

AGA KHAN UNIVERSITY EXAMINATION BOARD
SECONDARY SCHOOL CERTIFICATE
CLASS X
ANNUAL EXAMINATIONS 2021
Chemistry
Total Time: 1 hour 40 minutes
Total Marks: 50 (40-Theory & 10-Alternate to Practical)

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 50 only.
4. Question Distribution:

Theory	Alternate to Practical (ATP)
40 MCQs	10 MCQs

5. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.

Correct Way	Incorrect Ways
1 ☐ A ☐ B ☒ C ☐ D	1 ☐ A ☐ B ☒ C ☐ D
	2 ☐ A ☐ B ☒ C ☐ D
	3 ☐ A ☐ B ☒ C ☐ D
	4 ☐ A ☐ B ☒ C ☐ D

Candidate's Signature

6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
8. The marks obtained on the 40 MCQs will be equated to the total marks of 65 for the theory examination results.
9. You may use a simple calculator if you wish.

THEORY (Questions 1-40)

1. When nitric acid is added to magnesium hydroxide, it yields magnesium nitrate and a by-product Y.

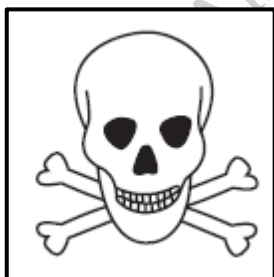
The CORRECT representation of this reaction using a balanced chemical equation would be

- A. $\text{MgOH} + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$
B. $\text{MgOH}_2 + \text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2\text{O}$
C. $\text{Mg}(\text{OH})_2 + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{H}_2$
D. $\text{Mg}(\text{OH})_2 + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$
2. The set of reactants that produces a combination of soluble and insoluble salts is
- A. copper + nitric acid.
B. zinc + copper sulphate.
C. potassium carbonate + sulphuric acid.
D. magnesium sulphate + barium chloride.
3. Brønsted-Lowry theory was able to explain the
- A. reactions between acidic and basic oxides.
B. reactions in non-protonic solvents.
C. acidic behaviour of AlCl_3 .
D. basic nature of NH_3 gas.
4. Aleena titrates 0.0450 M aqueous solution of sulphuric acid with 25 cm³ of 0.120 M aqueous solution of potassium hydroxide using phenolphthalein as an indicator.
- How much volume of aqueous solution of sulphuric acid will she utilise for this titration?
- A. 0.015 cm³
B. 33.33 cm³
C. 66.67 cm³
D. 133.33 cm³
5. The equation that exemplifies Arrhenius theory is
- A. $\text{CO}_{2(\text{g})} \xrightarrow{\text{H}_2\text{O}} \text{H}_2\text{CO}_{3(\text{aq})}$
B. $\text{NH}_{3(\text{g})} \xrightarrow{\text{H}_2\text{O}} \text{NH}_{4(\text{aq})}^+ + \text{OH}_{(\text{aq})}^-$
C. $\text{H}_2\text{SO}_{4(\text{l})} \xrightarrow{\text{H}_2\text{O}} 2\text{H}_{(\text{aq})}^+ + \text{SO}_{4(\text{aq})}^{2-}$
D. $\text{CH}_3\text{NH}_{2(\text{aq})} \xrightarrow{\text{H}_2\text{O}} \text{CH}_3\text{NH}_{3(\text{aq})}^+ + \text{OH}_{(\text{aq})}^-$
6. Water is an example of Lewis base because it tends to
- A. accept a proton.
B. donate a proton.
C. accept an electron pair.
D. donate an electron pair.

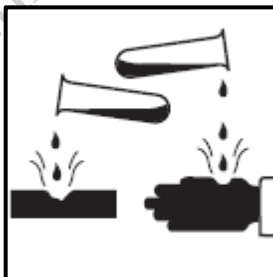
7. One mole of compound **X** gives two moles of ions on dissociation in aqueous medium. When compound **X** reacts with calcium carbonate, it causes bubbling of an acidic gas.

The compound **X** is a dilute solution of

- A. sulphuric acid.
 - B. hydrochloric acid.
 - C. sodium hydroxide.
 - D. potassium hydroxide.
8. Citrus fruits have high acidity with low pH.
- This statement indicates that citrus fruits have
- A. no detectable H^+ or OH^- ions.
 - B. high concentrations of H^+ ions.
 - C. high concentrations of OH^- ions.
 - D. equal concentrations of H^+ and OH^- ions.
9. A compound with the formula $\text{C}_2\text{H}_3\text{O}_2\text{Na}$ is formed when sodium carbonate reacts with
- A. ethanal.
 - B. ethanol.
 - C. propanone.
 - D. ethanoic acid.
10. When storing ethanol in the Science laboratory, which symbol is the MOST appropriate to place it on its label?



A



B



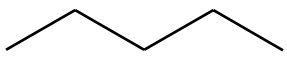
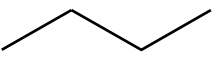
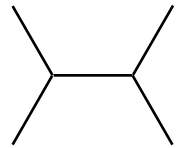
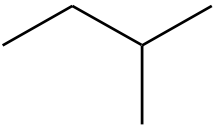
C



D

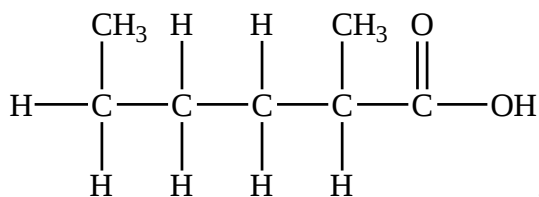
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11. Which pair of alkanes are isomers of each other?

			
I	II	III	IV

- A. I and II
- B. I and IV
- C. II and III
- D. III and IV

12. The functional group present in the given molecule is



- A. ester.
- B. amide.
- C. hydroxyl.
- D. carboxylic acid.

13. The molecular formula of an alkene having eight carbon atoms is

- A. C_8H_{14}
- B. C_8H_{16}
- C. C_8H_{17}
- D. C_8H_{18}

14. Butane can be converted into sec-butyl by the

- A. addition of one hydrogen atom to C-1.
- B. addition of one hydrogen atom to C-2.
- C. removal of one hydrogen atom from C-1.
- D. removal of one hydrogen atom from C-2.

15. Two successive members of a homologous series differ by a mass unit that is equivalent to

- A. 1 amu.
- B. 12 amu.
- C. 14 amu.
- D. 16 amu.

16. Complementary base pairing in deoxyribonucleic acid (DNA) allows the molecule to

- A. replicate itself accurately.
- B. direct the synthesis of ribose sugar.
- C. form a bond between adenine and uracil.
- D. undergo hydrolysis in alkaline condition.

17. Protease enzyme breaks down proteins into

- A. glucose.
- B. glycerols.
- C. fatty acids.
- D. amino acids.

18. The given statements describe a micronutrient.

- It cannot be produced naturally by the human body.
- It supports the immune system of the human body.
- It is essential for cell division and growth.
- It is richly found in shellfish and meat.

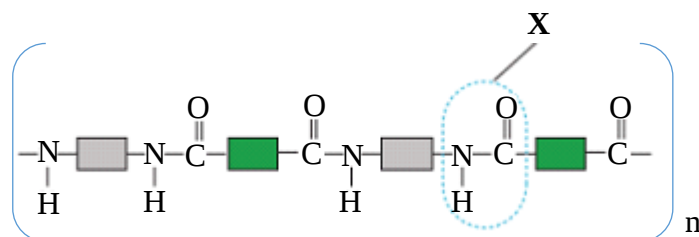
This micronutrient is

- A. zinc.
- B. copper.
- C. calcium.
- D. magnesium.

19. If three molecules of palmitic acid react with one molecule of propan-1,2,3-triol, then the resultant macromolecule is of

- A. fat.
- B. protein.
- C. vitamin.
- D. carbohydrate.

20. The given figure shows a part of a macromolecule.



The monomers at X are joined through a/an

- A. ester linkage.
- B. ether linkage.
- C. peptide linkage.
- D. glycosidic linkage.

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21. Thousands of glucose monomers make up the macromolecule of starch through the process of
- addition.
 - hydrolysis.
 - condensation.
 - neutralisation.
22. Monosaccharides differ from disaccharides on the basis of their
- colour.
 - hydrolysis.
 - physical state.
 - solubility in water.
23. A molecule of fructose contains five hydroxyl groups and one
- aldehyde group.
 - carboxyl group.
 - ketone group.
 - amino group.
24. The chemical reaction that does NOT contribute to acid rain is
- $\text{SO}_{2(g)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{H}_2\text{SO}_{3(aq)}$
 - $2\text{H}_2\text{SO}_{3(aq)} + \text{O}_{2(g)} \rightarrow 2\text{H}_2\text{SO}_{4(aq)}$
 - $2\text{NO}_{2(g)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{HNO}_{3(aq)} + \text{HNO}_{2(aq)}$
 - $\text{NaOH}_{(aq)} + \text{HNO}_{3(aq)} \rightarrow \text{NaNO}_{3(aq)} + \text{H}_2\text{O}_{(l)}$
25. Which of the following statements is TRUE for troposphere?
- The middle portion of troposphere comprises of the ozone layer.
 - The troposphere is situated between stratosphere and mesosphere.
 - The troposphere hardly contains any water so it lacks cloud formation.
 - The temperature in the troposphere decreases with the increase in altitude.
26. What is ozone?
- An odourless gas
 - A transparent gas
 - An isotope of oxygen
 - An allotrope of oxygen
27. It is advised to switch off gas heaters before going to sleep. This is because the combustion of natural gas in a poorly ventilated room produces carbon monoxide.

The inhalation of carbon monoxide for a long time may reduce the blood's

- oxygen level.
- glucose level.
- salt concentration.
- water concentration.

28. Which of the following is a greenhouse gas?
- A. Oxygen
 - B. Hydrogen
 - C. Carbon dioxide
 - D. Sulphur dioxide
29. Depletion of ozone layer causes an increase in the amount of ultraviolet (UV) radiations that reaches the Earth's surface.

In human beings, exposure to higher UV levels may cause

- I. asthma
 - II. cataract
 - III. diabetes
 - IV. skin cancer
- A. I and II.
 - B. I and III.
 - C. II and IV.
 - D. III and IV.
30. The MOST convenient method used domestically to remove temporary hardness from water is
- A. zeolite process.
 - B. boiling process.
 - C. Clark's method.
 - D. washing soda method.
31. The CORRECT set of properties that allows water to dissolve all ionic and many molecular compounds is its
- A. density and covalent bonding.
 - B. polarity and covalent bonding.
 - C. density and hydrogen bonding.
 - D. polarity and hydrogen bonding.
32. Which of the following compounds are agricultural wastes that cause water pollution?
- I. Fertilisers
 - II. Oil and greases
 - III. Pesticides
 - IV. Heavy metals
- A. I and II
 - B. I and III
 - C. II and IV
 - D. III and IV

33. The water borne disease which causes the human body to loose salts is
- A. cholera.
 - B. jaundice.
 - C. hepatitis.
 - D. fluorosis.
34. In raw water treatment, the purpose of adding alum is to
- A. form flocs of suspended particles.
 - B. destroy harmful microorganisms.
 - C. eliminate foul-smelling gases.
 - D. remove colour and taste.
35. The process that returns water into the atmosphere is
- A. deposition.
 - B. precipitation.
 - C. transpiration.
 - D. condensation.
36. The industrial process for extracting aluminium through electrolysis is
- A. Bayer.
 - B. Calcination.
 - C. Hall-Hérault.
 - D. Froth floatation.
37. The fractional distillation of crude oil does NOT yield
- A. kerosene.
 - B. charcoal.
 - C. grease.
 - D. wax.
38. On an industrial scale, urea is produced by reacting ammonia with
- A. ozone.
 - B. oxygen.
 - C. carbon dioxide.
 - D. carbon disulphide.
39. Iron is used as a catalyst in the manufacturing of ammonia by Haber process to
- A. prevent the decomposition of ammonia.
 - B. speed up the rate of formation of ammonia.
 - C. remove impurities from the reaction mixture.
 - D. reduce the temperature of the reaction mixture.

40. The source(s) of hydrogen and nitrogen for the manufacturing of ammonia by Haber process is/are

	Hydrogen	Nitrogen
A	air	air
B	oil	air
C	oil	oil
D	air	oil

ALTERNATE TO PRACTICAL (ATP: Questions 41-50)

Use the given information to answer Q.41, Q.42 and Q.43.

The neutralisation of 10 cm³ of oxalic acid by sodium hydroxide was investigated by titration. The oxalic acid solution contained 9.6 g/dm³ of the acid. The sodium hydroxide solution contained 4.0 g/dm³ of the alkali. The sodium hydroxide solution was placed in the burette. The results of the titration were as follows.

Titration number	1 st Burette Reading (cm ³)	2 nd Burette Reading (cm ³)
1	0.0	15.1
2	15.1	30.1
3	30.1	45.0

41. How many moles of NaOH will neutralise 1 mole of H₂C₂O₄·2H₂O?
- A. 2.0 mol
B. 3.0 mol
C. 4.0 mol
D. 9.6 mol
42. The concentration of the oxalic acid solution (Atomic Masses: C = 12 amu, O = 16 amu and H = 1 amu) used in this titration is
- A. 0.076 M.
B. 0.106 M.
C. 2.4 M.
D. 9.6 M.
43. The average volume of sodium hydroxide solution used in this titration is
- A. 15.0 cm³.
B. 30.1 cm³.
C. 45.0 cm³.
D. 90.2 cm³.

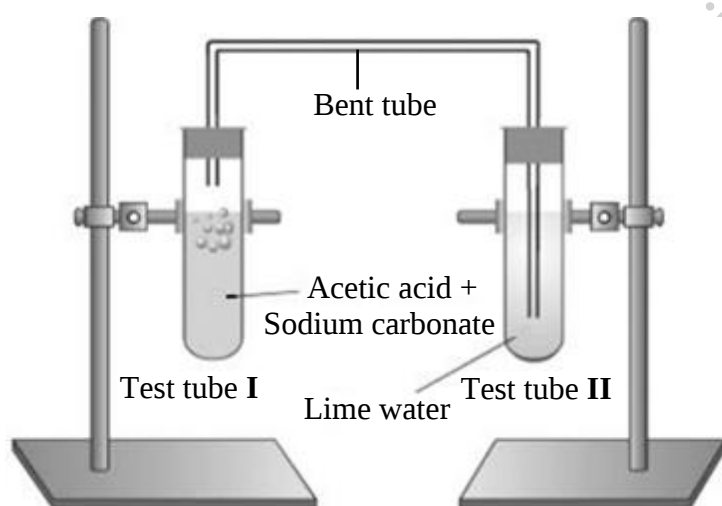
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44. A student investigated a sample containing white powder by decomposing it on a Bunsen flame. It produced a gas **X** which turned moist litmus paper blue.

Based on the given information, it can be inferred that gas **X** present in the tested mixture is

- A. chlorine.
 - B. ammonia.
 - C. carbon dioxide.
 - D. nitrogen dioxide.
45. For a flame test, salts are mixed with a few drops of concentrated hydrochloric acid to
- A. convert them into coloured compounds.
 - B. convert them into their chlorides.
 - C. remove impurities from them.
 - D. remove moisture from them.

Use the given diagram to answer Q.46 and Q.47.



46. The purpose of using a bent tube in the shown setup is to
- A. facilitate the migration of ions.
 - B. prevent the mixing of two solutions.
 - C. allow the movement of gas molecules.
 - D. maintain charge balance in both test tubes.
47. At the end of this experiment, which results would be visible in test tube **I** and **II**?

	Test tube I	Test tube II
A	Effervescence + Colourless solution of sodium ethanoate	Lime water turns cloudy white.
B	Effervescence + Colourless solution of sodium ethanoate	Lime water becomes pale yellow.
C	Effervescence + Colourless solution of sodium ethoxide	Lime water turns cloudy white.
D	Effervescence + Colourless solution of sodium ethoxide	Lime water becomes pale yellow.

48. When a mixture of ammoniacal silver nitrate and glucose solution are heated on a water bath, the aldehyde group of glucose oxidises itself and reduces the diamminesilver(I) ion to metallic silver.

The structural feature that makes the aldehyde very easy to oxidise is the presence of a/ an

- A. single bond between two carbon atoms.
 - B. hydrogen atom attached to the carbonyl group.
 - C. alkyl group next to carbon-oxygen double bond.
 - D. double bond between carbon and oxygen atoms.
49. A blue flame is preferred over yellow flame for heating purposes in the laboratory because it is
- A. reducing and provides more energy.
 - B. reducing and produces a lot of soot.
 - C. oxidising and produces a lot of soot.
 - D. oxidising and provides more energy.
50. A student observed the formation of scum when she/ he tested the cleansing action of a soap with a sample of hard water.

This insoluble scum is formed by the combination of the negative ion of the soap with

- A. Al^{3+}
- B. Mg^{2+}
- C. Na^{+}
- D. K^{+}

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