Revised August 2011

DRAFT TASK ANSWERS for AP NOTES TOPICS 1-17

This document is a DRAFT version of a document that will ultimately be completed at some point in the future! Until the word "DRAFT" is removed, please consider these answers 'provisional'. Please email me with any errors that you find.

There have been MANY versions of the tasks within the AP notes over the years, and as such the numbers and questions have (in some cases) dramatically changed.

The answers given in this document are my first attempt at consolidation of all of the answers that I have given over the years and may or may not be especially reliable or accurate. I welcome any input at this stage before the final, more accurate document is produced.

Thanks for your patience while I complete this task.

TASKS FROM TOPIC 1 NOTES

Task 1a

1.
   (a) 2.45×10^{4}
   (b) 3.56×10^{2}
   (c) 9.85×10^{-4}
   (d) 2.22×10^{-1}
   (e) 1.22×10^{4}

2.
   (a) 4200
   (b) 0.000215
   (c) 0.00000314
   (d) 922000
   (e) 957

Task 1b

1.
   (a) 0.0186
   (b) 0.852
   (c) 331407.68
   (d) 74.97
   (e) 15.4195

2.
   (a) 14
   (b) -391
   (c) -10.56
   (d) 1663
   (e) 5432

Task 1c

1.
   (a) 4
   (b) 2
   (c) 4
   (d) 2
   (e) 2

2.
   (a) 809
   (b) 40
   (c) 92.9
   (d) 67.64
   (e) 12.7
   (f) 3

Task 1d

1.

(a) Y
(b) Y

TASKS FROM TOPIC 2 NOTES

Task 2a

1.

(a) No – different elements
(b) Yes – Same element with different numbers of protons and therefore different masses

2.

(a) p = 82, e = 82, n = 128
(b) p = 16, e = 16, n =18

Task 2b

1. 20.18

2. 85.58

3. 69.76

4. 35.5; Cl^{37} = 25%, Cl^{35} = 75%

Task 2c

1. 7 days

2.

(i) $1/(2)^{10}$
(a) $1/(2)^{40}$

3. 1344 years

4. 9.14 hours

Task 2d

(a) Sodium chloride
(b) Strontium oxide
(c) Aluminum nitride
(d) Barium chloride
(e) Potassium oxide
(f) Copper (II) oxide
(g) Copper (I) oxide

Task 2e

(a) NH_4NO_3
(b) $CuBr_2$
(c) CuBr
(d) $Zn(HSO_4)_2$
(e) $Al_2(SO_4)_3$
(f) $NaClO_4$
(g) $Cu(IO_2)_2$

Task 2f

(a) N_2O_4
(b) Dinitrogen pentoxide
(c) Phosphorous trichloride
(d) PCl_5
(e) Sulfur hexafluoride

TASKS FROM TOPIC 3 NOTES

Task 3a

1.

1	$1s^1$
2	$1s^2$
3	$1s^2\ 2s^1$
4	$1s^2\ 2s^2$
5	$1s^2\ 2s^2\ 2p^1$
6	$1s^2\ 2s^2\ 2p^2$
7	$1s^2\ 2s^2\ 2p^3$
8	$1s^2\ 2s^2\ 2p^4$
9	$1s^2\ 2s^2\ 2p^5$
10	$1s^2\ 2s^2\ 2p^6$
11	$1s^2\ 2s^2\ 2p^6\ 3s^1$
12	$1s^2\ 2s^2\ 2p^6\ 3s^2$
13	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$
14	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
15	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
16	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
17	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
18	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
19	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
20	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
21	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^1$
22	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^2$
23	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^3$
24	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$
25	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^5$
26	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$
27	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^7$
28	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^8$
29	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^{10}$
30	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}$
31	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^1$
32	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^2$
33	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^3$
34	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^4$
35	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$
36	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6$

Task 3b

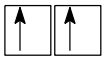
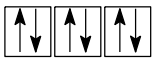
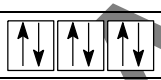
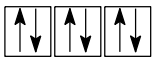
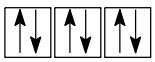
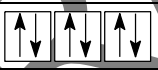
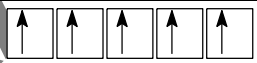
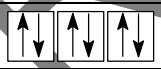
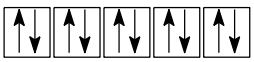
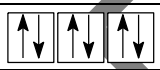
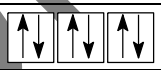
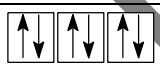
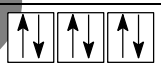
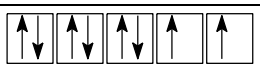
1.

(a) [Ar] $4s^1$ $3d^{10}$
(b) [Ar] $4s^2$ $3d^5$
(c) [Ar] $4s^2$
(d) [He] $2s^2$ $2p^2$
(e) [Ne] $3s^2$ $3p^6$
(f) [Ar] $4s^2$ $3d^{10}$ $4p^1$

2.

(a) [He] $2s^2$ $2p^6$
(b) [Ne] $3s^2$ $3p^6$
(c) [Ne] $3s^2$ $3p^6$
(d) [He] $2s^2$ $2p^6$
(e) [He] $2s^2$ $2p^6$

Task 3c

1s	2s	2p	3s	3p	3d	4s	4p	
								C
								Ca
								Ne
								Cr
								Ga
								K
								Ni
								N
								Sc
								Kr

TASKS FROM TOPIC 4 NOTES

Task 4a

1.

(a) FeO
(b) Fe_2O_3
(c) Fe_3O_4

2.

CH

Task 4b

1. C_6H_6

Task 4c

1.

(a) H_2 + CuO → Cu + H_2O

(b) 2C + O_2 → 2CO

(c) Mg + H_2SO_4 → $MgSO_4$ + H_2

2.

(a) Ca + $2H_2O$ → H_2 + $Ca(OH)_2$

(b) 2Cu + O_2 → 2CuO

(c) 4Na + O_2 → $2Na_2O$

(d) Fe + 2HCl → $FeCl_2$ + H_2

(e) 2Fe + $3Br_2$ → $2FeBr_3$

(f) C_4H_8 + $6O_2$ → CO_2 + H_2O

(g) Na_2CO_3 + 2HI → 2NaI + CO_2 + H_2O

(h) $CuCO_3$ → CuO + CO_2

(i) $2Pb(NO_3)_2$ → 2PbO + $4NO_2$ + O_2

(j) H_2SO_4 + 2KOH → K_2SO_4 + $2H_2O$

(k) $2NaHCO_3$ → Na_2CO_3 + H_2O + CO_2

(l) 4Al + $3O_2$ → $2Al_2O_3$

Task 4d

1. 58.5 g

2. 3.5 mols

3. 0.00234 mols

4. 0.523 mols

5. Answers here are number of moles multiplied by 6.02×10^{23} REMEMBERING that for example, NaCl contains both Na^+ AND Cl^- and $CuBr_2$ contains twice as many Br^- ions as $CuBr_2$ etc.

Task 4e

(a) 3.24 g
(b) 76.5 g

Task 4f

1. 34.98 g

2. 1:2 ratio of Cu^{2+} to I^-

3. 0.142 M

4. 0.981 g

5. 50 mL

Task 4g

1. 0.299 m

2. 8.71 m

Task 4h

1. 0.192 L

2. 0.192 L

3. 1.75 L

Task 4i

$C_5H_6O_3$

Task 4j

1. 6

2. Heating until no further mass loss is observed, i.e. driving off all the water of crystallization.

Task 4k

Cl_2, 1.423 mols of products, 4.89 mols excess reactant left over.

Task 4l

89%

TASKS FROM TOPIC 5 NOTES

Task 5a

(a) $Mg^{2+}_{(aq)} + 2OH^-_{(aq)} \rightarrow Mg(OH)_{2(s)}$
(b) $Ba^{2+}_{(aq)} + S^{2-}_{(aq)} + Ni^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow NiS_{(s)} + BaSO_{4(s)}$
(c) No reaction
(d) $Al^{3+}_{(aq)} + 3OH^-_{(aq)} \rightarrow Al(OH)_{3(s)}$

Task 5b

Assumes sulfuric acid lose both protons in a single step.

$2KOH_{(aq)} + H_2SO_{4(aq)} \rightarrow K_2SO_{4(aq)} + 2H_2O_{(l)}$

$2K^+_{(aq)} + 2OH^-_{(aq)} + 2H^+_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow 2K^+_{(aq)} + SO_4^{2-}{}_{(aq)} + 2H_2O_{(l)}$

$2H^+_{(aq)} + 2OH^-_{(aq)} \rightarrow 2H_2O_{(l)}$

Task 5c

1.

(a) +6
(b) -0.5
(c) -3
(d) +2
(e) +3

2.

(a)
$Ca + S \rightarrow CaS$
$Ca \rightarrow Ca^{2+} + 2e^-$
$S + 2e^- \rightarrow S^{2-}$

(b)
$2Al + 3Br_2 \rightarrow 2AlBr_3$
$Al \rightarrow Al^{3+} + 3e^-$
$Br_2 + 2e^- \rightarrow 2Br^-$

(c)
$4Al + 3O_2 \rightarrow 2Al_2O_3$
$Al \rightarrow Al^{3+} + 3e^-$
$O_2 + 4e^- \rightarrow 2O^{2-}$

3.

(a)
$IO_3^- + 5e^- + 6H^+ \rightarrow ½I_2 + 3H_2O$
$5I^- \rightarrow 2½I_2 + 5e^-$
$IO_3^- + 6H^+ + 5I^- \rightarrow 3H_2O + 3I_2$

(b)
$I_2 + 2e^- \rightarrow 2I^-$
$2S_2O_3^{2-} \rightarrow S_4O_6^{2-} + 2e^-$
$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$

(c)
$Br_2 + 2e^- \rightarrow 2Br^-$
$2I^- \rightarrow I_2 + 2e^-$
$Br_2 + 2KI \rightarrow I_2 + 2KBr$

(d)
$2MnO_4^{2-} \rightarrow 2MnO_4^- + 2e^-$
$MnO_4^{2-} + 2e^- + 4H^+ \rightarrow MnO_2 + 2H_2O$
$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(e)
NOT REDOX (all oxidation states the same) so no half reactions required.
$2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$

Task 5d

0.0754 M

Task 5e

12

TASKS FROM TOPIC 6 NOTES

Task 6a

1. 8.73×10^{4}

2. 1.09

3. 7.72×10^{-2}

4. 9.03

Task 6b

1. 0.272 L

2. 422 mL

Task 6c

1. 10.4L

2. 288K

Task 6d

1. 8.73 L

2. 37.4L

Task 6e

1. 318K

2. 247K

Task 6f

1. 0.435 moles

2. 267 g/mol

Task 6g

1. 0.0255 moles

2. 717.6 kPa

Task 6h

1. 27.7 g

2. 1.12 L

Task 6i

1.

(i) 1363 ms^{-1}
(ii) 482 ms^{-1}
(iii) 183 ms^{-1}

2.

(i) 1419 ms^{-1}
(ii) 502 ms^{-1}
(iii) 191 ms^{-1}

3. u_{rms} is lower at lower temperatures and lower with larger molar masses.

TASKS FROM TOPIC 7 NOTES

Task 7a

1.

$O_{(g)} + e^- \rightarrow O^-_{(g)}$
$O^-_{(g)} + e^- \rightarrow O^{2-}_{(g)}$

Second is endothermic since adding an electron to a negative species will require energy.

2.

(i) Decreases. Greater shielding outweighs greater number of protons.
(ii) Increases. Same shielding, more protons.

3.

(i) Group 1
(ii) Group 2
(iii) It only has three electrons

4. Energy required to remove one mole of electrons from one mole of gaseous atoms to form one mole of singly charge ions.

Shielding and nuclear charge.

5.

(i) RO
(ii) Less mutual repulsion of electrons but same number of protons.

6. Increases. Same shielding, more protons.

7. Zero shielding, electrons directly adjacent to the nucleus.

Task 7b

Isoelectronic BUT different numbers of protons. Largest number of protons = greatest attraction = smallest species.

TASKS FROM TOPIC 8 NOTES

Task 8a

Na^+, Cl^-; NaCl
Ca^{2+}, Cl^-; $CaCl_2$
Fe^{3+}, Br^-; $FeBr_3$
Na^+, O^{2-}; Na_2O

Task 8b

Molecule or ion	Lewis Structure
F_2	F single bonded to F with each F atom having 6 other electrons around it to complete the octet
O_2	O double bonded to O with each O atom having 4 other electrons around it to complete the octet
N_2	N triple bonded to N with each N atom having 2 other electrons around it to complete the octet
HCl	H single bonded to Cl with the Cl atom having 6 other electrons around it to complete the octet
HF	H single bonded to F with the F atom having 6 other electrons around it to complete the octet
H_2O	2 H atoms single bonded to central O with the O atom having 4 other electrons around it complete the octet
NH_3	3 H atoms single bonded to central N with the N atom having 2 other electrons around it complete the octet
CBr_4	4 Br atoms single bonded to central C with each Br atom having 6 other electrons around it to complete the octet
PF_5	5 F atoms single bonded to central P with each F atom having 6 other electrons around it to complete the octet
PCl_6^-	6 Cl atoms single bonded to central P with each Cl atom having 6 other electrons around it to complete the octet
NH_4^+	4 H atoms single bonded to central N

Task 8c

Molecule or ion	Lewis Structure	Shape	Bonding pairs around central atom	Non-Bonding pairs around central atom	Bond Angles
PCl_6^-	6 Cl atoms single bonded to central P with each Cl atom having 6 other electrons around it to complete the octet	Octahedral	6	0	90^o
ICl_3	3 Cl atoms single bonded to central I with each Cl atom having 6 other electrons around it to complete the octet PLUS 2 lone pairs on central I	T-shaped	3	2	Approx. 90^o
BrF_5	5 Cl atoms single bonded to central Br with each Cl atom having 6 other electrons around it to complete the octet PLUS 1 lone pair on central Br	Square Pyramid	5	1	Approx. 90^o
SO_3^{2-}	3 O atoms single bonded to central S with each O atom having 6 other electrons around it to complete the octet PLUS 1 lone pair on central S	Trigonal pyramid	3	1	107.5^o
CH_4	4 H atoms single bonded to central C	Tetrahedral	4	0	109.5^o
NH_4^+	4 H atoms single bonded to central N	Tetrahedral	4	0	109.5^o
ICl_4^-	4 Cl atoms single bonded to central I with each Cl atom having 6 other electrons around it to complete the octet PLUS 2 lone pairs on central I	Square Planar	4	2	90^o
SO_2	2 O atoms bonded to central S atom (one double bonded, one single bonded with possibility of resonance) with each O atom having other electrons around it to complete the octet PLUS 1 lone pair on central S	V-shaped	2	1	Slightly less than 120^o

TASKS FROM TOPIC 9 NOTES

Task 9a

1. $C_{(graphite)} + 1½H_{2(g)} + ½Br_{2(l)} \rightarrow CH_3Br_{(l)}$

2. $4C_{(graphite)} + 4H_{2(g)} + ½O_{2(g)} \rightarrow CH_3COC_2H_{5(l)}$

3. $Na_{(s)} + ½N_{2(g)} + 1½O_{2(g)} \rightarrow NaNO_{3(s)}$

4. During the formation of an element, "from its elements", i.e. from ITSELF, there is no change. For example; $Na_{(s)} \rightarrow Na_{(s)}$ represents no change in any aspect, of which enthalpy is just one

Task 9b

1. $C_5H_{12(l)} + 8O_{2(g)} \rightarrow 5CO_{2(g)} + 6H_2O_{(l)}$

2. $CO_{(g)} + ½O_{2(g)} \rightarrow CO_{2(g)}$

3. $H_{2(g)} + ½O_{2(g)} \rightarrow H_2O_{(l)}$

4. $Al_{(s)} + ¾O_{2(g)} \rightarrow ½Al_2O_{3(s)}$

Task 9c

1. -84 kJ

2. -2005 kJ

3.

   (i) -852 kJ
   (ii) They are zero

4.

   (i) $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}$
   (ii) -297 kJ

Task 9d

1. -124 kJ

2. -95 kJ

3. -1198 kJ

4. Zero. Identical bonds are broken and made

5.

(i) -126 kJ
(ii) -124 kJ
(iii) (i) since it is calculated from formation and combustion data that are specific to the compounds involved, and in (ii) the bond enthalpies are average values and therefore not necessarily specific to the compounds involved.

Task 9e

1. Negative

2. Positive

TASKS FROM TOPIC 10 NOTES

Task 10a

1.

(i) hexaaquacopper(II) sulfite
(ii) triamminetrichloronickel(III)
(iii) hexaamminecobalt(III) iodide
(iv) sodium hexacyanoferrate(III)
(v) diamminetetraaquacopper(I) fluoride

2.

(i) $(NH_4)_2\,[TiCl_6]$
(ii) $[Cr(H_2O)_3(NH)_3]Cl_3$
(iii) $[Fe(H_2O)_5OH]^+$
(iv) $Na_3\,[Co(NO_2)_6]$
(v) $[CoCl(NH_3)_5]Br_2$

Task 10b

1. $[Cr(H_2O)_6]SO_4$; tetraaquadihydroxoxcopper(II); $[CrCl_3(NH_3)_3]$

2.

(i) [Ar] $4s^0\ 3d^6$
(ii) [Ar] $4s^0\ 3d^7$
(iii) [Ar] $4s^0\ 3d^0$

3.

(i) +3
(ii) +3
(iii) +5
(iv) +3

4. $2CrO_4^{2-} + H^+ \leftrightarrows Cr_2O_7^{2-} + OH^-$

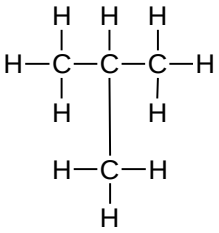
Revised August 2011

TASKS FROM TOPIC 11 NOTES

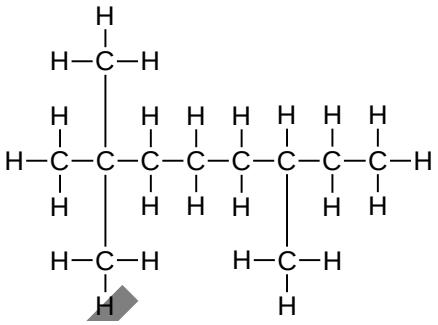
Task 11a

1.

(i)



(ii)

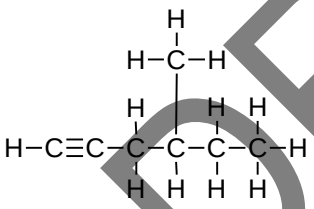


2.

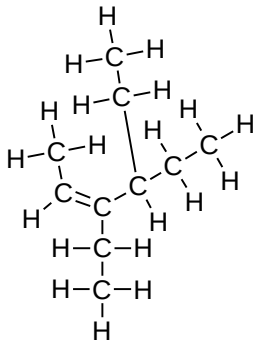
(i) 2,2-dimethylbutane
(ii) 2,4-dimethylpentane

3.

(i)



(ii)

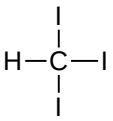


4.

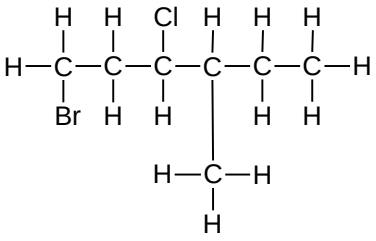
(i) But-1-ene or 1-butene
(ii) 4-methylhex-2-yne or 4-methyl-2-hexyne

5.

(i)



(ii)

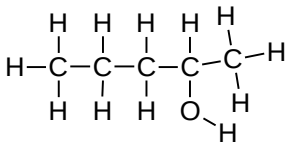


6.

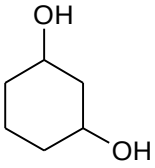
(i) 1-iodopentane
(ii) 3-bromopentane

7.

(i)



(ii)

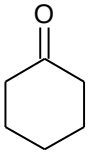


8.

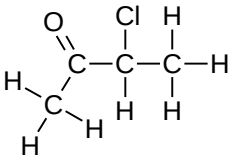
(i) Pentan-3-ol or 3-pentanol
(ii) 2-methylbutan-2-ol or 2-methyl-2-butanol

9.

(i)



(ii)

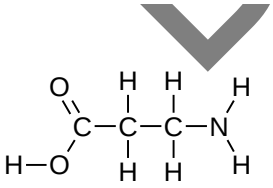


10.

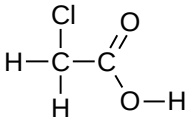
(i) Butanal
(ii) Methylbutanone (3-methyl-2-butanone)

11.

(i)



(ii)



12.

(i) Propanoic acid
(ii) 3-hydroxypentanoic acid

TASKS FROM TOPIC 12 NOTES

No Tasks included in the TOPIC 12 notes.

TASKS FROM TOPIC 13 NOTES

Task 13a

1. Kc = 4. All experiments yield the same answer because each reaction is carried out at the same temperature.

2. Moles of;

Acid = 0.155, Alcohol = 1.155, Ester = 0.845, Water = 0.845

3. Kc = 13.1

4. Moles of HBr = 8.62

Task 13b

1.

(i) Kp = 3.05

(ii) The expression Kp = $\frac{\left(\frac{2x(1.5)}{1+x}\right)^2}{\left(\frac{1-x(1.5)}{1+x}\right)}$ leads to a math equation that is beyond the scope of AP, but can be solved. Here it is simply important to see how the expression reached.

2.

(i) Kp =13.8
(ii) Kp = 21.8

(iii) The expression Kp = $2.11 \times 10^4 = \frac{\left(\frac{2x}{2}\right)^2}{\left(\frac{1-x}{2}\right)^2}$ leads to a math equation that is beyond the scope of AP, but can be solved. Here it is simply important to see how the expression reached. Actual answer = 98.6% which is consistent with a huge change in Kp.

3.

Kp = 0.128

Task 13c

1. 1.72×10^{-11}

2. 2.36×10^{-5}

3. 0.0152, 4.75 g/L

4. Precipitate forms since Q > Ksp

Task 13 d

(i) 1.26×10^{-5}
(ii) 2.9×10^{-8}
(iii) 6×10^{-9}

TASKS FROM TOPIC 14 NOTES

Task 14a

1. 1.52

2. 12.3

3. 4.79×10^{-5}

4. 13.1

Task 14b

1. 1.82×10^{-5}

2. 4.86

3. Ethanoic

4. 2.37

5. 3.1×10^{-5}

6. 2.41×10^{-10}

Task 14c

1. 1.78×10^{-5}

2. 3.36

3. Methylamine

4. 11.45

5. 3.1×10^{-5}

6. 6.95×10^{-10}

Task 14d

1. 4.74

2. 4.62

3. 5.13

TASKS FROM TOPIC 15 NOTES

Task 15a

1.

Order wrt X = 2
Order wrt Y = 0

Rate = k $[X]^2$ $[Y]^0$ = k $[X]^2$

k = 40000 M^{-1} min^{-1}

2.

Order wrt [A] = 1
Order wrt [B] = 1

Rate = k $[A]^1$ $[B]^1$

k = 8000 M^{-1} s^{-1}

Task 15b

By comparing experiments 2 and 1, we find;

$$\frac{\text{Rate}_{\text{Expt. 2}} = 2.00 = k\,[0.01000]^x\,[0.0250]^y}{\text{Rate}_{\text{Expt. 1}} = 1.00 = k\,[0.00500]^x\,[0.0250]^y}$$

Where x and y are the orders with respect to [A] and [B] respectively, and k is the rate constant.

This allows the simplification of the expression to read;

$$\frac{\text{Rate}_{\text{Expt. 2}} = 2.00 = \cancel{k}\,[0.01000]^x\,\cancel{[0.0250]^y}}{\text{Rate}_{\text{Expt. 1}} = 1.00 = \cancel{k}\,[0.00500]^x\,\cancel{[0.0250]^y}} = 2 = 2^x$$

Therefore x = 1, i.e. the order with respect to [A] is 1.

Repeat the process to investigate the order with respect to [B] by comparing experiments 1 and 3;

$$\frac{\text{Rate}_{\text{Expt. 1}} = 1.00 = k\,[0.00500]^x\,[0.0250]^y}{\text{Rate}_{\text{Expt. 3}} = 0.50 = k\,[0.00500]^x\,[0.0125]^y}$$

Where x and y are the orders with respect to [A] and [B] respectively, and k is the rate constant.

This allows the simplification of the expression to read;

$$\frac{\text{Rate}_{\text{Expt. 1}} = 1.00 = \cancel{k}\,\cancel{[0.00500]^x}\,[0.0250]^y}{\text{Rate}_{\text{Expt. 3}} = 0.50 = \cancel{k}\,\cancel{[0.00500]^x}\,[0.0125]^y} = 2 = 2^y$$

Therefore y = 1, i.e. the order with respect to [B] is 1.

TASKS FROM TOPIC 16 NOTES

Task 16 a

(i) $Zn_{(s)} \mid Zn^{2+}_{(aq)} \parallel \frac{1}{2} F_{2(g)} \mid F^{-}_{(aq)} \mid (Pt)$
(ii) $Sn_{(s)} \mid Sn^{2+}_{(aq)} \parallel H^{+}_{(aq)} \mid \frac{1}{2} H_{2(g)} \mid (Pt)$
(iii) $Cu_{(s)} \mid Cu^{2+}_{(aq)} \parallel Fe^{3+}_{(aq)}, Fe^{2+}_{(aq)} \mid (Pt)$
(iv) $(Pt) \mid \frac{1}{2} H_{2(g)} \mid H^{+}_{(aq)} \parallel Fe^{3+}_{(aq)}, Fe^{2+}_{(aq)} \mid (Pt)$
(v) $Zn_{(s)} \mid Zn^{2+}_{(aq)} \parallel Cu^{2+}_{(aq)} \mid Cu_{(s)}$

Task 16b

(i) $(Pt) \mid \frac{1}{2} H_{2(g)} \mid H^{+}_{(aq)} \parallel Ag^{+}_{(aq)} \mid Ag_{(s)}$; +0.80 V
(ii) $Al_{(s)} \mid Al^{3+}_{(aq)} \parallel Ag^{+}_{(aq)} \mid Ag_{(s)}$; -1.66 V
(iii) It would become more positive

TASKS FROM TOPIC 17 NOTES

Task 17a

1. 22.5 mmHg

2. 45.4 g mol^{-1}

3.

(b) 19 mmHg & 36 mmHg
(c) 55 mmHg
(d) 34.5% & 65.5 %

4. 304 mmHg, 456.8 mmHg; 40% and 60%; vapor is richer in the more volatile component than the corresponding liquid mixture. (Benzene was 20% in liquid but 40% in vapor since vapor is always richer in low boiling point component).

Task 17b

1. 149 g mol^{-1}

2. -7.8 ^{o}C

3. 308 g mol^{-1}

4. 128 g mol^{-1}

Task 17c

2.72 atm

Task 17d

1.96