233/1
CHEMISTRY
PAPER 2
THEORY
TIME – 2HRS

SUKELEMO PRE MOCK JOINT EXAMS
Pre Mock Examination
JUNE 2022

MARKING SCHEMES
a) i) To remove dust particles √ - than would otherwise “poison” that catalyst √ (1mk)
ii) 9 atmospheres √ (1mk)
iii) To pre heat NH₃ and air to an optimum temperature (reactants) √
      To cool NO (product) √ (2mks)
iv) Platinum–Rhodium catalyst √ (1mk)
v) I : 4NH₃(g) + 5O₂(g) → 4NO(g) + 6H₂O(g) √ (1mk)
    II : 2NO(g) + O₂(g) → 2NO₂(g) √ (1mk)
    III : 4NO₂(g) + O₂(g) + 2H₂O(l) → 4 HNO₃(aq) (1mk)

b) i)     \[ 2\text{NaNO}_3(S) \rightarrow 2\text{NaNO}_2(g) + \text{O}_2(g) \]
NaNO₃ = 23 + 14 + 48 = 85
Moles of NaNO₃ = \[ \frac{21.25}{85} \] √ \[ \frac{1}{2} \] (3mks)

Moles of O₂ ⇒ \[ \frac{1}{2} \times 0.25 \]
= 0.125 √ \[ \frac{1}{2} \]

Volume of O₂ ⇒ 0.125 \times 22.4
= 2.8dm³
V = 280 cm³

ii) Manufacture of fertilizers √
Manufacture of explosives √
Manufacture dyes and drugs √
Purification of metals eg. silver and gold
Etching designs on some metals (2mks)

2. (a) this is the maximum mass of salt/solute that can saturate 100g of water at a given temperature.
(b)
(c) (i) 30g of H₂O 
   Accept 36g/100g water

(ii) 33.5°C

(d) (i) Sol at 40°C = 61g/100g H₂O
   At 27°C

(ii) Sol at 40°C = 61g/100g H₂O
   Sol at 27°C = 35g/100g H₂O
   Sol at 5°C = 10g/100g of H₂O

(e) Y is more soluble than Z.
   Y dissolves better at higher temperatures than Z

(f) Fractional crystallization – Separation of mixtures with different solubilities
3. (a) (i) I: \( \text{Zn(OH)}_2 \) \( \checkmark \)
   II: \( \text{ZnCl}_2 \) \( \checkmark \)
   III: \( \text{ZnO} \) \( \checkmark \)
(ii) \( \text{Pb}^{2+} + 2\text{Cl}^- \rightarrow \text{PbCl}_2(s) \) \( \checkmark \)
(iii) White precipitate soluble in excess. \( \checkmark \)
(b) Ammonia gas is polar and ionizes \( \checkmark \) in water which is polar.
   While it does not ionize in methylbenzene which is non polar.
(c) (i) Calcium carbonate/magnesium carbonate.
   (ii) Passing a solution of dilute hydrochloric acid or nitric (V) acid
        in the boiler. (1mk)
(d) \( [\text{Zn(OH)}_4]^{2-} \)

4a

i) Hygroscopy
ii) Deliquescence
iii) Efflorescence
b) i) \((\text{Zn(OH)₄})^{2-}\)  \(\sqrt{1}\)mk  
ii) \(\text{Cu(OH)₄}^{2-}\) \(\sqrt{1}\)mk

<table>
<thead>
<tr>
<th>Element</th>
<th>S</th>
<th>O</th>
<th>H₂O</th>
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<tbody>
<tr>
<td>Fe</td>
<td>20.2</td>
<td>11.5</td>
<td>23.0</td>
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<tr>
<td></td>
<td>56</td>
<td>32</td>
<td>16</td>
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<td>0.36</td>
<td>0.36</td>
<td>1.44</td>
<td>2.52</td>
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<td>4</td>
<td>7</td>
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\((\text{FeSO₄.7H₂O})=278\)

278n=278

n=1 \(\sqrt{1}\)mk

Formula  \(\text{FeSO₄.7H₂O} \sqrt{1}\)mk

ii) No. of moles \(\frac{6.95}{278} = 0.025\text{moles} \sqrt{1}\)mk

0.025 moles-250 cm³

\[
\frac{0.025 \times 1000}{250} = \frac{25}{250} = 0.1 \text{mole/litre} \sqrt{1}\)mk

d)
- Add excess lead carbonate to dilute HNO₃. \(\sqrt{1}\)mk
- Shake and filter to remove unreacted carbonate \(\sqrt{1/2}\)mk
- Add excess dilute HCl to the mixture \(\sqrt{1/2}\)mk
- Filter to obtain lead(II) chloride as the residue \(\sqrt{1/2}\)mk
- Rinse and dry between filter paper to obtain solid PbCl₂ \(\sqrt{1/2}\)mk
5.  i)  

ii) – Catalyst Nickel  
- Temperature 150ºC to 250ºC  

iii) magnesium is very expensive  
it gives a mixture of gases including bad smelling and poisonous hydrogen sulphide  

CuSO₄. 5H₂O  
v) – Manufacture of ammonia  
- Manufacture of hydrochloric acid  
- Welding and cutting of metals  
- Rocket fuel and in fuel cells.  

b)  
i) Slowly to allow ample time for reaction repeatedly to ensure all active air (oxygen) is used up  
ii) The brown copper turnings slowly changed black.  

![Diagram of a chemical reaction]

iii)  
\[
\frac{120 - 95.5}{120} \times 100 = 20.41667\% \\
\frac{24.5}{120} \times 100
\]

6.  
(a)  
B – 2 : 8 \( \sqrt{\frac{1}{2}} \)  
D – 2 : 8 : 8 \( \sqrt{\frac{1}{2}} \)  

(b)  
i) D \( \sqrt{\frac{1}{2}} \)
(ii) $E \sqrt{\frac{1}{2}}$

(c) Atomic radius of $B$ is larger $\sqrt{1}$ than that of $C$. $C$ has more protons. The outer energy level electrons are pulled $\sqrt{1}$ strongly to the nucleus reducing the atomic size.

(d)

(e) Element $B$ has stronger metallic $\sqrt{1}$ bond (has more delocalized electrons) than $A$, hence higher amount of heat $\sqrt{1}$ energy is needed to break the bond.

(f) $2A(s) + 2H_2O(l) \rightarrow 2AOH(aq) + H_2(g) \sqrt{1}$

- Reject fully if unbalanced
- Award $\frac{1}{2}$ mk if states are missing or any one state is wrong.

(g) Add water $\sqrt{\frac{1}{2}}$ to the mixture and stir.
Filter $\sqrt{\frac{1}{2}}$ to obtain lead (II) sulphate as $\sqrt{\frac{1}{2}}$ residue and sulphate of $E$ as filtrate
Dry the residue $\sqrt{\frac{1}{2}}$ to obtain lead (II) sulphate.
Evaporate $\sqrt{\frac{1}{2}}$ the filtrate to dryness $\sqrt{\frac{1}{2}}$ to obtain the solid sulphate of $E$.

a) Ethylpropanoate
b) But-2,3-diene
b) i) A - yeast √1 (1mk)
   I - fractional distillation (1mk)
   B - Sodium ethoxide (1mk)
   C - Hydrogen (1mk)
   D - Ethene (1mk)
   E – polyethene / polythene (1mk)

(4mks)

iii) I : C₆H₁₂O₆ → 2C₂H₅O + 2CO₂ √ (1mk)

\[
moleofsugar \frac{144000}{180} = 800 \text{ moles}
\]

\[
\text{molesofethanol} = \sqrt{2 \times 800}
\]
\[
= 1600 \text{ moles}
\]

II

nf \rightarrow 2 \times 12 + 6 + 16 = 46

\[
\text{massofethanol} = \frac{46 \times 1600}{1000}
\]
\[
= 73.6 \text{ kg}
\]