Measurement of the density of solids

Practical question — PH3 2012 Task A1

Total	/8

INSTRUCTIONS

Candidates will make measurements on a ball.

Test 1:

- Electronic balance — suggested resolution ± 0.1 g
- Callipers – suggested resolution ± 0.01 mm (digital callipers can also be used)
- Golf ball

Test 2:

The apparatus is as for Test 1 except that a dice should be used. E.g. Large wooden dice — 5 cm are available.

TASK A1

In this task you are going to determine the mean density of a golf ball. Repeat readings are not required for this task.

1. Measure the mass of the ball and calculate its percentage uncertainty. [2]

2. By taking a suitable measurement determine the volume of the golf ball. Ignore the effect of the dimples.
[You do not need to determine the percentage uncertainty.] [3]

3. (a) Determine the mean density of the golf ball and its percentage uncertainty assuming the percentage uncertainty in the volume to be 0.5%. [2]

(b) Explain how the dimples in the golf ball affect the value of the density calculated in part **3.**(a) [1]

MARK SCHEME

Question		Marks available
1.	Mass measured correctly, given to the resolution of the balance with unit. *(1)* Percentage uncertainty calculated correctly using the resolution of the balance and expressed to 1 [accept 2] significant figures. *(1)*	2
2.	Diameter correctly measured with unit. *(1)* [This mark can be awarded 'by implication' if the volume is correct.] Volume calculated correctly with correct units *(1)* [e.c.f. on incorrect diameter]. Volume given to 3 or 4 s.f. *(1)* [e.c.f. on incorrect volume].	3
3.(a)	Density calculated correctly with units [Allow ecf from part *(b)*]. *(1)* Percentage uncertainty calculated correctly [Ans: uncertainty in *(a)* + 0.5%]. *(1)*	2
3.(b)	The true density is greater than the measured / calculated density *because* the true volume is less than the measured volume [or equiv, e.g. accept "there is missing mass which would fill up the dimples!"] NB Effect on density **and** reason required.	1