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			

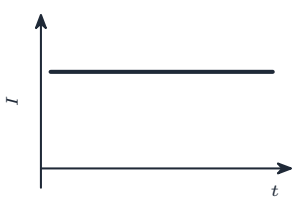
Recall

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

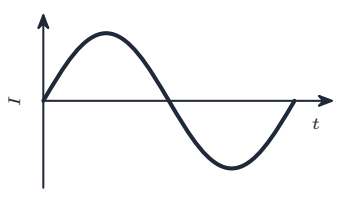
New ideas

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

1 Direct vs alternating



direct current

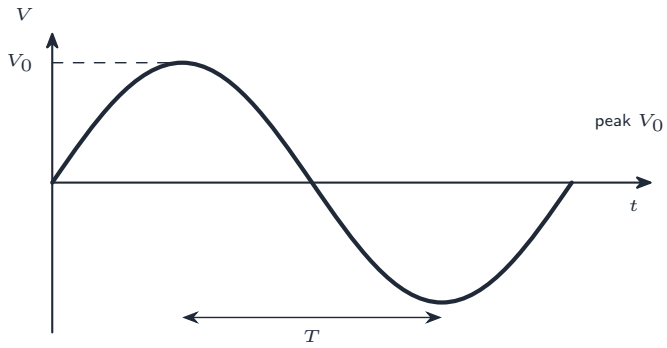


alternating current

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]