SCAD WORLD SCHOOL
AFFILIATED TO CAMBRIDGE INTERNATIONAL , UK
AN INTERNATIONAL RESIDENTIAL SCHOOL
PALLADAM TIRUPUR - TAMILNADU|INDIA

FORMATIVE ASSESSMENT 2 - NOVEMBER 2020

CHEMISTRY - THEORY

1 Hour 30 mins

Name: _____ Center number: _____

Grade: AS Roll number: _____

READ THESE INSTRUCTION FIRST

Write your Centre number, candidate number and name on all the work you hand in
Write in dark blue or black pen.
You may use an HB pencil or any diagrams or graphs.
Do not use staples, paper clips, glue or correction tape.
Answer **all** the questions.
Electronic calculators may be used.
Periodic table is given at the last page.
You may lose marks if you do not show your working or if you do not use appropriate units
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

MARK DETAILS

2	3	4	5	6	7	MARKS AWARDED	MAX MARKS
							50

Name of the invigilator. Name of the Examiner. Name of the HOD/ Rechecker

_____ _____ _____

Signature of the invigilator. Signature of the Examiner. Signature of the HOD/ Rechecker

_____ _____ _____

1 Organic compound which usually contains carbon, hydrogen and oxygen.

Compound **X** is an organic compound

When 0.240 g of the vapour of **X** is slowly passed over a large quantity of heated copper(II) oxide, CuO, the organic compound **X** is completely oxidised to carbon dioxide and water.

Copper is the only other product of the reaction.

The products are collected and it is found that 0.352g of CO_2 and 0.144g of H_2O are formed.

(a) In this section, give your answers to three decimal places.

(i) Calculate the mass of carbon present in 0.352 g of CO_2.
Use this value to calculate the amount, in moles, of carbon atoms present in 0.240 g of **X**.

[2]

(ii) Calculate the mass of hydrogen present in 0.144 g of H_2O.
Use this value to calculate the amount, in moles, of hydrogen atoms present in 0.240 g of **X**.

[2]

(iii) Use your answers to calculate the mass of oxygen present in 0.240g of **X**.
Use this value to calculate the amount, in moles, of oxygen atoms present in 0.240 g of **X**.

[2]

2 A flammable gas, **X** was collected by Sir Humphrey Davy and Michael Faraday from the ground near Florence in Italy.

They analysed **X** which they found to be a hydrocarbon.

Further experiments were then carried out to determine the molecular formula of **X**.

(a) What is meant by the term *molecular formula*?

.....

.....

..... [2]

Davy and Faraday deduced the formula of **X** by exploding it with an excess of oxygen and analysing the products of combustion.

(b) Complete and balance the following equation for the complete combustion of a hydrocarbon with the formula C_xH_y.

$$C_xH_y + (x + \frac{y}{4})O_2 \longrightarrow \text{.....} + \text{.....}$$ [2]

(c) When 10cm^3 of **X** was mixed at room temperature with 50cm^3 of oxygen (an excess) and exploded, 40 cm^3 of gas remained after cooling the apparatus to room temperature and pressure. When this 40cm^3 of gas was shaken with an excess of aqueous potassium hydroxide, KOH, 30cm^3 of gas still remained.

(i) What is the identity of the 30cm^3 of gas that remained at the end of the experiment?

.....

(ii) The combustion of **X** produced a gas that reacted with the KOH(aq).

What is the identity of this gas?

.....

(iii) What volume of the gas you have identified in **(ii)** was produced by the combustion of **X**?

.....cm^3

(iv) What volume of oxygen was used up in the combustion of **X**?

.....cm^3 [4]

3 Iron has three main occurring isotopes, cobalt has one naturally

Iron and cobalt are adjacent elements in the Periodic Table.

(a) Explain the meaning of the term *isotope*.

.....

.....

..... [2]

(b) The most common isotope of iron is ^{56}Fe;

the only naturally occurring isotope of cobalt is ^{59}Co.

Use the periodic table to complete the table below to show the atomic structure of ^{56}Fe and of ^{59}Co.

	number of		
isotope	protons	neutrons	electrons
^{56}Fe			
^{59}Co			

[3]

(c) A sample of iron has the following isotopic composition by mass.

isotope mass	54	56	57
% by mass	5.84	91.68	2.17

(i) Define the term *relative atomic mass*.

.....

.....

.....

.....

(ii) By using the data above, calculate the relative atomic mass of iron to **three** significant figures.

[3]

4 The elements of Group VII of the Periodic Table show variation in their properties.

(a) (i) Complete the table below, stating the physical state of each element at room temperature.

halogen	**melting point / ^{0}C**	**physical state**
chlorine	-101	
bromine	-7	
iodine	114	

[3]

5 Titanium can reacts with chlorine.

(a) When an excess of chlorine was reacted with 0.72 g of titanium, 2.85 g of a chloride **A** was formed.

(i) Calculate the amount, in moles, of titanium used.

(ii) Calculate the amount, in moles, of chlorine atoms that reacted.

(iii) Hence, determine the empirical formula of **A**.

(iv) Construct a balanced equation for the reaction between titanium and chlorine.

[4]

6 (a) Define the term mole.

. .....

..... [1]

20 cm^3 of a gaseous hydrocarbon, CxHy, was reacted with 200 cm^3 of oxygen gas, an excess. The final volume of the gaseous mixture was 185 cm^3.

This gaseous mixture was treated with concentrated, aqueous sodium hydroxide to absorb the carbon dioxide present. This reduced the gas volume to 150 cm^3.

All gas volumes were measured at 298 K and 100 kPa.

(i) Write an equation for the reaction between sodium hydroxide and carbon dioxide.

..... [1]

(ii) Calculate the volume of carbon dioxide produced by the combustion of the hydrocarbon.

volume of CO_2 produced = ... cm^3 [1]

(iii) Calculate the volume of oxygen used up in the reaction with the hydrocarbon.

volume of O_2 used = ... cm^3 [1]

(iv) Use your answers to (b)(ii) and (b)(iii), together with the initial volume of hydrocarbon, to balance the equation below.

.....CxHy + ...O_2 ——> .....CO_2 + zH_2O [2]

(v) Deduce the values of x, y and z in the equation in (iv).

x = ...

y = ...

z = ...

[3]

7 Calculate the maximum mass of zinc which will react with 50cm^3 of hydrochloric acid, of concentration 2.0 mol/dm^3.

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

Number of moles of HC*l* used =

Maximum number of moles of Zn =

Maximum mass of Zn = [3]

8 In the first experiment, the maximum volume of oxygen produced was 96cm^3 measured at r.t.p.

Calculate the concentration of the aqueous hydrogen peroxide in mol / dm^3.

$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$

number of moles of O_2 formed =

number of moles of H_2O_2 in 40 cm^3 of solution =

concentration of the aqueous hydrogen peroxide in mol / dm^3 = [3]

9. 0.07 mole of silicon reacts with 25 g of bromine, Br_2.

$$Si + 2Br_2 \rightarrow SiBr_4$$

Number of mole of Silicon =

Number of mole of Bromine, Br_2 =

Number of moles of Silicon bromide formed =

Mass of silicon bromide formed = [4]

10. Write the formula to find maximum percentage yeild

[2]

The Periodic Table of Elements

Cambridge International AS & A Level

1	2	Group										13	14	15	16	17	18
								1 H hydrogen 1.0									2 He helium 4.0
3 Li lithium 6.9	4 Be beryllium 9.0											5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2
11 Na sodium 23.0	12 Mg magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9
19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium –	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57–71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.4	61 Pm promethium –	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.1	71 Lu lutetium 175.0
89 Ac actinium –	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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