Hillcrest High School

PHYSICAL SCIENCE P2 memo

Nov 2024

Grade 10

MARKS: 120

TIME: 2 Hours

EXAMINER: Mrs J. Knox-Whitehead

MODERATOR: Ms N. Badenhorst

1.1 C

1.2 C

1.3 C

1.4 B

1.5 A

1.6 B

1.7 B

1.8 C

1.9 B

1.10 A

Question 2 – matter, homogeneous and heterogenous

2.1 A mixture of uniform composition where all components are in the same phase. ✓ ✓ (2)

2.2.1 compound ✓

2.2.2 made of hydrogen and oxygen / 2 elements bonded together ✓

2.2.3 mixture ✓

2.2.4 (homogeneous) mixture / alloy of different metals ✓ (4)

2.3.1 (a) Filtration/*Filtrering/filtrasie* ✓ (1)

(b) Evaporation/*Verdamping* ✓ (1)

(c) Sand ✓ (1)

(d) Sugar solution/sugar and water ✓
Suikeroplossing/suiker en water (1)

2.3.2 Physical (process)/*Fisiese (proses)* ✓
No new substances are formed./Water only changes phase./The chemical composition of the substance is not altered. ✓
Geen nuwe stowwe word gevorm nie./Water verander slegs van fase./Die chemiese samestelling van die stowwe verander nie. (2)

[12]

Question 3 – atom

3.1 Isotopes are atoms of the same element having the same number of proton but different numbers of neutrons. ✓✓ (2)

3.2 $^{19}_{9}X$ and/*en* $^{20}_{9}X$ ✓
OR/*OF*
A and/en C✓ (1)

3.3.1 $\underline{1s^2}\,\underline{2s^2}\,\underline{2p^6}$ ✓ $\underline{3s^2}\,\underline{3p^5}$ ✓

3.3.2

%Cℓ-35 = x ∴ %Cℓ-37 = 100 – x ✓

$$\left(\frac{x}{100}\right)35 + \left(\frac{100-x}{100}\right)37 = 35,5 \checkmark$$

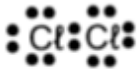
$0,35x + 37 - 0,37x = 35,5$

$1,5 = 0,02x$

$x = 75$ ✓

3.4.1 7 ✓ (1)

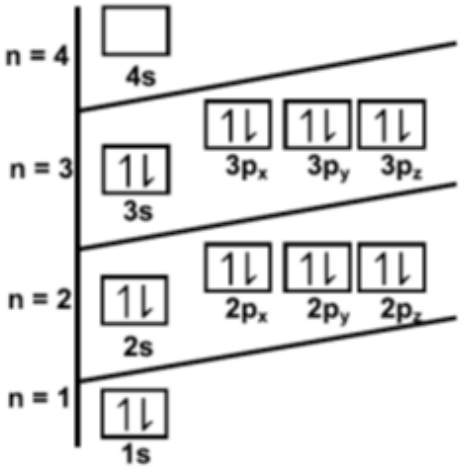
3.4.2 Covalent (bond)/*Kovalente (binding)* ✓ (1)

3.4.3  ✓✓ (2)

3.5.1

Ca^{2+} ✓ & $Cℓ^-$ ✓ (2)

3.5.2



(3)

[17]

Question 4

4.1.1 The temperature ✓ at which the vapour pressure is equal to the external/atmospheric pressure. ✓
Die temperatuur waarby die dampdruk gelyk is aan die eksterne/atmosferiese druk. (2)

4.1.2 (a) D ✓ (1)

(b) B ✓ (1)

(c) C ✓ (1)

4.1.3 II ✓ (1)

4.2.1 temperature ✓ (1)

4.2.2 solid ✓ (1)

4.2.3 -24°C ✓ (1)

4.2.4 liquid to gas ✓ (1)

4.2.5 Substance 2. ✓ lower boiling point ✓ (1)

4.2.6 thermometer ✓ (1)

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Question 5

5.1 EXOTHERMIC ✓ (1)

5.2 $\Delta H = H_{products} - H_{reactants}$ ✓

$= 100 - 200$ ✓

$= -100\ kJ.mol^{-1}$ ✓

ΔH is negative for exothermic reactions. ✓ (4)

5.3 $Ea = 200\ kJ.mol^{-1}$ ✓ (1)

5.4 The Ea value would decrease. ✓ (1)

[7]

Question 6

6.1

$$n(Na) = \frac{m}{M} \checkmark$$

$$= \frac{10}{23} \checkmark$$

$$= 0,43 \text{ mol Na}$$

$Na : H_2$

$2 : 1$ ✓

Thus 0,22 mol H_2 produced

$$n(H_2) = \frac{V}{V_m} \checkmark$$

$$0,22 = \frac{V}{22,4} \checkmark$$

$$V = 4,93\ dm^3 \checkmark$$

($4,87\ dm^3$) (6)

6.2

$n(Na) : n(NaOH)$

$2 : 2$ ✓

Thus mol NaOH = 0,43 mol

Dus mol NaOH = 0,43 mol

$$n(NaOH) = \frac{m}{M}$$

$$0,43 = \frac{m}{(23+16+1)} \checkmark$$

$m = 17,2$ g ✓ of NaOH produced/*gevorm* (3)

6.3 Concentration is the number of moles of solute per dm^3 of solution. ✓ ✓ (2)

6.4

$$c = \frac{n}{V} \checkmark$$

$$c = \frac{0,43}{2} \checkmark$$

$$c = 0,22 \text{ mol.dm}^{-3} \checkmark$$

(3)

6.5 Yield = actual mass / expected mass x 100

96,5 = actual mass / 17,2 x100 ✓

Actual mass = 16,60 g ✓ (2)

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Question 7

7.1

$$m(O_2) = 239 - 207 = 32 \text{ g} \checkmark$$

$$n(Pb) = \frac{m}{M} \checkmark$$

$$= \frac{207}{207} \checkmark$$

$$= 1 \text{ mol}$$

$$n(O) = \frac{m}{M}$$

$$= \frac{32}{16} \checkmark$$

$$= 2 \text{ mol}$$

$\therefore PbO_2$ ✓

(5)

7.2.1 $CaCO_3(s) + 2\ HC\ell(aq) \rightarrow CaC\ell_2(aq) + CO_2(g) + H_2O(\ell)$

LHS = 40+12+(3x16) + 2[1+35,5] ✓ RHS = 40+(35,5x2) + 12+(16x2) + (2x1)+16 ✓

= 173 amu = 173 amu ✓ **(both)**

LHS = RHS therefore mass is conserved ✓ (4)

7.2.2 0,1 g ✓ (1)

7.2.3 $n(CaCO_3) = \frac{m}{M}$

$= \frac{0,1}{100}$ ✓

$= 1 \times 10^{-3}$ mol

$n(HCl) = 2 \times n(CaCO_3) = 2 \times 10^{-3}$ mol ✓

Volume acid/*volume suur*:

$c = \frac{n}{V}$ ✓

$0,1 = \frac{2 \times 10^{-3}}{V}$ ✓

$V = 0.02\ dm^3$ ✓ (5)

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Question 8

8.1 An acid is a proton donor. ✓ (1)

8.2.1 $Zn + 2HCl \rightarrow ZnCl_2$ ✓ + H_2 ✓ ✓**bal.** (3)

8.2.2 $H_2CO_3 + Ba(OH)_2 \rightarrow BaCO_3$ ✓ + $2\ H_2O$ ✓ ✓**bal.** (3)

8.3 $6HNO_3$ ✓ + $Al_2(CO_3)_3$ ✓ → $2Al(NO_3)_3$ ✓ + $3\underline{CO_2 + 3H_2O}$ ✓ ✓**bal.** (5)

[12]

Question 9

9.1.1 CuF2 ✓ ✓ (2)

9.2.2 $Mg_3(PO_4)_2$ ✓ ✓ (2)

9.2.1 potassium ✓ dichromate ✓ (2)

9.2.2 iron (III) ✓ hydroxide ✓ (2)

[8]

Total 120

EXTENSION QUESTION 10

10.1 $M(NH_3) = 14 + 3(1.01) = 17g.mol^{-1}$

$$n(NH_3) = \frac{m}{M} = \frac{42.5}{17} = 2.5mol$$

$$(O_2) = \frac{m}{M} = \frac{80}{32} = 2.5mol$$

2.5mol NH_3 ÷ 4 x 5 = 3,125mol O_2

Therefore the limiting reagent is O_2 **(6)**

10.2 2,5 mol O2 / 5 x 4 *you must show this step again here – even if you calculated it at the top*

= 2 mol

Number of mole NH_3 left = 2.5 – 2 = 0.5moles

$m = nM = 0.5(17) = 8.5g$ **(3)**

[9]