Practice Question Set For A-Level
**Subject : Chemistry**
**Paper-1 Topic: Inorganic 2**

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**Name of the Student**:_____
**Max. Marks : 24 Marks** **Time : 24 Minutes**

Q1.

This question is about emissions of oxides of nitrogen from petrol and diesel engines.

(a) Explain how oxides of nitrogen are formed in engines.

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**(2)**

(b) State why it is desirable to decrease emissions of oxides of nitrogen from vehicles.

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**(1)**

(c) Modern diesel vehicles use diesel exhaust fluids, such as AdBlue, to decrease emissions of oxides of nitrogen.

AdBlue reacts with water in the hot exhaust gases to form ammonia.
In the presence of a catalyst the ammonia reacts with oxides of nitrogen to form nitrogen and water.

Give the oxidation state of nitrogen in each of $NO_2$, $NH_3$ and $N_2$

Complete the equation for the reaction between $NO_2$ and $NH_3$

Oxidation state of nitrogen in

$NO_2$_____ $NH_3$_____ $N_2$_____

Equation

_____ $NO_2$ + _____ $NH_3$ → _____ $N_2$ + _____ $H_2O$

**(2)**

(d) Petrol vehicles have a catalytic converter which decreases emissions of oxides of nitrogen.
Platinum in the catalytic converter acts as a heterogeneous catalyst.

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State the meaning of the term heterogeneous catalyst.

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**(2)**

(e) Some carbon particulates are also formed in both diesel and petrol vehicles.

Explain why carbon particulates are formed.

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**(1)**

**(Total 8 marks)**

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Q2.

This question is about oxides.

(a) Sodium oxide forms a solution with a higher pH than magnesium oxide when equal amounts, in moles, of each oxide are added separately to equal volumes of water.

State why both oxides form alkaline solutions.

Suggest why sodium oxide forms a solution with a higher pH than the solution formed from magnesium oxide.

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**(2)**

(b) Give an equation for the reaction between phosphorus(V) oxide and water.

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**(1)**

(c) In the Contact process, sulfur(IV) oxide is converted into sulfur(VI) oxide using vanadium(V) oxide as a catalyst.

Give **two** equations to show how the vanadium(V) oxide acts as a catalyst in this process.

Equation 1 _____

Equation 2 _____

**(2)**

**(Total 5 marks)**

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Q3.

(a) Explain why complexes formed from transition metal ions are coloured.

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**(3)**

The iron content of iron tablets can be determined by colorimetry.

Method:

- Dissolve a tablet in sulfuric acid.
- Oxidise all the iron from the tablet to $Fe^{3+}(aq)$.
- Convert the $Fe^{3+}(aq)$ into a complex that absorbs light of wavelength 490 nm
- Make the solution up to 250 $cm^3$
- Measure the absorbance of light at 490 nm with a colorimeter.
- Use a calibration graph to find the concentration of the iron(III) complex.

(b) Calculate the energy, in J, gained by each excited electron in the absorption at 490 nm

Speed of light, $c = 3.00 \times 10^8$ m $s^{-1}$
Planck constant, $h = 6.63 \times 10^{-34}$ J s

Energy gained by each electron _____ J

**(3)**

(c) Describe how a calibration graph is produced and used to find the concentration of the iron(III) complex.

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**(3)**

(d) The concentration of iron(III) in the solution is $4.66 \times 10^{-3}$ mol $dm^{-3}$

Calculate the mass, in mg, of iron in the tablet used to make the 250 $cm^3$ of solution.

Mass of iron in the tablet _____ mg

**(2)**

**(Total 11 marks)**

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