VISION GROUP

NATIONAL PRIDE • GLOBAL EXCELLENCE

HOME SCHOOLING MATERIAL

SECONDARY

PASS O'LEVEL

GUIDE TO *MAY 11* PRACTICAL QUESTIONS

COMPUTER STUDIES

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1 (a) WORD PROCESSING

SKILL	Headed paper				Mail merge								Total
	Header	Logo	Contact	Design	Data table	Letter	Merged objects	Header	Watermark	Letter saving	Print	Document saving	
EXPECTED	2	2	1	1	2	2	2	2	2	2	1	1	20
ACTUAL													

(b) SPREADSHEETS

SKILL	Data entry	Heading		Formula						Columns	Borders	,000	Chart							total
		Merge	Centre	PAYE	NSSF	Hsng	Trans	Net	Gross				Choice	Data	Heading	Axes	Header	Print	Save	
EXPECTED	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
ACTUAL																				

MORE PRACTICAL QUESTIONS

SECTION B

1. ELECTRONIC PRESENTATION

You are a social worker and you have the following information on the coronavirus pandemic that you would wish to pass on to the community.

The COVID-19 pandemic has spread all over the world. It is now time for the people to prevent its continuous spread. The virus spreads through hand contact with infected persons and with contaminated surfaces. It gets into the body through the eyes, mouth and nose.

The disease can be prevented through regular washing of hands with soap and water, use of sanitisers, masks, continuous disinfecting of publicly-used surfaces and ensuring social distancing.

The symptoms of the virus are dry cough, dry sneezing, shortness of breath, soar throats and high body temperature.

Ugandans are encouraged to report any suspected cases to the health workers and to stay home and stay safe.

REQUIRED
(i)   Using a presentation software, prepare a six-slide presentation that reflects the given information.
(ii) Apply action buttons that link the slides to each other.
(iii) Insert well-formatted and relevant pictures on at least one of the slides.
(iv) Apply an appropriate background for the slides.
(v)   The slide should be set to move at the click of the mouse.
(vi) Set the headings in the slide to have a different font size and colour from the rest of the content.
(vii) Make use of bullets and numbers where necessary.
(viii) Insert a blank slide to appear as the last.
(ix) On the blank slide, insert a SmartArt that shows the transfer of coronavirus from one person to another.
(x)   Set appropriate animation for your work.
(xi) Insert your name as a footer.
(xii) Save your work.
(xiii) Print your work as handouts.
(xiv)

2. DATABASE MANAGEMENT
The following information is extracted from XYZ employment records

Employee data

EMPLOYEE NUMBER	NAME	DATE OF BIRTH	GENDER
XYZ001	Patrick	March 2, 1980	Male
XYZ002	Sandra	August 12, 1978	Female
XYZ003	Charity	May 3, 1981	Female
XYZ004	Moses	April 10, 1990	Male
XYZ005	Trendy	April 3, 1991	Female
XYZ006	Eric	June 16, 1995	Male
XYZ007	Ismail	January 13, 1999	Male
XYZ008	Hussein	December 20, 2000	Male
XYZ009	Angella	November 18, 2000	Female
XYZ010	Sofia	September 13, 1999	Female

Employee salary

EMPLOYEE NUMBER	DEPARTMENT	SALARY
XYZ001	Accounts	560,000
XYZ002	Accounts	400,000
XYZ003	Administration	650,000
XYZ004	Administration	423,000
XYZ005	Accounts	720,000
XYZ006	Security	400,000
XYZ007	Security	500,000
XYZ008	Administration	400,000
XYZ009	Accounts	410,000
XYZ010	Administration	700,000

REQUIRED
(i) Open a database management software and save it as your name.
(ii) Create the two tables — employee data and employee salary — with relevant fields.
(iii) Set the relevant field as a primary key.
(iv) Set the relevant field types with lookup wizard for each of the tables.
(v) Create a relationship between the two tables.
(vi) Create a form "entry" that will be used to enter data into the two tables.
(vii) Use the "entry" form to enter the above data.
(viii) Create a report that returns the workers in the accounts department, showing their names, department, date of birth and salaries.
(ix) All workers have been given a 20% salary increase, create a query that returns the new salary.
(x) Create one report that shows all the information above with the names presented in ascending order.
(xi) Print the database objects.

3. WEB DESIGNING
As a class monitor for your class, you wish to keep in touch with your classmates during the COVID-19 lockdown.
(i) Design a four-page collaborative website which you will use to continuously discuss with your classmates
• **Page 1 — Home page**
  a. Banner of your choice, a header and motto.
  b. A marquee "STAY HOME STAY SAFE".
  c. Provision of active links to other pages.
  d. A short introduction to the website.
  e. Relevant graphics.

• **Page 2 — Updates**
This page updates the learners on what is happening in the country.
  f. Add a table and list the various things happening in the country like COVID-19 testing, closure of schools, ban on public transport, etc.
  g. Include relevant pictures.
  h. Use an appropriate background.

• **Page 3 — Discussion**
Make a collaborative page, where the learners will always have a topic of discussion updated daily.
  i. Show the topic of discussion.
  j. Space for discussion.
  k. A short paragraph, explaining the page.

• **Page 4 — Conclusion**
  l. A brief conclusion.
  m. Contact, where the learners can get in touch with you by phone or email.
  n. Appropriate background and photographs.

(ii) Save your work as a website.
(iii) Print your work.

For enquiries, send an email to *learners@newvision.co.ug*

MATHEMATICS PAPER TWO ANSWERS

IVAN GIMEI,
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AUGUSTUS ISINGOMA,
ST JOHN'S SS, NYABWINA - SHEEMA

1. Let $x = 2.4233....$

$100x = 242.33.........$ (i)

$1000x = 2423.33 ....$ (ii)

(ii) − (i)

$1000x = 2423.33...$
$-100x = 242.33...$

$900x = 2181$

$x = \dfrac{2181}{900} = \dfrac{727}{300}$

$x = 2\frac{127}{300}$ as required.

2. $\log(7x + 3) - \log(x - 1) = \dfrac{2}{3}\log 8$

$\log\left(\dfrac{7x+3}{x-1}\right) = \log 8^{\frac{2}{3}}$

$\log\left(\dfrac{7x+3}{x-1}\right) = \log 4$

$\dfrac{7x+3}{x-1} = 4$

$7x + 3 = 4x - 4$

$3x = -7$

$x = \dfrac{-7}{3}$

$x = -2\frac{1}{3}$

3. Gradient of $AB = \dfrac{0-1}{4-^-2} = \dfrac{-1}{6}$

Gradient of AB × Gradient of a perpendicular = -1

$\dfrac{-1}{6}$ × Gradient of a perpendicular bisector = -1

Gradient of a perpendicular bisector = 6

Midpoint of AB $= \left(\dfrac{-2+4}{2}, \dfrac{0+1}{2}\right) = (1, \frac{1}{2})$

A(-2, 1)

(1, $\frac{1}{2}$)

B(4, 0)

$\dfrac{y-\frac{1}{2}}{x-1} = 6$

$y - \frac{1}{2} = 6x - 6$

$2y - 1 = 12x - 12$
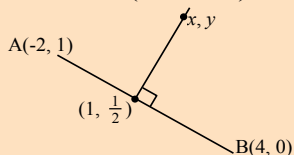
$2y = 12x - 11$

The equation of the perpendicular bisector is $2y = 12x - 11$.

4. Volume scale factor $= \dfrac{67510.8}{2500.4}$

$= 27$

Linear scale factor $= \sqrt[3]{\text{VSF}}$

$= \sqrt[3]{27}$

$= 3$

Height of a small kettle $= \dfrac{\text{Height of a big kettle}}{\text{linear scale factor}} = \dfrac{113.5}{3}$

$= 37.833$ cm

5. $n^2 + 3n + 5 - 54 = 3n$

$n^2 + 5 - 54 = 3n - 3n$

$n^2 - 49 = 0$

$\sqrt{n^2} = \sqrt{49}$

$n = 7$

6. $\dfrac{\sqrt{108}-3\sqrt{3}}{3\sqrt{3}-\sqrt{18}} = \dfrac{6\sqrt{3}-3\sqrt{3}}{3\sqrt{3}-3\sqrt{2}}$

$= \dfrac{3\sqrt{3}}{3\sqrt{3}-3\sqrt{2}}$

$= \dfrac{\sqrt{3}}{\sqrt{3}-\sqrt{2}}$

$= \dfrac{\sqrt{3}(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})}$

$= \dfrac{3+\sqrt{6}}{3-2}$

$= 3+\sqrt{6}$

$= 3 + 2.449$

$= 5.449$

7. a) US $ 2000 = UGX 2000 × 3800

$= $ UGX 7,600,000

Money spent $=\begin{array}{r}7,600,000 \\ -\ 1,050,000 \\ \hline 6,550,000\end{array}$

The money he spent = UGX 6,550,000

b) UGX 1,050,000 = US $ $\dfrac{1,050,000}{3800}$

$= $ US $ 276.316

8. (i) $\begin{pmatrix}3\\-6\end{pmatrix} - 3\begin{pmatrix}-3\\1\end{pmatrix} = 3\underset{\sim}{m}$

$\begin{pmatrix}3\\-6\end{pmatrix} - \begin{pmatrix}-9\\3\end{pmatrix} = 3\underset{\sim}{m}$

$\begin{pmatrix}3+9\\-6-3\end{pmatrix} = 3\underset{\sim}{m}$

$\begin{pmatrix}12\\-9\end{pmatrix} = 3\underset{\sim}{m}$

$\dfrac{1}{3}\begin{pmatrix}12\\-9\end{pmatrix} = \underset{\sim}{m}$

$\underset{\sim}{m} = \begin{pmatrix}4\\-3\end{pmatrix}$

(ii) Length of $\underset{\sim}{m} = |\underset{\sim}{m}| = \sqrt{(4)^2 + (-3)^2}$

$= \sqrt{16+9}$

$= \sqrt{25}$

$= 5$ units

9. Area of grassed part = Area of the whole Alena − Area of the throwing part.

$= \dfrac{40}{360} \times \pi \times 100^2 - \dfrac{40}{360} \times \pi \times 5^2$

$= \dfrac{1}{9}\pi\left(100^2 - 5^2\right)$

$= \dfrac{1}{9}\pi\left(10000 - 25\right)$

$= \dfrac{9975\pi}{9}$

$= 3481.931858$

The area = 3481.932 (3 dps)

10. $P = \{1, 3, 6, 10, 15\}$

a) "Is a factor of"
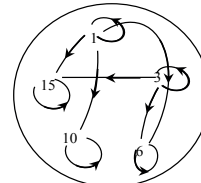
b) "is less than"
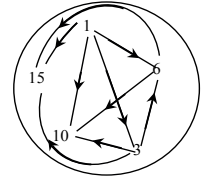
11. (a) $x + y + 3 + 4 = 18$

$x + y = 11$ .... (i)

$x + z + 4 + 5 = 19$

$x + z = 10$ .... (ii)

$y + z + 1 + 4 = 20$

$y + z = 15$ .... (iii)

$x + y = 11$ .... (i)

$x + z = 10$ .... (ii)

$y + z = 15$ .... (iii)

From Eqn (ii);

$z = 15 - y$

Substituting $z = 15 - y$ in (ii)

$x + 15 - y = 10$

$x - y = -5$ .... (iv)

Solve (i) and (iv) simultaneously

$\begin{array}{r} x+y=11 \\ +\ x-y=-5 \\ \hline 2x=6 \end{array}$

$x = 3$

Substituting $x = 3$ in equation (i)

$x + y = 11$

$y = 11 - x$

$y = 11 - 3 = 9$

$y = 9$

Substituting $y = 9$ in $z = 15 - y$

$x = 3, y = 9$ and $z = 6$

b) (i) n(F) + 5 + 6 + 1 + 11

$= 18 + 5 + 6 + 1 + 11$

$= 41$

c) Probability $=$

$\dfrac{\text{number of staff who speak only two languages}}{\text{Total number of staff}}$

$= \dfrac{3+9+6}{41}$

$= \dfrac{18}{41}$

$= 0.439$

12. $f(x) = \dfrac{3x}{x+2}$, $fh(x) = \dfrac{3x^2-18}{x^2-4}$

(i) Let $h(x) = m$

$fh(x) = \dfrac{3m}{m+2} = \dfrac{3x^2-18}{x^2-4}$

$= \dfrac{\cancel{3}m}{m+2} = \dfrac{\cancel{3}(x^2-6)}{x^2-4}$

$\dfrac{m}{m+2} = \dfrac{x^2-6}{x^2-4}$

$= mx^2 - 4m = mx^2 - 6m + 2x^2 - 12$

$= {}^-4m + 6m = mx^2 - mx^2 + 2x^2 - 12$

$2m = 2x^2 - 12$

$2m = 2(x^2 - 6)$

$m = x^2 - 6$

$h(x) = x^2 - 6$

(ii) $f^{-1}(x)$

$$\frac{y}{1} = \frac{3x}{x+2}$$

$yx + 2y = 3x$

$2y = 3x - yx$

$3x - yx = 2y$

$x(3 - y) = 2$

$$x = \frac{2}{3-y}$$

$x \to f^{-1}(x)$ and $y \to x$

$$f^{-1}(x) = \frac{2}{3-x}$$

(iii) $f^{-1}(-3) = \frac{2}{3 - ^-3} = \frac{2}{6} = \frac{1}{3}$

(c) $fh(x) = \frac{3x^2 - 18}{x^2 - 4}$

Equate the denominator to zero:

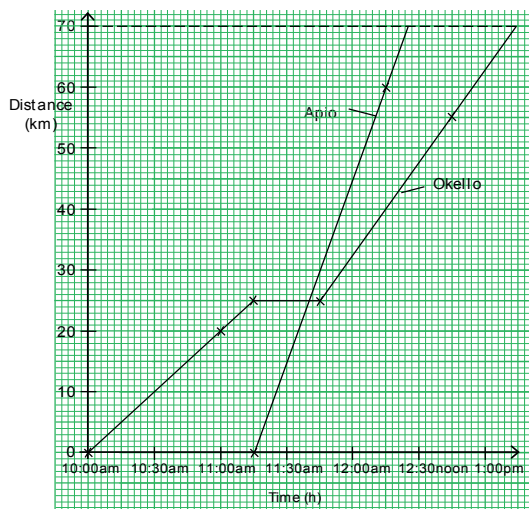$x^2 - 4 = 0$

$x^2 = 4$

$x = \sqrt{4}$

$x = -2$ and $x = 2$

13. Okello

Time (hrs)	10:00	11:00	11:15	11:45	12:45
Distance	0	20	25	25	55

Apio

Time (hrs)		11:15	12:15
Distance (km)		0	60

Distance–Time graph for Okello and Apio's Journey

b) (i) 11:40 am

(ii) 1:15 pm

$=\underline{12:24 \text{ pm}}$

51 minutes

Okello arrived 51 minutes later than Apio.

14 (a) Let the size of the land be p and the time they will take be t.

Sharon: 50 hours $\Rightarrow p$

1 hour $\Rightarrow \dfrac{p}{50}$

t hours $= \dfrac{p}{50}t$

Peter: 10 hours $\Rightarrow P$

1 hour $\Rightarrow \dfrac{p}{10}$

t hours $= \dfrac{p}{10}t$

Sharon's portion in t hours + Peter's portion in t hours

$= p$ $\quad \therefore \dfrac{p}{50}t + \dfrac{p}{10}t = p$

$$\frac{pt + 5pt}{50} = p$$

$$\frac{6pt}{6p} = \frac{50p}{6p}$$

$$t = \frac{50}{6} = 8\tfrac{1}{3}$$

They will take $8\tfrac{1}{3}$ hours or 8 hrs 20 minutes

b) $Y \propto X^2$ let a = constant of proportionality.

$Y = aX^2$ also

$Y \propto X^3$ let b = constant of proportionality

$Y = bX^3$

$Y = aX^2 + bX^3$

When $X = 40$, $Y = 3264$

$3264 = a(40)^2 + b(40)^3$

$3264 = 1600a + 64000b$

Reduce by 64

$51 = 25a + 1000b$ ………….. (i)

When $X = 20$, $Y = 416$

$416 = a(20)^2 + b(20)^3$

$416 = 400a + 8000b$

$26 = 25a + 500b$ …………. (i)

Eliminating a in (i) and (ii)

$51 = 25a + 1000b$

$26 = 25a + 500b$

$\overline{}$

$25 = 500b$

$$b = \frac{25}{500} = \frac{1}{20}$$

Substituting $b = \dfrac{1}{20}$ in (i)

$$25a = 51 - 1000 \times \frac{1}{20}$$

$25a = 51 - 50$

$$a = \frac{1}{25}$$

$Y = aX^2 + bX^3$

$$Y = \frac{1}{25}X^2 + \frac{1}{20}X^3$$

(ii) When $X = 30$

$$Y = \frac{1}{25} \times 30^2 + \frac{1}{20} \times 30^3$$

$$Y = \frac{900}{25} + \frac{27000}{20}$$

$Y = 36 + 1350$

$Y = 1386$

15. (i) Cash price $\left(\dfrac{100-15}{100}\right) \times 750{,}000$

$= \dfrac{85}{100} \times 750{,}000$

$= 637500$

Customer pays UGX 637500 if he/she pays cash.

Weekly hire purchase price$=100{,}000+(8\times100{,}000)$

$= $ UGX 900,000

Saving the customer makes by buying cash rather than weekly hire purchase

$= 900{,}000 - 637500$

$= $ UGX 262500

She/he saves UGX 262500

(ii) Monthly hire purchase $= 210{,}000 + (4 \times 150{,}000)$

$= 210{,}000 + 600{,}000$

$= $ UGX 810,000

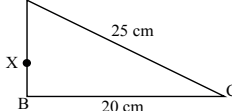Saving $= 810{,}000 - 637{,}500$

$= $ UGX 172,500

Customer saves UGX 172,500

b) $A = 15000000\left(1 - \tfrac{15}{100}\right)^3$

$= 9{,}211{,}875$

The car's value will be UGX 9,211,875 after 3 years.

16. (a)

$AB = \sqrt{25^2 - 20^2}$

$= \sqrt{625 - 400}$

$= \sqrt{225} = 15$ cm

$BX = \dfrac{AB}{2} = \dfrac{15}{2} = 7.5$ cm

b) Surface Area 2 × Area of each face

$= 2(20 \times 8 + 20 \times 15 + 8 \times 15)$

$= 2(160 + 300 + 120)$

$= 1160$ cm²

The surface area $= 1160$ cm²
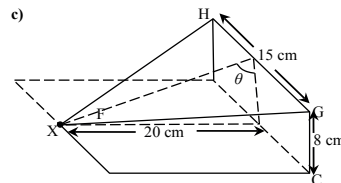
(ii) $V = L \times W \times H$

$V = 20 \times 15 \times 8$

$= 2400$ cm³

The volume $= 2400$ cm³

c)

$\tan\theta = \dfrac{20}{8}$

$\theta = \tan^{-1}\dfrac{20}{8}$

68.199°

$\therefore$ Angle between planes AGH and CDHG is 68.199°

17. a) (i) $\overrightarrow{BA} = \overrightarrow{OA} - \overrightarrow{OB}$

$= \underline{a} - \underline{b}$

(ii) $\overrightarrow{OQ} = \overrightarrow{OP} + \overrightarrow{PQ}$

$= 4\underline{a} + 2\overrightarrow{OB}$

$= 4\underline{a} + 2\underline{b}$

b) $\overrightarrow{BX} = \overrightarrow{OX} - \overrightarrow{OB} = m\overrightarrow{BA}$

$= \overrightarrow{OX} - \underline{b} = m(\underline{a} - \underline{b})$

$= \overrightarrow{OX} = m\underline{a} + (1-m)\underline{b}$ ……… (i)

But $\overrightarrow{OX} = n\overrightarrow{OQ}$

$\overrightarrow{OX} = n(4\underline{a} + 2\underline{b})$

$\overrightarrow{OX} = 4n\underline{a} + 2n\underline{b}$ ……….. (ii)

Equate Eqns (i) and (ii)

$4n\underline{a} + 2n\underline{b} = m\underline{a} + (1-m)\underline{b}$

$4n = m$ …….. 1

$2n = 1 - m$

But m = 4n

$2n = 1 - 4n$

$6n = 1$, $n = \dfrac{1}{6}$

From $4n = m$

$m = 4 \times \dfrac{1}{6} = \dfrac{2}{3}$

$\therefore n = \dfrac{1}{6}$ and $m = \dfrac{2}{3}$

MORE REVISION QUESTIONS

SECTION A

1. Solve the simultaneous equations.

$\sqrt{x} = 4 - y$

$5 + y = 2\sqrt{x}$

2. Given that $m * n = \dfrac{3m^2 - 10n}{1 - mn}$, evaluate

(i) $2 * -3$ (ii) $7 * (\bullet 2 * -3)$

In the figure above two chords AB and CD intersect at E. AB = 10cm, CD = 4cm. If EB is 2cm shorter than ED, find the length of EB and ED.

Continued from page III

3.

4. Factorise $64 - (x - 5)^2$ completely, hence state the values of x for which $64 - (x - 5)^2 = 0$.

5. Given that $P^{-1} = \begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$. Find matrix P.

6. If $\sin\theta = \dfrac{1}{2}$, find two possible values of θ between 0° and 360°.

7. Patrick is twice as old as Prudance. After five years, the sum of their age will be 40 years. Find their ages after 5 years.

8. Find a matrix representing a rotation of x-axis onto the line $y = x$.

9. Find the range, median and interquartile range of the data given
7, 8, 9, 10, 12, 13, 14, 16

10. An aeroplane takes off from P and flies to Q. It then flies to R. The bearing of Q from P is 054° and the bearing of R from Q is 133°. If PQ = 300km and QR = 500km, find the distance PR and bearing of P from R.

SECTION B

11. (a) Copy and complete the table of values below for $y = (2x + 5)(x - 3)$.

x	-5	-4	-3	-2	-1	1	2	3	4	5	6
$2x + 5$					7						
$x - 3$					-2						
y											51

(b) Use your complete table to draw the graph of $y = (2x + 5)(x - 3)$. Use a scale of 1cm to represent 5 units on the y-axis.

(c) Draw on the same graph the line $y = 3x + 15$
hence solve the equation $x^2 - 2x = 15$.

12. (a) If $\begin{pmatrix} 1 & 3 \\ 4 & 2 \end{pmatrix}\begin{pmatrix} 5 & x \\ 1 & y \end{pmatrix} = \begin{pmatrix} 8 & x \\ z & 4 \end{pmatrix}$, Find the value of x, y and z.

(b) Find the inverse of $\begin{pmatrix} 3 & 5 \\ 1 & 1 \end{pmatrix}$ and hence solve the simultaneous equations
$3x + 5y = 7$
$x + y = 1$

13. In a trading Centre, there are four wholesale shops A, B, C and D. A is 750m on a bearing of 038° from B. C is 600m on a bearing of 170° from B. D is 950m on a bearing of 50° from C.
   (a) Use a scale of km to represent 100m to construct a scale drawing showing the positions of the four wholesale shops.
   (b) Find the distance and bearing of D from A.

14. The histogram below shows the heights of students in a given class.
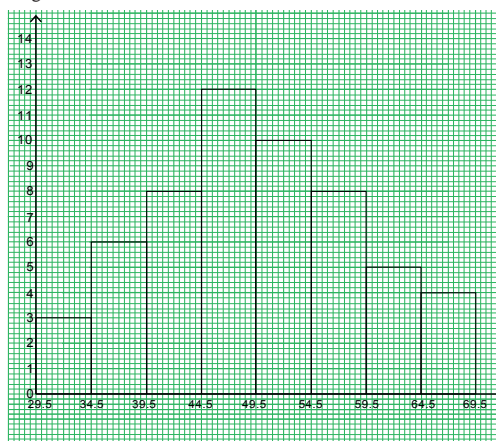
(a) Find the model weight from the histogram.
(b) Draw a frequency distribution table and hence calculate the;
   (i) Mean weight
   (ii) Median weight

15. (a) Draw the graph of $y = \sin x$ for the domain $0° \leq x \leq 720°$ using an interval of 60°.
   (b) From the graph, if; (i) $\sin x = 0$ (ii) $\sin x = \dfrac{-1}{2}$
      (iii) $\sin x = \dfrac{1}{2}$ and $\sin x = 1$, what are the positive possible values of x?
   (c) Obtain from the graph the values of:
      (i) $\sin 170°$ (ii) $\sin 270°$

16. A triangle PQR with vertices P(2, -2), Q(4, -4) and R(7, -3) is mapped onto triangle P'Q'R' by a transformation matrix $M = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.
   The triangle P'Q'R' is mapped onto triangle P''Q''Q'' by another transformation matrix $N = \begin{pmatrix} -0.5 & 0 \\ 0 & -0.5 \end{pmatrix}$.
   (a) Determine the coordinates of the vertices
      (i)   P', Q' and R'
      (ii) P'', Q'' and R''
   (b) On the same axes draw the triangle PQR, P'Q'R' and P''Q''R''.
   (c) Describe fully the transformation represented by
      (i) M   (ii) N.

17. A farmer pains to plant a 20 hectare field with maize and beans. The farmer's estimates for the projects are shown in the table.

|	Maize	Beans
Number of working hours per hectare	15 days	6 days
Planting and harvesting costs per hectare	UGX 900,000	UGX 600,000
Expected profit per hectare	UGX 2,000,000	UGX 1,500,000

The farmer has only UGX 12,600,000 to invest in the project. The total number of working days is 150.
   (a) Let x and y represent number of hectares to be planted with maize and beans respectively. Write down all the inequalities for the above information.
   (b) Write down an expression for the profit P in terms of x and y.
   (c) (i) On the same axes plot graphs of the inequalities by shading out the unwanted regions.
      (ii) Use your graphs to determine how the farmer should use the field to maximise the profit. Hence find the farmer's maximum profit.


ANSWERS FOR CHEMISTRY PAPER TWO (MAY 11 ISSUE)

SECTION A

1 a) Chromatography is a technique for the separation of a mixture by passing it in a solution or suspension through a medium in which the components move at different rates on an adsorbent medium.

b) Athlete y

c) Paper chromatography works by passing the dissolved material, liquid or gas through a filter/adsorbent material/medium.

The molecules separate into layers as the molecules pass through the filter. Chemical components in liquid mixture spread out and travel at different speeds over a stationary solid. The component that is more soluble in the solvent, rises faster and this way, component colours get separated and spread out. Coloured patches on adsorbent medium for PED and samples are matched. Patterns in a sample similar to those in PED confirm presence of PED in the sample.

d) Large quantity of sample cannot be applied on paper chromatography.

Does not give quantities of components in the sample.

2. a) i)   W
   ii)   X and Z
   b)   X, W, Z
   c)   WX₂
   d) i) Noble gases or inert gases
   ii) Its outermost shell/valance shell has eight electrons
      Stable and does not combine with other atoms

3. a) $Mg(s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu(s)$
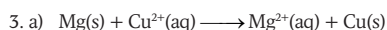
b) Redox combines the terms reduction and oxidation.
Mg(s) loses two (2) electrons to form magnesium ions (Mg^{2+}) this is an oxidation, Cu^{2+} gains the electrons lost by Mg^{2+} to become Cu(s) this a reduction reaction.
The equation involves both oxidation and reduction.

c)
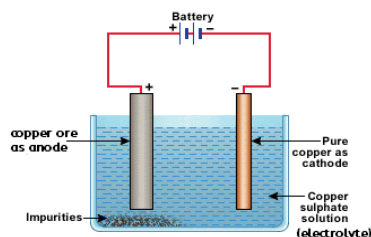
4. a)(i) $\begin{array}{cc} C & H \\ 85.7 & 14.3 \\ \hline 12 & 1 \\ 7.142 & 14.3 \\ \hline 7.142 & 7.142 \\ 1 & 2 \end{array}$

   CH_2

ii) $(CH_2)x = 42$
   $12x + 2x = 42$
   $14x = 42$

Continued from page IV

$$x = \frac{42}{14}$$

$$x = 3$$

$$(CH_2)_3 = C_3H_6$$
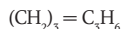
b) Ethene

5 a) The solubility of the salt refers to the mass of the salt which will dissolve per 100g of solvent (in this case, water) at a particular temperature.

b) Increasing the temperature increases the solubility of substances. For example, sugar and salt are more soluble in water at higher temperatures. When a solvent is heated, the average kinetic energies of its molecules increases. Hence, the solvent is able to free more particles from the surface of the solute.
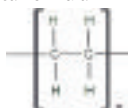
c) Salting out of soap during saponification
Purification of common salt

6. a) 1. sulphuric acid must be concentrated
2. temperature above 150°C

b)

Ethanol, Ethylene

c) i) Name: Polyethene
Chemical formula $-\!\!\left[CH_2\text{-}CH_2\right]\!\!-_n$
or

ii) Polythene bags are one kind of plastics which are non-biodegradable and cause environmental pollution.

7 a) i) Arrangement:
Copper II sulphate is an ionic compound. The ions in a solid ionic compound are not randomly arranged. Instead, they have a regular, repeating arrangement called an ionic lattice. The lattice is formed because the ions attract each other and form a regular pattern with oppositely charged ions next to each other.

Type of attractive forces:
Atoms in copper II sulphate are held together by ionic bonds, created by the electrostatic forces of attraction of opposite charges.

b) Copper sulphate is an ionic compound. When in solid state, the electrons are held by the strong electrostatic forces so they are not free to conduct electricity. However, when dissolved in water, the ions dissociate, electrons become delocalised and conduct electricity.

c) The blue colour fades as more and more copper is deposited, depleting the concentration of blue copper ion Cu^{2+} in solution. The negative cathode electrode attracts Cu^{2+} ions (from copper sulphate) and H^+ ions (from water).
$$Cu^{2+}(aq) + 2e^- \longrightarrow Cu(s)$$
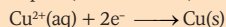
8. a) A functional group is defined as an atom or group of atoms joined in a specific manner, which gives the chemical properties of the organic compound and are the centres for chemical reactivity.

b) 1. carboxyl functional group (-COOH)
2. hydroxyl functional group (-OH)
Are soluble in water
Are weak acids
have strong odours
Their boiling points of increase as the molecular chain gets longer.

9. Moles of acid:
1000 cm³ contain 0.150 moles
1 cm³ contain $\frac{0.150}{1000}$ moles
10.5 cm³ contain $\frac{0.150}{1000} \times 10.5$ moles
= 0.001575 moles of acid
From the equation,

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1 mole of acid reacts with 2 moles of ammonia
0.001575 moles of acid react with $\frac{2}{1} \times 0.001575$ moles
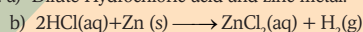= 0.00315 moles of ammonia
20.0 cm³ of solution contain 0.00315 moles of ammonia
1 cm³ of solution contains $\frac{0.00315}{20}$ moles
1000 cm³ of solution contains $\frac{0.00315}{20} \times 1000$ moles
= 0.1575 M ammonia solution.

10. a) Dilute Hydrochloric acid and zinc metal.
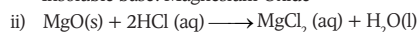b) $2HCl(aq) + Zn(s) \longrightarrow ZnCl_2(aq) + H_2(g)$
c) Add a catalyst like copper II sulphate to speed up the reaction by lowering the activation energy.
Use zinc powder to increase the surface area for reaction

SECTION B

11. a) i) Acid: hydrochloric acid
Insoluble base: Magnesium Oxide
ii) $MgO(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2O(l)$
iii) Use concentrated acid
The oxide should be in powder form
Add a catalyst

b) i) Moles of acid:
1000 cm³ contain 0.650 moles of acid
1 cm³ contains $\frac{0.650}{1000}$ moles of acid
20.0 cm³ contain $\frac{0.650}{1000} \times 20.0$ moles of acid
= 0.013 moles of acid

ii) Moles of KOH:
From the equation,
1 mole of acid reacts with 2 moles of KOH
0.013 moles of acid react with $\frac{2}{1} \times 0.013$ moles of KOH
= 0.026 moles of KOH

iii) Mass of K_2SO_4
From the equation,
2 moles of KOH yield 1 mole of K_2SO_4
0.026 moles of KOH yield $(\frac{1}{2} \times 0.026)$ moles
= 0.013 moles
Rfm of $K_2SO_4 = 174$
1 mole of K_2SO_4 contains 174g
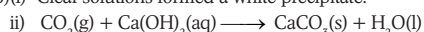0.013 moles if K_2SO_4 contain $(\frac{174}{1} \times 0.013)$g
= 2.262 g of K_2SO_4

b) Potassium sulphate is a soluble salt; the solution is gently heated until it evaporates. A glass rod is dipped in the hot solution and removed to see if crystals form. When they start to form, the solution is allowed to cool. The excess solution is poured off and the crystals dried using a bolting paper.

12 a) Dilute Hydrochloric acid is placed in a thistle funnel and plunged into a round bottomed flask containing calcium carbonate supported by a retort stand. A delivery tube is connected from the flask to a conical flask containing water which remove any impurities and hydrogen chloride gas. The stopped conical flask connects to a stoppered reagent bottle containing concentrated sulphuric acid which dries the gas. Another delivery tube is connected to a bee hive. When the tap is opened, the acid reacts with calcium carbonate. The gas is dried and collected by downward delivery or upward displacement of air.
$HCl(aq) + CaCO_3(s) \longrightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

b)(i) Clear solutions formed a white precipitate.
ii) $CO_2(g) + Ca(OH)_2(aq) \longrightarrow CaCO_3(s) + H_2O(l)$
White ppt

c) i) The white ppt dissolved to colourless solution.
ii) Excess carbon dioxide reacts with $CaCO_3$ (ppt) to form $Ca(HCO_3)_2$ which is soluble.
$CaCO_3(s) + H_2O(l) + CO_2(g) \longrightarrow Ca(HCO_3)_2(aq)$

d) i) Magnesium continues to burn with a dazzling white flame forming white ash and black particles.
ii) Magnesium is more reactive than carbon. It is able to displace the carbon in carbon dioxide reacting with oxygen to form magnesium oxide. The reaction is exothermic
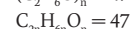
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which enables the burning to continue.
iii) $2Mg(s) + CO_2(g) \longrightarrow 2MgO(s) + C(s)$
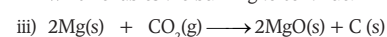
13 a)(i)

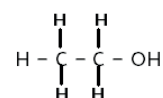| C	H	O
0.522	0.130	0.348
12	1	16
0.0435	0.130	0.02175
0.02175	0.02175	0.02175
2	6	1

$$C_2H_6O$$

ii) $(C_2H_6O)_n = 47$
$C_{2n}H_{6n}O_n = 47$
$(12 \times 2n) + (1 \times 6n) + (16 \times n) = 47$
$24n + 6n + 16n = 47$
$46n = 47$
$n = \frac{47}{46}$

iii)

b)(i) Ethene
(ii) $H_2C = CH_2 + H_2O \xrightarrow{\text{warm}} C_2H_5\text{-}OH$
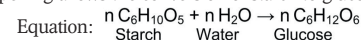
c) Preparation of ethanol from plants materials
Locally any starchy food materials which can ferment is used. Foods like banana, cassava, sweet potato, maize and others
From bananas:
■ Bananas are kept in a warm place until when ripe. Ripening allows the conversion of starch to glucose.
Equation: $nC_6H_{10}O_5 + nH_2O \rightarrow nC_6H_{12}O_6$
Starch   Water   Glucose
■ Juice is squeezed out of banana using grass. The banana juice is chemically a concentrated glucose solution.
■ Sprouted sorghum is roasted and crushed then added to the banana juice, sorghum provides an enzyme zymase. The mixture buried in earth to provide warm and stable temperature for fermentation to take place.
■ After a few days, fermentation of glucose in banana juice by zymase takes place converting glucose to ethanol.
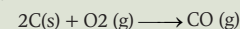Equation: $nC_6H_{12}O_6 \longrightarrow 2nC_2H_5OH + 2nCO_2$
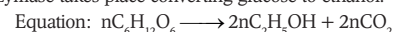
14. a) An ore is a material that contains a sufficiently high concentration of a mineral to constitute an economically feasible source from which the metal can be extracted.

b)

Name of ore	Chemical formula
hematite	Fe_2O_3
magnetite	Fe_3O_4
limonite	$FeO(OH) \cdot nH_2O$
siderite	$FeCO_3$

c) Extraction of iron from hematite in a blast furnace
- Raw materials: iron ore, coke and limestone are added at the top of the furnace.
- Blasts of hot air are blown in near the bottom of the furnace.
- Oxygen in the blast of air reacts with coke to form carbon monoxide.
$$2C(s) + O_2(g) \longrightarrow CO(g)$$
This reaction is exothermic and the temperature in the furnace reaches 2000°C.
- As the carbon monoxide rises up the furnace, it reacts with the iron ore to form iron.
  - $Fe_2O_3(s) + 3CO(g) \longrightarrow 2Fe(l) + CO_2(g)$
- Molten iron runs to the bottom of the furnace where it is tapped off.
- The molten iron is used to make steel or poured into moulds to solidify. The large chunks of iron formed are called 'pig iron'.
- Removing impurities:
The calcium carbonate in the limestone thermally decomposes to form calcium oxide.
calcium carbonate → calcium oxide + carbon dioxide
$CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$

The calcium oxide then reacts with silica (sand) impurities in the haematite, to produce slag - which is calcium silicate.

CHEMISTRY REVISION QUESTIONS

SECTION A

1. The figure below shows a set-up to separate mixtures in the laboratory.
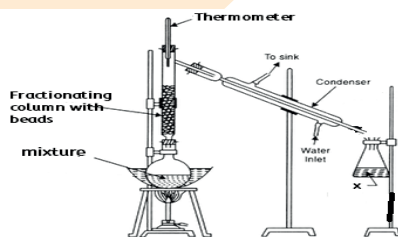
a) Identify;
   i) the method of separation of mixtures shown.
   ii) liquid X
b) During the process, what is the role of;
   i) water in the trough
   ii) beads in fractionating column
c) Explain the principle behind this method of separation of mixtures.

2. The atomic number and mass numbers of hydrogen and Nitrogen are shown in the table below.

Element	Atomic number	Mass number
Hydrogen	1	1
Nitrogen	7	14

Write the standard representation of the atoms of each element.
(a) (i) Name the type of bond formed when the two atoms combine.
(ii) State two characteristics of the compound formed resulting from the type of bond.
(b) Using valence shells, show how the atoms of the two elements bond.

3. Ammonia is manufactured by the reaction between hydrogen and nitrogen in the Haber process.
a) State the conditions used in the Haber process.
   i) Temperature
   ii) Pressure
   iii) Catalyst
b) Describe and explain the effect of increasing the pressure on the rate of this reaction.
c) Ammonia is used to make fertilisers. The table gives some information about two fertilisers made from ammonia.

| Fertiliser	Formula	Relative formula mass (M_r)
Ammonium nitrate	NH_4NO_3	80
Urea	$(NH_2)_2CO$	60

Use the data in the table to find which fertiliser contains a greater percentage by mass of nitrogen than ammonium nitrate.

4. The statements below give some of the chemical properties of metal X and its compounds.
• X does not react with cold water.
• X does not form a precipitate with potassium iodide.
• X reacts dissolves in excess sodium hydroxide solution.
• X reacts with magnesium oxide.
a) Suggest a possible identity for X.
b) Write the equation for the reaction between X and the oxide of magnesium.
c) Write an ionic equation for the reaction between X and sodium hydroxide solution.
d) Metal X is a good electrical conductor explain why X conducts electricity.

5. The atmosphere contains a large number of gases, including oxygen, nitrogen, carbondioxide, sulphur dioxide, oxides of nitrogen, methane and chlorofluorocarbons (CFCs).
a) Carbondioxide, methane and CFCs are greenhouse gases.

i) State one effect of an increase in the atmospheric concentration of carbondioxide.
ii) State one source of methane gas.
iii) How is methane gas useful in the environment?
b) The formula of one molecule carbondioxide is CO_2. Using valence shells only, show how carbon bonds with oxygen.

6. Iron metal was reacted with dilute sulphuric acid.
a) i) State what was observed.
   ii) Write a chemical equation for this reaction.
b) Zinc granules were added to the resultant solution.
   i) State what was observed.
   ii) Write an equation of reaction.

7. The flow chart shows some reactions of copper(II) nitrate, $Cu(NO_3)_2$
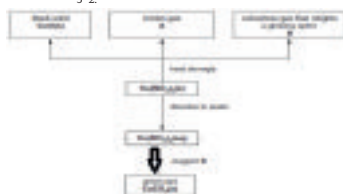
a) When two moles of $Cu(NO_3)_2$ is heated strongly, a black residue; gases A and B are formed. Identify;
   i) The black residue.
   ii) Gases A and B.
   iii) Write an equation of reaction for the action of heat on $Cu(NO_3)_2$
b) i) Identify reagent X
c) Write an equation that leads to formation of the green precipitate.

8. The figure below shows processes involved in the treatment of water.
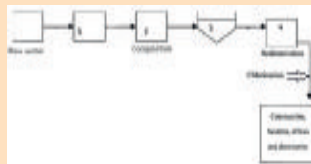
a) Identify the processes,
   i) 1
   ii) 3
b) i) Which important step has been left out?
   ii) How is the step important for good water quality?
c) Explain how chlorination ensures that water is colourless before being released to the community.

9. Concentrated sulphuric acid was reacted with sugar crystals in a boiling tube.
a) i) State what was observed.
   ii) Write a chemical equation for the reaction.
b) State one domestic use of the solid product in the above reaction.
c) i) Which property of sulphuric acid is demonstrated by this reaction?
   ii) State two ways the property of sulphuric acid in b (i) can be applied.

10. Nitrogen and hydrogen gases were reacted to form ammonia gas.
a) i) State the conditions for this reaction.
   ii) Write an equation of reaction.

b) $25cm^3$ of nitrogen were reacted with $15cm^3$ of hydrogen gas. Calculate;
   i) The volume of ammonia formed.
   ii) The volume of excess gas.

SECTION B:

11. a) What is meant by the term heat of neutralisation?
b) An experiment was carried out where different volumes of dilute hydrochloric acid and aqueous sodium hydroxide both at 25°C were mixed and stirred with a thermometer. The highest temperature reached by each mixture was recorded in the table below:

Volume of hydrochloric acid (cm^3)	5	10	15	20	25	30	35	40	45
Volume of sodium hydroxide (cm3)	45	40	35	30	25	20	15	10	5
Highest temperature of mixture (°C)	27.2	29.4	31.6	33.8	33.6	31.8	30.0	28.4	26.6

Plot a graph to represent the above information.
   i) Using your graph, determine the highest temperature reached, the volume of acid and base reacting when highest temperature is reached.
c) i) Write an ionic equation for this reaction.
   ii) Calculate the amount of heat liberated during the neutralisation process at this temperature. (Specific heat capacity is 4.2 J g^{-1} K^{-1} and the density of solutions is 1.0 g/cm^3).
d) State any factor which can affect the results of this experiment.
e) The molar enthalpy of neutralisation between hydrochloric acid and ammonia solution was found to be -52.2 kJ mol^{-1}, while that of hydrochloric acid and sodium hydroxide was -57.1 kJ mol^{-1}. Explain the difference in these values.

12. Sulphur can be extracted by Frasch process. In the process, superheated water is used.
a) i) Why is it necessary to use superheated water in this process?
   ii) State two physical properties of sulphur that makes it possible for it to be extracted by this method.
b) The diagram below shows part of the processes in the manufacture of sulphuric acid.
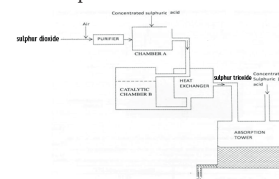
   i) State the conditions under which sulphur dioxide can be formed from sulphur and air.
   ii) Write a chemical equation for the reaction.
   iii) What is the role of concentrated sulphuric acid in chamber A?
c) i) Name two catalysts that can be used in the catalytic chamber B.
   ii) Write the equation of reaction.
d) i) Explain, with equations, how sulphuric acid can be formed in the absorption tower.
   ii) One way in which sulphur dioxide is a pollutant.

13. (a)(i) What is the chemical name of soap?
(ii) Briefly describe how soap can be prepared in the laboratory.
(iii) Explain the cleansing action of soap.
(b) Detergents are sometimes called soapless soaps.
   (i) What are soapless soaps?
   (ii) How are detergents different from soap?
   (iii) Explain why detergents don't form scum with hard water.

14. (a) With help of a diagram, describe how a dry sample of chlorine gas can be prepared in the laboratory.
(b) Dry chlorine gas was reacted with hydrogen.
   (i) State what was observed.
   (ii) Write an equation of reaction.
(c) The product in (b) above was dissolved in water and the resultant solution;
   (i) tested with a red litmus paper. State what was observed.
   (ii) reacted with a solution of lead II nitrate. State what was observed and write an equation of reaction.
(d) State any two uses of chlorine gas.