A-LEVEL PHYSICS • HOLIDAY HOMEWORK 假期作业

21 Alternating current – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
alternating current	交流电			
peak value	峰值			
period	周期			
frequency	频率			

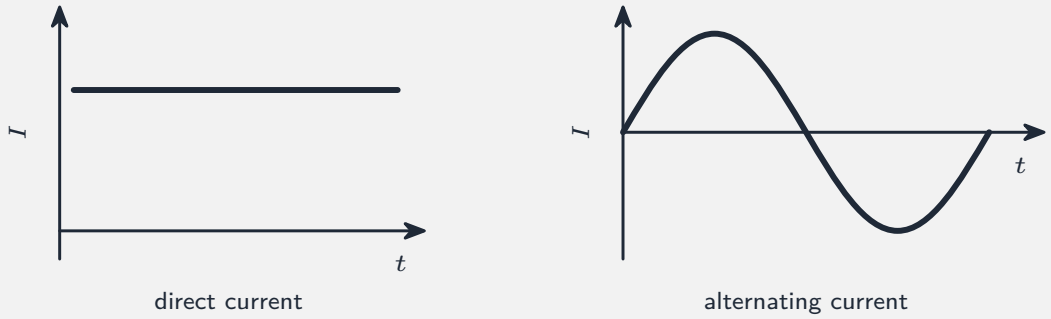
Recall

An **alternating current** 交流电 (a.c.) keeps reversing direction. The mains supply is a.c., following a sine wave.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice.

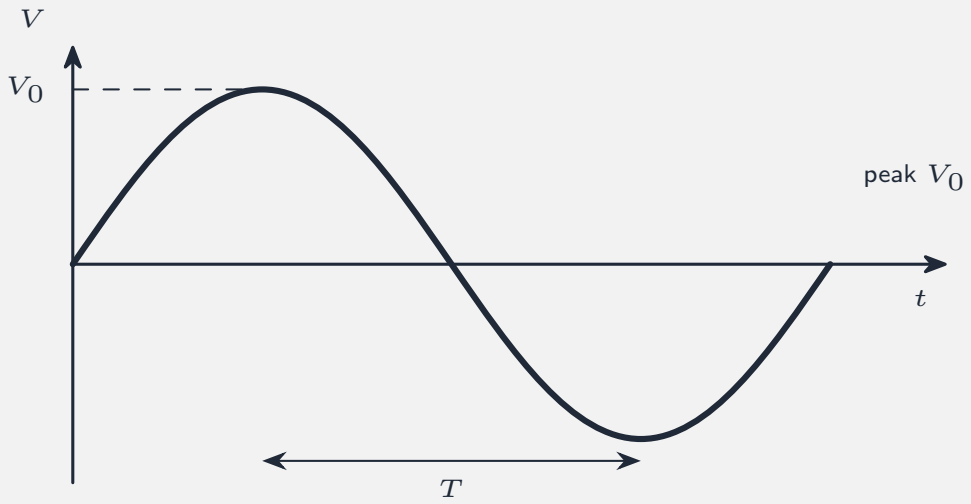
1 Direct vs alternating



Direct current (d.c.) is steady; alternating current rises and falls, reversing each cycle. Mains a.c. follows $I = I_0 \sin(\omega t)$.

Worked example. A battery gives a steady d.c. —the same value all the time. Mains a.c. instead climbs to a peak one way, falls back through zero, peaks the other way, and repeats, 50 times each second.

2 Reading the wave



- the **peak value** 峰值 I_0 or V_0 is the largest value in a cycle;
- the **period** 周期 T is the time for one cycle, and the **frequency** 频率 $f = 1/T$.

Worked example. An a.c. wave has period $T = 0.020$ s. Then $f = 1/T = 1/0.020 = 50$ Hz, and the angular frequency is $\omega = 2\pi f = 2\pi(50) \approx 314$ rad s^{-1}.

Watch out: the peak value is the *largest* value reached, which is bigger than the value the mains is usually rated at (that rated value is the r.m.s. value —see Part 2).

Practice

Try these in order.

21.1 What does an *alternating current* keep doing? [1]

21.2 What shape is mains a.c.? [1]

21.3 What is the *peak value*? [1]

21.4 What is the *period* of an a.c. wave? [1]

21.5 An a.c. wave has period 0.020 s. Find its frequency. [1]

21.6 Mains a.c. in many countries has frequency 50 Hz. Find the period of one cycle. [2]

21.7 Challenge. A torch battery and the mains both light a bulb. Explain the key difference between the current each one supplies. [2]