Topics – numbered only for teaching purposes
Some terms have more than one commonly used name, therefore brackets are used.

1) ICT - Information and Communication Technologies – the "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information."

Grade 12 Theory. Exploring IT: Theory. Second Edition 2021 (LU 1 is for PAT only)
Grade 11 Theory. **Helicopter** over the whole textbook. Exploring IT: Theory. Second Edition. 2020. 50% of the questions come from grade 11.

2) The scenario keywords – collaboration, communication, and productivity. Also privacy and security. **Synchronization** – latest version overwrites older versions (regardless of the device).
3) Collaboration – sharing a file on the cloud so that many people can work on it at the same time.
Tracking – comments, edits and deletions by multiples users can be seen by everybody.

Learning Unit 1 Hardware.
4) A 32-bit computer has 32-bit registers, a 32-bit OS, a 32-bit address bus, a 32-bit data bus supported by a 32-bit BIOS. Cannot run 64 bit software.
5) A 64-bit computer has 64-bit registers, a 64-bit OS, a 64-bit address bus and a 64-bit data bus supported by a 64-bit BIOS/UEFI. Can run 32 bit software.

6) A modern **computer** - motherboard, a CPU that fits into a socket (e.g. LGA 1150), primary memory (volatile) (RAM), secondary memory (non-volatile), CMOS (volatile), BIOS or UEFI (non-volatile), power supply, a casing and connectivity via WiFi or cable. These are all core **components**. The monitor, keyboard, mouse and external hard drivees are **peripherals**.

7) Modular design for upgrading (via **expansion cards**), flexibility and easy repair (replacement) – desktop PC only, (not laptop, tablet, smart phone, wearables or single board computers.)

8) CPU - single core, dual core, quad core etc. with or without hyperthreading. Measured in clock speed, cores and cache e.g. quad-core processor @ 4.2GHz

9) CPU – Control Unit (**CU**), the Arithmetic Logic Unit (**ALU**) and the **registers**. The fast system clock synchronizes the movement of data in the CPU (3 – 4.5 GHz). Most modern CPUs have a built-in **GPU** (a co-processor) (which you can disable with a GPU expansion card plugged into a motherboard slot.

10) Co-Processors (part of the CPU)
Onboard math co-processor. Onboard graphic processor. This **GPU** offers **parallel processing** taking the load off the CPU for graphics rendering (which can be disabled when plugging in a dedicated GPU card)
11) Cache memory – more cache less latency
Made from faster **SRAM** chips – does not need to be refreshed like DRAM chips.
L1 - built into the CPU and processor (approx. 64KB). Same speed as the CPU.
L2 – built into the CPU but *outside* the processor (approx. 256KB). Half the speed of the CPU. May be shared between different cores but this is slower than each core having its own L2 cache.
L3 – Usually built into the motherboard before the RAM (4 to 24MB). Not always present on budget computers.
Latency – the time lapse between something being asked for and the code arriving. HDD has higher latency than a SSD.

12) Concept: A desktop computer in a casing (tower)
A CPU to process instructions + RAM to store *current* instructions and data; secondary storage for the operating system (OS) permanent data and software; motherboard and internet connectivity via WiFi or LAN cable. Ports to add external peripherals.

13) The **motherboard** keeps things together, offers connectivity (attached to the board and via ports), facilitates power and cooling. Motherboards offers flexibility and upgradability by offering expansion slots. **Integrated peripherals** – graphic, network (wired and wireless), sound etc. More flexibility is offered by ports for **external peripherals** to plug into (USB and HDMI)
14) The **chipset** relays communications between the CPU and the many connected storage and expansion devices. The chipset supports, or does not support, overclocking.

15) NOTES: **Booting up** is a process achieved by the BIOS/UEFI (firmware stored (burnt) onto a **ROM** chip) using the settings stored in the CMOS. CMOS memory keeps the user's unique settings when the power is off using a battery. Loads the OS kernel only into RAM. You can boot off a HDD, SSD, CD-ROM, USB thumb drive (flash drive) or an external hard drive.

16) NOTES: Intel CPUs – for instructions and data:
From entry level to high performance gaming, graphics, and animation –
- Atom, Celeron – difficult to upgrade, slow bus speeds, small cache memory, no hyperthreading
- i3, i5, i7 – like one another, motherboard socket is often the same, increasing bus speeds, larger cache memory especially L3, generally 4 cores with hyperthreading
- i9 – high performance, unique socket size, up to 18 cores with hyperthreading, very fast bus speeds, large amount of L1, L2 and L3 cache memory.

Fundamental concept – one core can only execute one set of instructions at a time. For instructions (threads/processes) to run at the *same time*, more than one core is required.

17) An i5 CPU with 2 cores that runs 4 threads is an example of ***hyperthreading*** (each core has its own set of registers) – each core *simulates* 2 execution units.
18) An i5 CPU with 4 cores that runs 4 threads is an example of ***multiprocessing*** (but this example does not offer hyperthreading). Threads (processes) run on different cores at the *same time*.
Only i5 and higher for HD, videos, and animation in 4K hi- resolution, high performance 3D gaming.

These two are *hardware* related . . .
19) Multiprocessing. More than one process can run at the same time achieved by having more than one core (one chip can have many cores *or* multiple CPUs plugged into one motherboard).
20) Hyperthreading (the *simulation* of more than one execution unit(core) in one chip by having 2 sets of registers per core) (must be supported by BIOS),

These two are *software* related . . .
21) Multitasking – more than one program in RAM at the same time in their own area of RAM.
22) Multithreading – a program can have more than one thread (process) running at the same time (a game is a good example – for a smooth experience more than one core is needed). This is **multiprocessing** but needs more than one core. It is coded that way but must be supported by the OS.

23) Role of the **system clock** and **overclocking**. Overclocking increases performance (whole system *or* per component – see textbook). Increase in heat and uses more power. Upgrade fans and power supply. Can lead to component failure.

24) Parallel processing – When a large program is divided into pieces and each piece is run in parallel (at the same time). Generally, this means a single computer whose motherboard can physically accommodate multiple CPUs that work in parallel, but a single CPU with multiple cores also offers parallel processing if supported by the chipset etc.

25) Example: A CPU has 4 cores. All 4 offer hyperthreading i.e. 2 cores each. Therefore, this computer is capable of **both** multiprocessing and hyperthreading.

26) Chip manufacturers improve **performance** by – CPU speed, hyperthreading, multiprocessing, L1, L2 L3 cache memory, register size, bus size.

27) RAM (**DRAM**) – Capacitors must be refreshed many times per second. Improvements in speed - DD2, DDR2, DDR3, DDR4, DDR5 but note than motherboard memory slots are different. Measured in size, type, and access speed (16GB, DDR3 @ 1866 MHz).
28) Virtual memory (paging). When a computer runs out of RAM it moves data onto the slower secondary memory which acts like additional primary memory but increases latency. If this happens too often it is better to buy more RAM.

29) Internal bus (Front side bus **FSB** or local bus) – the **address bus**, the **data bus**, and the **control bus** link the CPU to RAM. The bus clock is slower than the system clock.

30) External buses. For external devices. **PCI Express** (PCIe. 1x, 4x, 8x, 16x, 32x) for graphics cards, RAID cards, Wi-Fi cards, SSDs etc. **SATA** for mechanical HHD (relatively old and slow). **USB** for peripherals (USB 1, 2 and 3).
31) NVMe is a high-speed communications bus interface that connects M.2 cards directly to the motherboard. M.2 cards are small, require little power include Wi-Fi, radios and SSDs. These M.2 cards can connect to the SATA bus, or the PCIe bus (for best performance esp for SSDs).

32) Expansion cards versus Onboard controllers. Integrated, onboard controllers are built into the motherboard and cannot be repaired, upgraded, or replaced e.g. The Raspberry Pi (System on Chip – **SOC**) **single-board computer** is an example of a computer where all controllers are integrated into a single board – this brings speed at a fraction of the cost.

33) Expansion cards – Graphics Processing Unit (GPU e.g. for additional monitors, video editing), sound card (e.g. surround sound), network (e.g. to connect to more than one type of network), Wireless LAN (WLAN for Wi-Fi), RAID (to connect RAID 1, RAID5 etc), serial port card (e.g. to connect to sensors), USB interface (e.g. for more and upgraded USB ports), cellular cards (e.g. to connect to 4G or LTE), TV card (e.g. home theater PC), video capture card (e.g. to record and stream videos onto the Internet)

34) A GPU expansion card has its own motherboard, processor, and memory (**VRAM**)

Ports
35) USB. USB 1.0, 2.0, 3.0 and 3.1 indicate the speed of the port. Type A, B, C indicate the size and shape. Smaller USB ports were needed for portable devices like smart phones.

36) HDMI and Display ports for high-definition video and audio signals in a single cable.

37) Primary storage – Non-volatile: BIOS/UEFI, ROM, CMOS. Volatile: RAM

Secondary storage.
38) Internal. HDD – slower, bigger, and cheaper. Great for storing big files and large folders. **SSD** – faster and smaller that mechanical HDD, and more expensive. Great for resource hungry software and the OS.
39) External – HDD or SSD connected via USB 3, SD cards, flash drives
40) On the **cloud** – Google Drive, OneDrive etc

41) SSD – SATA versus PCIe. Also compact form factor "M.2"
Older solid-state drives (SSD) connect to the old SATA bus (slower). Then SSDs got smaller and smaller. The tiny M.2 SSDs now connect to a small **M.2 socket / connector** on the motherboard which connects to the fast PCIe bus (not the old SATA bus). This is called a **NVMe** drive. This super-fast drive (which requires little power) should have your OS and other resource-hungry software for maximum benefit. The M.2 slot can also be used for Wi-Fi, Bluetooth radios etc M.2 slots are useful for mini-desktop computers where space is limited.
42) Devices: Pros and cons of desktops, laptops, tablets, smartphones, servers - upgradability, ease of input, screen size, battery life, amount of memory, portability, the software it can run.
43) Convergence of devices and technologies. One device can replace many devices.
44) Shorter questions.
touch screen, buffering and streaming, dual booting PC, firmware v software, thunderbolt (I/O interface), SSD [does not need defrag, no moving parts, very fast], wearables, interrupts (hardware and software), mobility (advantages and constraints), plug and play technology

Concept: Categories of computers - scenario questions
- 45) A computer for **creating content – a desktop** (word processing, spreadsheets, presentations, photo editing, video creation, blogging, designing, development, accounting, budgeting, working large files, project management and running big applications. Full size keyboard and monitor. Input and is easy. *Expansion* is easy on desktops. Easy to secure. Zero mobility. **Fat client**
- 46) A computer for **creating content** – a **laptop**. General everyday office applications. Input is easy. Added mobility and a battery. Not upgradable except for more RAM. Easy to buy but difficult to secure. **Fat client**
- 47) A computer **consuming content – a tablet**. reading, viewing, searching, downloading media, transacting (eg buying a T shirt), presenting, news updates (includes e-readers). Big screen advantage. Highly mobile. Touch screens. Speed and memory is limited. Cannot expand easily. Battery life is better than smart phone.
- 48) A computer device for a **thin client** setup – **tablet or a thin client desktop PC**. Minimal local storage, minimal installed software, connects wirelessly to a database, GUI for touch screen input, portable, good battery life, large colour screen for GUIs, easy to update. Some can accept a SIM.
- 49) A computer for **staying in-touch – a smart phone.** for mobility, mobile banking, communication, social media, sharing small files, photo and video making capabilities (also slow motion), small size and weight. Can be used for **vlogging** and as a GPS for navigation. Lite version of apps, input is clumsy and slow. Short battery life. Small screen. Cannot expand easily.
- **50) Gaming computer or video creation and video editing** – at least 4 cores/4 threads with a *graphics accelerator card* (has its own CPU, cache and RAM dedicated to the display only).

51) Upgrading PC performance – add RAM, replace HDD with SSD, overclock, add an **NVMe** drive, ensure that the OS is on the SSD. Add GPU only if the re-draw times are slow.

Learning Unit 2. Software and computer management.
Longer questions.

52) The role of the OS – provides an interface, loads and runs programs, manages resources
Booting: Old BIOS – New EUFI
53) BIOS. 16 bit. Can only address a HHD < 2Tb. Limited GUI.
54) UEFI. 32/64bit. Can address all the memory. Has a full featured GUI with lots of options (eg multiple boot options). Can run anti-malware prior to OS loading. Mini OS that loads your main OS. Firmware on a ROM chip.

55) Virtualization is an entity that exists only in software i.e. a computer, a server, networks, storage, a desk top, application – issue of ownership
56) Computer management - delete (data, files, cookies etc), file and folder management, updates, backups, defrag, archiving, firewall, antivirus, temporary internet files, recycle bin, install new programs and uninstall programs no longer needed. Also software, OS and security updates.

57) Backups – duplicate copies of current work, onsite + offsite, local + on the cloud, whole drive or folders, different physical devices, scheduled, different versions, example of a cloud service.
58) Archiving – is to group old important project-based files together for future reference (and is therefore not the same as a backup)

59) Interpreters – Java, Java Script, Python
60) Compilers – C, C++
61) Compiled Java bytecode is *interpreted* by the JVM.
Machine code is binary, Java *bytecode* is not machine code

62) Shorter questions
Network interface card (NIC), backup and recovery, scalability and performance, security and privacy, vendor lock-in, Google Drive, downloading v streaming, Open Source Software(OSS),

63) NOTES: Some file extensions. Also **compression**.
- File compression – zip, par, pkg, tar, gz. **No loss of data (lossless)**
- Audio – wav. **No loss of data.**
- Audio – compressed. mp3 – **Data is lost (lossy)**
- Image – compressed jpg, jpeg. – **Data is lost.**
- Image – gif, png. **No data is lost.**
- Video – avi. **Very little data is lost.**
- Video – compressed. mp4. **Data is lost**.
- Data and database – db, sql
- Plain text (could have a delimiter) – txt
- Ms Access – mdb (before 2007), accdb (after 2007)
- Executable – exe, com
- Java – java, class, jar, pkg
- Data interchange – csv, xml, json
- Internet and webpages – html, css, js (javascript)
- Text documents (editable) – doc, txt
- Text files (not editable) – pdf (for contracts etc, everybody can open a pdf)

Quality and reliable data
64) Errors – human error, arithmetic error (inappropriate rounding or truncating), transmission errors, logical errors in code.
65) Solutions for errors – verification (is it there?), validation (it may be there but is it valid?), input techniques (GUIs, scanners)

Learning Unit 3. Networks and E-Communications.

66) LAN – Traditionally interpreted as an Ethernet cabled network solution in one location.
67) WLAN – An Ethernet network in one location without cables – connection is via Wi-Fi.
LANs and WLANs connect to the Internet via an **ISP** – Internet service provider. Offers access to the Internet for a monthly fee.
68) Client server model versus a peer-to-peer model (P2P).
69) Bounded connection media – UTP and fibre-optic. Challenges are eavesdropping, attenuation, crosstalk and Electromagnetic Interference (EMI)
70) Unbounded – is wireless - radio waves, microwaves – WiFi, Bluetooth use radio waves.
71) Topologies – star with a switch (Ethernet). Also bus, ring, mesh and hybrid.
72) Addressing – **IPv4** (216.27.61.137), **MAC** address (62:4D:EA:89:75:B3)
IPv6 (3668:cd38:7aed:11d3:437:f584:819:f1fd)

Networking protocols
73) ARP - (Address resolution protocol) Keeps a table that links the physical MAC address to the allocated IP address.
74) DHCP – (Dynamic Host Configuration Protocol). Allocates an unused IP address from a pool to a new node. Once done updates the ARP table on the LAN.
75) DNS – (Domain Name Service). Links the domain name (of a website) to its IP address. Eg java-teacher.com – IP address is 196.22.132.246
76) TCP/IP – A stack of communication protocols that makes the internet and email work.
  o File transfer – FTP, HTTP, HTTPS (HTTP + SSL)
  o Email – SMTP, IMAP, POP
77) UDP and TCP – (part of TCP/IP). Both are transportation protocols
78) UDP - - Used for streaming and voice. Packets of data may or may not arrive and may not arrive in the right order. Will not request missing packets
79) TCP – Used for www, email. Will arrive, and the packets will be arranged into the right order. Will request resend for missing packets.
80) Wi-Fi -a stack of wireless network protocols, (IEEE 802.11). Local area networking of devices and offers Internet access, allowing nearby digital devices to exchange data by radio waves.

81) Data is broken into **frames** (within an Ethernet LAN) and **packets** (on the internet – TCP/IP), Both have error correction.
82) Frames – The frame contains the packet. The frame has the sender's and the receiver's MAC address because the network is a local Ethernet LAN.
83) Packets – Header, Payload and trailer. Sender's IP address. Receivers IP address.

84) WLAN – an Ethernet network with unbounded media (always slower). A transceiver broadcasts a signal within an area called a **microcell (hotspot)**
85) Wireless access point connects nodes to one another. Connects via Wi-Fi (radio waves.)
86) Wireless router can connect the WLAN to the Internet.
87) Hotspot is a physical place where you can connect to the WLAN or internet via Wi-Fi.
NOTE: Most WLANs connect to a wired LAN or backbone that can connect to other microcells or to a wired router offering Internet access

88) Bluetooth – Communication protocol for short distances, offers data and voice. Is bi-directional. Uses radio waves.

89) Thin clients (no hard drive) much cheaper but a powerful centralized server is needed possibly with RAID 5. Good internet connectivity is essential. **Centralized processing**.
90) Fat clients (a fully featured computer with locally installed software – less dependent on internet connectivity). When part of a network can offer decentralized computing. **Distributed processing**.
91) P2P – every computer is a server, and every computer is potentially a client. (Cost saving, reliable, scalable, move large files quickly).
92) BitTorrent is P2P. Many users form a swarm that all upload and download among themselves. Large files are split into smaller packets. Once a user has a complete file it becomes a seed from which others can download from.
93) FTP is a download/upload protocol that uses a client server model e.g. you download a file, edit it and upload it and overwrite the original.
94) WebDav – also a download/upload protocol that allows a user to interact with the website e.g. upload, edit or delete a blog entry *without* downloading and uploading the file/webpage.
95) Hub – joins nodes in a star topology. Uses broadcast (cheap)
96) Switch – joins nodes in a star topology. Reduces network traffic because it does not broadcast but uses peer to peer communication.
97) Bridge – joins network segments together that are similar eg Ethernet LAN. Can be wireless.
98) Router joins dis-similar netwoeks.g. ethernet to the internet. A router takes data packets and directs them to the right place using IP addresses.
99) Gateway - Converts data from one protocol or format to another. A router may perform some of the functions of a gateway.
Proxy server - a gateway between users and the internet, separating their computers from the websites they browse, providing additional security, redundancy, and privacy.

100) SOHO Internet solutions (small office home office)
> **ADSL router** allows fast connection to the internet via existing home office telephone wires. Most routers today double up as switches, wireless access points, firewall.
> **Wireless router** – Offers wireless connection to the Internet. Most these days also create a WLAN functionality.

101) Firewall – Can be hardware or software or both. You program rules into a firewall to prevent unauthorized access to your LAN from the Internet. A rule can also prevent a user going to unauthorized websites.
102) VPN - Remote access from anywhere to a private network - your private LAN is extending over the public network (internet). Your work is protected by encryption- location/identity is protected.
103) Remote access – when you allow a repair technician to access your computer directly using the Internet using a product like "Team Viewer".
104) VOIP - Voice over Internet Protocol for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet.

105) IoT – objects that are network enabled that can transfer data without human interaction. The data is collected via sensors and uploaded automatically. These devices are SoC. (System on chip). Useful for monitoring, fault detection, remote control, automation

106) LBS – (Location Based Services). Uses geographical position of a device to provide useful local information e.g. ATMs, roadside assistance, fraud prevention etc, LBS mostly uses GPS technology (Global Positioning System using a matrix of 24 satellites) but can also use cell phone towers eg Google Maps.

107) Cloud based apps. Computing services—including servers, storage, databases, networking, processing power, software, analytics, and intelligence—over the Internet ("the cloud"). You pay monthly for the cloud services you use - cheaper.

> **Advantages** – anywhere anytime access, synchronization of files between devices, easy file sharing, secure and reliable if on a small budget, advanced protection against malware and ransomware. Don't need to buy expensive hardware and software or employ expensive IT professionals as your business grows (scalability). Rights and permissions can be granted on a need to have basis.
>
> **Disadvantage** – good fast stable internet connection, stop paying you can no longer access your files stored on the cloud server – download, then cancel.

108) Desktop apps – Here the full apps are installed on your local hard drive. You can pay for a once off license or monthly (depending on the product). **The fat client model**.

> **Advantage** – Can work offline. Fast if you have a high-performance PC.
>
> **Disadvantages** – Saving and updates are done manually.

109) Web based apps. (e.g. G-Suite, Ms Office 365) You don't have to install the software on your local hard drive - you pay to use the software on the cloud via your browser – **thin client model**.

> **Advantages** - always available, latest version, cheaper, shared access, bugs and security patches are done on the server, uses the processing power of the server. OS independent. Autosave as you type.
>
> **Disadvantages** - you must have a good fast stable internet connection. Must use an up-to-date browser. Uses data. Slow on a poor internet connection. Stop paying, it stops working – you must then download your emails and work before cancelling. Vendor lock-in.

110) Microsoft 365 – word processor, spreadsheet, email, database, presentation software, team collaboration, digital notetaking and cloud storage)

111) Educational Licensing – Products like Google's G Suite and Microsoft's Office 365 are free to use for registered members of an educational institution.

112) Mobile apps – Here the apps are downloaded and installed on the device. They are written and designed specifically for mobile devices because of screen size, limited storage, and processing.

> **Advantages** – Convenient and portable. Native coded apps can interact with all the features of the device (camera, sensors, address book, touch screen etc)
>
> **Disadvantages** – LITE versions, limited processing, and storage. Must download the correct version for your device and OS. Non-native coded apps have limited ability to interact with all the features of the device.

113) RAID – with the thin client model reliability and performance is needed. RAID is a solution.

114) RAID 1 – offers redundancy by writing the same data on two drives ("mirroring,") If one drive fails, the second drive is used, and the failed drive is manually replaced. Therefore RAID 1 is actually a back up.
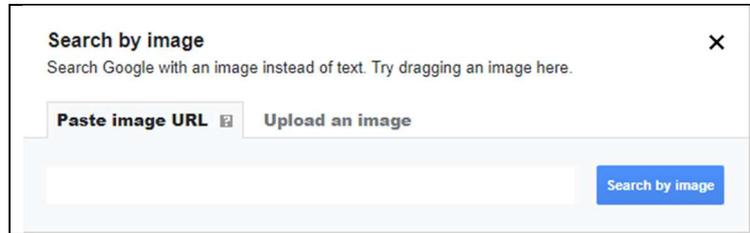
115) RAID 5 – a computer subsystem that stripes interleaving data across three or more drives, increasing performance, and providing redundancy. Data on the failed drive can be automatically rebuilt by the other working drives. RAID 5 is about up-time, performance – it is not a back up.

116) Two-step authentication - In banking you often must use your mobile app in conjunction with the website (need password **and** your mobile device)

117) Browser - extensions can customize and add additional features to the browser when using web and mobile apps (while browser plug ins are depreciated (discouraged))

118) SEO – Search engine optimization. People search for a keyword(s). Your site comes up because of the quality, quantity, and reputation of your sites content – your site matches the search algorithm better than other websites. Good URL and description, share-worthy content, great user experience, focus on keywords (one main keyword per page), website is fast and well designed.

119) Search – for text, for sound (Shazam), for images – **Reverse Image Lookup)**

Search image - to find the original source of the image, obtain higher resolution versions, websites where the image appears, find the content creator, and get information about the image. Can be used to identify **fake news**

120) Deepfake – Lies disguised as the truth. Can be an image, audio or video which have been tampered with using editing and cloning software.

121) Shorter questions
Repeater, hub/switch, bridge, gateway, proxy server/firewall, router (in order of intelligence), Instant messaging, cabling copper v fibre, wireless and Wi-Fi WLAN(802.11a, 802.11b, 802.11g, 802.11n, 802.11ac), wireless disadvantages, Bluetooth (for handhelds), permissions(read write, read only),

Learning Unit 4. Internet.

Web overview
122) Web 1.0 – HTML, HTTP, CSS. Static read only. Authorative centralized content.
123) Web 2.0 – Above plus interaction, preferences. Cookies. About like-minded groups. Self-publishing. Sharing news. Blogs and Wikis. Opinion based. Fake news. Interactive advertising.
124) Web 3.0 – Above, plus multimedia, animations. About the individual and personalization, customization, interactive. Location based services (LBS). Behavioral advertising.
125) Web 4.0 – The mobile web. Customized to the person, the device and the surroundings.

126) Scripts – **client-side and server-side**. Webpages are tailored based on your log in credentials, your browser history, cookies, behavioural history, the date (Black Friday, Valentine's Day etc) previous engagement with products and content, purchase history, click history e.g. Facebook advertising for one person is completely different to another person (age, gender, demographic, interests etc).

127) Web based applications need the following Internet technologies
- HTTP, HTTPS (transfer protocol without and with encryption resp),
- HTML for webpage layout
- CSS for webpage styling
- JSON (and XML) for data values and settings (data interchange)
  - Transmit structured text-based information across the web
- JavaScript for added functionality and customization e.g. filling in a form, displaying a suitable ad

128) Shorter questions
responsive website design to match the device (tablet or smart phone) , web caching, Public and private key encryption, digital signatures, digital certificates, Internet v intranet v extranet

129) Concept: Interactive website content example. Information gathering via online forms (applications, results) then stored in an online database when can be queried and can produce reports, different access rights for administrators and for users eg E-Government, project management

130) Publishing. Longer posts – traditional web browsing on PC
- Websites – being present/findable on the Internet
- Blog – Content publishing, text based
- Podcast – Content publishing via audio
- Video: Content publishing via videos (YouTube)
- Wiki - Content creation via collaboration
- E-Commerce – Online shopping

131) Publishing. Shorter posts – because of mobile web browsing
- Mini websites (landing pages)
- Microblogging – Twitter, Instagram, Pinterest

132) Social Networking
- Facebook, Instagram, LinkedIn (for business and professional growth)

133) Instant messaging
- WhatsApp, Windows Messenger, Skype

134) Social bookmarking
- Pinterest, Delicious, Bitly

135) Telecommunications
- Skype – uses VoIP (text, audio and video)

136) Newsgroups and Bulletin Boards
- Forums (for discussion around topics of mutual interest)
- WhatsApp is also used

137) Collaboration, meetings, productivity, video conferencing
- Zoom, Ms Teams

138) Surface web - Publicly searchable via commercial search engines.
139) Deep web – Not indexed. Private, Need the URL, username and password.
140) Dark web – Small part of the deep web. Not indexed. Need a special browser called a Tor browser. Tor uses **onion routing** – packets of data take an indirect route to provide anonymity, layers of encryption.
141) Cryptocurrency – Not real. Uses **blockchain** to ensure validity. Facilitates a trusted agreement between 2 individuals without the need of a third party e.g. direct online payments without the need of a bank. Allows you to pay anonymously on the dark web.

Learning Unit 5. Social Implications.

Threats to data stored on a computer system
  142) Hardware - failure, power failure
  143) Malware – any malicious code - software designed to cause disruption to a computer system, leak private information, gain illegal access, or deprive users from gaining access.
  144) Social engineering - psychological manipulation of a user to get them to reveal personal information – phishing, pharming, Trojan horses, shoulder surfing, role-playing via online chats, instant messaging, emails and phone calls can be used for i**dentity theft.**
  145) Phishing – fraudulent emails designed to lead you to a fraudulent website.
  146) Pharming – fraudulent websites designed to steal your private personal details.

147) Spoofing - when someone impersonates a trusted contact or brand, pretending to be someone you trust to access sensitive personal information.

148) Hacker – legal. **Cracker** – illegal.

149) Ransomware - Malware designed to encrypt files on a device, rendering files and the systems unusable. A ransom is demanded for decryption.

150) Spyware – when a user obtains private information about another's computer activities by transmitting data secretly from their hard drive.

151) Virus - when executed, replicates itself by modifying other computer programs and inserting its own code.

152) DDos - a denial-of-service (DDoS) attack aims to disrupt the normal traffic of a targeted server by overwhelming its capacity with a flood of Internet traffic (Zombie army)

153) Zombie army (Botnets) - a computer on to a network infected by malware that is under the control of an attacking party; used remotely for malicious tasks e.g. DDos.

How to protect data from these threats.

154) Hardware – UPS, redundant power supplies, install a RAID subsystem,

155) Firewalls – hardware and software, maintained and updated

156) Proxy server - a gateway between users and the internet, separating their computers from the websites they browse, providing additional security, redundancy, and privacy.

157) Software – regular security patches and software updates, audit trails, anti-malware

158) Backups – onsite, remote, on the cloud

159) Strong passwords – also with **two-step authentication** (password and phone together)

160) User rights and permissions for all users as appropriate

161) Encryption – sensitive files

162) User education regarding social engineering and sharing passwords

163) Shorter questions

Artificial intelligence – AI, E-Waste, cyber bullying

Learning Unit 6. Database Management.

Longer questions.

164) Analyzing a given SQL query

165) Getting good data . . . not corrupted, outdated, invalid.

166) 1) Verification – is the data there? Does it match the pattern/template? E.g. postal code, four digits (suburb may not exist therefore validation still needs to be done.)

166) 2) Validation – it matches the pattern, but is it valid? Right length, data type, is not a duplicate, has legal characters, fits the expected range of values, is logical, formatted correctly
Eg – the date – dd/mm/yyyy – 99/99/9999 is there, and matches the pattern, but it is not valid. 01/01/2021 is valid. GUI components like check boxes, radio buttons and drop-down lists can help. String and character methods like length, charAt, substring, indexOf, trim, endsWith, contains, isLetter, isDigit are helpful. Hardware like QR code and bar code scanners can help.

168) SQL – highly structured relational database using related tables to avoid anomalies and redundant data. Records individual transactions in real time. **OLTP**

169) NoSQL – unstructured data eg Facebook. Has data, images, text, hyperlinks on any and all topics all mashed into one place

170) Datawarehouse combines historic data from different sources (often de-normalizing databases into **Big Data**) so that it can be analyzed (data mined) using **OLAP.**

171) Class diagrams – create a class diagram from the given scenario including the access modifiers, properties, and methods – constructor method (could be more than one), mutator methods, accessor methods and toString method.

172) Boolean logic with 4 variable truth table, inheritance.

173) OOP. Pivotal to the examination paper is OOP theory – the characteristics and advantages of using OOP structures and designs. Note that inheritance is not compulsory – it is an option offered by OOP design that can be used or not used.
Fundamental concept of a class: It has **properties** (attributes) and **methods.**
174) Four pillars of OOP:
Encapsulation groups *properties* and *methods* into a *single entity.* It can then hide, or keep private, its values and algorithms using access modifiers. **Inheritance** when one class can inherit the properties and methods of another class. **Polymorphism** is when code can respond in different ways (provide different outcomes) based on the circumstances e.g. method overloading is an example. The constructor method has different outcomes depending on the number of parameters it receives. **Abstraction** only exposing what is important and making all else unimportant e.g. when you expose only the needed/ relevant/ essential features of an object while hiding its complex inner workings. It allows you to concentrate on what an object does rather than how it does it.
175) Overloading – when a method can behave in different ways eg the "+" is an overloaded operator because it can both add or concatenate depending on the circumstances
176) Overriding – when there are two identical methods, but one overrides the other e.g. the toString method in inheritance.

177) Also: role of arrays in OOP, **arrays of objects** and the loops that create them, typed and void methods, constructor methods and their parameters, accessor and mutator methods, parameters and arguments, role and structure of the toString method, access modifiers, information hiding