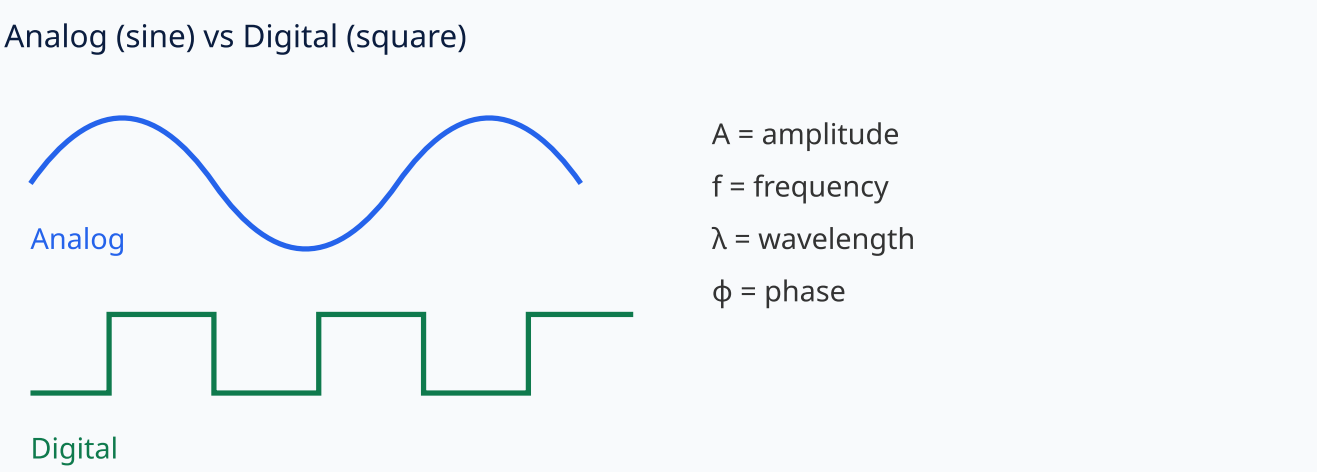
Grade 12 A/L ICT · Lesson 6

6.1 Signals and Their Properties

Syllabus 6.1. Data moves as **signals**. Compare **analog** and **digital** and study **amplitude**, **frequency**, **wavelength**, **phase** and **propagation speed** (λ = v / f).

1. Analog and digital

Analog varies smoothly. **Digital** uses discrete levels (often two voltages for 0 and 1).



Analog vs digital

2. Properties

- **Amplitude** – height/strength.
- **Frequency f** – cycles/s (Hz).
- **Wavelength λ = v/f**.
- **Phase** – timing in the cycle.
- **Propagation speed** – depends on medium.

🧱 **Worked example: f=100 MHz, v=3×10⁸ m/s. Find λ and T.**
λ=3 m; T=10 ns.

💡 Higher f → shorter λ at same speed.

🚀 **Beyond the syllabus (2026 update)** *Not required for the exam – read for interest.* 5G/Wi-Fi still use frequency bands; exam wants λ=v/f and sketches.

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Key Words

Analog signal – Smooth continuous signal.	**Digital signal** – Discrete-level signal.
Amplitude – Height/strength of a wave.	**Frequency** – Cycles per second (Hz).
Wavelength – λ = v/f.	**Phase** – Timing offset in a cycle.
Propagation speed – Wave speed in a medium.	**Hertz** – Unit of frequency.
Period – T = 1/f.	**Medium** – Path the signal travels.
Bit – Binary 0 or 1.	**Sine wave** – Common analog shape.

Sample Q&A

1. Define analog vs digital.

> **Answer:** Analog continuous; digital discrete.

2. What is frequency?

> **Answer:** Cycles per second (Hz).

3. State λ = ?

> **Answer:** v/f.

4. What is phase?

> **Answer:** Timing position in the cycle.

5. λ for 100 MHz at 3e8 m/s?

> **Answer:** 3 m.

6. Why does medium matter?

> **Answer:** Sets propagation speed and delay.

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MCQ

1. A digital signal mainly uses

A. random heat
B. paper letters
C. discrete levels such as two voltages
D. only smooth sine waves
E. folder icons

2. Frequency unit

A. metres only
B. amperes only
C. candela
D. kilograms
E. hertz (Hz)

3. λ equals

A. v / f
B. v + f
C. f / v
D. v × f
E. 1 / v

4. f=100 MHz, v=3×10^8 → λ

A. 300 m
B. 0.3 m
C. 3 km
D. 3 m
E. 30 m

5. Period T

A. v × f
B. v + f
C. 1 / f
D. λ × f
E. f

6. Amplitude is

A. IP address
B. height or strength of the wave
C. GUI theme
D. MAC address
E. port number

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7. Phase describes

A. timing shift within the cycle
B. disk size
C. printer ink
D. CPU brand
E. cable colour

8. Propagation speed depends on

A. folder icon
B. file name
C. the medium
D. username
E. GUI theme

9. Which term means: “Smooth continuous signal”?

A. Amplitude
B. Bit
C. Phase
D. Hertz
E. Analog signal

10. Which term means: “Discrete-level signal”?

A. Period
B. Digital signal
C. Propagation speed
D. Sine wave
E. Frequency

11. Which term means: “Height/strength of a wave”?

A. Hertz
B. Wavelength
C. Analog signal
D. Medium
E. Amplitude

12. Which term means: “Cycles per second (Hz)”?

A. Bit
B. Digital signal
C. Period
D. Frequency
E. Phase

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13. Which term means: “λ = v/f”?

A. Medium
B. Amplitude
C. Sine wave
D. Wavelength
E. Propagation speed

14. Which term means: “Timing offset in a cycle”?

A. Phase
B. Analog signal
C. Hertz
D. Bit
E. Frequency

15. Which term means: “Wave speed in a medium”?

A. Propagation speed
B. Sine wave
C. Period
D. Wavelength
E. Digital signal

16. Which term means: “Unit of frequency”?

A. Medium
B. Amplitude
C. Analog signal
D. Phase
E. Hertz

17. Which term means: “T = 1/f”?

A. Bit
B. Period
C. Digital signal
D. Frequency
E. Propagation speed

18. Which term means: “Path the signal travels”?

A. Hertz
B. Sine wave
C. Medium
D. Amplitude
E. Wavelength

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19. Which term means: “Binary 0 or 1”?

A. Period
B. Bit
C. Analog signal
D. Frequency
E. Phase

20. Which term means: “Common analog shape”?

A. Propagation speed
B. Wavelength
C. Medium
D. Sine wave
E. Digital signal

Structured Questions

1. Define analog and digital. *(2 marks)*

> Analog continuous; digital discrete.

2. List four properties. *(4 marks)*

> Amplitude; frequency; wavelength; phase.

3. Compute λ and T for f=100 MHz, v=3×10^8. *(2 marks)*

> λ=3 m; T=10 ns.

4. Explain propagation speed. *(2 marks)*

> How fast the wave travels in the medium.

5. Why sketch both types? *(2 marks)*

> Contrast smooth vs stepped bit levels.

Summary

- Analog vs digital signals.
- Amplitude, f, λ, phase.
- λ=v/f, T=1/f.
- Speed depends on medium.
- Digital levels encode bits.

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MCQ answer key – 6.1

1. **C** – Discrete levels.
2. **E** – Hz.
3. **A** – λ=v/f.
4. **D** – 3 m.
5. **C** – T=1/f.
6. **B** – Height.
7. **A** – Timing.
8. **C** – Medium.
9. **E** – Analog signal – Smooth continuous signal.
10. **B** – Digital signal – Discrete-level signal.
11. **E** – Amplitude – Height/strength of a wave.
12. **D** – Frequency – Cycles per second (Hz).
13. **D** – Wavelength – λ = v/f.
14. **A** – Phase – Timing offset in a cycle.
15. **A** – Propagation speed – Wave speed in a medium.
16. **E** – Hertz – Unit of frequency.
17. **B** – Period – T = 1/f.
18. **C** – Medium – Path the signal travels.
19. **B** – Bit – Binary 0 or 1.
20. **D** – Sine wave – Common analog shape.

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