Trial STPM 2012
Chemistry Paper 1
962/1
Answers

No.	Answer	No.	Answer
1	A	26	D
2	C	27	C
3	A	28	B
4	B	29	C
5	B	30	B
6	D	31	B
7	D	32	D
8	D	33	B
9	B	34	C
10	A	35	B
11	D	36	B
12	C	37	D
13	A	38	C
14	B	39	C
15	C	40	B
16	C	41	A
17	B	42	B
18	D	43	D
19	D	44	A
20	A	45	C
21	A	46	B
22	C	47	D
23	C	48	B
24	D	49	A
25	A	50	A

Pahang STPM trial Mark scheme
Section A

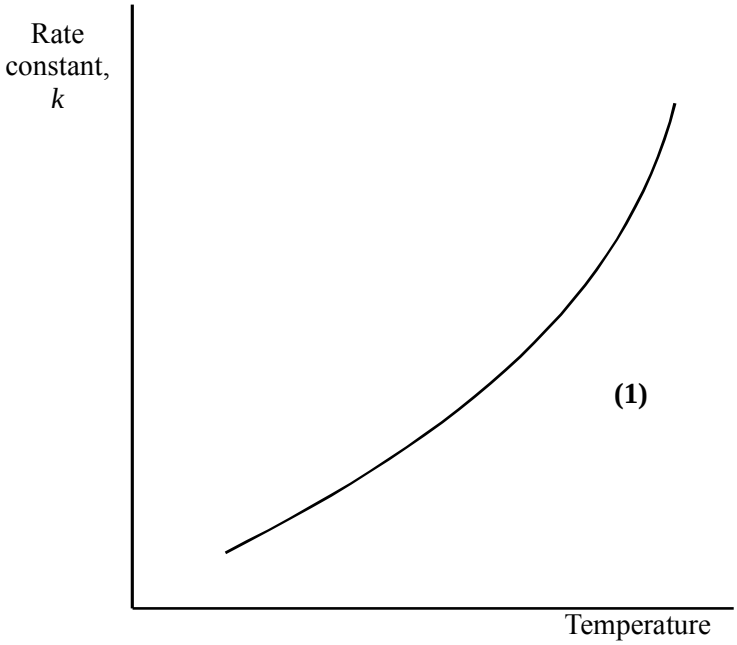
1. (a)(i) *Order with respect to A* 1 [1]

Order with respect to B 1 [1]

(c) (i) *Calculation* $k = \frac{7.5 \times 10^{-3}}{(0.25)^2 (0.50)^2}$ **(1)** = 0.48 [1]

Units $\frac{\text{mol dm}^{-3}\text{s}^{-1}}{(\text{mol dm}^{-3})^2 (\text{mol dm}^{-3})^2} = \text{mol}^{-3}\ \text{dm}^9\ \text{s}^{-1}$ [1]

(ii)



(1)

(

(b) (i)

Compound	Ksp, mol^2dm^{-6}	Solubility, mol dm^{-3}	Solubility, g dm^{-3}
AgI	8.30×10^{-17}	9.11×10^{-9}	2.14×10^{-6}
AgCl	1.8×10^{-10}	**1.34×10^{-5}**	**1.93×10^{-3}**
$CaCO_3$	**9×10^{-8}**	**3.00×10^{-4}**	0.03

[4]

(ii)

Salt	Sodium nitrate	Sodium chloride
Effect	**No effect**	**Decrease**
explanation	**No common ion**	**Common ion effect**

2. (a) *Hydrogen ion concentration*: 1.00 mol dm^{-3} **(1)**

Hydrogen gas pressure: 100 kPa or 1.0 atm **(1)**

(b) *Explanation of change*: Equilibrium displaced to left **(1)**
to reduce constraint **(1)**

Change in electrode potential: Becomes negative or decreases **(1)**
allow more negative

(c) (i) 0.43V **(1)**

(ii) *Half-equation*: $2Br^- \leftrightarrow Br_2 + 2e^-$ **(1)**

Overall equation: $2BrO_3^- + 10Br^- + 12H^+ \rightarrow 6Br_2 + 6H_2O$ **(2)**

or $BrO_3^- + 5Br^- + 6H^+ \rightarrow 3Br_2 + 3H_2O$

*species **(1) and** balanced **(1)***

(iii) Pt | Br^- , Br_2 || BrO_3^- , Br_2, H^+ | Pt

[10]

3 (a) (i) Tetrahedral 1
(ii) $SiCl_4 + 2\ H_2O$ -----> $SiO_2 + 4$ HCl 1
(iii) has the electronic configuration of $1s^2 2s^2 2p^2$ 1
does not have empty d orbitals, cannot ex pand its valence shell. 1
OR cannot fonn the intermediate coordinate bond with the water molecule
[4]

(b) (i) A white prec ipitate is formed 1
(ii) Acidic in nature 1
(iii) The white precipitate is soluble in excess aqueous ammonia 1
and form a colourless solut ion 1
$Al(H_2O)_3(OH)_3 + OH^- \rightarrow [Al(H_2O)_2(OH)_4]^- + H_2O$ 1
(iv) Acidic in nature 1
. [6] .
. 10 .

4 (a) (i) $C_2H_5NH_2 + HCl \rightarrow C_2H_5NH_3^+Cl^-$ 1
(ii) Neutralisation 1
(iii) The fishy smell of ethylamine disappears 1
Temperature of mixture rises 1

(b) (i)

$$CH_3CH_2Br + 2\ NH_3 \xrightarrow[\text{reflux}]{\text{ethanol}} CH_3CH_2NH_2 + NH_4Br \checkmark$$

conc. in excess ✓

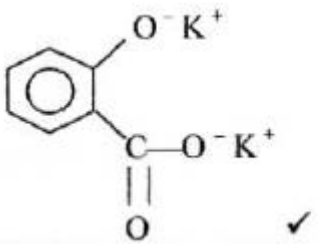
..1+1

(ii)

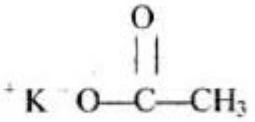
$$CH_3CN + 2\ H_2 \xrightarrow[180\ ^\circ C]{Ni} \checkmark\ CH_3CH_2NH_2 \checkmark$$

..1+1

(c)



✓



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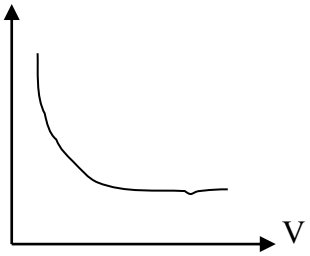
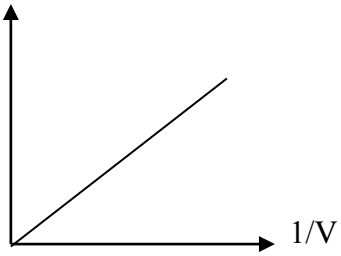
..1+1

10

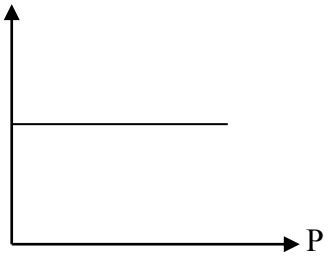
4. (a) (i) P



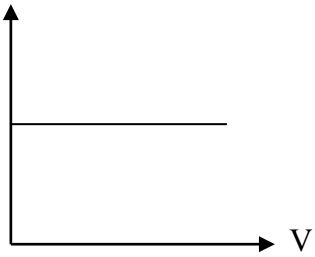
(ii) p



(iii) P

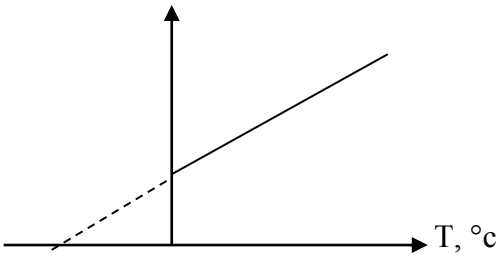


(iv) PV

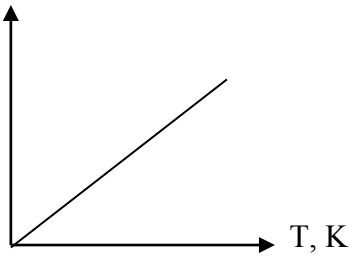


[4]

(b) (i) V



(ii) V



[2]

(b) PV = nRT, PV = (m/M)RT

0.25 X 1 = (0.5/M) x 0.082 x 364

= 60

(d) $\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{V_1}{273 + 29} = \frac{975}{273 + 5}$

V_1 = > 1000
The balloon will burst.

(e) $H_2O(l)$ < ===== > $H_2O(g)$

As pressure increases at constant temperature, this equilibrium shifts to the liquid phase --- the more dense phase. Thus a movement straight up on the phase diagram, increasing the pressure at constant temperature causes melting as one crossees the solid liquid equilibrium line.

Question 6

(a) Ionisation energy o nitrogen is expected to be higher than the elements preceding it because across the period, affective charge increase (nuclear charge increases, atomic size decreases) with similar screening effect. [1]
The element following nitrogen has the following electronic configuration :

↑↓	↑↓	↑↓ ↑ ↑
$1s^2$	$2s^2$	$2p^4$

[1]
The electrons in the 2p-orbital experience electronic repulsion and this makes its removal easier. Hence, it has a lower ionization energy than nitrogen, [1]

(b) Although phosphine has a larger molecular size than ammonia and hence stronger van der Waals forces, [1]
it is not capable of intermolecular hydrogen bonding. [1]
On the other hand, due to the high electronegativity of nitrogen and is small size, the N-H is greatly polarized and hydrogen bonds exist between the ammonia molecules. More energy required to break the intermolecular hydrogen bond and hence ammonia has a higher boiling point. [1]

(c) The bond energies of the 2 isoelectronic systems are very endothermic and are similar to one another. This is due to the strong tripple bonds between the atoms (N≡N and C≡O). [1]
However, the bond in carbon monoxide is slightly more polar (oxygen is more electronegative than carbon) and this makes the bond even stronger. Hence, its bond energy is more endothermic than that of nitrogen. [2]

(d) The synthesis of ammonia is exothermic. Therefore, increasing temperature sifts the equilibrium position to theleft. Hence, Kc decrease. [1]

However, the formation of nitrogen monoxide is endothermic, increasing temperature shifts the equilibrium position to the right, Kc increase. [1]

(e) On addition of a small amount of acid, NH_3 reacts with the H^+ added so that $[H^+]$ remains approximately constant and pH is maintained. [1]
$NH_3 + H^+$ ---- > NH_4^+ [1]

On addition of a small amount of base, NH_4^+ reacts with the OH^- added so that $[OH^-]$ remains approximately constant and pH is maintained. [1]

$NH_4^+ + OH^- \text{ ----- } > NH_3 + H_2O$ [1]

The large reservoir of NH_3 and NH_4^+ in the buffer sufficientlycopes with the addition of the acid and the base.

Total : 15 marks

7 (a) (i)

	Al_2O_3	SiO_2	P_4O_6
Structure	Giant ionic	Giant covalent	Simple molecule
Bonding	Ionic	Covalent	Weak van der Waals between molecules

.....1x6

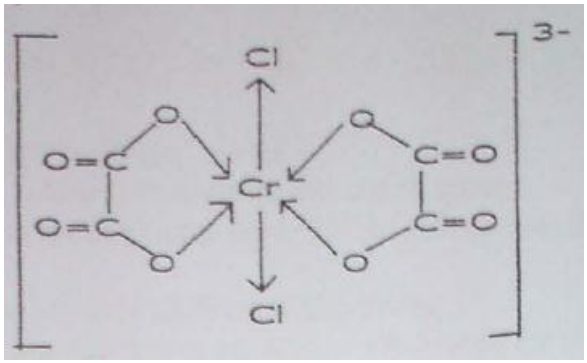
(ii) Al_2O_3 insoluble in water 1

SiO_2 insoluble in water 1

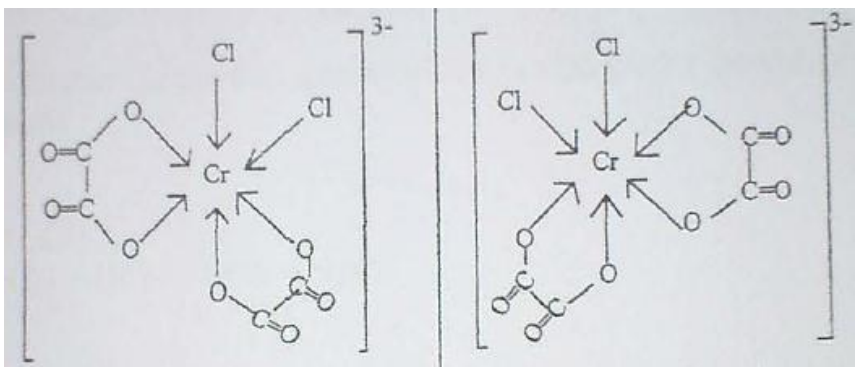
P_4O_6 dissolves in water to form acidic solution 1

$P_4O_6 + 6H_2O \rightarrow 4\ H_3PO_3$ 1

(b) (i)



Cis isomer *[arrow heads not required]*



Trans isomer Enantiomer of trans isomer ...1x3

(ii) Geometric isomerism
Optical isomerism ... 1x2

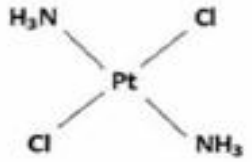
15

8 a i) An ion which is made up of a central metal ion bonded through dative bonds to 2 or more ligands. 1 1

ii) Diamminedichloroplatinum(II) 1

Tetraamminebromochloroplatinum(IV) 1

iii)



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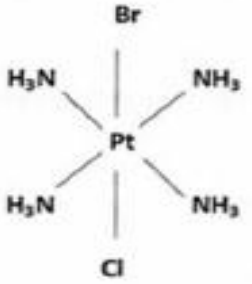


1

b

Co	:	N	:	Cl	:	H
= 23.52	:	28.00	:	42.53	:	5.95
58.9		14.0		35.5		1.0
= 0.3993	:	2.0	:	1.1980	:	5.95
= 1	:	5	:	3	:	15

1

Formula of H: $Co\ Cl_3\ (NH_3)_5$ / x = 3 and y = 5 1

$Ag^+ (aq) + Cl^- (aq) \rightarrow AgCl (s)$

$Cl^- \equiv AgCl$ 1

12.52 g H ----- 14.35/143.5 mole AgCl

250.4 g H (1 mole) ----- (250.4/12.52)(14.35/143.5) = 2 mole 1

1 mole H has 2 moles free chloride ions

structural formula of H is $[Co\ Cl\ (NH_3)_5]^{2+}. 2\ Cl^-$ / $[Co\ Cl\ (NH_3)_5]Cl_2$ 1

H is coloured.

Co^{2+} : $[Ar]3d^7$

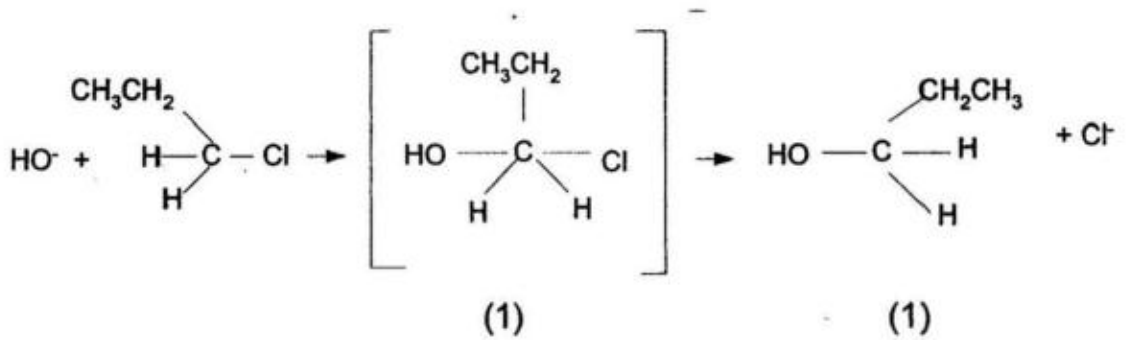
3d orbitals are partially filled 1

Under the influence of ligands, the 3d orbitals are split into 2 groups 1

energy difference falls within the visible lights 1

d-d transition happens 1

9 (a) (i)



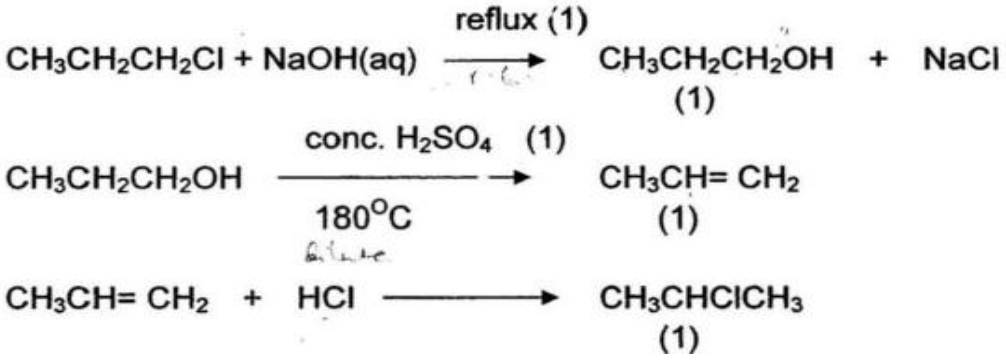
(1) (1)

...1x2

Bimolecular nucleophilic substitution 1

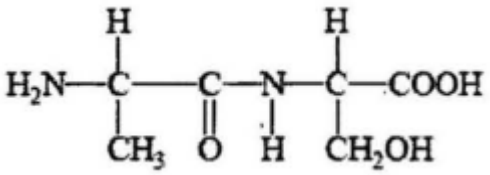
(ii) rate increases 1
atomic size of bromine > chlorine
C-Br bond is weaker and easier to break 1

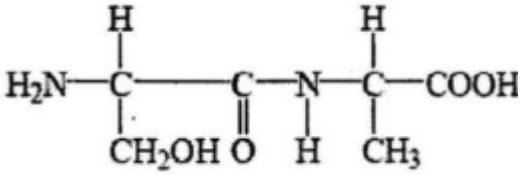
(iii)



..1x4

(b) (i)

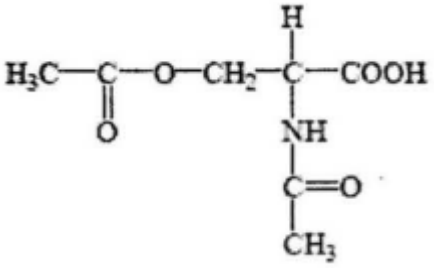




..1x2

(ii) serylalanine or alanylserine 1

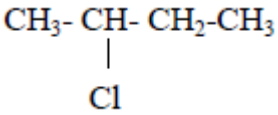
(iii)



.....1

15

10. (a) CH_3-CH=CH-CH_3 ....1x2



(b) (i) A: CH_3CH_2Cl B : CH_3CH_2OH
C : $CH_2=CH_2$ D : CH_2Br- CH_2Br
E : $CH_2OH - CH_2OH$ 1x5

(ii) ethanolic KOH 1
(iii) monomer for polyester 1

(c) *[Suggested answers]*
(i) - heat with ethanolic silver nitrate
1-iodohexane : yellow precipitate of AgI
1- chlorohexane : white precipitate of AgCl .....1+1

(ii) - heat with ethanolic silver nitrate
Chlorocyclohexane : white precipitate
Chlorobenzene : no precipitate .....1+1

(iii) - add acidified $KMnO_4$
1- chloro-1- butane : decolourisation of $KMnO_4$
1- chlorobutane : $KMnO_4$ solution is not decolourised. .....1+1

15