Province of the
EASTERN CAPE
EDUCATION

PHYSICAL SCIENCES P2

MEMORANDUM

COMMON TEST

JUNE 2014

NATIONAL SENIOR CERTIFICATE

GRADE 12

N.B. This memorandum consists of 7 pages including this page.

SECTION A

QUESTION 1

1.1 A ✓✓ (2)

1.2 C ✓✓ (2)

1.3 B ✓✓ (2)

1.4 D ✓✓ (2)

1.5 D ✓✓ (2)

1.6 D ✓✓ (2)

1.7 B ✓✓ (2)
[14]

SECTION B

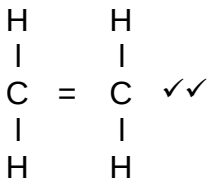
QUESTION 2

2.1

2.1.1 Carboxylic acid ✓ (1)

2.1.2 Butanal ✓ (1)

2.1.3



(2)

2.2 Tertiary ✓ (1)

2.3 They have the same molecular formula but different functional groups. ✓✓ (2)
[7]

QUESTION 3

3.1 Hydrocarbons are organic compounds that consist of hydrogen and carbon only. ✓ (1)

3.2

3.2.1 Boiling point increases as the surface area increases ✓ OR
Boiling point decreases as the chain become more branched (1)

3.2.2 The more branches the smaller the surface area, ✓ the weaker the intermolecular (Van der Waals) forces. ✓ Lesser energy needed to separate the chains. ✓ (the lower the boiling point). (3)

3.3 A. ✓ (1)
[6]

QUESTION 4

4.1.1 $CH_3\ CH_2\ CH_2\ CH_2$ -O-H ✓✓ (2)

4.1.2 $CH_3\ CH_2\ CH_2\ CH_2$ -O-H $\xrightarrow[H_2SO_4\ (conc)]{heat}$ ✓ $CH_3CH_2\overset{\checkmark}{C}H=CH_2 + H_2O$.

$\xrightarrow[\text{Excess}]{H_2O \quad | \quad H_2SO_4\ (conc),\ heat}$ ✓

$CH_3CH_2CHCH_3$ ✓
|
O -H (4)

4.2.1 Alcohol ✓ (1)

4.2.2 $CH_3CH=\overset{\checkmark}{C}H_2 + H_2O \xrightarrow[H_2SO_4\ (conc)]{heat}$ ✓ CH_3CHCH_3 ✓
|
O -H (3)

4.2.3 $CH_3\overset{\checkmark}{C}H_2CH_2C\ell + NaOH\ (aq) \xrightarrow{heat}$ ✓ $CH_3CH_2\overset{\checkmark}{C}H_2O\text{-}H + HC\ell$ (3)
[13]

QUESTION 5

5.1 Exothermic ✓
ΔH = energy of the products – energy of the reactants
ΔH = –197 – 0
ΔH = –197 kJmol^{-1} ✓ (2)

5.2 1580 kJmol^{-1} ✓ (1)

5.3 1777 kJmol^{-1} ✓ (1)

5.4 1537 kJmol^{-1} ✓ (1)
[5]

QUESTION 6

6.1 $Zn(s) + 2HC\ell(aq)$ ✓ $\rightarrow$ $ZnC\ell_2(aq) + H_2(g)$ ✓ bal ✓ (3)

6.2 surface area ✓ / state of division (1)

6.3 To make the investigation fair ✓ / To have 1 independent variable (1)

6.4 Volume of $H_{2(g)}$ is dependant on the amount of zinc used. ✓ (1)

6.5 Average reaction rate $= \frac{\Delta V}{\Delta t}$
$= \frac{48 - 30}{40 - 20}$ ✓✓
$= 0{,}9\ cm^3.s^{-1}$ ✓ (3)

6.6 Greater than ✓ (1)

6.7 Zn is powder, the more finely divided (greater surface area) the greater the contact area. ✓ This will result in more effective collision occur simultaneously per unit time. ✓ (2)

6.8

6.8.1 Remains the same. ✓ (1)

6.8.2 Steeper. ✓ (1)

6.9 Copper is a catalyst. Increase the rate of reaction. ✓✓ (2)
[16]

QUESTION 7

7.1 Homogenous, ✓ reactants and products are in the same phase. ✓ (2)

7.2 Catalyst ✓ (1)

7.3 The equilibrium in graph C is reached faster than in graph A while the concentration of the products in graph A and C are equal and also the concentration of the reactants in both graphs A and C are equal. ✓✓ (2)

7.4 Exothermic. ✓ (1)

7.5 If the temperature is increased from 500^0C to 600^0C the concentration of the products decreases and the reactants concentration increases. ✓ The reverse reaction is thus favoured. According to Le Chateliers' principle endothermic reaction is favoured when temperature is increased. ✓ Thus the forward reaction is exothermic. (2)

7.6 $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

$n(H_2) = \frac{1}{2}$

$= 0,5$ mol

$n(I_2) = \frac{127}{254}$

$= 0,5$ mol

Mole Ratio	H_2	I_2	2HI
Initial mol	(0,5	0,5) ✓	0
Change (used/ formed)	(0,4	0,4	0,8) ✓
Equilibrium mol	(0,1	0,1) ✓	0,8 ✓
Equilibrium Concentration C= n/v	$\frac{0,1}{2}$ (0,05)	$\frac{0,1}{2}$ (0,05)	$\frac{0,8}{2}$ (0,4) ✓

$Kc = \frac{[HI]^2}{[H_2] . [I_2]}$ ✓

$Kc = \frac{(0,4)^2}{(0,05)\ (0,05)}$ ✓

$Kc = 64$ ✓ (8)

[16]

QUESTION 8

8.1

8.1.1 C ✓ (1)

8.1.2 A ✓ (1)

8.1.3 E ✓ (1)

8.1.4 B ✓ (1)

8.2 $H_2SO_4 + 2H_2O \rightarrow 2H_3O^+ + SO_4^{2-}$

$pH = -\log [H_3O^+]$ ✓

$pH = -\log (2 \times 0,1)$ ✓

$pH = 0,698$ ✓ (3)

8.3 $Na_2CO_3 \rightarrow Na^+ + CO_3^{2-}$ ✓

$CO_3^{2-} + H_2O$ ✓ $\rightarrow HCO_3^- + OH^-$ ✓ (3)

[10]

QUESTION 9

9.1 Dilute acid contains a small number of moles of acid in proportion to the volume of water. ✓ (1)

9.2 Standard solution is the solution of known concentration. ✓ (1)

9.3 $c = \frac{m}{MV}$ ✓

$0,2$ ✓ $= \frac{m}{56 \times 0,3}$ ✓

$m = 3,36g$ ✓ (4)

9.4 To change the colour at the end point of titration. ✓ OR
To indicate/show when equivalent number of moles of acid and base have reacted. (1)

9.5 Bromothymol blue, ✓ because the equivalent point will be approximately pH = 7 since H_2SO_4 is a strong acid and KOH is a strong base. ✓ (2)

9.6

$$\frac{Ca \times Va}{Cb \times Vb} = \frac{na}{nb}$$ ✓

$$\frac{Ca \times 20,15}{15,04 \times 0,2}$$ ✓ $= \frac{1}{2}$ ✓

$Ca = 0,075 mol.dm^{-3}$ ✓

(4)
[13]

TOTAL SECTION B: 86
GRAND TOTAL: 100