INSTRUCTIONS TO CANDIDATES

Attempt All questions

1. (a) Name three radiations emitted by radioisotopes

(b) What is meant by the following terms:

(i) Decay constant.

(ii) Half life

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(c) The half-life for $^{223}_{88}Ra$ is 1620 years. Calculate the time taken for 90% of radium to disintegrate. (2 ½ mark)

2.(a) What is meant by the term first electron affinity. (1mark)

(b) The first electron affinities of some elements of period 3 are given below

<table>
<thead>
<tr>
<th>Element</th>
<th>Al</th>
<th>Si</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>First electron affinity (kJmol$^{-1}$)</td>
<td>-44</td>
<td>-134</td>
<td>-71.7</td>
<td>-200</td>
</tr>
</tbody>
</table>

(i) State how the electron affinities vary (1mark)

(ii) Explain your answer in (i) (3marks)

3. Complete the following reactions and name the main product.
4. (a) What is meant by the term boiling point elevation constant . (1 marks)

(b) (i) The boiling point of benzene under certain pressure condition is 80.0°C. Calculate the boiling point of a solution containing 5g of 2,4,6-trinitrophenol (HOC₆H₂(NO₂)₃) in 100g of benzene under these pressure conditions. Kb = 2.6°C per 1000g of benzene) (3mks)

(iii) State any three assumptions made in the calculation (1 ½ mark)

5. (a) When prop-1-ene was reacted with hydrogen chloride in the presence of a peroxide 1-chloropropane is formed but when the reaction occurs in absence of a peroxide, 2-chloropropane is the main product. Write the mechanisms leading to the formation of the two products.
(b) Explain why the products are different in (a)                     (2marks)

6 State what’s observed and write equation for the reactions when

(a) Dilute sodium hydroxide is added drop wise to a solution of chromium (III) sulphate (3mks)

(b) Potassium iodide is added to aqueous copper (II) sulphate  (2 ½ marks)

7 (a) (i) Explain what is meant by the term electronic configuration;  (01mark)

(ii) State two deductions that can be made from electronic configurations  (2marks)

(iv) Write electronic configuration of copper (Cu atomic number 29)  (2marks)
8. Name one reagent(s) that can be used to differentiate between the following species. In each case state what is observed if each species is separately treated with the reagent.

(a) $\text{H}_2\text{C}≡\text{CH}_2$ and $\text{HC}≡\text{CH}$

Reagent ……………………………………………………………………………………………………………………………………………………

Observations

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(b) $\text{Al}^{3+}$ and $\text{Pb}^{2+}$

Reagent ……………………………………………………………………………………………………………………………………………………

Observations

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9. 100cm$^3$ of concentrated hydrochloric acid were diluted to 1dm$^3$ with distilled water. 26.8cm$^3$ of the diluted solution required 25cm$^3$ of 0.5M sodium carbonate solution, with methyl orange indicator for complete neutralization. Calculate the molar concentration of the concentrated hydrochloric acid. (3 marks)

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10. (a) Explain what is meant by the term colligative property. (2 marks)

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(c) 0.72g of a compound M was dissolved in 80g of water and the resultant solution had a freezing point of -0.14$^\circ$C. When 2.9g of the same compound was dissolved in 111g of benzene the freezing point was depressed by 0.6$^\circ$C.
(\(K_f\) for water = 1.86 \(\text{Cmol}^{-1}\text{kg}^{-1}\) and \(K_f\) for benzene is 5.5 \(\text{Cmol}^{-1}\text{kg}^{-1}\))

(i) Calculate the apparent molecular mass of M in Water (2 ½ mark)

(ii) Explain why the molecular mass of M differs in the solvents. (2 mark)