change. ✓✓	(2)
		[18]

QUESTION 5/*VRAAG 5*

5.1

	X_2	**$3Y_2$**	**$\rightleftharpoons 2XY_3$**	
No of moles	1,65✓	2✓	0	
Change	0,4	1,2	0,8	Ratio✓
Moles at equm	1,25	0,8	0,8 (0,4 x2)	X 2✓
Conc at equm (mol·dm^{-3})	0,625	0,4	0,4	

$K_c = \frac{[XY_3]^2}{[X_2][Y_2]^3}$ ✓

✓4 $= \frac{[0,4]^2}{[X_2][0,4]^3}$ ✓

$[X_2] = \frac{[0,4]^2}{4[0,4]^3}$

=0,625 mol·dm^{-3} ✓

No. of mol X_2 = 1,65 mol

No. of mol Y_2 = 2 mol (9)

MARK ALLOCATION STARTING WITH K_c calculation and then working back to answer in table.

- Calculation of Kc (5 marks)
- Moles at equilibrium (1 marks)
- Change (1 marks)
- Initial Moles (2 marks)

5.2	endothermic✓	(1)
5.3	As temp increases the Kc increases, [product] increases, indicating the forward reaction is favoured. ✓ A temperature increase favours the endothermic reaction, thus the forward reaction is the endothermic reaction.✓	(2)
5.4. 1	increase✓	(1)
5.4.2	decrease✓	(1)
5.5	X_2✓	(1)
5.6	At a lower temperature the Kc is smaller indicating fewer products ✓and more reactants. ✓	(2)
		[17]

QUESTION 6/*VRAAG 6*

6.1	It is a weak acid✓	(1)
6.2	An acid that forms a large no of moles per volume of water✓✓	(2)
6.3	$H_2PO_4^-$ + H_2O ✓⇌ H_3PO_4 + OH^- ✓	(2)
6.4	H_2O/OH^-✓ or $H_2PO_4^-$ /H_3PO_4✓	(1)
6.5.1	m = cMV✓ = 58 ✓ x 0,2✓ x 0,5✓=5,8g✓	(5)
6.5.2	0,1x2=0,2 mol·dm $^{-3}$ ✓	(2)
6.5.3	Not safe✓ positive marking [OH-]=0.2 mol.dm^3✓ pOH = -log[OH-]= -log(0,2) ✓=0,7✓ pH + pOH = 14 pH=14-0,7=13,3✓ OR $[H^+][OH^-] = 10^{-14}$✓ $[H^+](0,2) = 10^{-14}$✓ $[H^+] = 5 \times 10^{-14}$ mol·dm^{-3}✓ pH = - log$[H^+]$ = - log (5×10^{-14}) = 13,3✓	(5)
6.6	$\frac{n_a}{n_b} = \frac{c_aV_a}{c_bV_b}$✓ 2/1✓ = $\frac{(0,1)V}{(0,2)25}$ ✓ V = 100 cm^3✓	(4)
		[22]

QUESTION 7/*VRAAG 7*

7.1	The cell where a chemical compound is broken down with the aid of an electric current. ✓✓	(2)
7.2	Al^{3+} ✓ and O^{2-} ✓ OR aluminium ion and oxide ion	(2)
7.3	$2\ O^{2-} \rightarrow O_2 + 4e^-$ ✓✓	(2)
7.4	$Al^{3+} + 3e^- \rightarrow Al$ ✓✓	(2)
7.5	$E^{\theta}_{cell/sel} = E^{\theta}_{cathode/katode} - E^{\theta}_{anode}$ ✓ = -1,66 ✓– (- 0,56) ✓ = - 1,1 V ✓	(4)
7.6	O^{2-} ions in the melt are oxidised to produce O_2 which then reacts with the graphite (carbon) rods to produce CO_2 and so the rods get corroded away and have to be replaced regularly. ✓	(1)
		[13]

QUESTION 8/*VRAAG 8*

8.1	The process in which electrons are lost by a substance.✓✓		(2)
8.2	8.2.1	Aℓ✓	(1)
	8.2.2	Zn✓	(1)
8.3	As reaction proceeds, the Ag^+ ion concentration decreases while the Zn^{2+} ion concentration increases.✓According to Le Chatelier's principle, the rate of reverse reaction will increase✓ to reduce the increase in product ion concentration, thus favouring the reverse reaction and lowering the forward reaction leading to the decrease in the overall cell potential.✓		(3)
8.4	$Aℓ^{3+} + 3e^-$✓ → Aℓ✓		(2)
8.5	Chemical to electrical energy✓		(1)
			[10]

QUESTION 9/*VRAAG 9*

9.1	Vanadium pentoxide✓	(1)
9.2	N_2 (g) + H_2 (g) ✓ (reactants) ⇌ $2NH_3$ (g) ✓ (products) balancing✓	(3)
9.3	22% of 5 kg ✓= 1,1 kg 7/11✓ x 1,1 = 0,7 kg = 700 g✓ n=m/M = 700/14✓= 50 moles ✓	(5)
9.4	Excess plants block sunlight from aquatic life and organisms die✓./Lack of oxygen.	(1)
		[10]