

SIR ARTHUR LEWIS COMMUNITY COLLEGE

Division of Agriculture

END OF SEMESTER ONE EXAMINATION – December 2018/2019

PROGRAMME TITLE : General Agriculture – Associate Degree (Year One)

COURSE TITLE : Chemistry

COURSE CODE : CHM102

DATE : 19th December, 2018

TIME : 3:00 pm

DURATION : 1 hour

ROOM : OTW - Room 3

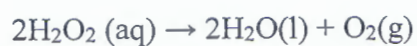
INVIGILATOR(S) :

INSTRUCTIONS:

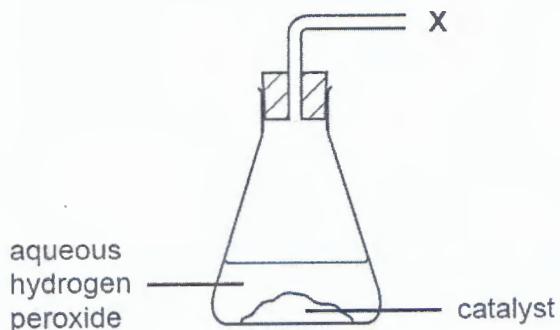
- Students must sign **IN** and **OUT** on the examination class list.
- Write your ID Number on *each* answer sheet.
- This paper contains forty (40) questions. Answer **ALL** questions by circling or shading the correct answer



1. Aqueous hydrogen peroxide undergoes catalytic decomposition as shown in the equation below.

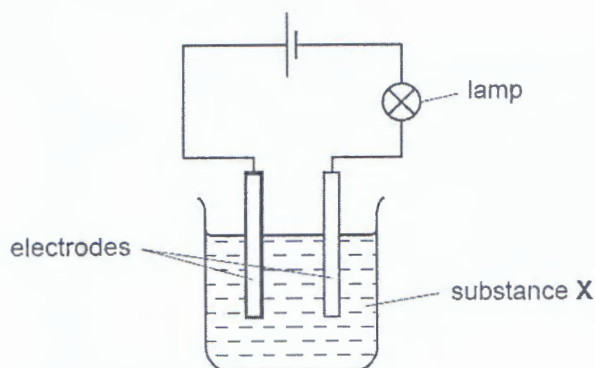


The diagram shows part of the apparatus used to measure the rate of decomposition.



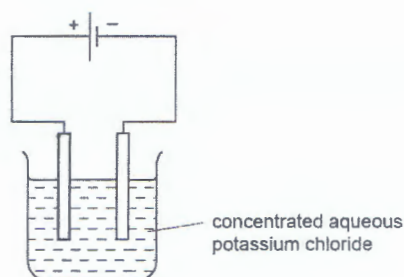
Which piece of apparatus is connected at position X?

- A burette
 - B gas syringe
 - C measuring cylinder
 - D pipette
2. In the circuit below, the lamp lights up.



What could X be?

- A a solution of ethanol in water
 - B a solution of sodium chloride in water
 - C liquid ethanol
 - D solid sodium chloride
3. What is the concentration of iodine, I_2 , molecules in a solution containing 2.54 g of iodine in 250 cm^3 of solution?
- A 0.01 mol / dm^3 B 0.02 mol / dm^3 C 0.04 mol / dm^3 D 0.08 mol / dm^3
4. A current was passed through concentrated aqueous potassium chloride, KCl , as shown.



Which entry in the table is correct?

	ions moving towards	
	the cathode (-ve)	the anode (+ve)
A	K ⁺ only	Cl ⁻ and OH ⁻
B	K ⁺ only	Cl ⁻ only
C	K ⁺ and H ⁺	Cl ⁻ only
D	K ⁺ and H ⁺	Cl ⁻ and OH ⁻

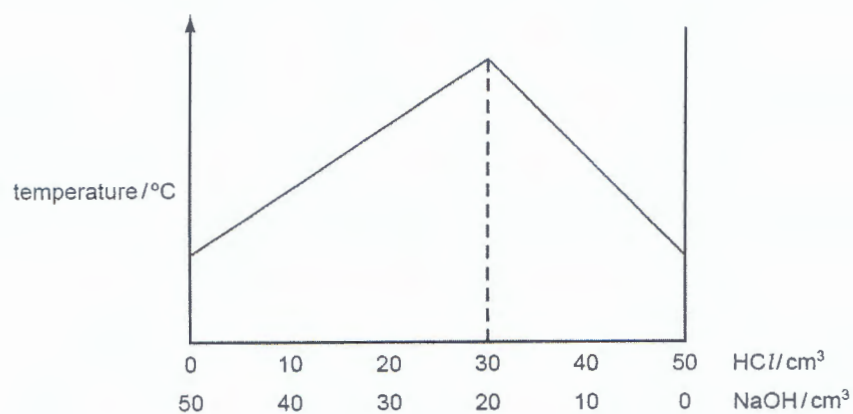
5. Which change will increase the speed of the reaction between 1 mol of each of the gases, X and Y?

- A a decrease in surface area of the catalyst
- B a decrease in temperature
- C a decrease in the volume of the reaction flask
- D an increase in the volume of the reaction flask

6. A solution of hydrochloric acid has a concentration of 2 mol / dm³. Different volumes of the acid are added to different volumes of aqueous sodium hydroxide.



The maximum temperature of each mixture is measured. The graph shows the results.



What is the concentration of the aqueous sodium hydroxide?

- A 0.67 mol / dm³
 - B 1.3 mol / dm³
 - C 1.5 mol / dm³
 - D 3.0 mol / dm³
7. Why does molten sodium chloride conduct electricity?
- A An electron is completely transferred from sodium to chlorine.
 - B Sodium ions are only weakly attracted to the chloride ions.
 - C The electrons in the sodium chloride are free to move.
 - D The sodium ions and the chloride ions are free to move.

8. Which of the following is an endothermic reaction?
- A the combustion of ethanol in air
 - B the formation of a carbohydrate and oxygen from carbon dioxide and water
 - C the oxidation of carbon to carbon dioxide
 - D the reaction between hydrogen and oxygen
9. At 400 °C the reaction between hydrogen and iodine reaches an equilibrium.
- $$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2\text{HI}(\text{g}) \quad \Delta\text{H} = -13 \text{ kJ}$$
- Which change in conditions would increase the percentage of hydrogen iodide in the equilibrium mixture?
- A a decrease in pressure
 - B a decrease in temperature
 - C an increase in pressure
 - D an increase in temperature
10. Which change will increase the speed of the reaction between 1 mol of each of the gases, X and Y?
- A a decrease in surface area of the catalyst
 - B a decrease in temperature
 - C a decrease in the volume of the reaction flask
 - D an increase in the volume of the reaction flask
11. When 20 cm³ of a 2 mol/dm³ solution of potassium hydroxide is mixed with 20 cm³ of a 1 mol/dm³ solution of sulphuric acid, the temperature of the mixture rises.
- What best explains this?
- A Sulphuric acid is a strong acid.
 - B The potassium hydroxide solution is more concentrated than the sulphuric acid solution.
 - C The reactants have higher energy content than the products.
 - D Potassium hydroxide is a very strong alkali.
12. Which equation represents the reaction between hydrochloric acid and sodium hydroxide?
- A $\text{Cl}^- + \text{Na}^+ \rightarrow \text{NaCl}$
 - B $2\text{H}^+ + \text{O}^{2-} \rightarrow \text{H}_2\text{O}$
 - C $\text{O}_2 + \text{H}_2 \rightarrow \text{H}_2\text{O}$
 - D $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
13. How many moles are present in 34 grams of Cu (OH) ₂?
- A 0.45
 - B 0.53
 - C 0.35
 - D 0.60
14. How much does 4.2 moles of Ca (NO₃)₂ weigh?
- A 588g
 - B 124 g
 - C 460g
 - D 689g

15. Which of the following is not a precaution to observe in a titration?

- A Rinsing the burette with the substance it is going to contain
- B Clamping the burette vertically
- C Ensure that the region below the tap is full
- D Rinse the conical flask with the substance it is going to contain

16. In the following equation, which element has been reduced $\text{Cu}^+ + \text{HNO}_3 \rightarrow \text{CuNO}_3 + \text{H}_2$

- A Cu
- B H
- C N
- D O

17. Which of the following is the amount of charge carried by one mole of electrons?

- A $6.022 \times 10^{23} \text{ C}$
- B 96,500C
- C 193000C
- D 3600C

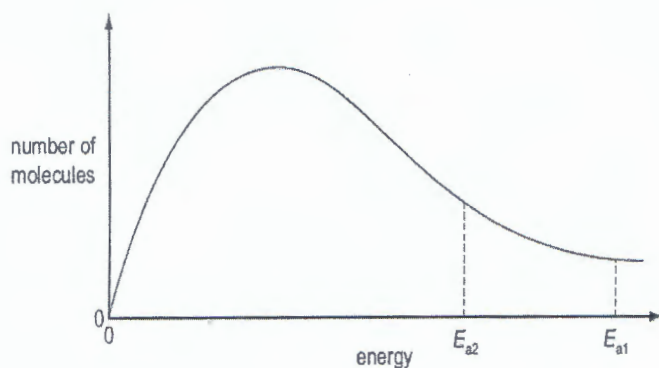
18. The dissociation of dinitrogen tetra-oxide into nitrogen dioxide is represented by the equation below.



If the temperature of an equilibrium mixture of the gases is increased at constant pressure, will the volume of the mixture increase or decrease and why?

- A. The volume will increase, but only because of a shift of equilibrium towards the right
- B. The volume will increase, both because of a shift of equilibrium towards the right and also because of thermal expansion
- C. The volume will decrease, because a shift of equilibrium towards the left would more than counteract any thermal expansion
- D. The volume will stay the same, because any thermal expansion could be exactly counteracted by a shift of equilibrium toward the left

19. The diagram shows the Maxwell-Boltzmann energy distribution curve for molecules of a mixture of two gases at a given temperature. For a reaction to occur the molecules must collide together with sufficient energy.



E_a is the activation energy for the reaction between the gases. Of the two values shown, one is for a catalyzed reaction, the other for an uncatalysed one.

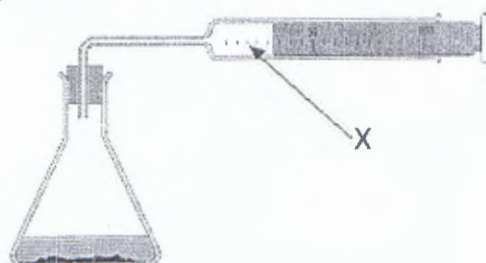
Which pair of statements is correct when a catalyst is used?

A	E_{a1} catalysed reaction more effective collisions	E_{a2} uncatalysed reaction fewer effective collisions
B	E_{a1} uncatalysed reaction more effective collisions	E_{a2} catalysed reaction fewer effective collisions
C	E_{a1} catalysed reaction more effective collisions	E_{a2} uncatalysed reaction fewer effective collisions
D	E_{a1} uncatalysed reaction more effective collisions	E_{a2} catalysed reaction fewer effective collisions

20. Which expression gives the pressure exerted by 1.6×10^{-3} mol of N_2 in a container of volume 3.0 dm^3 at $273 \text{ }^\circ\text{C}$?
- A. $\frac{1.6 \times 10^{-3} \times 8.31 \times 273}{3.0 \times 10^{-6}}$ Pa
- B. $\frac{1.6 \times 10^{-3} \times 8.31 \times 273+273}{3.0 \times 10^{-6}}$ Pa
- C. $\frac{1.6 \times 10^{-3} \times 8.31 \times 273}{3.0 \times 10^{-3}}$ Pa
- D. $\frac{1.6 \times 10^{-3} \times 8.31 \times 273+273}{3.0 \times 10^{-3}}$ Pa
21. In the reaction: $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ the reducing agent is:
- A. Fe_2O_3
- B. CO
- C. Fe
- D. CO_2
22. Which one of the following reactions is an oxidation reduction reaction?
- A. $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$
- B. $3\text{CuO} + 2\text{NH}_3 \rightarrow 3\text{Cu} + 3\text{H}_2\text{O} + \text{N}_2$
- C. $\text{NaNO}_2 + \text{HCl} \rightarrow \text{NaCl} + \text{HNO}_2$
- D. $\text{CaSO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{SO}_2$
23. Oxidation is defined as:
- A. the loss of electrons and an increase in oxidation number
- B. the gain of electrons and an increase in oxidation number
- C. the loss of electrons and a decrease in oxidation number
- D. the gain of electrons and a decrease in oxidation number
24. In an electrochemical cell (voltaic), the anode is:
- A. the electrode at which reduction occurs.
- B. the electrode at which electrons are produced
- C. the negative electrode
- D. all of the above
25. Which of the following is true about an electrolytic cell?
- A. Electrons flow from the cathode to the anode in the external circuit.
- B. Oxidation occurs at the cathode.
- C. The redox reaction involved in such a cell is spontaneous.
- D. None of the above.

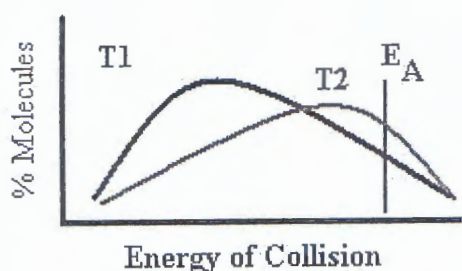
26. Which atom forms an ion that would migrate toward the cathode in an electrolytic cell?
- Na
 - F
 - I
 - Cl
27. In the reaction $2K + Cl_2 \rightarrow 2KCl$, the species oxidized is
- K
 - Cl_2
 - Cl^-
 - K^+
28. Catalysts are used in industry because
- they lower the temperature at which the reaction can proceed.
 - they increase the rate at which the products are formed.
 - they increase the yield of the products.
 - they remove the products from the reaction mixture as the products form
29. When powdered calcium carbonate is added to a solution of hydrochloric acid, it reacts completely within seconds. When the same mass of calcium carbonate chips are added to a similar amount of hydrochloric acid, the reaction takes several minutes to go to completion. Why?
- The powder has a greater surface area.
 - An acid will react faster with a powder.
 - The calcium carbonate chips are less soluble than the powder.
 - There are more impurities in the calcium carbonate chips.

30. The diagram shows the apparatus for studying the rate of reaction for the decomposition of hydrogen peroxide. Name the gas labelled X in the syringe.



- Hydrogen
- Carbon dioxide
- Oxygen
- Water vapour

Use your knowledge of collision theory and the energy distribution shown at right to answer questions 31 - 32. Assume that the graph shows the range of energies of collision of a collection of reactants at two temperatures.



31. Which is the highest temperature?
- $T_1 = T_2$
 - $T_1 < T_2$
 - $T_1 > T_2$
 - It is impossible to tell.

32. Which of the curves has the greatest number of collisions possessing the activation energy?
- A. T1 has the greatest number of collisions possessing the activation energy
 - B. T2 has the greatest number of collisions possessing the activation energy
 - C. Both have an equal number of collisions possessing the activation energy.
 - D. It is impossible to tell
33. Sodium hydroxide, NaOH, is an example of a:
- A. Strong acid
 - B. Conjugate base
 - C. Strong base
 - D. Conjugate acid
34. An exothermic reaction is allowed to reach equilibrium. If heat is then removed, the equilibrium will shift to
- A. to the reactants side
 - B. to the products side
 - C. to the middle
 - D. to the acid
 - E.
35. When ΔH is negative it represents a (n)
- A. exothermic reaction
 - B. endothermic reaction
 - C. neutralization reaction
 - D. acid-base reaction
36. The three factors that affect the equilibrium of a reaction are temperature, pressure and
- A. Catalyst
 - B. Concentration
 - C. Enthalpy
 - D. Surface area
37. A compound that donates a H^+ ion is
- A. A conjugate acid
 - B. Bronsted-Lowry acid
 - C. Arrhenius acid
 - D. Bronsted-Lowry base
38. Which of the following is transferred between a conjugate acid- base pair?
- A. An electron
 - B. A neutron
 - C. A proton
 - D. Hydroxide ion

39. What is the conjugate acid in this equation?



- A. PO_4^{3-}
- B. NO_3^-
- C. HNO_3
- D. HPO_4^{3-}

40. During electrolysis, mass of a substance produced is proportional to

- A. time of constant current
- B. strength of current
- C. voltage provided
- D. both A and B

