NOVA PIONEER
SCHOOLS FOR INNOVATORS & LEADERS

Form 3 End of Term 2 Chemistry Assessment
Paper 1
(Theory)
Term 1, 2020.
DATE: .....
MARKS: 80 Marks
2 hours

Name: .....

Track #: ..... House: .....

Total Score: ..... / 80 = ... %

Directions:

1. This assessment contains only one section.
2. Answer ALL the questions in the spaces provided in this question paper.
3. Read all questions carefully.
4. All ***working*** and ***key points*** must be shown clearly where necessary for full credit.
5. Review your answers before turning in your exam.
6. Silent non-programmable electronic calculators and math tables can be used in this assessment.

Mark Tally: Teacher's use only

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	

Answer All Questions (80 marks)

1. State two conditions that would make the boiling point of water to be higher than 100°C. [2 marks]

2. The atomic number of element Z is 18. Give one possible use of element Z. [1 mark]

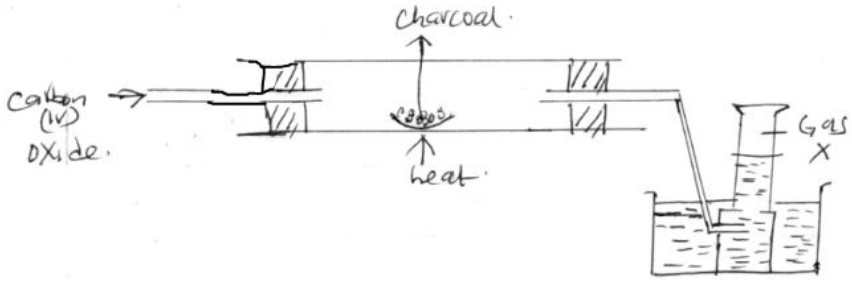
3. Element T has an atomic number of 9 while V has atomic number 11.
   a. Write down the electronic configuration of elements T and V. [2 marks]

      T: .....

      V: .....

   b. State the type of bond formed when T and V combine. [1 mark]

4. The following diagram shows carbon (IV) oxide passed over heated charcoal to produce gas X.

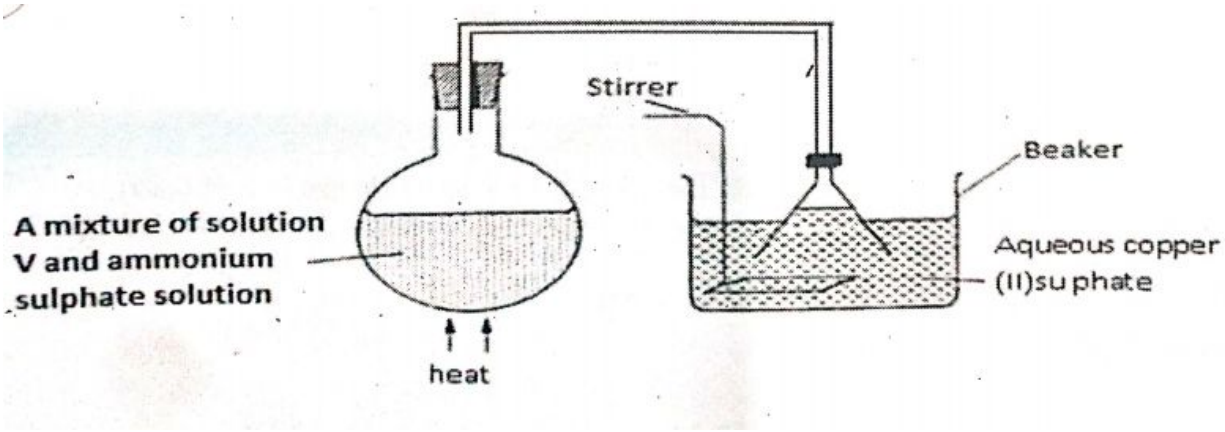


   a. Identify gas X. [1 mark]

   b. Write an equation for the reaction which produces gas X. [1 mark]

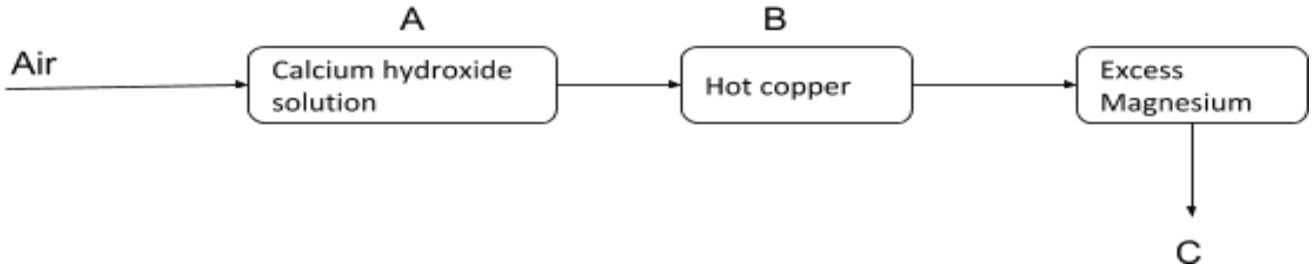
   c. The above experiment should be carried out in a fume chamber. Why? [1 mark]

5. A student set up the apparatus shown below to prepare ammonia gas and react it with copper (II) sulphate solution.



   a. Identity solution V. [1 mark]
   b. State the observations that were made in the beaker. [1 mark]

6. Air was passed through reagents as shown below.



a. State and explain the observations made when air is passed through chamber B for a long time. [2 marks]

b. Name one air component still present at C. [1 mark]

7. The table below shows the ionization energies for calcium.

1st Ionization Energy	*590 kJ/mol*
2nd Ionization Energy	*1150 kJ/mol*

a. Define ionization energy. [1 mark]

b. Explain why the second ionization energy for calcium is higher than the first. [1 mark]

8. Thomas Graham (20 December 1805[1] – 16 September 1869) was a British chemist known for his pioneering work in dialysis and the diffusion of gases. He is regarded as one of the founders of colloid chemistry.

a. State Graham's law of diffusion. [1 mark]

b. A gas P effuses through a porous material at a rate of 12 cm^3/s whereas gas A effuses through the same material at a rate of 7.2 cm^3/s. Given that the molar mass of P is 16, calculate the molar mass of A. [2 marks]

Ans: .....

9. Element R has an atomic number of 6 and S has an atomic number of 9. Using lewis dot (.) and cross (x) diagram, show how R and S combine to form a compound. [1 mark]

10. The table below shows pH values of solutions I, II, III and IV.

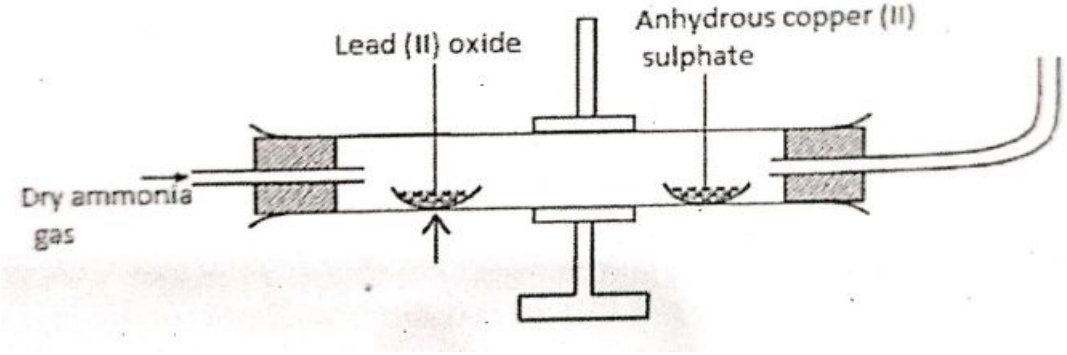
Solution	***I***	***II***	***III***	***IV***
pH	2	7	11	14

a. Which solution is likely to be sodium chloride solution? [1 mark]

b. A few drops of phenolphthalein indicator were added to solution (IV). State and explain the observations made. [2 marks]

c. Calculate the concentration of hydrogen ions in solution I. [2 marks]

11. Dry ammonia gas was passed over heated copper (II) oxide and the products passed over anhydrous copper (II) sulphate as shown in the diagram below.



State

a. Two observations made in the combustion tube. [2 marks]
b. The property of ammonia gas shown in this experiment. [1 mark]

12. When a white powder was heated, it decreased in mass and produced solid X which was reddish brown when hot and yellow when cold. A gas R which formed a white precipitate with calcium hydroxide was also evolved.
    a. Identify substances P and X. [2 marks]

    P: .....

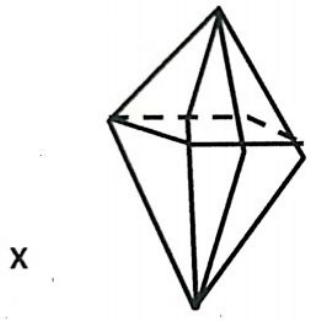
    X: .....

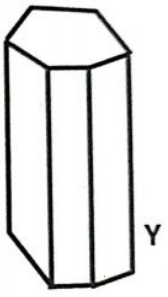
    b. Write an equation for the formation of a white precipitate. [1 mark]

13. Starting with lead (II) carbonate, explain how you would prepare a pure sample of lead (II) chloride. [3 marks]

14. Self raising flour contains a mixture of tartaric acid and sodium hydrogen carbonate. State and explain the role of tartaric acid in the mixture. [2 marks]

15. Sulphur occurs naturally in two different forms called allotropes.
    a. What are allotropes? [1 mark]
    b. Name the two allotropes of Sulphur labelled X and Y [2 marks]





16. Study the information in the table below and answer the questions that follow.

Element	*Atomic radius (nm)*	*Ionic radius (nm)*
W	0.114	0.195
X	0.072	0.136
Y	0.133	0.216
Z	0.099	0.181

a. Are the above elements metals or non-metals? Explain. [1 mark]

b. Select the most reactive element in the table above. Explain. [1 mark]

17. Iron roofs usually turn brown after sometime as a result of rust on their surfaces.
a. Explain whether rusting is a physical or a chemical change. [2 marks]

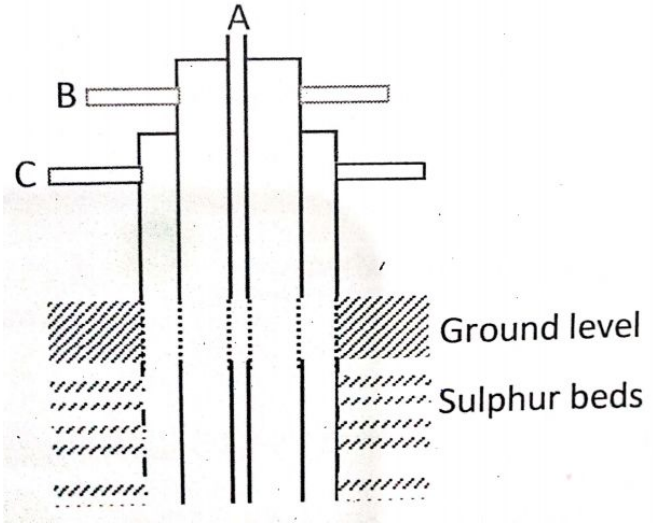
b. State one way of preventing rusting. [1 mark]

18. Explain why a high temperature is required for nitrogen to react with oxygen [1 mark]

19. The molar mass of caffeine is 194.19 g. Is the molecular formula of caffeine $C_4H_5N_2O$ or $C_8H_{10}N_4O_2$? (C = 12.00, H = 1.01, N = 14.00, O = 16.00). [2 marks]

20. A student bubbled carbon (IV) oxide through sodium hydroxide for a short while, and added dilute hydrochloric acid to the mixture. He observed bubbles of a colorless gas. Explain the student's observations. [2 marks].

21. The diagram below shows the extraction of sulphur by the Frasch process.



State the uses of pipes A, B and C [3 marks]

22. Use the information in the table below to answer the questions that follow. (Letter A, B, C, D and E are not actual symbols of the elements)

Oxide	**A_2O**	**BO**	**C_2O_3**	**DO_2**	**E_2O_5**	**ZO_2**
pH of oxide in water	13	9	X	X	1	4
Melting Point	1193	3075	2045	1728	563	-91

a. Identify the oxides with the following structures. [3 marks]

i. Giant atomic: .....

ii. Simple molecular: .....

iii. Giant ionic: .....

b. Write the formula of the chloride of B. [1 mark]

23. Molten lead bromide was electrolysed using graphite electrodes.

a. Define electrolysis. [1 mark]

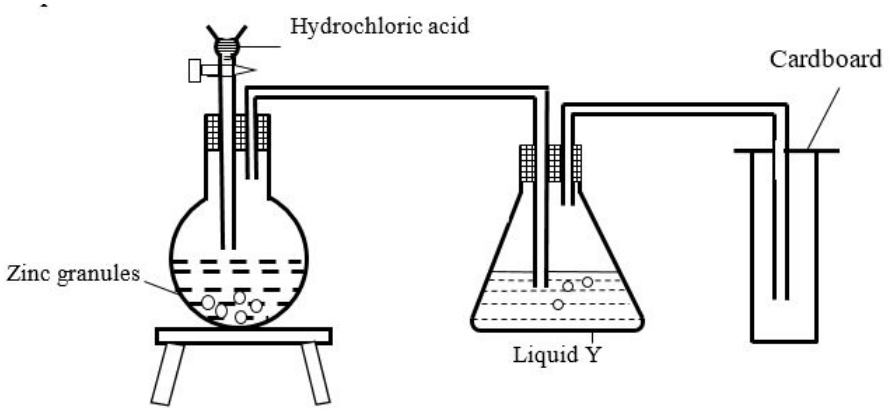
b. Write half reactions taking place at the cathode. [1 mark]

24. When a piece of sodium was put in a beaker, it darted over the water surface before dissolving.

a. Write an equation for the reaction between sodium and water. [1 mark]

b. State and explain the effect of the solution formed in (a) above on red and blue litmus papers. [2 marks]

25. The set up below was used to prepare dry hydrogen gas. Study it and answer the questions that follow.



a. With a reason, identify the mistake in the set-up above. [1 mark]

b. What would be liquid Y? [1 mark]

c. Give two physical properties of hydrogen gas [1 mark]

d. State one industrial use of hydrogen gas. [1 mark]

e. Determine the volume of hydrogen gas formed when excess zinc metal was used and 1100 cm^3 of 1 *M* hydrochloric acid was added. (V_m = 24.0 L) [2 marks]

26. DDT (Dichlorodiphenyltrichloroethane) is an insecticide banned by the US government because it is a hazard to fish birds and humans . Its preparation is described by the following reaction:

$$2C_6H_5Cl + C_2HOCl_3 \rightarrow C_{14}H_9Cl_5 + H_2O$$

chlorobenzene *chloral* *DDT*

a. If 451 g of chlorobenzene reacts with 899 g of chloral, identify the limiting reagent. (C = 12, H = 1, 0 = 16) [2 marks]

b. If 654 g of DDT was the actual mass isolated after the reaction, Calculate:

i. The Theoretical yield of DDT in grams. [2 marks]

ii. The percentage yield of DDT if 654 g of DDT was actually isolated. [2 marks]

27. A concentrated solution of sulphuric (IV) acid contains 70% H_2SO_4 and has a density of 1.8 g/cm^3. Determine the molarity of the sulphuric acid solution. (H= 1, S= 32, O=16) [3 marks]

28. A scuba diver is diving and exploring the bottom of a lake at pressures of 3.4 atm and at a temperature of 5^{0}C. The scuba diver notices that his oxygen tank is running low and takes a deep breath of oxygen to fill his lungs with 3.5 L, the maximum amount of air during inhalation referred to as lungs Inspiratory reserve volume (IRV). He holds his breath and does a quick emergency ascend to the surface whose temperature is 20^{0}C and 1 atm. Given that the normal adult Total lung capacity (TLC) is 6.0 Litres and that beyond this, the person suffers ruptured lungs hence fatality, explain if the scuba diver will survive upon reaching the surface. Show your working. [2 marks]

29. Why do aerosol/perfume containers display the warning “Do not throw into fire”? Explain the gas law in use. [2 marks]

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“Look up at the stars and not down at your feet. Try to make sense of what you see, and wonder about what makes the universe exist. Be curious.”
Stephen William Hawking, CH, CBE, FRS, FRSA, (8 January 1942 – 14 March 2018)