

2.1 Networks including the internet

Name: _____ Class: _____ Date: _____ **Total: 45 marks**

KEY WORDS router 路由器 • wide area network 广域网 • ip address IP 地址 • star 星形
• mesh 网状

Objective

Build the skills to answer exam questions on **networks** 网络 — the types and topologies of networks, the client-server and peer-to-peer models, IP addressing, and how a web page is found.

You must be able to:

- compare a **LAN** 局域网 and a **WAN** 广域网, and the **client-server** and **peer-to-peer** models
- describe the **bus**, **star** and **mesh** topologies
- explain **IP addresses** (IPv4 / IPv6, public / private, static / dynamic)
- explain how a **URL**, the **DNS** and the difference between the **internet** and the **WWW** work

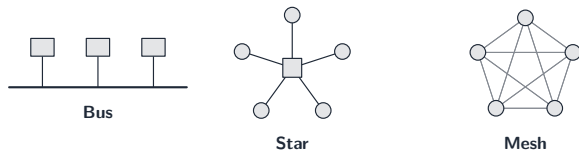
1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Network types and topologies

A **LAN** (local area network) covers a **small area** (one site), is owned by the organisation, and is fast. A **WAN** (wide area network) covers a **large area** using telecom links — the internet is the biggest WAN. A WAN joins LANs together.

The **topology** 拓扑 is how the devices are linked:



- **bus** — one shared cable: cheap, but the whole LAN fails if the cable does. Only one device can send at a time, so devices must **detect and manage collisions**

冲突 — if two send at once, they stop, wait a random time, and resend.

- **star** — each device to a central switch: one device failing doesn't affect others (most common).
- **mesh** — every device linked to others: very **fault-tolerant** (traffic reroutes), but lots of cabling.

■ Network hardware

- a **router** 路由器 joins different networks and sends (routes) data between them — it connects a LAN to the internet.
- a **switch** 交换机 connects devices **inside** one LAN and sends each message only to the device it is addressed to.
- a **network interface card (NIC)** gives a device its fixed physical **MAC address** 物理地址 and connects it to the network.

■ Client-server vs peer-to-peer

	client-server	peer-to-peer
Roles	servers 服务器 provide; clients 客户端 request	every node is both client and server
Control	central, easy to manage and back up	no central control
Weakness	server is a single point of failure	harder to secure / keep consistent

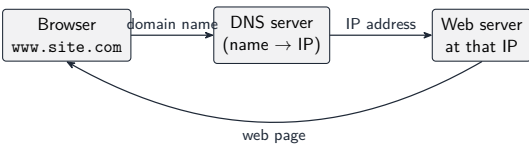
■ IP addresses

Every device on a network has an **IP address**.

- **IPv4** — four numbers 0–255, e.g. 192.168.0.5. **IPv6** — much longer (hex), created because IPv4 addresses ran out.
- **public** = unique across the whole internet; **private** = used only inside a LAN (not reachable directly from outside → safer).
- **static** = fixed; **dynamic** = assigned when the device joins and may change.

■ Finding a web page: URL and DNS

The **internet** is the global network of hardware; the **World Wide Web (WWW)** is the pages and resources carried on it. To open a page, the browser turns the **URL**'s domain name into an IP address using the **DNS** (Domain Name Service):



2 Practice

Now apply the methods above.

2.1 State **two** benefits of connecting computers in a network. [2]

2.2 State **two** differences between a LAN and a WAN. [2]

2.3 Name the topology in which every device connects to a central switch, and give one advantage of it. [2]

2.4 State the difference between a **public** and a **private** IP address. [1]

3 Exam-style questions

3.1 (a) Describe the **client–server** model of a network. [2]

(b) Give one advantage **and** one disadvantage of client–server compared with peer-to-peer. [2]

3.2 (a) State the format of an **IPv4** address. [1]

(b) Give one reason **IPv6** was introduced. [1]

(c) State the difference between a **static** and a **dynamic** IP address. [2]

3.3 Describe how the **DNS** is used when a user types a URL into a browser. [3]

3.4 (a) State the difference between the **internet** and the **World Wide Web**. [2]

(b) Give one advantage **and** one disadvantage of a wireless connection compared with a wired one. [2]

3.5 A company has offices in two cities, each with a star-topology LAN.

(a) Name the type of network that connects the two offices together. [1]

(b) State one benefit of using a mesh topology for the links between the key servers. [1]

3.6 A home has a router and several devices connected to a switch.

(a) State the role of the **router**. [1]

(b) State **one** difference between a **switch** and a **router**. [2]

3.7 A LAN uses a single shared cable (a bus). Describe how the network deals with a **collision** when two devices send data at the same time. [2]

3.8 A college streams recorded lectures to students and also runs live question-and-answer sessions.

(a) **Complete** the table by describing each type of IP address. [3]

type of IP address	description
public	
private	
static	

(b) Consider the address 2001:0db8:0000:0000:0000:ff00:0042:8329. **Identify** which version of IP this is, and **give** one advantage of it over the other version besides the number of addresses available. [2]

(c) **Describe** the difference between **real-time** and **on-demand** bit streaming, giving one example of each. [4]

(d) **Explain** why a high **bit rate** and a large enough **buffer** both matter when streaming video. [4]

(e) A student watching an on-demand lecture sees the video pause repeatedly to reload. **Explain**, in terms of the buffer, why this happens, and **give** one change that would reduce it. [3]
