

5.3 Cyber security

Name: _____ Class: _____ Date: _____

Total: 28 marks

KEY WORDS cyber security 网络安全 • malware 恶意软件 • firewall 防火墙 • phishing 网络钓鱼
• proxy server 代理服务器

Objective

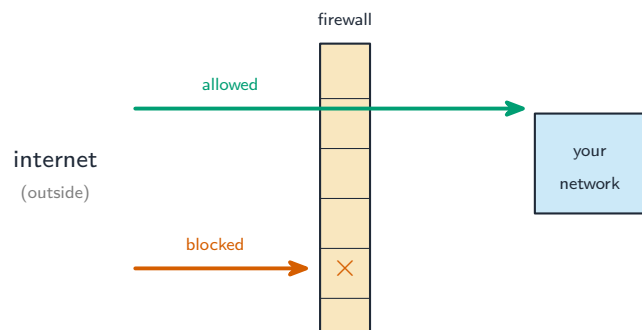
Build the skills to answer exam questions on **cyber security** 网络安全 — the threats, types of **malware** 恶意软件, and methods to keep data safe.

You must be able to:

- describe threats (brute force, DDoS, phishing, pharming, social engineering)
- describe the types of malware
- describe security methods (firewall, authentication, anti-malware)

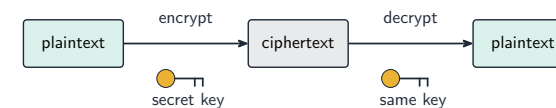
1 Worked examples

■ Threats and protection

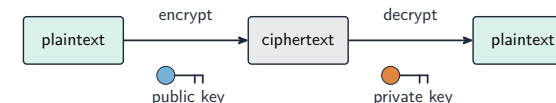


A firewall checks data in/out of a network and blocks anything not allowed

Symmetric: one shared secret key



Asymmetric: a public key and a private key



Encryption is a key security measure against interception

- **threats:** brute force, data interception, DDoS, hacking, malware, pharming, phishing, social engineering.
- **malware:** virus, worm, Trojan, spyware, adware, ransomware.

■ Keeping data safe: which measure answers which risk

Encryption 加密 scrambles data with a key so that an interceptor gets **ciphertext** 密文 they cannot read; the plaintext is recovered with the key. It does not stop the data being taken, it makes what is taken useless. **Symmetric encryption** uses the same key to encrypt and decrypt, so the key itself must be exchanged safely; **asymmetric encryption** uses a public key to encrypt and a matching private key to decrypt, so nothing secret has to be sent.

Secure sockets layer (SSL) and its successor TLS encrypt the traffic between a browser and a web server. The browser checks the site's **digital certificate**, then the two agree a session key. You can tell it is in use because the address begins **https** and a padlock appears.

Firewall 防火墙: examines traffic entering and leaving the network, compares it with a set of criteria, blocks what fails, logs traffic, and can block named sites or addresses.

Proxy server 代理服务器: sits between the user and the internet, so the web server never sees the user's own address. It can filter traffic, keep a cache of pages so they load faster, and act as a firewall.

Access rights 访问权限: each user gets only the permissions their role needs (read, read-and-write, none), so a person who is not authorised cannot see or change a file even after logging in.

Authentication 身份验证: passwords, biometrics (fingerprint, face, iris), and two-step verification, which sends a one-time code to a device the real user holds.

Worked example. A hospital keeps patient records on a server used by doctors and receptionists. Suggest measures. Encrypt the records so a stolen copy is unreadable; use access rights so receptionists see only appointment details while doctors see the

medical notes; use biometrics or two-step verification, so a stolen password alone is not enough; put a firewall between the server and the internet to block unauthorised traffic.

2 Practice

2.1 State what a brute force attack is. [1]

2.2 State what ransomware does. [1]

2.3 Give the name of the data before and after encryption. [2]

2.4 Identify two tasks performed by a proxy server. [2]

2.5 Explain why encryption does not stop data being intercepted. [2]

3 Exam-style questions

3.1 A firewall protects a network by: [1]

A	B
C	D

A scanning for viruses

B checking data in/out and blocking what is not allowed

C encrypting files

D hiding the IP address

3.2 A company wants to protect its data.

(a) Describe what a phishing attack is. [2]

(b) State two methods (other than a firewall) to keep data safe. [2]

3.3 State the difference between a virus and a worm. [2]

3.4 An online bank protects its customers' data.

(a) Explain what happens to data when it is encrypted, using the terms plaintext and ciphertext. [2]

(b) Identify the protocol that encrypts the connection between a customer's browser and the bank's server, and give one way the customer can tell it is being used. [2]

(c) Describe two tasks a firewall performs for the bank's network. [2]

(d) Bank staff have different access rights. Explain how access rights protect customer data even from someone who has logged in successfully. [2]

(e) The bank adds two-step verification. Describe how it works and explain why it is safer than a password alone. [3]

(f) Explain one advantage of asymmetric encryption over symmetric encryption when a customer first connects. [2]
