

NAIROBI SCHOOL

233/1

CHEMISTRY

PAPER 1

(THEORY)

2HOURS

NAME.....INDEX NO.....CLASS.....ADMN.....

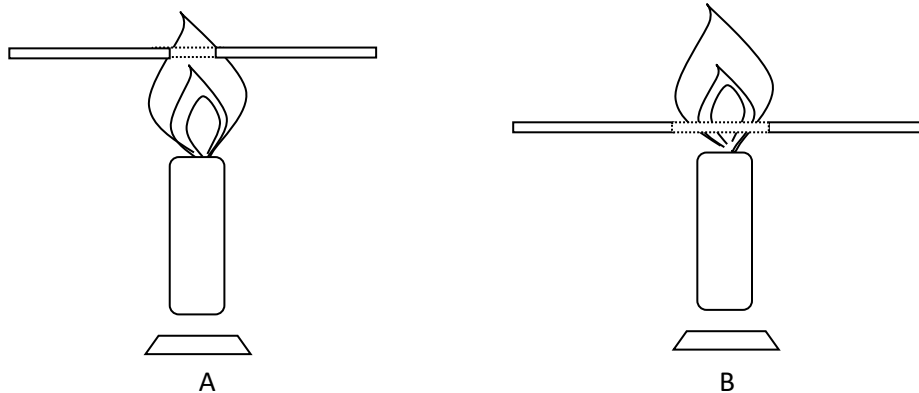
INSTRUCTIONS TO CANDIDATES

1. Write your **name**, **index number**, **class** and **admission number** in the spaces provided on this page above.
2. Sign and write the date of the practical examination in the spaces provided on this page above.
3. All working **MUST** be clearly shown where necessary.
4. Electronic calculators may be used.
5. This paper contains **13** printed pages.
6. Candidates should check the question paper to ascertain that **ALL** the pages are printed as indicated and that no questions are missing.

For Examiners Use Only:

Questions	Maximum Score	Candidates Score
1-28	80.0	

1. The wooden splints were slipped in and out of the non-luminous flame as shown in the diagram below. State the observation made on the wooden splint in set up A and B. (2mks)



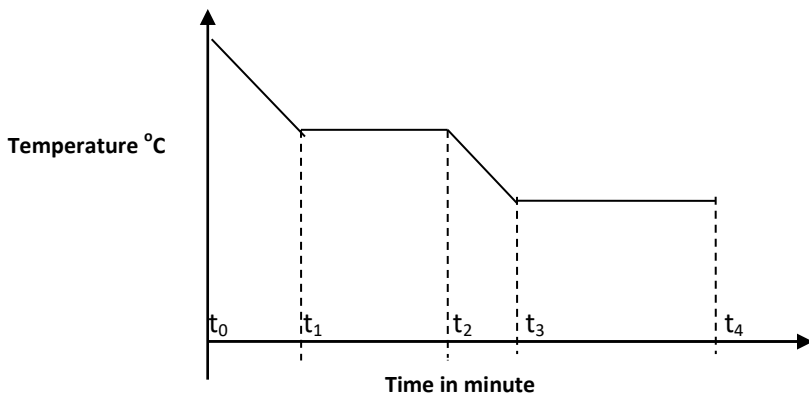
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2. The graph below represents a cooling curve of a substance from a gaseous state to a solid state.



- a) Give the name of the processes taking place between t_1 and t_2 . (1mk)

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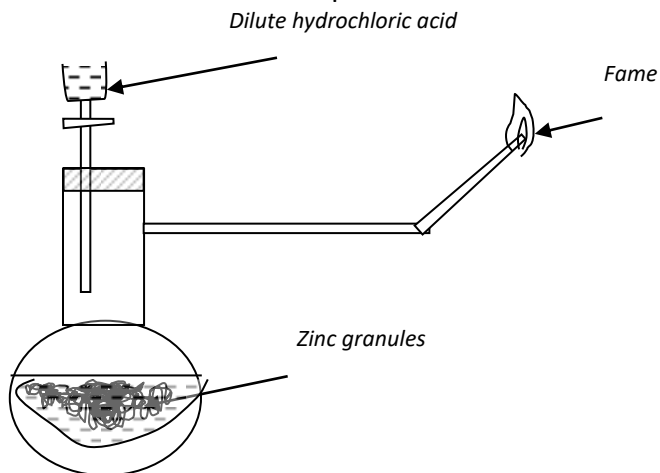
- b) Give the name of the energy change that occurs between t_3 and t_4 . (1mk)

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- c) If the substances undergoing cooling was iodine vapour, state the sections of cooling curve that would be missing. (1mk)

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3. Study the diagram below and answer the questions that follow.



- a) Write a chemical equation for each of the two reactions taking place in the experiment represented by the diagram above. (2mks)

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- b) Below are four metals G, H, K and L and how they react with cold water, hot water and steam.

- G - Does not react with cold water but reacts with hot water.
- H - Reacts vigorously with cold water.
- K - Reacts only with steam, does not react with cold water or hot water.
- L - Reacts slowly with cold water but vigorously with hot water

Arrange the metals in order of reactivity starting with the least reactive. (1mk)

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4. Iron roofing sheets were coated with zinc as a sacrificial metal.

- i) What is meant by the term 'sacrificial' as used in electrochemistry? (1mk)

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ii) Give the name of the process by which iron sheets are coated with zinc metal. (1mk)

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iii) Write an equation of the reaction leading to the formation of Rust. (1mk)

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5. Use the information in the table to answer the questions that follows. The letters do not represent the actual symbols of the element.

Element	P	Q	R	S	T
Atomic number	20	8	18	8	19
Mass number	40	16	40	18	39

a) Which two letters represent the same elements? Explain (2mks)

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b) Give the number of neutrons in atom of element T. (1mk)

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6. Both chlorine and iodine are halogens.

a) What are halogens? (1mk)

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b) In terms of structure and bonding, explain why boiling point of chlorine is lower than that of iodine. (2mks)

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7. A bottle of lead (II) sulphate has been contaminated by some solid Zinc nitrate. How can Zinc nitrate be obtained from the mixture in solid state? (2mks)

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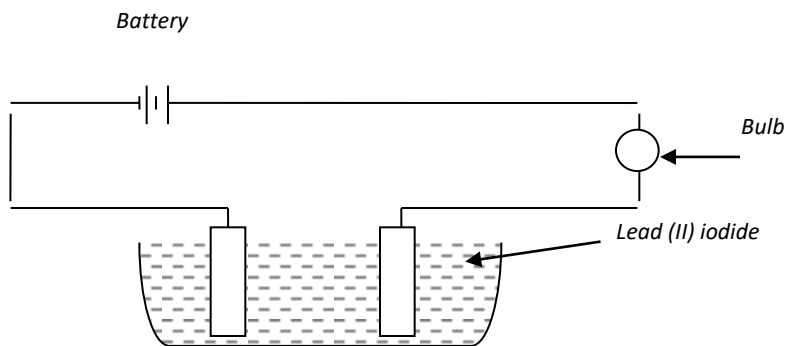
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8. The set-up below was used to investigate electrical conductivity of lead (II) iodide. Study it and use it to answer the questions that follow.



- a) Correct the omitted component in the above diagram. (1mk)
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- b) On the diagram.
- i) Label the cathode (1/2mk)
- ii) Show the direction of movement of electrons. (1/2mk)
- c) Write equation for the reaction that take place at the anode. (1mk)

9. The volume of a sample of nitrogen gas at a temperature of -18°C and 1.0×10^5 pascal was $3.0 \times 10^{-2} \text{m}^3$. Calculate the temperature at which the volume of the gas would be $2.8 \times 10^{-2} \text{m}^3$ at 1.0×10^5 pascals. (3mks)

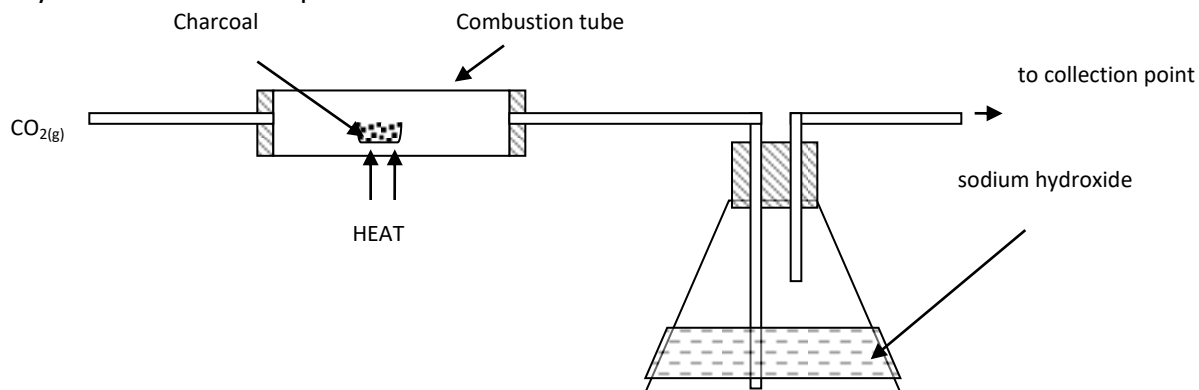
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10. Below is a diagram of a set-up of an experiment used by a student to investigate a property of carbon. Study it and answer the questions that follow.



a) Write an equation for the reaction taking place in the combustion tube. (1mk)

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b) Explain the observation that would be made in the flask if sodium hydroxide solution is replaced with calcium hydroxide solution. (2mks)

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11. Aluminium is used in making cooking vessels, extraction of metals and overhead cables. State the properties of aluminium that makes it suitable for the uses below.

i) Cooking vessels (1mk)

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ii) Extraction of metals (1mk)

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iii) Overhead cables (1mk)

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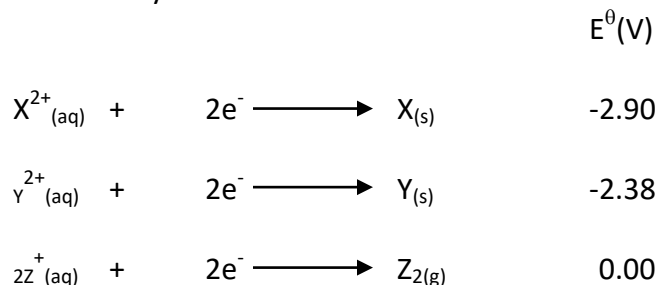
12. If chlorine gas is passed over heated iron fillings and product dissolved in water, a yellow solution is formed.

a) Identify the yellow solution. (1mk)

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b) What would be observed if the aqueous sodium hydroxide was added to the yellow solution? (1mk)

13. Study the given reduction potentials and answer the questions that follow. The letters do not represent actual symbols of elements.



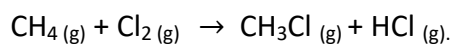
(i) Which element is likely to be hydrogen? (1mk)

(ii) Draw a diagram of an electrochemical cell formed when X and Y are combined to form a cell and show the direction of flow of electrons (2mks)

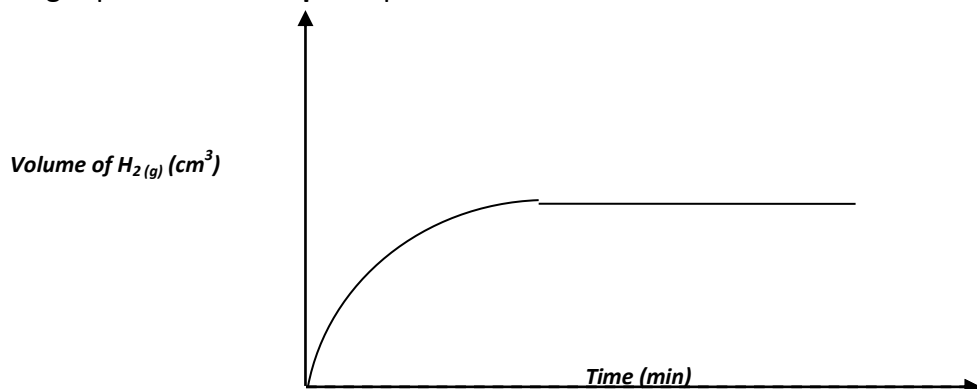
14. Use the bond energies given below to answer the questions that follow.

Bond	Bond energies KJ/mole
C - H	414
Cl - Cl	244
C - Cl	326
H - Cl	431

a) Calculate the heat change during for the reaction below. (3mks)



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15. A class reacted excess zinc granules with 1M hydrochloric acid and measured the volume of hydrogen gas produced at **s.t.p** and plotted curve I below.



a) Why did the student use excess zinc granules? (1mk)

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b) Show how you would use the graph above to calculate the rate of evolution of hydrogen gas between 1st minute and the 3rd minute. (1mk)

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c) On the same axis above, draw the kind of graph the students would get if powdered zinc was used instead. Label it *curve 2*. (1mk)

16. A radio-active substance with a half-life of 7 years had an initial activity of 9600counts per second.

a) Calculate the time it will take for the activity to fall to 600 counts per second. (2mks)

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b) What percentage of the initial activity will be remaining after 49 years? (2mks)

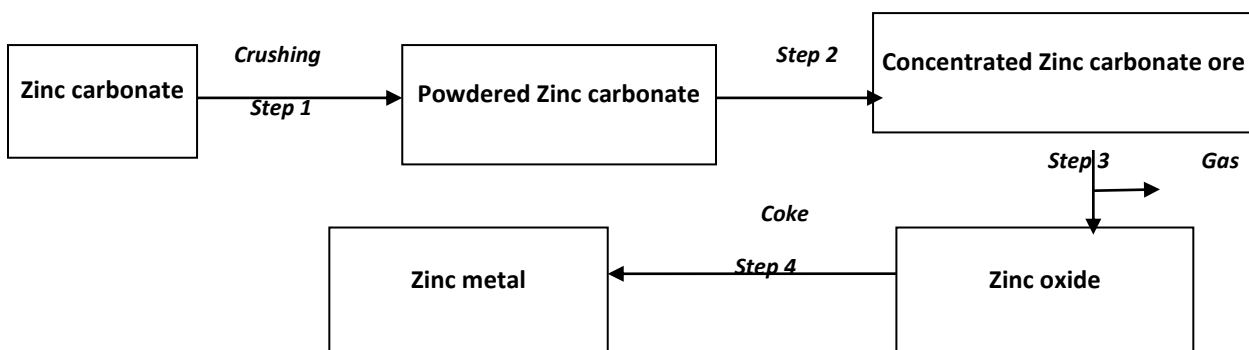
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17. The flow –chart below shows steps used in extraction of zinc from its ores.



a) Name the process that is used in *Step 2* to concentrate the ore. (1mk)

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b) Write an equation for the reaction which takes place in *Step 3*. (1mk)

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c) Name one use of zinc other than galvanizing. (1mk)

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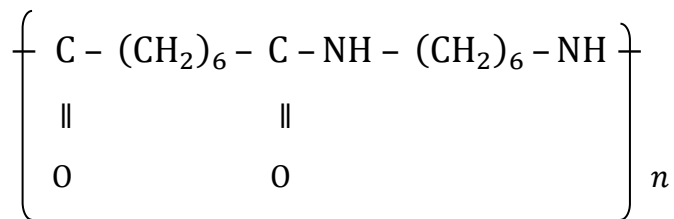
18. 10cm^3 of sodium hydroxide solution containing 4.0gdm^{-3} were required for complete neutralization of 0.09g of a dibasic acid. Calculate the relative molecular mass of the acid. (Na =23.0, H =1.0, O=16.0) (3mks)

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19. a) Nylon molecule has the structure below.



Determine the structure of the monomers.

(1mk)

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b) Q belongs to the family of hydrocarbons with the general formula C_nH_{2n} and has 3 carbon atoms in its molecule.

i) Write down the formula of Q.

(1mk)

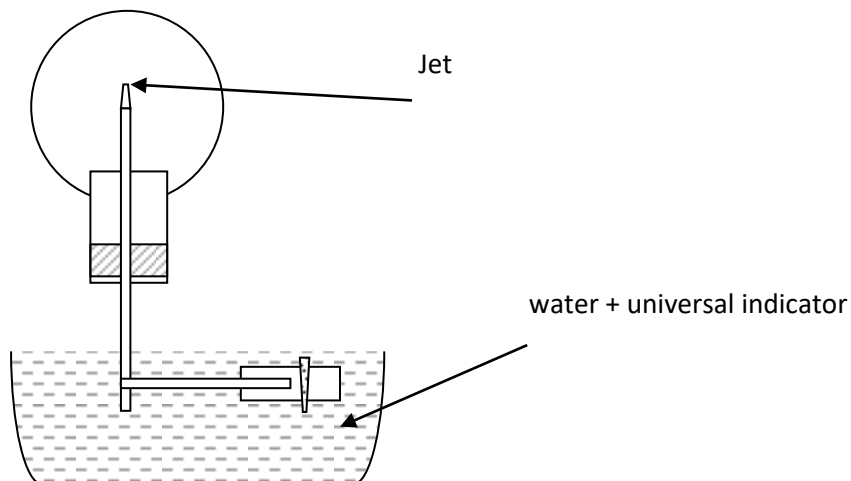
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ii) When Q is reacted with concentrated sulphuric (VI) acid compound P is formed, which is further reacted with water to form K. Identify substances. (2mks)

P:

K:

20. A student prepared ammonia in the laboratory and inverted the flask with the gas in water with Universal indicator solution.



a) In the diagram complete to show what was observed. (1/2mk)

b) State and explain the observation in (a) above. (2mks)

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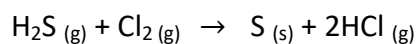
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c) State one property of ammonia we can deduce from the above observation. (1/2mk)

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21. In an experiment 2.4g of sulphur was obtained by reducing hydrogen sulphide and chlorine as shown in the experiment below.



Which of the reactants behaves as a reducing agent in the above reaction? Explain (2mks)

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22. In water treatment plants both chlorine and sodium carbonate is used. After preliminary purification, chlorine is added to the water followed by sodium carbonate.

a) What is the function of water treatment? (1mk)

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b) State two reasons why sodium carbonate is added after chlorine. (1mk)

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23. A hydrated salt of sodium has the formula $\text{Na}_2\text{SO}_4 \cdot x\text{H}_2\text{O}$. A 64.4g sample was heated until all the water of crystallization evaporated. The new mass of the sample was 28.4g. Determine the value of x .

(Na = 23.0, S = 32.0, H = 1.0) (3mks)

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24. a) Define an acid according to Bronsted and Lowry Theory. (1mk)

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b) Using the equation below identify the base and explain.



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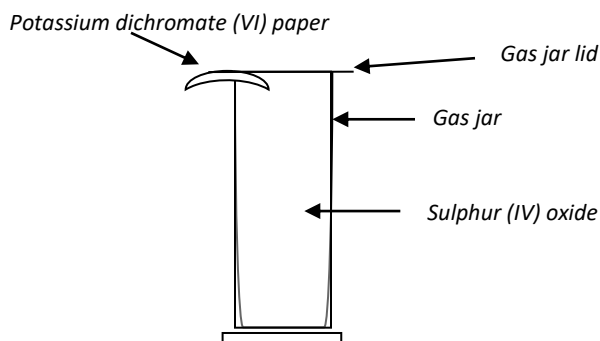
25. The table below shows the atomic number of some elements represented by letter J to Q (letters are not their actual symbols). Study and answer the questions that follow.

Element	J	K	L	M	N	P	Q
Atomic Number	11	17	15	14	12	20	19

- a) Write the electronic configuration of
- (i) M (1mk)
- (ii) P^{2+} (1mk)
- b) Write the formula of the compound formed when L combines with N (1mk)

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26. The setup below was used for testing of sulphuric (IV) oxide.



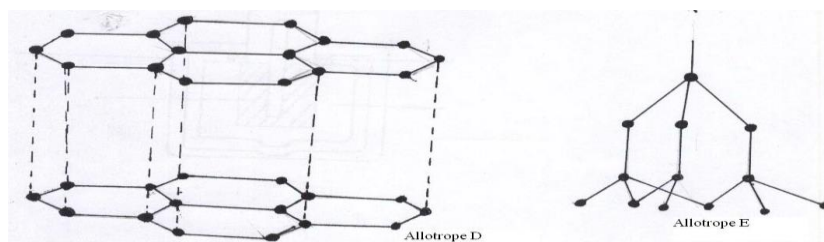
Potassium chromate (VI) paper which is orange in colour was introduced on the mouth of the gas jar full of sulphur (IV) oxide. State and explain the observation made. (2mks)

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27. The following diagrams show the structures of two allotropes of carbon. Study them and answer the questions that follow.



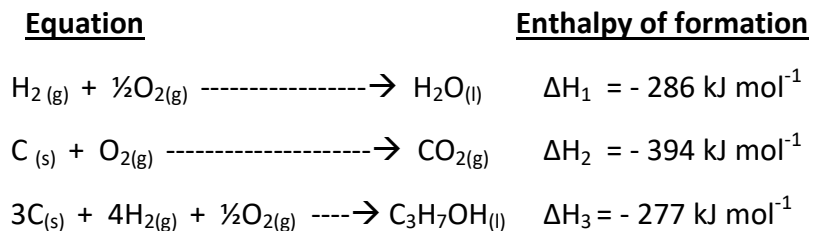
(i) Name the allotrope (2mks)

D..... E.....

(ii) Give one use of D (1mk)

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28. Use the information below to answer the questions that follows



a) Define the term “enthalpy of formation of a compound.” (1mk)

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b) Calculate the molar enthalpy of combustion, ΔH_4 of propanol



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