Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1_Oxidation, Reduction and Redox Equations

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Name of the Student:_____
Max. Marks : 28 Marks **Time : 28 Minutes**

Mark Schemes

Q1.

(a) Fe^{2+}

Accept any Fe(II) compound – correct formula or name

1

$E^{\ominus}$ VO_2^+(/ VO^{2+}) > $E^{\ominus}$ Fe^{3+}(/Fe^{2+}) > $E^{\ominus}$ VO^{2+}(/V^{3+})

If calculations of EMF are provided producing EMFs = 0.23(V) and -0.43(V), with a comment, allow M2

allow $E^{\ominus}$ Fe^{3+} (/Fe^{2+}) value of +0.77 is between the $E^{\ominus}$ values for the electrode half-equations containing the V species or wtte

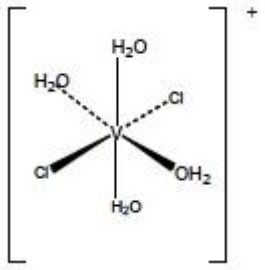
1

(b) (+) 4

IV or four

1

(c)



Ignore absence of charge
Wedges, dotted lines and [ ] not required
Do not penalise bond from H to V (in water ligands)

1

Cis/trans

allow E/Z, geometric and stereo(isomerism)

1

(d) $2\ NH_4VO_3 \rightarrow V_2O_5 + H_2O + 2NH_3$

Accept multiples
Ignore state symbols

1

(e) $V_2O_5 + SO_2 \rightarrow V_2O_4 + SO_3$

$V_2O_4 + ½\ O2 \rightarrow V_2O_5$

Both equations needed for 1 mark in this order
Allow multiples

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1

[7]

Q2.

(a) (+) 5

1

(+) 2

1

Allow Roman numerals

(b) Cl^- / chloride (ions)

Allow $2Cl^-$

Do not allow chlorine / Cl / Cl_2

Ignore (aq)

1

(c) nitric acid / HNO_3

If not nitric acid then CE = 0

If NO_3^- ions identified, lose M1 and mark on

Allow 0.96V > 0.34V

1

the E^θ $\mathbf{NO_3^-}$ (/NO) > E^θ $\mathbf{Cu^{2+}}$(/Cu) or in words

Allow $\mathbf{NO_3^-}$ is a better oxidising agent than $\mathbf{Cu^{2+}}$

Allow $\mathbf{NO_3^-}$ has a more positive E^θ than $\mathbf{Cu^{2+}}$

1

$3Cu + 8H^+ + 2NO_3^- \longrightarrow 3Cu^{2+} + 2NO + 4H_2O$

Allow $3Cu + 8HNO_3 \longrightarrow 3Cu(NO_3)_2 + 2NO + 4\ H_2O$

1

EMF for the reaction is <u>0.62(V)</u>

1

[7]

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Q3.

(a) [Kr] $5s^2$ $4d^{10}5p^5$

1

(b) This question is marked using levels of response. Refer to the Mark Scheme Instructions for Examiners for guidance on how to mark this question.

Level 3
All stages are covered and the explanation of each stage is correct and complete.

Answer communicates the whole explanation coherently and shows a logical progression from stage 1 to stage 2 and then stage 3.

5-6 marks

Level 2
All stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies **OR** two stages are covered and the explanations are generally correct and virtually complete.

Answer is mainly coherent and shows a progression through the stages. Some steps in each stage may be out of order and incomplete.

3-4 marks

Level 1
Two stages are covered but the explanation of each stage may be incomplete or may contain inaccuracies, **OR** only one stage is covered but the explanation is generally correct and virtually complete.

Answer includes some isolated statements, but these are not presented in a logical order or show confused reasoning.

1-2 marks

Level 0
Insufficient correct chemistry to warrant a mark.

0 marks

Indicative Chemistry content

Stage 1

I_2 is molecular.

HI is molecular.

Stage 2

IMF hold the molecules together.

There are weak IMF forces hence the melting point is low in both substances.

I_2 bigger molecule than HI so I_2 has more electrons.

Stage 3

Therefore stronger van der Waals between molecules in I_2 that need more energy to break causing the melting point to be higher.

HI also shows permanent dipole-dipole attraction between molecules but these forces are less than the vdW forces in iodine.

6

(c) No delocalised electrons or ions

1

(d) $\frac{1}{2}H_2 + \frac{1}{2}I_2 \longrightarrow HI$

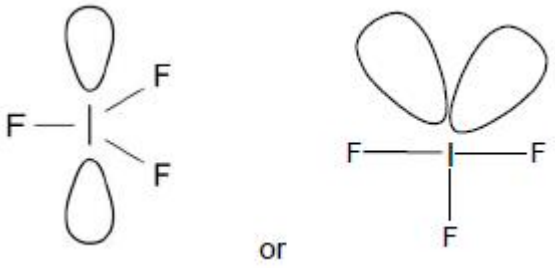
Allow multiples

1

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(e) NH_4I_3

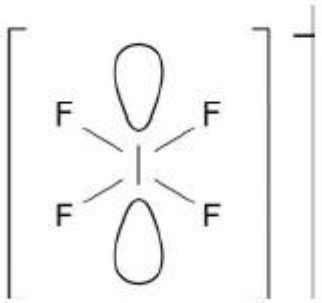
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(f)

Allow any shape with 3 bond pairs and 2 lone pairs

1



Allow any shape with 4 bond pairs and 2 lone pairs (e.g. lone pairs in equatorial positions)

1

(g) +5

1

+7

1

[14]

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