

KENYA CERTIFICATE OF BASIC EDUCATION

SENIOR SCHOOL ASSESSMENT

DECEMBER ASSIGNMENT 2026

GRADE 10 – CHEMISTRY

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ School: _____

Assessment Number: _____ Date: _____

School Code: _____ Signature: _____

INSTRUCTIONS TO CANDIDATES

1. Write your name in the spaces provided above.
2. Write the name of your school and your stream in the spaces provided.
3. Write your admission number and the date of the assessment in the spaces provided.
4. This paper consists of two sections: A and B.
5. Answer all questions in section A and section B.
6. Answer the questions in English.
7. All answers **MUST** be written in the spaces provided in the paper.
8. Do **NOT** remove any page from this question paper.

FOR OFFICIAL USE ONLY (EXAMINER'S USE)

SECTION	SECTION A	SECTION B	% SCORE	EE1	EE2	ME1	ME2	AE1	AE2	BE1	BE2
SCORE RANGE	30 MARKS	50 MARKS		90-100	75-89	58-74	41-57	31-40	21-30	11-20	1-10
POINTS				8 POINTS	7 POINTS	6 POINTS	5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT
LEARNER'S TOTAL SCORE											

SECTION A (30 MARKS)

INSTRUCTIONS TO LEARNERS

1. This paper consists of **TWO SECTIONS: A and B**.
2. Answer **ALL** questions.
3. **Section A carries 30 marks** while **Section B carries 50 marks**.
4. All questions are **structured**; there are **no multiple-choice questions**.
5. Show all working for calculations.
6. Write chemical formulae and equations correctly and balance equations where necessary.
7. Study the diagrams carefully before answering questions based on them.
8. Use appropriate scientific terminology throughout your answers.
9. Non-programmable calculators may be used where necessary.

SECTION A: 30 MARKS

Answer ALL questions in this section.

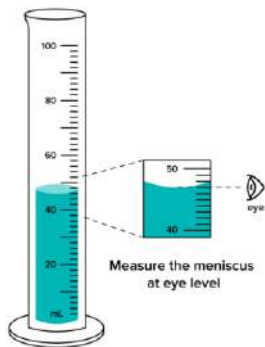
1. A mixture contains **iron filings, sand and common salt**.

a) Name the method that can be used to separate the iron filings from the mixture. **(1 mark)**

b) State the method used to separate sand from the salt solution after adding water to the remaining mixture. **(1 mark)**

c) Name the method that can be used to obtain solid sodium chloride from the salt solution. **(1 mark)**

2. A learner measured the volume of a liquid using a measuring cylinder as shown below.



a) What should the learner do to obtain an accurate reading of the volume? **(1 mark)**

b) At which part of the meniscus should the reading be taken for water? **(1 mark)**

c) State the appropriate position of the learner's eye when taking the reading. **(1 mark)**

3. Study the apparatus represented below.



a) Identify the apparatus represented above. _____ **(1 mark)**

b) State one use of the apparatus in the chemistry laboratory. **(1 mark)**

c) Name one other apparatus that can be used to measure a fixed volume of a liquid accurately. **(1 mark)**

4. An atom of element **A** has **13 protons, 13 electrons and 14 neutrons**.

a) State the atomic number of element A. (1 mark)

b) Calculate the mass number of element A. (1 mark)

c) Write the electronic arrangement of element A. (1 mark)

5. Consider the following elements:

Element	Electronic arrangement
P	2.1
Q	2.8.2
R	2.8.6

a) Which element belongs to Group 1? (1 mark)

b) Which element belongs to Group 16? (1 mark)

c) State the period occupied by element Q. (1 mark)

6. Calcium has the electronic arrangement **2.8.8.2**, while oxygen has the electronic arrangement **2.6**.

a) State the number of electrons calcium loses when forming an ion. (1 mark)

b) State the number of electrons oxygen gains when forming an ion. (1 mark)

c) Write the formula of the compound formed between calcium and oxygen. (1 mark)

7. A learner tested three solutions using litmus paper.

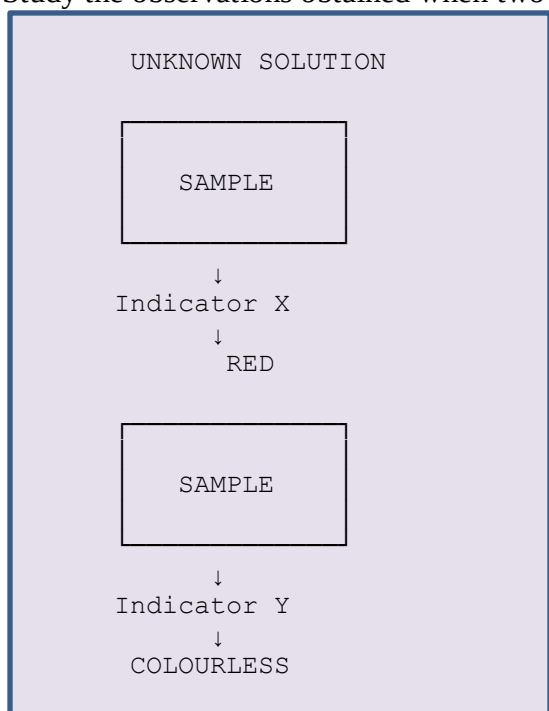
Solution	Effect on blue litmus	Effect on red litmus
A	Turns red	No change
B	No change	Turns blue
C	No change	No change

a) Identify solution A as acidic, alkaline or neutral. **(1 mark)**

b) Identify solution B as acidic, alkaline or neutral. **(1 mark)**

c) Identify solution C as acidic, alkaline or neutral. **(1 mark)**

8. Study the observations obtained when two indicators were added to an unknown solution.

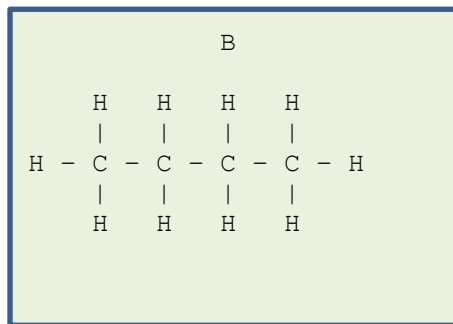
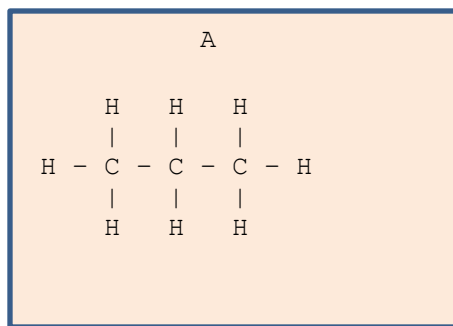


a) If indicator X is phenolphthalein, state whether the observation is possible. Give a reason. **(1 mark)**

b) State the colour of phenolphthalein in an alkaline solution. **(1 mark)**

c) Name one indicator that may give a red colour in a strongly acidic solution. **(1 mark)**

9. Study the compounds below:



a) Name compound A. **(1 mark)**

b) Name compound B. **(1 mark)**

c) State the homologous series to which the two compounds belong. **(1 mark)**

10. A learner burns a hydrocarbon in a plentiful supply of air.

a) Name the type of combustion expected when sufficient oxygen is available. **(1 mark)**

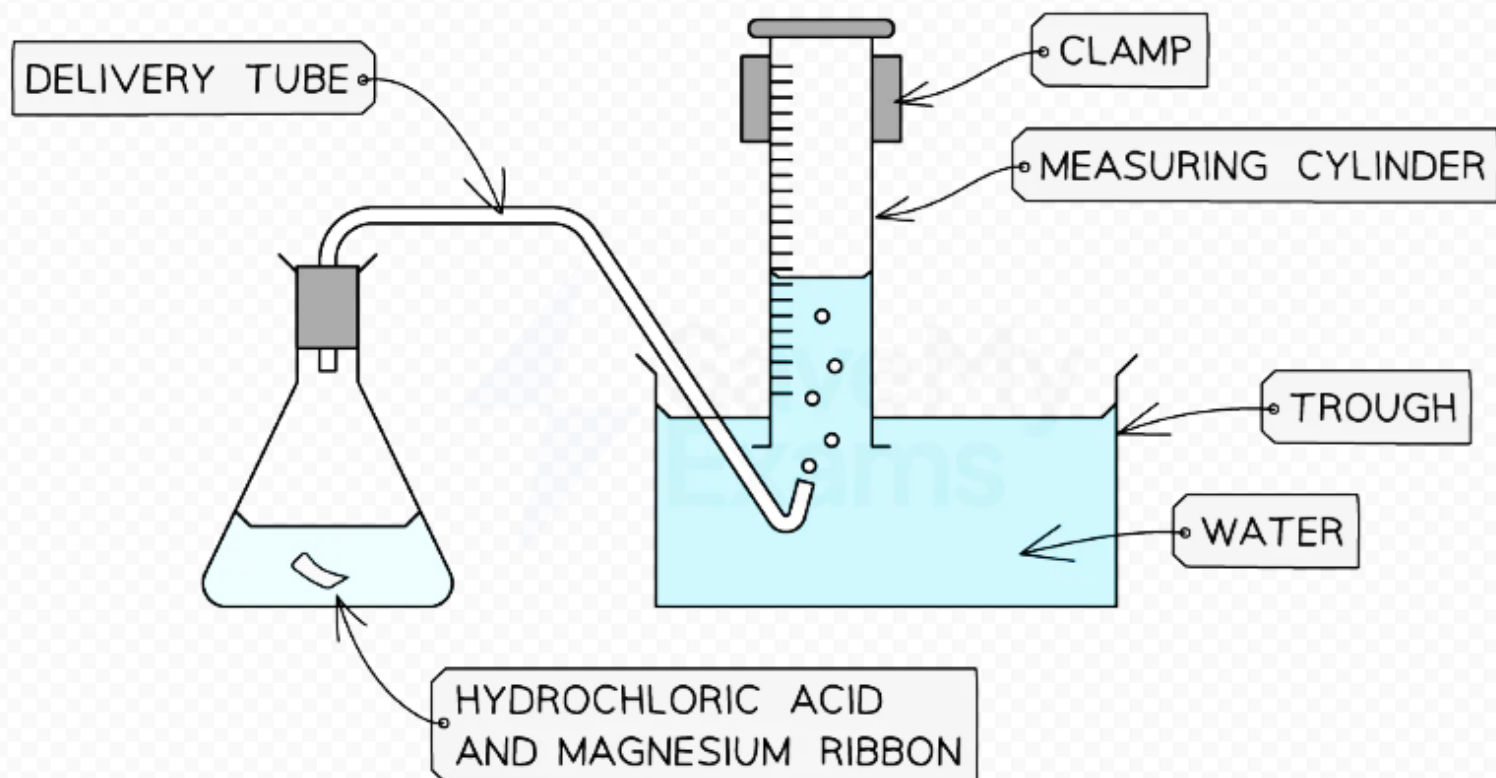
b) Name the two main products formed during complete combustion of a hydrocarbon. **(1 mark)**

c) State one environmental effect of carbon dioxide released during combustion. **(1 mark)**

SECTION B:50 MARKS

Answer ALL questions in this section.

11. A learner carried out an experiment in which **magnesium ribbon** was placed in dilute hydrochloric acid. Bubbles of gas were produced and the magnesium gradually disappeared.



a) Name the gas produced. _____ (1 mark)

b) Describe a chemical test for the gas identified in (a). (2 marks)

c) State two observations made during the reaction apart from the production of gas. (2 marks)

d) Write a balanced chemical equation for the reaction. (2 marks)

e) Name the salt formed in the reaction. (1 mark)

f) Explain why magnesium ribbon is cleaned before it is placed in the acid. (2 marks)

12. A farmer obtained a soil sample that was found to be excessively acidic. The farmer was advised to apply an appropriate substance to reduce the acidity.

a) What is meant by an acid? (1 mark)

b) Name one substance that can be used to reduce excessive acidity in agricultural soil. (1 mark)

c) Explain how the substance named in (b) helps to reduce soil acidity. (2 marks)

d) Hydrochloric acid reacts with calcium hydroxide. Write a balanced chemical equation for the reaction. (2 marks)

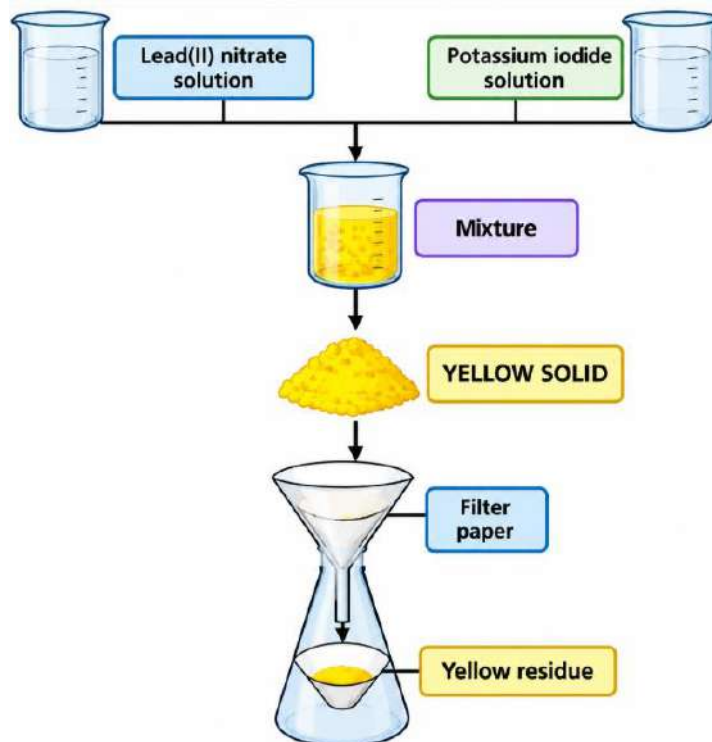
e) Name the type of reaction represented by the equation in (d). (1 mark)

f) Name the salt formed in the reaction. (1 mark)

g) State two practical applications of neutralisation reactions. (2 marks)

13. A learner was instructed to prepare **lead(II) iodide** by mixing suitable solutions of lead(II) nitrate and potassium iodide.

The process is represented below.



- a) Name the yellow solid formed. _____ (1 mark)
- b) Name the method used to separate the solid from the mixture. _____ (1 mark)
- c) State the purpose of the filter paper. (1 mark)
- _____
- d) Write a balanced chemical equation for the reaction using chemical formulae. (3 marks)
- _____
- _____
- e) Explain why the reaction is classified as a precipitation reaction. (2 marks)
- _____
- _____
- f) State one way of obtaining a cleaner sample of the solid product. (1 mark)
- _____

14. The following compounds are represented by their molecular formulae:

- ☞ A – C_2H_6
- ☞ B – C_3H_6
- ☞ C – C_4H_{10}
- ☞ D – C_5H_{10}

a) Identify the compounds that are alkanes. (2 marks)

b) Identify the compounds that could represent alkenes. (2 marks)

c) State the general formula of alkanes. (1 mark)

d) State the general formula of alkenes. (1 mark)

e) Give the names of compounds A and C. (2 marks)

A: _____

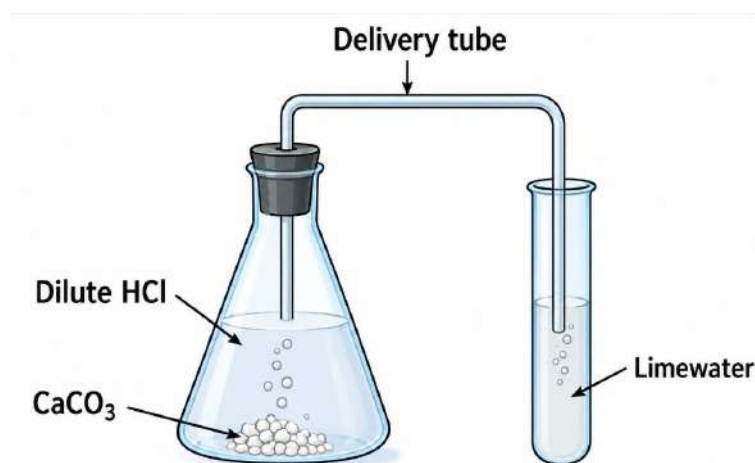
C: _____

f) State one chemical test that can be used to distinguish an alkene from an alkane. (1 mark)

g) State the expected observation when the test in (f) is carried out on an alkene. (1 mark)

15. A Grade 10 learner was investigating the reaction between an acid and a carbonate. The learner placed a small amount of calcium carbonate in a flask and added dilute hydrochloric acid.

The experimental arrangement is represented below.



a) Name the gas produced in the flask. _____ (1 mark)

b) State the chemical test for the gas using limewater. **(2 marks)**

c) State the observation expected in the limewater test. **(1 mark)**

d) Write a balanced chemical equation for the reaction between calcium carbonate and hydrochloric acid. **(3 marks)**

e) Name the salt formed in the reaction. **(1 mark)**

f) State two safety precautions the learner should observe during the experiment. **(2 marks)**

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GRADE 10 CHEMISTRY

MARKING SCHEME

SECTION A

1:

a) Magnetic separation / use of a magnet.

(1 mark)

b) Filtration.

(1 mark)

c) Evaporation to dryness / crystallisation.

(1 mark)

2:

a) Place the measuring cylinder on a **level surface** before taking the reading.

(1 mark)

b) The **bottom of the meniscus**.

(1 mark)

c) The eye should be **at the same level as the meniscus** to avoid parallax error.

(1 mark)

3:

a) **Measuring cylinder**.

(1 mark)

b) Used to **measure the volume of liquids**.

(1 mark)

c) **Pipette** or **burette**.

(1 mark)

4:

Given:

- Protons = 13
- Electrons = 13
- Neutrons = 14

a) Atomic number = **13**.

(1 mark)

b)

Mass number=protons + neutrons=13+14=27

Answer: 27

(1 mark)

c) Electronic arrangement = 2.8.3.

(1 mark)

5:

a) Element P.

(1 mark)

b) Element R.

(1 mark)

c) Element Q has three occupied electron shells.

Period 3.

(1 mark)

6:

a) Calcium loses 2 electrons.

(1 mark)

b) Oxygen gains 2 electrons.

(1 mark)

c) Formula of the compound:

CaO

(1 mark)

7:

a) Solution A – Acidic.

(1 mark)

b) Solution B – Alkaline.

(1 mark)

c) Solution C – Neutral.

(1 mark)

8:

a) No. Phenolphthalein is colourless in an acidic solution and pink in an alkaline solution.

(1 mark)

b) Pink.

(1 mark)

c) Methyl orange.

(1 mark)

9:

a) Compound A – Propane. (1 mark)

b) Compound B – Butane. (1 mark)

c) Alkanes. (1 mark)

10:

a) Complete combustion. (1 mark)

**b) Carbon dioxide and water.
(1 mark)**

c) Any one:

- Carbon dioxide contributes to **global warming**.
- It contributes to the **greenhouse effect**.
- It contributes to **climate change**.

(1 mark)

SECTION B

11:

a) Gas produced

**Hydrogen gas (H₂).
(1 mark)**

b) Test for hydrogen

Collect the gas in a test tube and introduce a **lighted splint**.

A **squeaky pop** is heard if the gas is hydrogen.
(2 marks)

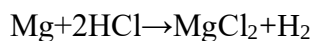
c) Two observations

Any two:

- Magnesium ribbon gradually disappears/dissolves.
- Effervescence/bubbles are produced.
- The reaction produces heat; the mixture becomes warm.
- The magnesium reacts vigorously with the acid.

(2 marks)

d) Balanced equation



(2 marks)

e) Salt formed

Magnesium chloride (MgCl₂). (1 mark)

f) Reason for cleaning magnesium

Magnesium ribbon is cleaned to **remove the oxide coating** on its surface so that the magnesium can react directly with the hydrochloric acid.

(2 marks)

12:

a) Meaning of an acid

An acid is a substance that **produces hydrogen ions (H⁺) in aqueous solution.**

(1 mark)

b) Substance used to reduce soil acidity

Any one:

- **Calcium carbonate**
- Calcium oxide
- Calcium hydroxide
- Agricultural lime

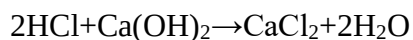
(1 mark)

c) How it reduces acidity

The alkaline substance **reacts with and neutralises the acids in the soil**, thereby increasing the soil pH towards neutrality.

(2 marks)

d) Balanced equation



(2 marks)

e) Type of reaction

Neutralisation reaction.

(1 mark)

f) Salt formed

Calcium chloride (CaCl₂).

(1 mark)

g) Applications of neutralisation

Any two:

- Treating **acidic soils** using lime.
- Treating **indigestion/heartburn** using antacids.
- Treating **acidic industrial waste**.
- Correcting the pH of water.
- Treating acidic conditions in lakes or other water bodies.

(2 marks)

13:

a) Yellow solid

Lead(II) iodide (PbI₂).

(1 mark)

b) Separation method

Filtration.

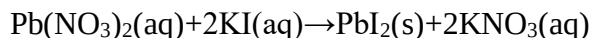
(1 mark)

c) Purpose of filter paper

It allows the **liquid/filtrate to pass through while retaining the insoluble lead(II) iodide precipitate.**

(1 mark)

d) Balanced chemical equation



(3 marks)

e) Why it is a precipitation reaction

It is a precipitation reaction because **two soluble solutions react to form an insoluble solid, lead(II) iodide, which separates from the solution as a precipitate.**

(2 marks)

f) Obtaining a cleaner sample

Wash the precipitate with distilled/deionised water before drying it.

(1 mark)

14:

Given:

- A – C₂H₆
- B – C₃H₆
- C – C₄H₁₀
- D – C₅H₁₀

a) Compounds that are alkanes

A and C.
(2 marks)

b) Compounds that could represent alkenes

B and D.
(2 marks)

c) General formula of alkanes

C_nH_{2n+2}

(1 mark)

d) General formula of alkenes

C_nH_{2n}

(1 mark)

e) Names of A and C

A = **Ethane**
C = **Butane**

(2 marks)

f) Chemical test for an alkene

Add **bromine water** to the substance and shake.

(1 mark)

g) Observation with an alkene

The **orange/brown colour of bromine water is decolourised.**
(1 mark)

15:

a) Gas produced

Carbon dioxide (CO₂).
(1 mark)

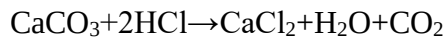
b) Chemical test

Pass the gas through **limewater (calcium hydroxide solution).**
(2 marks)

c) Observation

The limewater **turns milky/cloudy**.
(1 mark)

d) Balanced chemical equation



(3 marks)

e) Salt formed

Calcium chloride (CaCl_2).
(1 mark)

f) Safety precautions

Any two:

- Wear **safety goggles**.
- Wear a **laboratory coat**.
- Handle dilute hydrochloric acid carefully.
- Avoid contact of the acid with the skin and eyes.
- Do not inhale gases directly.
- Handle glassware carefully.
- Carry out the experiment in a well-ventilated laboratory.

(2 marks)

SENIOR SCHOOL ASSESSMENT

TERM 3: PROJECT BASED ASSESSMENT 2026

GRADE 10 – CHEMISTRY

Time: 2 Hours

LEARNER'S DETAILS

Name: _____ . School: _____ .

Assessment Number: _____ . Date: _____ .

School Code: _____ . Signature: _____ .

Time: To be completed over an agreed project period

Mode: Individual or teacher-approved pair/group project

PROJECT TITLE

INVESTIGATION OF ACIDS AND BASES IN EVERYDAY MATERIALS USING A NATURAL INDICATOR

INTRODUCTION

Chemistry is applied in everyday activities such as food preparation, agriculture, cleaning, medicine, water treatment and environmental conservation.

In this project, the learner will investigate the **acidic and basic properties of selected household substances** using a **natural indicator prepared from plant material**. The learner will collect data, record observations, interpret results and present evidence of the investigation.

The project should demonstrate the learner's ability to:

- plan and carry out a simple chemical investigation;
- prepare and use a natural indicator;
- distinguish between acidic, neutral and basic substances;
- record observations systematically;
- analyse and interpret experimental results;
- apply chemistry to everyday life;
- demonstrate safe handling of materials;
- communicate findings using a written and/or digital portfolio.

LEARNER'S TASK

You are required to investigate the acidic or basic nature of **at least five readily available household substances** using a natural indicator.

Examples of substances may include:

- lemon juice;
- vinegar;
- soap solution;
- baking soda solution;
- ordinary water;
- fruit juice;

- salt solution;
- toothpaste solution.

Do not taste or deliberately ingest any substance used in the investigation.

You may use a natural indicator prepared from suitable plant material such as **red/purple cabbage, hibiscus or another teacher-approved indicator source.**

PROJECT REQUIREMENTS

TASK 1: PROJECT PLANNING – 3 MARKS

Before carrying out the investigation, prepare a brief project plan containing the following:

- (a) State the problem to be investigated. (1 mark)**
- (b) State the aim of the investigation. (1 mark)**
- (c) State one hypothesis or prediction about the expected results. (1 mark)**

TASK 2: PREPARATION OF THE NATURAL INDICATOR – 3 MARKS

Prepare a natural indicator using a suitable plant material.

- (a) Identify the plant material selected for preparing the indicator. (1 mark)**
-

- (b) Describe the procedure followed to obtain the indicator solution. (1 mark)**
-

- (c) State one safety precaution observed during preparation and use of the indicator. (1 mark)**
-

TASK 3: EXPERIMENTAL INVESTIGATION – 5 MARKS

Select **at least five household substances** and test each substance using the natural indicator.

Prepare a results table similar to the one below.

Substance Tested	Colour Before Adding Indicator	Colour After Adding Indicator	Inference
Substance 1			
Substance 2			
Substance 3			
Substance 4			
Substance 5			

- (a) Correctly identify and record at least five substances tested. (1 mark)**
- (b) Record the colour changes observed for the different substances. (2 marks)**
- (c) Classify the substances as acidic, neutral or basic, based on the indicator results. (2 marks)**

TASK 4: DATA ANALYSIS AND INTERPRETATION – 4 MARKS

Use your results to answer the following:

- (a) Which substance was the **most clearly acidic** according to your indicator? Give a reason for your answer. **(1 mark)**
- (b) Which substance was the **most clearly basic** according to your indicator? Give a reason. **(1 mark)**
- (c) Identify one substance that could be considered approximately neutral and explain your answer. **(1 mark)**
- (d) State **one limitation** of using a natural indicator compared with a standard laboratory pH indicator or pH meter. **(1 mark)**

TASK 5: APPLICATION OF CHEMISTRY TO DAILY LIFE – 2 MARKS

Explain **two ways in which knowledge of acids and bases is useful in everyday life**.

Examples may include:

- agriculture and soil management;
- food preservation;
- cleaning;
- treatment of acidic soils;
- water treatment;
- household safety;
- manufacture of products. **(2 marks)**

TASK 6: DIGITAL PORTFOLIO / EVIDENCE OF WORK – 2 MARKS

The learner must maintain **digital evidence of the project throughout the investigation**.

The digital portfolio may contain:

1. photographs showing preparation of materials;
2. photographs showing the investigation being carried out;
3. photographs of the natural indicator;
4. photographs of the tested substances;
5. photographs of the results table;
6. photographs/video of the completed project;
7. a typed or handwritten copy of the project report;
8. relevant diagrams, observations or data;
9. evidence of communication with the teacher where applicable, such as an email or approved digital submission.

Evidence requirement

The learner should **save the digital portfolio safely** on a phone, computer, flash disk, cloud storage or another teacher-approved platform.

If the project involves a **sizeable model, display, chart or other physical product**, the learner should:

- **bring the model/product to school on the official opening date or date specified by the school for assessment**,
OR
- if the model/product is too large or cannot safely be transported, **take clear photographs and/or video from different angles showing the completed work** and submit the evidence as directed by the teacher.

The learner should retain the original evidence until the project has been assessed. (2 marks)

PROJECT REPORT FORMAT

The final project report should be arranged in the following order:

1. Cover Page

Include:

- Name of learner
- Admission number
- School
- Grade
- Subject
- Project title
- Teacher
- Date

2. Introduction

Briefly explain acids, bases and indicators.

3. Problem Statement

State the problem being investigated.

4. Aim

State the purpose of the investigation.

5. Hypothesis

Give the learner's prediction.

6. Materials

List the materials used.

7. Procedure

Describe the investigation step by step.

8. Safety Precautions

List the precautions observed.

9. Results

Present observations in a table.

10. Data Analysis

Explain what the observations show.

11. Conclusion

State whether the findings support the hypothesis.

12. Application

Explain how knowledge of acids and bases is useful in daily life.

13. Evidence Portfolio

Attach or provide photographs, video evidence, diagrams and other evidence of the work.

14. References

List any books, approved learning resources or other sources consulted.

MARKING SCHEME – 20 MARKS

Task	Assessment Area	Marks
1	Project planning	3
2	Preparation of natural indicator	3
3	Experimental investigation and observations	5
4	Data analysis and interpretation	4
5	Application of chemistry to daily life	2
6	Digital portfolio/evidence of work	2
TOTAL		20

DETAILED ASSESSMENT RUBRIC

Competency/Aspect	EE	ME	AE	Marks
Planning	Clear problem, aim and logical hypothesis	Mostly clear planning	Limited planning	3
Practical skills	Correct preparation and safe handling	Minor errors	Requires considerable guidance	3
Investigation	Accurate testing, observations and classification	Generally accurate	Incomplete investigation	5
Analysis	Correct interpretation supported by evidence	Reasonable interpretation	Limited interpretation	4
Application	Relevant real-life applications	Some relevant applications	Limited application	2
Portfolio	Clear, authentic and well-organised evidence	Adequate evidence	Incomplete evidence	2
TOTAL				20

TEACHER'S ASSESSMENT CHECKLIST

Learner's Name: _____

Grade: _____

Admission No.: _____

No.	Assessment Indicator	Marks Awarded
1	States a clear investigation problem	/1
2	States a suitable aim	/1
3	Gives a reasonable hypothesis/prediction	/1
4	Identifies suitable indicator material	/1
5	Correctly describes preparation of indicator	/1
6	Observes safety precautions	/1
7	Tests at least five substances	/1
8	Records colour changes accurately	/2
9	Correctly classifies substances	/2
10	Identifies acidic substance with justification	/1
11	Identifies basic substance with justification	/1
12	Identifies/explains neutral substance	/1
13	States a limitation of natural indicators	/1
14	Gives two relevant applications	/2
15	Provides adequate digital/physical evidence	/2
TOTAL		/20

IMPORTANT INSTRUCTIONS TO LEARNERS

1. **This is a practical project and not a multiple-choice examination.**
2. The project must represent **your own work**.
3. You may consult your Chemistry notes, approved learning resources and the teacher for guidance.
4. Do not copy another learner's results.
5. Record **actual observations** obtained during your investigation.
6. Do not taste or ingest any chemical or household substance.
7. Use teacher-approved materials and follow laboratory safety procedures.
8. Keep photographs or video evidence as the work progresses rather than only photographing the final product.
9. Maintain a **digital portfolio/evidence folder** containing your work.
10. Where the completed project includes a **sizeable physical model, display or product**, bring it to school on the official opening/assessment date as directed by the school.
11. If the product is too large to transport, submit **clear photographs and/or video evidence** showing the completed work.
12. The teacher may ask the learner to **demonstrate or explain the project orally** to verify ownership of the work.
13. Submit the completed written report together with the required evidence.
14. Ensure all electronic files are clearly labelled with the learner's name, grade and project title.

END-OF-YEAR PROJECT

SCHOOL-BASED PRACTICAL ASSESSMENT

MARKING SCHEME

Project: Investigation of Acids and Bases in Everyday Materials Using a Natural Indicator

Total Marks: 20

Note to teacher: Since this is a practical/project assessment, learners' actual observations may differ slightly depending on the substances, concentrations and natural indicator used. Award marks for **scientifically reasonable observations and conclusions**, not for forcing identical colours/results.

TASK 1: PROJECT PLANNING — 3 MARKS

(a) Problem statement — 1 mark

Expected answer:

Household substances have different chemical properties, and some are acidic, some basic and others approximately neutral. The investigation seeks to determine the nature of selected household substances using a natural indicator.

Award:

- Clear and relevant problem statement — **1 mark**

(b) Aim — 1 mark

Expected answer:

To investigate and classify selected household substances as acidic, neutral or basic using a natural plant indicator.

Award:

- Appropriate aim related to the investigation — **1 mark**

(c) Hypothesis/prediction — 1 mark

Expected answer:

If different household substances are tested using a natural indicator, they will produce different colour changes because they have different acidic or basic properties.

Accept: Any scientifically reasonable prediction.

Award:

- Logical and testable hypothesis — **1 mark**

Task 1 Total: 3 marks

TASK 2: PREPARATION OF THE NATURAL INDICATOR — 3 MARKS

(a) Identify the plant material — 1 mark

Accept any suitable teacher-approved plant indicator, for example:

- Red/purple cabbage
- Hibiscus petals
- Other suitable plant material containing natural pigments

Award:

- Correctly identifies suitable plant material — **1 mark**

(b) Procedure for preparing the indicator — 1 mark

Sample answer:

1. Collect suitable plant material.
2. Cut or crush the material into small pieces.
3. Place it in a container.
4. Add hot water and allow it to stand/steep.
5. Filter the mixture to obtain the coloured indicator solution.
6. Allow it to cool before use.

Award 1 mark for:

- A reasonably correct procedure showing extraction of the indicator pigment.

(c) Safety precaution — 1 mark

Any one:

- Do not taste the substances.
- Wash hands after the experiment.
- Handle hot water carefully.
- Wear protective clothing/gloves where appropriate.
- Do not mix unknown household chemicals.
- Keep chemicals away from the eyes and mouth.
- Work in a well-ventilated area.
- Clean the working area after the experiment.

Task 2 Total: 3 marks

TASK 3: EXPERIMENTAL INVESTIGATION — 5 MARKS

A possible set of results is shown below.

Substance Tested	Colour Before Indicator	Colour After Indicator*	Inference
Lemon juice	Colourless/pale	Acidic-indicator colour	Acidic
Vinegar	Colourless/pale	Acidic-indicator colour	Acidic
Baking soda solution	Colourless	Basic-indicator colour	Basic
Soap solution	Colourless/cloudy	Basic-indicator colour	Basic
Water	Colourless	Little/no significant change	Approximately neutral

*The exact colour depends on the natural indicator used.

(a) Identify at least five substances — 1 mark

- Five suitable substances correctly identified — **1 mark**

(b) Record colour changes — 2 marks

Award:

- Correct observations for three or more substances — **1 mark**
- Correct observations for the remaining substances/consistent complete table — **1 mark**

Important: Accept different colours where the learner has used a different valid natural indicator and the observation is scientifically plausible.

(c) Classification — 2 marks

Award:

- Correctly classifies acidic substances — **1 mark**
- Correctly classifies basic/neutral substances — **1 mark**

Task 3 Total: 5 marks

TASK 4: DATA ANALYSIS AND INTERPRETATION — 4 MARKS

(a) Most clearly acidic substance — 1 mark

Sample answer:

Lemon juice was clearly acidic because it produced the colour associated with an acidic medium when the natural indicator was added.

Accept: Vinegar or another correctly tested acidic substance if supported by the learner's results.

Award: 1 mark

(b) Most clearly basic substance — 1 mark

Sample answer:

Baking soda solution was basic because it produced the colour associated with a basic medium when tested with the natural indicator.

Accept: Soap solution or another correctly tested basic substance if supported by results.

Award: 1 mark

(c) Approximately neutral substance — 1 mark

Sample answer:

Water was approximately neutral because it produced little or no significant colour change with the natural indicator.

Accept: Another substance if the learner's experimental results reasonably support the conclusion.

Award: 1 mark

(d) Limitation of a natural indicator — 1 mark

Any one:

- It may only give an approximate indication of acidity or alkalinity.

- Its colour changes may be less distinct than those of laboratory indicators.
- The colour may be affected by the concentration of the substance.
- Different plant materials produce different colours.
- It cannot usually give an exact pH value.
- Colour interpretation can be subjective.

Award: 1 mark

Task 4 Total: 4 marks

TASK 5: APPLICATION OF CHEMISTRY TO DAILY LIFE — 2 MARKS

Expected answers

Any **two** well-explained applications:

1. **Agriculture:** Acids and bases are important in managing soil pH for suitable crop growth.
2. **Cleaning:** Basic substances are found in some cleaning products and can help remove grease.
3. **Food:** Acids such as those in citrus fruits and vinegar are used in food preparation and preservation.
4. **Water treatment:** Knowledge of pH helps in monitoring and treating water.
5. **Household safety:** Understanding acidic and basic substances helps people handle cleaning materials safely.
6. **Manufacturing:** Acids and bases are used in the production of many industrial and household products.

Marking:

- First relevant application with explanation — **1 mark**
- Second relevant application with explanation — **1 mark**

Task 5 Total: 2 marks

TASK 6: DIGITAL PORTFOLIO / EVIDENCE — 2 MARKS

Expected evidence

The learner should provide evidence such as:

- photograph of materials;
- photograph of preparation of the natural indicator;
- photograph/video of the investigation;
- photograph of tested substances;
- photograph of results;
- completed project report;
- diagrams;
- digital records;
- teacher-approved email/digital submission evidence where applicable.

Marking

2 marks:

- Clear, authentic and well-organised evidence showing the stages of the project.

1 mark:

- Some evidence provided but incomplete or poorly organised.

0 marks:

- No meaningful evidence of the project provided.

Special requirement for sizeable models/products

Where a learner produces a **sizeable physical model, display or other project product**:

- The learner should bring the model/product to school on the official opening/assessment date as directed by the school.
- Where transportation is impractical, the learner should provide **clear photographs and/or video showing the completed model/product from different angles**.
- The teacher may require the learner to explain or demonstrate the work to authenticate it.

Task 6 Total: 2 marks

SUMMARY MARKING SCHEME

Task	Component	Marks
1	Problem, aim and hypothesis	3
2	Natural indicator preparation and safety	3
3	Investigation, observations and classification	5
4	Analysis and interpretation	4
5	Everyday applications	2
6	Digital portfolio/evidence	2
TOTAL		20

CONSOLIDATED TEACHER'S MARK SHEET

No.	Assessment Indicator	Marks
1	States a clear investigation problem	/1
2	States a suitable aim	/1
3	Gives a logical hypothesis/prediction	/1
4	Identifies suitable natural indicator material	/1
5	Describes preparation of indicator	/1
6	States a relevant safety precaution	/1
7	Identifies at least five substances	/1
8	Records colour observations	/2
9	Correctly classifies substances	/2
10	Identifies an acidic substance and gives reason	/1
11	Identifies a basic substance and gives reason	/1
12	Identifies/explains an approximately neutral substance	/1
13	States one limitation of natural indicators	/1
14	Gives first relevant application	/1
15	Gives second relevant application	/1
16	Provides adequate digital/physical evidence	/2
	TOTAL	/20

EXPECTED CONCLUSION

Model answer:

The investigation showed that different household substances have different chemical properties. Lemon juice and vinegar were found to be acidic, while substances such as baking soda solution and soap solution were basic. Water was

approximately neutral. The natural indicator was therefore useful for distinguishing between acidic, neutral and basic substances, although it does not normally provide an exact pH value. The investigation also demonstrated the importance of acids and bases in everyday life.

Marking: Award the conclusion mark(s) under the relevant project criteria where the learner's conclusion is consistent with their **actual recorded results**.

TEACHER'S NOTE

Because this is a **school-based practical assessment**, the teacher should assess the learner's **process, practical skills, observations, interpretation, application and evidence**, rather than awarding marks solely on whether the learner's final colour observations exactly match the model table above.