

# EXERCISE

## PHY 6: Synoptic Paper - June 2003

### Question 1

Read the passage and then consider the following:

- (a) Not in passage - Unit 2 (basic electricity)
- (b) (i) Not directly in passage - Unit 5 (induced e.m.f.)  
(ii) Deduce from equation in passage  
(iii) Last paragraph of passage
- (c) (i) What does 'estimate' mean?
- what is the 'equivalent value' of each square?
  - count small or large squares, or
  - approximate to a triangle or rectangle
  - easy to get within 10%
- (ii) You need to
- know  $P = I^2 r$
  - read off peak  $I$
  - remember  $I$  is in  $10^6$  A
  - give units for  $P$

(d) Homogeneity

- practice checking all equations on Formula Sheet
- some key units - try these:

newton:

$$N \equiv \text{kg m s}^{-2}$$

volt:

$$V \equiv \text{J C}^{-1}$$

joule:

$$J \equiv \text{N m}$$

farad:

$$F \equiv \text{C V}^{-1}$$

watt:

$$W \equiv \text{J s}^{-1}$$

tesla:

$$T \equiv \text{N A}^{-1} \text{m}^{-1}$$

coulomb:

$$C \equiv \text{A s}$$

pascal:

$$\text{Pa} \equiv \text{N m}^{-2}$$

- common faults:

the 'graffiti' approach

cancelling exponents

altering exponents

working backwards

unashamed 'fiddling'

- (e) (i) First paragraph of passage  
(ii) Second paragraph of passage  
(iii) You need to:
- put  $v = r\omega$  (Formula Sheet)
  - and  $\omega = 2\pi f$  (Formula Sheet)
  - hence  $v = 2\pi rf$
  - remember to halve the diameter for  $r$
- (f) Not in passage - Unit 2 (electric circuits)
- (g) You need to:
- recall centripetal force =  $mv^2/r$
  - and gravitational force =  $Gm_E m/r^2$
  - equate, and
  - remember to put  $r = r_E + h$

### Question 3

This is typically synoptic as it brings together:

- radioactivity (Unit 1)
- gas laws (Unit 2)
- spectra and photons (Unit 4)

## Question 4

This contains two common graphical exercises:

- the meaning of exponential decay
  - ✓ *ratios* of successive positive *or* negative amplitudes - equal
  - ✓ *ratios* of successive positive *and* negative amplitudes - equal
  - × *differences* between successive maxima -gradually decrease
  - ✓ draw *envelope* of maximum (positive or negative) amplitudes and read off at least two '*half lives*' - equal
- sketch a rough graph
  - ✓ label the axes with quantities and units (and numerical values if appropriate)
  - ✓ give key points numerical values where known
  - ✓ draw approximate shape between these points