**MID TERM TWO 2022 EXAM**

**CHEMISTRY FORM FOUR.**

**TIME: 1 ½ HRS**

**NAME…………………………………… CLASS……….. ADM NO………….**

1. (a) An atom Q can be represented as 52Q .

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What does the number 52 represent? (1mk)

(b) Study the information in the table below and answer the equations that follow. (Letters are not the actual symbols of the elements)

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Electronic arrangement of stable ion | AtomicRadius(nm) | IonicRadius(nm) |
| N | 2.8.8 | 0.197 | 0.099 |
| P | 2.8.8 | 0.099 | 0.181 |
| R | 2.8 | 0.160 | 0.065 |
| S | 2.8 | 0.186 | 0.095 |
| T | 2 | 0.152 | 0.068 |
| U | 2.8 | 0.072 | 0.136 |

 (i) Write the formula of the compound formed when N reacts with P.

 (Atomic numbers are N = 20; P = 17) (1mk)

(ii) Identify the elements which belong to the third period of the periodic table. Explain (2mks)

(iii) Which of the element identified in b (ii) above comes last in the third period? Explain (2mks)

 (iv) Select two elements which are non- metals (1mk)

 (c) The table below gives some properties of substances I, II, III, and IV. Study it and answer the questions that follow

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | Electrical conductivity | M.P (0C) | B.P (0C) |
| Solid | Molten |
| I | Does not conduct | Conducts | 801 | 1420 |
| II | Conducts | Conducts | 650 | 1107 |
| III | Does not conduct | Does not conduct | 1700 | 2200 |
| IV | Does not conduct | Does not conduct | 113 | 440 |

(i) What type of bonding exists in substances I and II (1mk)

 I

 II

(ii) Which substances is likely to be sulphur? Explain (2mks)

2. a) State two differences between chemical and nuclear reactions (2mks)

 (b) The table below gives the percentages of a radioactive isotope of Bismuth that remains after decaying at different times.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) | 0 | 6 | 12 | 22 | 38 | 62 | 100 |
| Percentage of Bismuth | 100 | 81 | 65 | 46 | 29 | 12 | 3 |

i) On the grid provided, plot a graph of the percentage of Bismuth remaining

(Vertical axis) against time. (3mks)

ii) Using the graph, determine the:

1. Half – life of the Bismuth isotope (1mk)

 II. Original mass of the Bismuth isotope given that the mass that remained

after 70 minutes was 0.16g (2mk

c) Give one use of radioactive isotopes in medicine (1mk)

 3. The set up below is used to measure the change in mass during the course of the reaction between **7**dilute hydrochloric acid (excess) and marble chips at 22°C.



 Changes in mass were noted at one minute intervals and were as follows.

 a) Give an equation for the reaction taking place in the flask. (1 mark)

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 b) Why did the mass of the flask change with time? (1 mark)

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 c) What is the role of cotton wool at the mouth of the flask? (1 mark)

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 d) Plot a graph of loss in mass (Y-axis) against time (X-axis). Label the curve 22°C. (3 marks)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Loss in mass(g) | 0.26 | 0.46 | 0.60 | 0.69 | 0.73 | 0.73 | 0.73 |



e) On the graph same axis as in (d) above, sketch the graph you would expect to obtain if the

 experiment was repeated at 35°C. Label the curve 35°C. (2 marks)

f) State what would happen if the marble chips were replaced with the same mass of marble powder. Explain (2 marks)

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g) Why is it not advisable to use sulphuric (VI) acid in place of hydrochloric acid in this experiment? (1 mark)

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4.  a) Study the table below and answer the questions that follow

 Bond type bond energy kJmol-1

 C-C 346

 C = C 610

 C-H 413

 C-Br 280

 Br-Br 193

 i) Calculate the enthalpy change for the following reaction **(3 marks)**

 C2H4(g) + Br2(g) C2H4Br2(g)

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 ii) Name the type of reaction that took place in (a) above **(1mark)**

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b) Butane C4H10 cannot be prepared directly from its elements but its standard heat of formation ($∆H\_{ʄ}^{θ}$) can be obtained indirectly.

 The following heats of combustion are given.

 $∆H\_{C}^{θ}$ (Carbon) = -393kJ/mol

 $∆H\_{C}^{θ}$ (Hydrogen) = -286kJ/mol

 $∆H\_{C}^{θ}$ (Butane) =-2877kJ/mol

* + 1. Draw an energy cycle diagram linking the heat of formation of butane with its heat of combustion and the heat of combustion of its constituents elements. **(1mark)**

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* + 1. Calculate the heat of formation of butane $∆H\_{ʄ}^{θ}$ (C4H10) **(2marks)**

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c) Given that the lattice enthalpy of potassium chloride is +690kJ/mol and hydration enthalpies of K+ and Cl- are -322kJ and -364kJ respectively. Calculate the enthalpy of solution of potassium chloride. **(3 marks)**

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 5.The scheme below shows a series of reactions starting with ethanol. Study it and answer the questions that follow.



 a) Give the type of reaction, the reagent(s) and the condition(s) necessary for step 1 to take place. (1 mark)

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b) Write the equation for the reaction that takes place in step L. (1 mark)

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c) Name product V and give the equation responsible for its formation. (2 marks)

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d) Give the reagent(s) and condition(s) necessary for step W to take place. (1 mark)

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e) Give the IUPAC name and structural formula of compound X. (1 mark)

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f) Name compound K and state the type of reaction involved in its formation. (2 marks)

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g) If the relative molecular mass of K is 44800, determine the value of n. (*C = 12, H = 1)* (2 marks)

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