



HOME SCHOOLING MATERIAL

PASS O' LEVEL

COMPUTER, MATH AND CHEMISTRY



YOUR GUIDE AWAY FROM SCHOOL

COMPUTER STUDIES PAPER ONE SOLUTIONS (OCOMP006)

SECTION A

1. **C:** Input devices receive data from a user and put it into a computer-understandable format. A memory unit is used to hold data, while output devices are used to display feedback to the user and an ALU is used to perform calculations on a computer.
2. **B:** A computer uses electricity. Normally, electricity is either on or off, and electric switches are represented as either in a state of being on or off. These two states are represented by 1s and 0s, which we call bits and they formulate the binary language.
3. **C:** RAM holds all program instructions which are running. A flash disk, compact disc and a hard disk are examples of secondary storage devices. They permanently store data which is not being actively worked upon by the processor.
4. **D:** Application software is responsible for performing specific tasks for the user. An example of such software is WhatsApp. Android is an operating system, while a disk cleaner and antivirus are utility programs.
5. **B:** Supercomputers are extremely powerful computers used for complex computations and processing, while mainframe are powerful computers used to host a large amount of data and programs available to a wide group of users.
6. **D:** Fifth-generation computers are most commonly defined as those that are based on artificial intelligence, allowing them to think, reason and learn. Transistors are in the second generation, Microprocessors in the fourth, integrated circuits in the third.
7. **C:** Presentation, spreadsheet and photo-editing software are examples of application software since they perform specific tasks for the user. OS & programming languages are types of system software which operate, control and extend the processing capabilities of a computer system.
8. **C:** The results which are presented after processing are referred to as output. The picture has been taken (input) and processed appropriately, so, the actual print represents the output.
9. **C:** Forensics deals with finding evidence on computers and other digital storage media, robotics deal with devices controlled by a computer that can move and react to sensory input. Simulation involves imitation of a situation and put on a computer. Animation is a method in which pictures are manipulated to appear as moving images.
10. **B:** A computer virus is designed to alter the way a computer operates or to cause harm to the computer system. Disk crash, corruption of programs and deletion of files are some of the effects caused by a virus.
11. **D:** A formula is an expression which calculates the value of a cell. A function is a predefined formula in excel. Cell address is used to identify a specific cell in a spreadsheet e.g A2. Values are numbers entered in a spreadsheet.
12. **D:** You will need to know the email address of the person whom you are sending the message just like how you first get to know the phone number of the person you are contacting.
13. **C:** The programs which can be carried out are compiled in an executable file.
14. **D:** To move a file, it means no copy of the file should remain in that location. You need to select it, cut and then paste it. If you use the option of select, copy, paste, it creates a copy of the same file, but it doesn't



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- necessarily move the file.
15. **B:** System software operate, control and extend processing capabilities of a computer. Application software such as off shelf software perform specific tasks for the user.
 16. **A:** Online databases have search tools which can help someone easily access information.
 17. **D:** The first thing is to enter data (scan the picture) in the computer, then process it (resize) and give the output (print).
 18. **D:** A printer can easily be shared on a network. Joystick, mouse and keyboard may not be easily shared on a network.
 19. **A:** User interfaces control the interaction between the OS & the user. Language translator converts computer programs from one language to another. A platform is a group of technologies that is used as a base upon which other applications are developed. A screensaver is a program that is activated after the computer is inactive for a specified amount of time.
 20. **A:** CPU and simulator are not language processors. A compiler converts the entire program at once.

SECTION B

21. (a) A software licence is an agreement, either included in a software package or displayed on the screen when the software is installed or launched that specifies the conditions under which the program can be used.
(b) Give two examples for each of the following type of software.
 - (i) Freeware
 - Chrome (Web browser)
 - LibreOffice (office suite)
 - VLC Media Player (media player)
 - Evernote Basic (notetaking/archiving software)
 - (ii) Shareware
 - WinZip (file compression program)
 - Video Edit Magic (video editing program)
 - Image Shrinker (image optimizer)
 - Deluxe Ski Jump 3 (game)
- (c) A Senior One student saw a presentation and spreadsheet software on a computer. Explain the use of each of them.
 - (i) **Presentation software**
 - Allows users to create visual presentations to convey information more easily to others
 - (ii) **Spreadsheet software**
 - Provides users with a convenient means of creating documents containing complex mathematical calculations.
22. (a) **Data** refers to raw, unorganised facts, while **information** refers to data that has been processed into a meaningful form.

- (b) Devices in an information processing cycle that are at the specified levels of operation.
 - (i) **Input**
 - Keyboard, Mouse, Scanner, Digital camera, Digital pen/stylus, Touchpad, joystick etc
 - (ii) **Output**
 - Monitor, printer, speaker, projector, Headphones
 - (iii) **Processing**
 - Central Processing Unit (CPU), Graphics Processing Unit (GPU)
 - (iv) **Storage**
 - Hard drive, CD/DVD/Blu-ray drives, Flash drive, Flash memory card reader.
23. (a) Examples of spreadsheet programs.
 - Microsoft Excel, Corel Quattro Pro, Google Sheets, Apple Numbers(b) Advantages of using a spreadsheet program.
 - It is easier to organise data, such as sorting it.
 - It allows multiple user access to the file.
 - It is easier to represent data in graphical form.
 - Easy to make changes and corrections to data on the worksheet.
 - The rest of the worksheet is recalculated whenever data on a worksheet changes.
 - Operation is fast with the help of built-in functions and macros.
 - Calculation is always accurate, provided that data and formulae entered are correct.(c) Study the function provided =IF (A3>50, PASS, FAIL)
 - (i) State the category under which the above function falls.
 - Logical function
 - (ii) State whether the above function will run or not when executed. Give the reason for your answer.
 - The function given will not run. The words PASS and FAIL are missing quotation marks.
 - (b) Give two function which are in the same category as the one indicated above.
 - AND, FALSE, NOT, OR, TRUE.
24. (a) (i) what is the difference between a web server and web browser.
Web server refers to a computer that is continually connected to the internet and hosts Web pages that are accessible through the Internet while a web browser is a program used to view Web pages.
(ii) Give two examples of web browsers.
 - Microsoft Edge, Internet Explorer (IE), Chrome, Safari, Opera, or Firefox(b) The screenshot below was obtained from a smartphone.

- (i) The labels A and B represent;
 - A- Wireless Fidelity
 - B- Bluetooth
- (ii) The major advantage of using connection A over connection B?
 - It has a faster speed of connection.
 - It has a wider coverage compared to B.
- (iii) With an example, define a protocol. Protocol. Set of rules that govern the communication between the devices. Examples: FTP, http, SMTP, TCP/IP

25. (a) (i) Optical disc is a type of storage medium read from and written to using a laser beam
(ii) Disk cache is memory used in conjunction with a magnetic hard drive to improve system performance.
(b) The following specifications were obtained from a compact disk: CDR-80, 700MB/80 Min (2x-56x CD-recordable)
In these specifications, "80 Min" means that a compact disk (CD) can record up to 80 minutes of audio version. i.e if you burn audio on a CD, it will fit 80 minutes of music.
(c) Sort the following storage media according to the categories given in the table. Flash disk, CD, Memory card, DVD, SD card, Blu ray disc.
Optical storage: CD, DVD, Blu Ray disk
Solid state storage: Flash disk
DVD Memory card, SD card

26. (a) Explain the following network area coverages.
 - (i) **Local Area Network**
A network that connects devices located in a small geographical area, such as within a building.
 - (ii) **Wide area Network**
A network that connects devices located in a large geographical area.
 - (iii) **Metropolitan Area Network**
A network designed to service a metropolitan area.
- (b) Advantages of using;
 - (i) **Fiber optic cable**
 - It is fast and supports high bandwidth.
 - It can be used for long distances because it suffers less attenuation.
 - (ii) **Coaxial cable**
 - It is more resistant to radio and electromagnetic interference than the twisted pair cable.
 - It can carry voice, data and video signal simultaneously.

SECTION C

27. (a) **Computer crime** is any illegal act involving a computer.
 - (ii) **Computer crimes**
 - **Hacking:** Using a computer to break into a computing resource.
 - **Fraud:** Using computers to conceal information or cheat other people with the aim of gaining money or information.
 - **Identity theft:** Using someone else's identity to purchase goods or services or otherwise illegally masquerade as that individual.
 - **Phishing:** The use of spoofed electronic communications (typically e-mail messages) to obtain credit card numbers and other personal data to be used for fraudulent purposes.
- (b) Environmental threats/hazards to

From page I

- computers and information systems.
- **Fire**; It destroys data, information, software and hardware.
 - **Water/moisture**. This causes metallic components of computer to rust.
 - **Lightning and electricity**. This causes power failure, which can cause damage to data.
 - **Excess heat or high temperature** from the computer or outside environment can destroy computer storage media or devices.
 - **People** can also cause threats such as carelessness, accidental deletion of data and even theft of computer components.
- 28 (a) Explain the following terms as used in programming.
- (i) **An algorithm** is a sequence of steps that can solve a problem.
- (ii) **Syntax** is a set of rules that defines

the combination of symbols that are considered correctly structured in a programming language.

b) Write an algorithm that prompts a user to enter two values, adds them and then displays the result.

Start

Declare variables a, b and c

Read the values of a and b

Add a and b and assign the result to c

c = a + b

Display the result of c

Stop

c) Using a programming language of your choice, write a program that can accept a value, obtains its square root and then displays the result

Using C programming

```
#include <stdio.h>
#include <math.h>
main ()
{
```

```
int a;
float b;
printf("enter the number\n");
scanf("%d", &a);
b=sqrt(a);
printf("The square root of the number is: %f", b);
return 0;
}
```

29. (a) Explain the following terms as used in information technology.

(i) **Troubleshooting**
The process of identifying and fixing/solving computer problems.

(ii) **control panel**
The component of Microsoft windows that provides the ability to view and change system settings.

(iii) **cold booting**
Starting a computer that has been previously off.

(iv) **Uninstalling**
Act of removing software from a computer.

(v) **Warm booting**
Restarting a computer.

b) State any five components/applets of the system control panel and their uses.

- **Network and internet**; used to manage all networks.
- **User accounts**; used to manage access to the computer i.e determining the user privileges or account type, providing user passwords and adding or removing user accounts.
- **Device Manager**; lists all installed and known devices and indicates device status
- **Date, time, language and regions**; used to adjust date and time, change region and time zone settings.
- **Appearance and personalisation**; used to make interface changes.
- **Uninstall programs**; used to remove programs.

COMPUTER STUDIES PAPER ONE QUESTIONS (OCOMP007)

SECTION A

1. Which of the following statements is true?
- A. Minicomputer works faster than Microcomputer
- B. Microcomputer works faster than Minicomputer
- C. Speed of both computers is the same
- D. Microcomputer is faster than a mainframe computer
2. The computer size was very large in the ...
- A. first Generation
- B. second Generation
- C. third Generation
- D. fourth Generation
3. A telecommunication company has a dedicated computer. This company may require to buy more since a dedicated computer
- A. is used by only one person.
- B. is assigned one and only one task.
- C. uses one kind of software.
- D. is meant for application software.
4. The instructions that tell a computer how to carry out the processing tasks are referred to as computer.....
- A. programs
- B. processors
- C. Integrated circuits
- D. Memory chips.
5. Which of the following are functions of an operating system?
- i. Administering security
- ii. Buffering and spooling
- iii. Used to design websites.
- iv. Memory management
- v. Writing computer programs
- A. (i), (ii), (iii)
- B. (i), (ii), (iv)
- C. (iii), (iv), (v)
- D. (ii), (iv), (v)
6. When creating a computer program, the designs the structure of the program.
- A. End user
- B. System Analyst
- C. Programmer
- D. web master
7. A computer user shared copyrighted files with her friends. Which of the following statements is valid about this user sharing the files?
- A. It is ethical, because it is legal.
- B. It is unethical because the files are being given for free.
- C. Sharing copyrighted files without permission breaks copyright laws.
- D. It is ethical because the files are being given for free.
8. A malicious program that masquerades as something useful such as an application software is referred to as

- A. Worm.
- B. Trojan horse.
- C. Virus
- D. Macro virus.
9. The logical link between two tables in a database is known as
- A. Primary Key
- B. Query
- C. Form
- D. Relationship
10. Which of the following can be used to select the entire document?
- A. CTRL+A
- B. ALT+F5
- C. SHIFT+S
- D. CTRL+S
11. A contains specific rules and words that express the logical steps of an algorithm
- A. Programming language
- B. Syntax error
- C. Compiler
- D. Logic chart
12. What is the overall term for creating editing, formatting, storing, retrieving and printing a text document?
- A. Word processing
- B. Spreadsheet program
- C. Web design
- D. Database management
13. A compiler translates a program written in a high-level language into
- A. Machine language
- B. An algorithm
- C. A debugged program
- D. Java
14. When your turn on the computer, the boot routine will perform this test.....
- A. RAM test
- B. disk drive test
- C. memory test
- D. power on self-test
15. Computer programs are written in a high-level programming language; however, the human readable version of a program is called.....
- A. cache
- B. instruction set
- C. source code
- D. word size
16. When sending an e-mail, the line describe the contents of the message.
- A. Subject
- B. To
- C. Contents
- D. CC
17. Computers that reside in other products such as ovens, cars to perform specific functions or tasks for that product are referred to as computers.
- A. Server
- B. Embedded
- C. Robotics
- D. Mainframe
18. Which of the following places the common data elements in order from smallest to largest?
- A. Character, file, record, field, database
- B. Character, database, field, file, record
- C. Character, field, record, file, database
- D. Character, record, field, file, database

19. A USB communication device that supports data encryption for secure wireless communication for notebook users is called a
- A. USB wireless network adapter
- B. wireless switch
- C. wireless hub
- D. router
20. Mechanism to protect private networks from outside attack is
- A. Firewall
- B. Antivirus
- C. Digital signature
- D. Formatting
- SECTION B**
21. (a) Differentiate a database from database management system?
- (b) State four advantages of using a database management system.
- (c) Explain the following terms in relation to database management systems.
- (i) Validation rule
- (ii) Validation text
22. (a) Explain the duties of each of the following computer specialists.
- (i) Database administrator
- (ii) ICT instructor.
- (iii) Web master
- (iv) Web designer
- (b) ICT has brought about a lot of concerns in Ugandan lives. List three arguments for and against ICT.
23. (a) Define a transmission media.
- (b) list the two types of transmission media
- (c) (i) Distinguish a Hub from a switch.
- (ii) Explain the different sections of a fiber optic cable.
- (iii) Mention two advantages of using a fiber-optic cable.
24. (a) Explain any two services offered by the internet.
- (b) Explain the following terms in relation to internet.
- (i) Cookie.
- (ii) Webinar.
- (iii) Wiki.
- (iv) Blog.
25. (a) State any four stages of a system development life cycle.
- (b) Explain the term system analysis in relation to software development.
- (c) State four roles of a system analyst in an ICT firm.
26. (a) Identify the programming languages which were used in each of the following computer generations.
- (i) First generation
- (ii) Second generation

(b) Explain the following terms as used in booting:

(i) BIOS

(ii) POST

(c) State four characteristics of modern computers.

SECTION C

27. A school bought the following items: Intel® core™ i5-7200U CPU @2.7 GHz (4 CPU), 8192 MB of RAM, sound card, speakers, monitor, keyboard, 500 GB hard disk, a floppy disk drive, a CD -R/W drive, mouse, modem, printer and a joystick. The software supplied include: windows 10 Pro, a compiler, spreadsheets, graphics, word processor, presentation, Adobe pdf reader, antivirus, and Microsoft Access.
- (a) Identify any three devices which shall be used to:
- (i) Enter data in the computer
- (ii) Display data from the computer
- (b) Given the specifications above, at which speed shall the computer process the information?
- (c) Some of the students in the school use the computer to do homework. Name the software used to:
- (i) Do calculations and draw graphs.
- (ii) Write an essay.
- (iii) Make a poster.
- (d) Students enjoy playing noisy computer games.
- (i) Which two hardware items are needed to produce sound?
- (ii) Which input device is mostly used for playing games?
- (e) State two specifications you would consider when buying a computer.
28. Using a programming language of your choice, write a program that calculates roots of a quadratic equation ($ax^2 + bx + c = 0$).
29. (a) Explain why the following controls should be implemented for computer-based systems.
- i) Backups
- ii) Air conditioners
- iii) Uninterruptible power supply (UPS)
- iv) Firewall
- v) Passwords
- (b) Computer systems need maximum security to prevent an unauthorized access. State five precautions that you would expect an organization to take to prevent illegal access to its computer-based systems.



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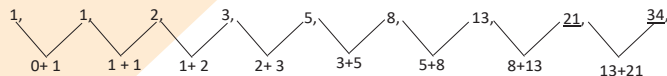
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Monday, June 15, 2020



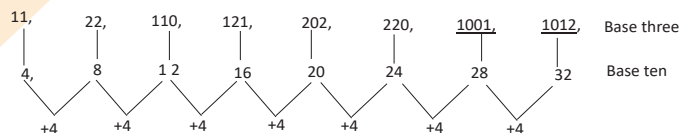
SOLUTIONS FOR MATHEMATICS PAPER TWO (OM006)

1. a)



Add two consecutive values to get the succeeding value

b).



3	28	REMAINDER
3	9	1
3	3	0
	1	0

$$28 = 1001_{\text{three}}$$

3	32	
3	10	2
3	3	1
3	1	0

$$32 = 1012_{\text{three}}$$

2.

$$\begin{aligned} y &= ax^2 \\ y &= kx^2 \\ x_1 &= 6 \\ y_1 &= k \times 6^2 = 36k \\ x_2 &= 10 \\ y_2 &= k + 10^2 = 100k \end{aligned}$$

$$\begin{aligned} y_1 - y_2 &= 36k - 100k = \\ &= -64k = 16 \end{aligned}$$

$$\begin{aligned} k &= \frac{16}{-64} = -\frac{1}{4} \\ \therefore y &= -\frac{1}{4}x^2 \end{aligned}$$

3.

$$\left(\frac{a+3}{2}, \frac{-1+b}{2} \right) = (5, 2)$$

$$\frac{a+3}{2} = 5, a = 7$$

$$\frac{-1+b}{2} = 2, b = 5$$

$$A(7, -1) \quad B(3, 5)$$

$$\overrightarrow{AM} = \overrightarrow{OM} - \overrightarrow{OA} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} - \begin{pmatrix} 7 \\ -1 \end{pmatrix} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

$$|\overrightarrow{AM}| = \sqrt{(-2)^2 + (3)^2} = \sqrt{13} = 3.6056 \text{ units}$$

4.

Number (x)	Standard form	Log(x)
0.841	8.41×10^{-1}	1.9250
32.7	3.27×10^1	+ 1.5145
32.7×0.841		1.4395
$\sqrt[3]{32.7 \times 0.841}$		$1.4395 \times \frac{1}{3} = 0.4798$
3.019	3.019×10^0 ← Anti-log	0.4798

$$\therefore \sqrt[3]{32.7 \times 0.841} = 3.02$$



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$$\begin{aligned} 5. \quad & \frac{1}{\sqrt{5}} + \frac{\sqrt{5}+2}{\sqrt{5}-2} \\ &= \frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} + \frac{(\sqrt{5}+2)}{(\sqrt{5}-2)} \times \frac{(\sqrt{5}+2)}{(\sqrt{5}+2)} = \frac{\sqrt{5}}{5} + \frac{\sqrt{5}(\sqrt{5}+2)+2(\sqrt{5}+2)}{5-4} \\ &= \frac{\sqrt{5}}{5} + 5 + 2\sqrt{5} + 2\sqrt{5} + 4 = \frac{\sqrt{5}}{5} + 9 + 4\sqrt{5} = \frac{\sqrt{5}+45+20\sqrt{5}}{5} \\ &= \frac{45+21\sqrt{5}}{5} = \frac{45}{5} + \frac{21\sqrt{5}}{5} = 9 + \frac{21}{5}\sqrt{5} \end{aligned}$$

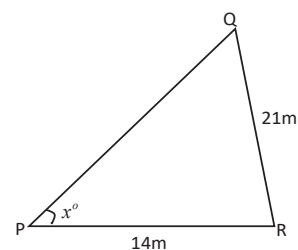
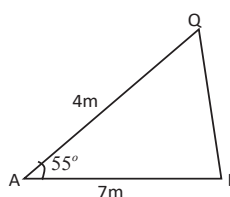
$$\begin{aligned} \text{Comparing with } a+b\sqrt{c} \\ a &= 9, \quad b = \frac{21}{5}, \quad c = 5 \end{aligned}$$

$$\begin{aligned} 6. \quad & f(x) = \frac{x-1}{x^2-x-12} \text{ is undefined when the denominator is 0} \\ & x^2-x-12=0 \\ & x^2-x-12=(x-4)(x+3)=0 \\ & \text{either } x-4=0 \quad x=4 \\ & \text{or } x+3=0 \quad x=-3 \end{aligned}$$

$$\begin{aligned} 7. \quad & \text{a) The percentage for the old price is 100\%} \\ & \text{Let the percentage for the new price be } N \\ & \text{New price: Old price} = 5:4 \\ & 100\% \rightarrow 4 \\ & N\% \rightarrow 5 \\ & \frac{100}{N} = \frac{4}{5} \\ & 500 = 4N \\ & N = 125 \\ & \text{Percentage increase} = 125 - 100 = 25\% \\ & \frac{100}{N} = \frac{4}{5} \\ & 500 = 4N \\ & N = 125 \\ & \text{Percentage increase} = 125 - 100 = 25\% \\ & \frac{125}{100} \times 3000 = 3750 \end{aligned}$$

$$\therefore \text{The new price is UGX 3750}$$

$$8. \quad \text{a) } x = 55^\circ \text{ (alternating angles)}$$





From page III

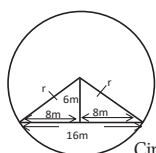
For similar figures, the ratio of corresponding sides is equal

$$\frac{PQ}{4} = \frac{14}{7}, \overline{PQ} = 8m$$

$$\frac{QB}{21} = \frac{7}{14}, \overline{QB} = 10.5m$$

9.

In km²
 100000cm = 1km
 (100000cm)² = (1km)²
 $1 \times 10^{10} \text{ cm}^2 = 1 \text{ km}^2$
 $1 \text{ cm}^2 = \frac{1}{1 \times 10^{10}} \text{ km}^2$
 $(8 \times 10^{10}) \text{ cm}^2 = \frac{1}{1 \times 10^{10}} \times 8 \times 10^{10} \text{ km}^2 = 8 \text{ km}^2$
 Therefore, 2cm² on the map is equivalent to 8km² on land



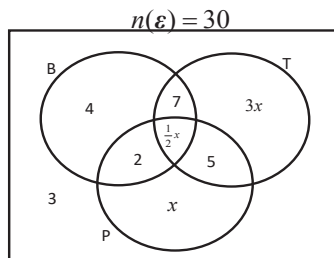
$$\text{Circumference} = 2\pi r^2$$

$$r^2 = 6^2 + 8^2$$

$$r = \sqrt{6^2 + 8^2} = \sqrt{100} = 10 \text{ cm}$$

$$\text{Circumference} = 2\pi r = 2 \times 3.14 \times 10 = 62.8 \text{ cm}$$

10. $n(\epsilon) = 30$
 $n(T \cap B \cap P) = 7$
 $n(T \cap P \cap B) = 5$
 $n(B \cap P \cap T) = 2$
 $n(B \cup T \cup P) = 3$
 $n(B' \cap T' \cap P) = x$
 $n(B \cap T \cap P) = \frac{1}{2}x$
 $n(T \cap B' \cap P) = 3x$
 $n(T' \cap B \cap P) = 4$



- b) (i) $n(T \cap B \cap P) = ?$

$$3x + x + \frac{1}{2}x + 3 + 5 + 7 + 4 + 2 = 30$$

$$\frac{9}{2}x + 21 = 30$$

$$\frac{9}{2}x = 30 - 21$$

$$\frac{9}{2}x = 9$$

$$x = 2$$

$$n(T \cap B \cap P) = \frac{1}{2}x = \frac{1}{2} \times 2 = 1$$

Therefore, only one employee liked all the three means of transport

- ii) $n(P) = ?$

$$n(P) = 2 + 5 + x + \frac{1}{2}x$$

$$n(P) = 2 + 5 + 2 + \frac{1}{2} \times 2$$

$$n(P) = 10$$

The number of employees who preferred a car is 10

- iii) $n(T) = 7 + 5 + 3x + \frac{1}{2}x$

$$n(T) = 12 + 3 \times \frac{1}{2} \times 2$$

$$n(T) = 19$$

The number of employees who preferred a private car is 19

- c) Number of students who preferred only one type of means

Probability =

$$\frac{n(B' \cap T' \cap P) + n(B' \cap T \cap P') + n(B \cap T' \cap P')}{n(\epsilon)}$$

$$n(B' \cap T' \cap P) + n(B' \cap T \cap P') + n(B \cap T' \cap P') = 4 + 3x + x = 4 + (3 \times 2) + 2 = 12$$

$$\text{Probability} = \frac{12}{30} = \frac{4}{10} = 0.4$$

The probability that an employee picked at random preferred only one mean of transport is 0.4

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

$$\text{Let } y = \frac{x^2 - 1}{3}$$

$$\sqrt{3y + 1} = x$$

$$x \rightarrow f^{-1}(x)$$

$$y \rightarrow x$$

$$f^{-1}(x) = \sqrt{3x + 1}$$

$$f^{-1}(8) = \sqrt{3 \times 8 + 1} = 5$$

b) $g(x) = x^2 - 2x - 1$

$$h(x) = x + 3$$

$$hg(x) - gh(x) = 2$$

$$hg(x) = g(x) + 3 = x^2 - 2x - 1 + 3 = x^2 - 2x + 2$$

$$gh(x) = (h(x))^2 - 2h(x) - 1 = (x + 3)^2 - 2(x + 3) - 1$$

$$x(x + 3) + 3(x + 3) - 2x - 6 - 1 = x^2 + 3x + 3x + 9$$

$$x^2 + 6x + 9 - 2x - 7$$

$$x^2 + 6x + 9 - 2x - 7$$

$$x^2 + 4x + 2$$

$$hg(x) - gh(x) = 2$$

$$(x^2 - 2x + 2) - (x^2 + 4x + 2) = 2$$

$$x^2 - 2x + 2 - x^2 - 4x - 2 = 2$$

$$-6x = 2, x = \frac{2}{-6} = -\frac{1}{3}$$

13. a)

$$i) \left(\frac{16}{625}\right)^{-\frac{3}{4}} \times (0.16)^{-\frac{1}{2}} \times \left(\frac{5}{2}\right)^{-1} = \left(\frac{16}{625}\right)^{-\frac{3}{4}} \times \left(\frac{16}{100}\right)^{-\frac{1}{2}} \times \left(\frac{5}{2}\right)^{-1} = \left(\frac{625}{16}\right)^{\frac{3}{4}} \times \left(\frac{100}{16}\right)^{\frac{1}{2}} \times \left(\frac{2}{5}\right)^1$$

$$\left(\frac{5^4}{2^4}\right)^{\frac{3}{4}} \times \left(\frac{25}{4}\right)^{\frac{1}{2}} \times \left(\frac{2}{5}\right)^1 = \frac{5^{(4 \times \frac{3}{4})}}{2^{(4 \times \frac{3}{4})}} + \frac{5^{(2 \times \frac{1}{2})}}{2^{(2 \times \frac{1}{2})}} \times \frac{2}{5} = \frac{5^3}{2^3} \times \frac{5^1}{2^1} \times \frac{2}{5} = \frac{5^3}{2^3} \times 1 = \frac{125}{8} = 15\frac{5}{8}$$

$$\therefore \left(\frac{16}{625}\right)^{-\frac{3}{4}} \times (0.16)^{-\frac{1}{2}} \times \left(\frac{5}{2}\right)^{-1} = 15\frac{5}{8}$$

$$ii) \frac{1}{2} \log_{10} 16 - 2 \log_{10} \left(\frac{a}{5}\right) + \log_{10} a^2 = \log_{10} 16^{\frac{1}{2}} - \log_{10} \left(\frac{a}{5}\right)^2 + \log_{10} a^2 = \log_{10} 4 - (\log_{10} a^2 - \log_{10} 5^2) + \log_{10} a^2$$

$$\log_{10} 4 - \log_{10} a^2 + \log_{10} 25 + \log_{10} a^2 = \log_{10} 4 + \log_{10} 25 = \log_{10} (4 \times 25) = \log_{10} 100 = 2$$

$$\therefore \frac{1}{2} \log_{10} 16 - 2 \log_{10} \left(\frac{a}{5}\right) + \log_{10} a^2 = 2$$

b) train = two thirds = $\frac{2}{3}$

$$\text{remainder} = 1 - \frac{2}{3} = \frac{1}{3}$$

$$\text{bus} = \frac{7}{8} \times \frac{1}{3} = \frac{7}{24}$$

$$\text{walking} = \frac{1}{8} \times \frac{1}{3} = \frac{1}{24}$$

Train	Bus	Walking
$\frac{2}{3}$	$\frac{7}{24}$	$\frac{1}{24}$

$$\frac{1}{24} \times A = x, A = 24x$$

$$\frac{7}{24} A = (x + 3),$$

$$\frac{7}{24} \times 24x = (x + 3),$$

$$7x = x + 3$$

$$6x = 3, x = \frac{3}{6} = \frac{1}{2}$$

$$A = 24x = 24 \times \frac{1}{2} = 12 \text{ km}$$

Therefore, the complete journey is 12 kilometers

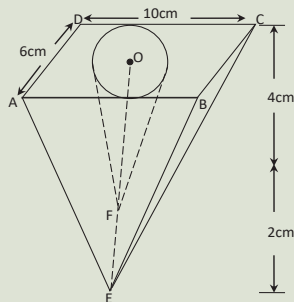
14. Maximum volume = Volume of a cone

$$\begin{aligned} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times 3^2 \times 4 \\ &= 12\pi \\ &= 37.6991 \text{ cm}^3 \end{aligned}$$

(ii) = Volume of pyramid - Volume of a cone

$$\begin{aligned} &= \frac{1}{3} \times 6 \times 10 \times 6 - \frac{1}{3} \times \pi \times 3^2 \times 4 \\ &= \frac{1}{3} (360 - 36\pi) \\ &= 120 - 12\pi \\ &= 82.3009 \text{ cm}^3 \end{aligned}$$

(iii) Surface Area of the remaining solid = Area of slanting sides + Area of curved part of the cone + Area of rectangular base - Area of circular base of the cone



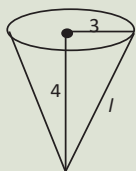
Area of slanting sides

$$\begin{aligned} \overline{XE}^2 &= 5^2 + 6^2 \\ \overline{XE} &= \sqrt{25 + 36} = 7.8102 \\ \overline{ME}^2 &= \sqrt{3^2 + 6^2} = \sqrt{45} \\ &= 6.7082 \text{ cm} \end{aligned}$$

Height of triangular face ADE = 7.8102 and ABE = 6.7082cm

$$\begin{aligned} \text{Area} &= \frac{1}{2} \times 2 (6 \times 6.7082 + 10 \times 7.8102) \\ &= 40.2492 + 78.102 \\ &= 118.3512 \text{ cm}^2 \end{aligned}$$

Area of curved surface = $\pi r l$



$$\begin{aligned} l &= \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} \\ &= \pi \times 3 \times 5 = 15\pi \\ &= 47.1239 \text{ cm}^2 \\ \text{Area of the rectangular base} &= 10 \times 6 = 60 \text{ cm}^2 \\ \text{Area of circular part} &= \pi r^2 = \pi \times 3^2 \\ &= 9\pi \\ &= 28.2743 \end{aligned}$$

$$\begin{aligned} \text{Surface area of the remaining wooden solid} &= 118.3512 + 47.1239 - 28.2743 + 60 \\ &= 197.2008 \text{ cm}^2 \end{aligned}$$

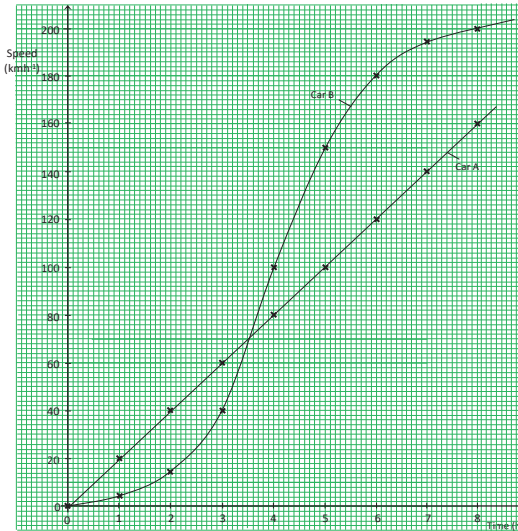
15. Car B

Time (hrs)	0	1	2	3	4	5	6	7	8
Speed (kmh ⁻¹)	0	2	15	40	100	150	180	195	200

Car A

Time (hrs)	0	1	2	3	4	5	6	7	8
Speed (kmh ⁻¹)	0	20	40	60	80	100	120	140	160

a) Velocity-time graph for car A and B



b) (i) After 3 hours and 30 minutes

The speed is 70kmh⁻¹

(ii) After 5 hours

The speed of car A = 100kmh⁻¹

Car B = 150kmh⁻¹

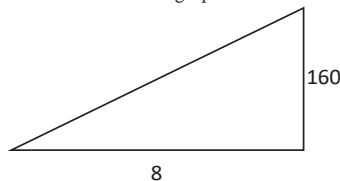
Difference = 150 - 100

= 50kmh⁻¹

After 5 hours, car B travels at 50kmh⁻¹ faster than car A.

(iii) Distance covered by A is 8 hours

= Area under the graph



8

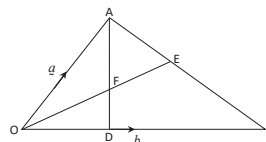
Distance = $\frac{1}{2} \times 8 \times 160$

= 4 × 160

= 640km

Car A cover 640km in 8 hours

16.



E is mid-point of $\overline{AB}$

$$\overline{OD} : \overline{DB} = 2$$

F is a point of intersection of $\overline{OE}$ and $\overline{AD}$

$$\overline{AB} = \overline{OB} - \overline{OA} = b - a$$

$$\overline{OE} = \overline{OA} + \overline{AE}$$

$$= a + \frac{1}{2} \overline{AB}$$

$$= a + \frac{1}{2} (b - a)$$

$$\overline{OE} = a - \frac{1}{2} a + \frac{1}{2} b$$

$$\overline{OE} = \frac{1}{2} a + \frac{1}{2} b$$

$$\overline{OE} = \frac{1}{2} (a + b)$$

$$\overline{AD} = \overline{AO} + \overline{OD}$$

$$= -\overline{OA} + \overline{OD}$$

$$= -a + \overline{OD}$$

$$\overline{OD} : \overline{DB} = 2 : 3$$

$$\overline{OD} : \overline{DB} = 2 : 3$$

$$\frac{\overline{OD}}{\overline{DB}} = \frac{2}{5}, \overline{OD} = \frac{2}{5} \overline{OB}$$

$$\overline{OD} = \frac{2}{5} b$$

$$\overline{AD} = -a + \frac{2}{5} b$$

$$\text{b) } \overline{AF} = h \overline{AD} \text{ and } \overline{OF} = k \overline{OE}$$

$$\overline{OF} = \overline{OA} + \overline{AF}$$

$$= a + h \overline{AD}$$

$$= a + h(-a + \frac{2}{5} b)$$

$$= a - ha + \frac{2}{5} hb$$

$$= (1-h)a + \frac{2}{5} hb$$

Also

$$\overline{OF} = k \overline{OE}$$

$$\overline{OF} = k \times \frac{1}{2} (a + b)$$

$$\overline{OF} = \frac{k}{2} a + \frac{k}{2} b$$

Equating the two expressions of $\overline{OF}$

$$(1-h)a + \frac{2}{5} hb = \frac{k}{2} a + \frac{k}{2} b$$

Equating corresponding elements

For a

$$1-h = \frac{k}{2}$$

$$2 - 2h = k \dots\dots\dots (i)$$

For b

$$\frac{2}{5} h = \frac{k}{2}$$

$$h = \frac{5}{4} k \dots\dots\dots (ii)$$

Substitute $h = \frac{5}{4} k$ in equation (i)

$$2 - 2 \times \frac{5}{4} k = k$$

$$2 - \frac{5}{2} k = k$$

$$4 - 5k = 2k$$

$$4 = 7k, k = \frac{4}{7}$$

Substitute $k = \frac{4}{7}$ in equation (ii)

$$h = \frac{5}{4} \times \frac{4}{7} = \frac{5}{7}$$

$$k = \frac{4}{7} \text{ and } h = \frac{5}{7}$$

$$\overline{OF} = k \overline{OE}$$

$$\overline{OF} = \frac{5}{7} \overline{OE}$$

$\overline{OF}$ is a scalar multiple of $\overline{OE}$ and therefore $\overline{OF}$ is

parallel to $\overline{OE}$. Since O is a common point O, F and E are collinear.

17. a) Allowances per month

Allowance per month

Transport = UGX 45,000

Insurance = UGX 64,000

$$\text{Feeding} = \frac{630,000}{12} = \text{UGX } 52,500$$

Water and electricity = UGX 11,800

Airtime an communication = UGX 40,000

Family for children aged 7, 12 and 18years = 5000 + 15000 + 15000 = UGX 35000

Total allowance = 45,000 + 64,000 + 52,500 + 11,800 + 40000 + 35000 = UGX 248300

From page V

- b) his income tax as a percentage of his gross monthly income
Taxable income = gross income – allowance

$$= 64500 - 248300 = \text{UGX } 396700$$

$$\frac{12}{100} \times (200000 - 50000) = \frac{12}{100} \times 150000 = \text{UGX } 18000$$

$$\frac{25}{100} \times (300000 - 200000) = \frac{25}{100} \times 100000 = \text{UGX } 25000$$

$$\frac{32}{100} \times (396700 - 300000) = \frac{32}{100} \times 96700 = \text{UGX } 30944$$

Total income tax =

$$18000 + 25000 + 30944 = \text{UGX } 73944$$

Income tax as a percentage of his gross monthly income

$$= \frac{\text{income tax}}{\text{gross income}} \times 100 = \frac{73944}{645000} \times 100\% = 11.4642\%$$

- c) His net income = gross income – income tax

$$= 645000 - 73944 = \text{UGX } 571056$$

MATHEMATICS PAPER 1 (OMTC007)

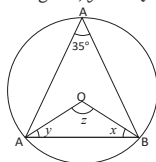
SECTION A

- Solve the quadratic equation $3x^2 - 7x + 4 = 0$.
- Given that $A = \begin{pmatrix} -3 & 7 \\ -1 & 5 \end{pmatrix}$, find the inverse of A.
- If $\tan \theta = \frac{5}{12}$ and $180^\circ \leq \theta \leq 360^\circ$, determine the value of $\sin \theta$ and $\cos \theta$.
- Solve the simultaneous equations
 $5x = 4y + 17$
 $4y + 3x - 23 = 0$
- The table below shows the marks obtained by 47 students in a mathematics test

Number of students	3	5	7	12	8	6	4	2
Marks (out of 100)	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99

Draw accumulative frequency curve (ogive) for the data.

6. Find the value of angle x , y and z from the diagram below.



- Factorise completely (i) $3x^2 - 4$ (ii) $5h^2 - 3h - 8$
- Make c the subject of the formula.
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Given that $a * b = a - b^2 a + ba$
Evaluate (i) $2 * 2$ (ii) find the value of m for which $3 * m = 3$
- Rotate the point P(-4, 5) on a graph paper through 180° . Hence state the new position of P.

SECTION B

11. a) Copy and complete the table below for the quadratic equation

x	-3	-2	-1	0	1	2	3	4
$4x$				0				
4				4				
$-3x^2$				0				
y				4				

- b) Draw a graph $y + 3x^2 - 4x - 4 = 0$
c) Use your graph to state the roots of;
(i) $4x - 3x^2 + 4 = 0$ and (ii) $3x + 2 = 3x^2$

12. a) The table below shows the marks obtained by 56 students of senior four of a certain school in a biology exam marked out of 100

32	38	42	57	91	70	78
42	53	44	62	71	61	77
38	44	79	33	78	63	63
51	48	56	55	75	48	61
70	61	88	90	71	78	68
70	53	72	68	72	69	89
54	53	56	68	78	49	39
89	79	69	59	60	59	49

- Draw a frequency distribution table and, hence, calculate the
(i) Mean mark
(ii) Median mark (correct to 2 decimal places)
 - Draw a histogram and use it to estimate the modal mark.
13. a) On the same axes plot the graph of $y = \cos 2x$ and $y = \sin x$ for values of x ranging from 0° to 360° . Use the interval of 60°
b) Use your graphs in (a) to state the values (x , y), the point of intersection.
14. (a) Use matrix method to solve the following part of simultaneous equations.

$$3y = 5x - 10$$

$$4 - y - 2x = 0$$

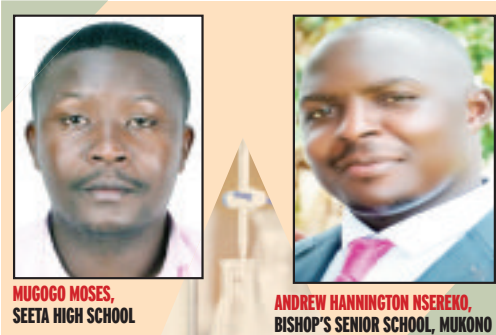
- (b) Shamim is a businesswoman who deals in agricultural produce. She visited four markets in a certain week. In market A, she bought 5 bags of beans, 3 bags of maize, 8 bags of Irish potatoes and 2 bags of millet. In market B she bought 2 bags of beans, 3 bags of Irish potatoes and 1 bag of millet. In market C she bought 4 bags of beans, 5 bags of Irish potatoes and 2 bags of millet. In market D she bought 5 bags of beans, 3 bags of maize, 3 bags of Irish potatoes and 3 bags of millet. She bought each bag of beans at UGX 300,000. A bag of maize at UGX 150,000. A bag of Irish potatoes at UGX 100,000 and a bag of millet at UGX 185,000. She later sold all the produce she had bought at UGX 350,000 per bag of beans, UGX 180,000 per bag of maize, UGX 145,000 per bag of Irish potatoes and UGX 200,000 per bag of millet.
- Form a 4×4 matrix for the produce Shamim bought from the four markets.
 - Form a cost matrix to the price of the produce.
 - By matrix multiplication, find the amount of money spent on the produce in each market.
 - Find also the amount of money she got from the sale of the produce.
 - Find her profit.
15. A triangle P(1, 2) Q(7, 2) and R(3, 7) is rotated through $+180^\circ$ to give the image P' Q' R'. the image is then reflected in the line $y = -x$ to give the second image P'' Q'' R''.
- State the co-ordinates of P' Q' R' and P'' Q'' R''.
 - Draw the three triangles on the same coordinate axes.

16. Using a ruler and a pair of compasses only.

- Construct triangle PQR in which QR = 7.5cm, QR = 10.2cm and angle QPR = 75° .
ii) Measure angle PQR.
- Construct a circle through the vertices of the triangle PQR
ii) Measure the radius of the circle.
iii) Calculate the area of the circle (take $\pi = 3.142$).

17. A geography club of a certain school wishes to go for a field trip. The club wishes to hire a bus and mini bus to take the students.
Each trip for a bus costs UGX 500,000 and that for a mini bus costs UGX 300,000. The bus has a capacity of 65 students and a mini bus has a capacity of 18 students. The maximum number of students allowed to go for a trip is 220. The number of trips that the bus makes do not have to exceed those made by the mini bus. The money available for transport is UGX 3,000,000.

- Write down five inequalities representing the above information.
- Plot these inequalities on the same axes.
- By shading out the unwanted regions, show the region satisfying the above inequalities.
- List the possible number of trips each vehicle can make.



CHEMISTRY (OCHEM006) SOLUTIONS

- Water
 - Vapour from the candle is condensed to water.
- Calcium hydroxide turns milky/cloudy.
 $\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \longrightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$
 - During combustion, water and carbon dioxide are produced.
- Separating funnel.
 - The two liquids are immiscible, the less dense liquid floats on the denser liquid. After settling, the denser liquid is allowed to flow out first and collected.
 - R – hexane
S – water
ii) The density of hexene (0.66 g/cm³) is lower than that of water (1g/cm³) so, hexene floats on water.
- Empirical formula shows the simplest whole number ratio of the moles of atoms of different elements in a compound, while the molecular formula shows the actual number of atoms of various elements present in one molecule of the compound.
ii) The **atomic number** or **proton number** of a chemical element is the number of protons found in the nucleus of every atom of that element, while **atomic mass** is the sum of protons and neutrons in the nucleus of an atom.
 - U – 2:8:2
V – 2:8:6
ii) U has a higher melting point compared to V because U is a metal and, therefore, forms strong bonds, which require more energy to break unlike V is a non-metal it forms weak bonds as it bonds with other atoms.
- Identify:
i) Copper pyrite has a formula, CuFeS₂.
ii) Concentrating the ore (froth floatation)
iii) Blister copper
 - $\text{FeO(s)} + \text{SiO}_2(\text{s}) \longrightarrow \text{FeSiO}_3(\text{s})$
ii) Slag is primarily used in the cement and construction industries and, largely in road construction.
- Moles of sulphuric acid
1000cm³ of solution contain 0.3 moles of acid
1cm³ of solution contains $\frac{\text{concentration}}{\text{Rfm}}$ moles of acid
30 cm³ of solution contain $\frac{0.3}{1000} \times 30$
= 0.009 moles
ii) $2\text{XOH}(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{X}_2\text{SO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$

From equation, 1 mole of acid reacts with 2 moles of XOH
0.009 moles of acid react with 2×0.009 moles of XOH
= 0.018 moles of XOH

- 250cm³ contain 0.018 moles of XOH
1cm³ contains 0.2 moles of XOH
1000cm³ of solution contain $\frac{0.018}{250} \times 1000$ moles/litre of XOH
= 0.072M
RFM of XOH = $\frac{\text{concentration}}{\text{molarity}}$

$$\text{RFM of XOH} = \frac{40.3}{0.072} = 559.7$$

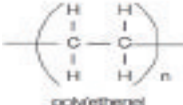
6. a) i) Magnesium continues to burn, forming greenish yellow powder
ii) $\text{Mg(s)} + \text{N}_2(\text{g}) \longrightarrow \text{Mg}_3\text{N}_2(\text{s})$
iii) This is because magnesium reacts with nitrogen to form a nitride.
b) It is used to make fertilisers, nitric acid, nylon, dyes and explosives.
7. a) - Wrong drying agent – Calcium oxide will react with the chlorine gas.
- Incorrect method of gas collection – No gas will be collected/chlorine is denser than air.
- i) $2\text{KMnO}_4(\text{s}) + \text{HCl}(\text{aq}) \longrightarrow 2\text{MnCl}_2(\text{aq}) + 2\text{KCl}(\text{aq}) + 8\text{H}_2\text{O}(\text{l}) + 5\text{Cl}_2(\text{g})$
ii) It is a disinfectant used to treat drinking water and swimming pool water.
It is also used to make hundreds of consumer products from paper to paints and from textiles to insecticides.
b) Because without water hypochlorous acid, which bleaches, cannot be formed. Therefore, a dry litmus will not be bleached.
8. a) Carbonate (CO_3^{2-})
b) $\text{Ba}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \longrightarrow \text{BaCO}_3(\text{s})$
c) - Making soft drinks/aerated drinks.
- In refrigeration.
- In extinguishing fires.
- Making baking powder; Manufacture of sodium carbonate; Cloud seeding.
9. $2\text{NaOH}(\text{aq}) + \text{H}_2\text{X}(\text{aq}) \longrightarrow \text{Na}_2\text{X}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
mole ratio base to acid is 2:1

$$\begin{aligned} \text{molarity of sodium hydroxide} &= \frac{\text{concentration}}{\text{Rfm}} \\ &= \frac{0.2 \times 30}{1000} = 0.2\text{M} \\ \text{Moles of NaOH} &= \frac{0.294}{0.003} = 0.006 \text{ moles} \\ \text{Moles of acid} &= \frac{0.006}{2} = 0.003 \text{ moles} \\ \text{Rfm of acid} &= \frac{0.294}{0.003} = 98 \end{aligned}$$

10 a) Monoclinic sulphur/beta sulphur/prismatic sulphur
b) 

c) i) A colourless gas with a choking or suffocating odour and turns a blue litmus paper red is given out.
ii) $\text{S} + 2\text{H}_2\text{SO}_4(\text{l}) \longrightarrow 3\text{SO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$

SECTION B:

11. a) i) Saturated hydrocarbons are hydrocarbons that contain only single bonds between carbon atoms.
ii) Propane, $\text{CH}_3\text{CH}_2\text{CH}_3$
b) i) $\text{C}_6\text{H}_{14} \longrightarrow \text{C}_2\text{H}_4 + \text{C}_4\text{H}_8 + \text{H}_2(\text{g})$
ii) Cracking
c) i) Ethene
ii) $\text{n}[\text{CH}_2=\text{CH}_2] \longrightarrow \longrightarrow \text{n}$
iii) 
poly(ethene)

- iv) It is non-biodegradable
v) $\text{CH}_3\text{COOH}(\text{aq}) + \text{NaOH}(\text{aq}) \longrightarrow \text{CH}_3\text{COO}^-\text{Na}^+(\text{aq}) + \text{H}_2\text{O}(\text{aq})$
d) Reagent: potassium permanganate
With butane: purple solution turns colourless
With butanol: no observable change
12. a) i) Concentrated sulphuric acid
Sodium chloride
ii) Concentrated sulphuric acid.
b) i) Pale green solid is formed
ii) $\text{Fe(s)} + 2\text{HCl}(\text{g}) \longrightarrow \text{FeCl}_2(\text{s}) + \text{H}_2(\text{g})$
c) i) Hydrogen gas
ii) $\text{H}_2(\text{g}) + \text{O}_2(\text{s}) \longrightarrow \text{H}_2\text{O}(\text{l})$.
d) i) Funnel arrangement is used to prepare HCl gas to avoid back suction. It prevents and minimises back suck of water and provides a large surface area for absorption of HCl gas.
ii) Lower a jar containing hydrogen chloride closer to another containing ammonia, dense white fumes of ammonia chloride are formed.
e) i)

Solution of hydrogen chloride gas in	Blue litmus paper	Calcium carbonate
Water	It turned red	Effervescence occurs
Methyl benzene	Blue litmus remains blue	No effervescence occurs

ii) Hydrogen chloride ionises in water, forming hydrogen ions, which make the solution acidic, however, when hydrogen chloride gas dissolves in methylbenzene, the molecules do not split up. A solution of HCl in methylbenzene does not contain hydrogen ions, so it is not acidic.

CHEMISTRY REVISION QUESTIONS OCHEM007

1. A chromatogram of enzymes A and E and three simple sugars are shown below.



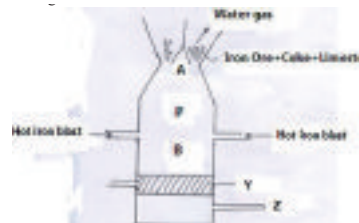
- a) What is paper chromatography?
b) i) Which simple sugar(s) are present in D and E.
ii) Which simple sugar(s) are absent in D and E.
c) State any limitation of using paper chromatography
2. Air is a source of many gases.
a) What is the percentage by volume of nitrogen in dry air?
b) Outline the separation of oxygen, nitrogen and the noble gases from liquid air.
c) State one large scale use of nitrogen.
3. The electronic configurations of five atoms are shown;

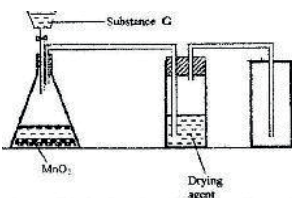
- a) Which electronic configuration represents each of the following descriptions?
i) A sodium atom
ii) An atom of a reactive non-metallic element.
iii) An atom with a proton (atomic) number of 12.
b) i) Chlorine has diatomic molecules. What is the meaning of the term diatomic?
ii) Why does chlorine form diatomic molecules?
4. The Periodic Table is an arrangement of elements in groups and periods.
a) Describe how the position of an element in the Periodic Table is related to its electronic

- configuration.
b) Aluminium is an element in Group III of the Periodic Table. Deduce the electronic configuration of the aluminium ion.
c) Aluminium reacts with oxygen to form aluminium oxide.
i) Write the equation for this reaction.
ii) Aluminium oxide reacts with both acids and alkalis. Write an ionic equation in each case.

5. a) With an example in each case, differentiate between;
i) a normal salt and an acid salt
ii) neutral and amphoteric oxides
b) Magnesium chloride is a soluble salt. Describe how a pure sample of magnesium chloride crystals can be made from magnesium.
6. Acid U is a compound containing carbon, hydrogen and oxygen.
a) 6.30 g sample of U contains 1.68 g of carbon and 0.14 g of hydrogen.
i) Calculate the empirical formula of U
ii) 0.086 g sample of U is completely neutralised by 12.7 cm³ of 0.150 mol / dm³ KOH. One mole of U reacts with two moles of KOH. Calculate the relative formula mass of U.
7. Sulphuric acid is made by the Contact process.
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{SO}_3(\text{g}) \quad \Delta H = -197 \text{ kJ / mol}$
a) Name the catalyst used in the contact process.
b) Describe how and explain why the position of equilibrium in the reaction is altered when;
i) the temperature of the equilibrium mixture is increased at constant pressure
ii) the pressure of the equilibrium mixture is increased at constant temperature.

8. The diagram below shows a blast furnace used for extraction of iron.



- a) Name an iron ore from which iron is extracted.
b) Name the reducing agent in the process above.
c) Identify;
i) Y
ii) Z
d) Write an equation for the formation of Z.
9. a) Define the term standard enthalpy change of combustion.
b) To determine the enthalpy of combustion of butane, 200cm³ of water was heated and temperature rose from 22°C to 70°C when one gram of butane was burnt.
i) Calculate the energy produced in kilo joules [specific heat capacity=4.2kJ/kg-1K-1, density of water =1g/cm³]
ii) Calculate the molar enthalpy change of combustion of butane.[C=12;H=1]
10. The diagram below shows a set up for the laboratory preparation and collection of dry chlorine gas

- a) Name;
i) Substance G
ii) A suitable drying agent
c) Write an equation of reaction
b) i) identify the method of gas collection used to collect chlorine gas
ii) What property of chlorine makes it possible for it to be collected as shown in the diagram