The Open University
Science Supplementary Material
S281 Astronomy and Planetary Science

S281 CMA 42
TMA 03

Course and assignment number:

Computer Marked Assignment

S281 42

Make sure you know how to use the CMA form: detailed instructions are given in your student handbook (or supplement).
You are strongly advised to attempt every question in this assignment.
If you do not wish to answer a question, pencil across the 'don't know' cell ('?').
If you think that a question is unsound in any way, pencil across the 'unsound' cell ('U') *in addition to* pencilling across either an answer cell or the 'don't know' cell.
Note For each question, you **must** *pencil across* **either** *the required number of answer cells* **or** *the 'don't know' cell.*

Covering: **Block 2**

Cut-off date:
Friday 22 July 1994

Q1 Comet Halley has an orbital period of 76 years. What is the size of its semi-major axis, in AU? Pencil across *one* cell in row 1.

KEY for Q1

A 2.4
B 3.7
C 10.8
D 17.9
E 23.3
F 27.9
G 31.1

Q2 The key for this question consists of a number of lists of events leading up to the formation of the Earth. Only two of these lists are in an order that is likely to be correct (earliest event first, latest event last). Choose the *two* lists that are probably in the correct order. Pencil across *two* cells in row 2.

KEY for Q2

A Condensation of volatiles, condensation of refractories, coagulation to form grains 1 mm across, T Tauri wind, growth of planetesimals bigger than 10 m across
B Condensation of refractories, condensation of volatiles, coagulation to form grains 1 mm across, T Tauri wind, growth of planetesimals bigger than 10 m across
C Coagulation to form grains 1 mm across, growth of 1 km planetesimals, runaway growth, differentiation
D Condensation of volatiles, condensation of refractories, giant impacts, growth of planetesimals
E Runaway growth, embryo–embryo collision, formation of a magma ocean, additions to the atmosphere by gas-loss from the interior
F Runaway growth, Moon-forming giant impact, embryo–embryo collisions, initiation of the crust by partial melting of the mantle
G Supernova explosion, decay of all the ^{26}Al, planetesimal formation, embryo–embryo collisions
H Planetesimal formation, runaway growth, late-heavy bombardment, embryo–embryo collisions

Q3 Figure 1 shows the proposed internal structure of Neptune's largest satellite, Triton, divided into three layers. Choose the *two* descriptions of the three layers from the key that are correct. Pencil across *two* cells in row 3.

KEY for Q3

A 1 crust, 2 mantle, 3 core
B 1 lithosphere, 2 asthenosphere, 3 core
C 1 crust, 2 lithosphere, 3 asthenosphere
D 1 asthenosphere, 2 lithosphere, 3 mantle
E 1 + 2 lithosphere, 3 asthenosphere
F 1 mantle, 2 + 3 core
G 1 + 2 crust, 3 core
H 1 + 2 mantle, 3 core

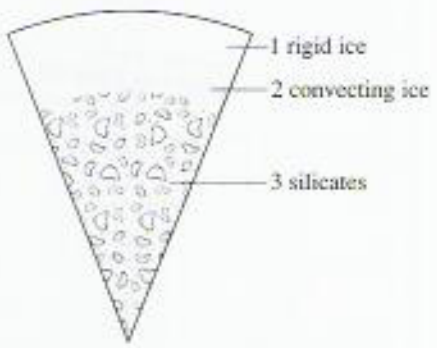

FIGURE 1 For use with Q3.

Q4 Using the data given in Table 3.2 (Subsection 3.5.2), calculate the rate of heat production by each of the four long-lived heat-producing radioactive isotopes within the Earth at the time of its formation. Add these values to determine the total global rate of heat production by all four long-lived radioactive isotopes at that time. Choose from the key the isotope that would have contributed most to the Earth's heat production at that time, and the value for *total* heat production at that time that is closest to your own. Pencil across *two* cells in row 4.