KEY for Q4

A	^{40}K	E	9×10^{12} W
B	^{235}U	F	2.9×10^{13} W
C	^{238}U	G	2.2×10^{14} W
D	^{232}Th	H	4.5×10^{14} W

Q5 Assuming that the Chicxulub impact site in Mexico, thought to have been the scene of the K–T boundary event, is about 120 km in diameter, which of these features is it likely to have possessed when pristine? Select *two*. (*Note*: think carefully about the differences between lunar and terrestrial cratering phenomena.) Pencil across *two* cells in row 5.

KEY for Q5

A A dark halo of ejecta

B A central peak

C A cluster of central peaks

D A peak-ring

E A multi-ring structure

F Pools of impact melt

G A surrounding pattern of bright radial rays

H Shocked fragments of the impacting body

Q6 An area of basaltic volcanism on Mars has an age estimated at 2.6 billion years. How many craters 16–32 km in diameter would you expect it to contain per square kilometre? Select the *one* answer from the key that is closest to your own best estimate. Pencil across *one* cell in row 6.

KEY for Q6

A	5×10^{-5}	D	5×10^{-6}
B	2×10^{-5}	E	2×10^{-6}
C	1×10^{-5}	F	5×10^{-7}

Q7 Io's mass is about 8.9×10^{22} kg. Assuming that the satellite is made of ordinary silicate materials which melt at about 1 300 °C, and that it started cold at 0 °C, how long would it take for the satellite to heat up and become completely molten, at the present rate of heat generation through tidal dissipation (4×10^{13} W), in the unlikely event that no heat were lost to space during this time? You may assume specific heat capacity = 1.2×10^{3} J kg^{-1} K^{-1} and latent heat of fusion = 4.8×10^{5} J kg^{-1}. Select the *one* value from the key that is nearest to the one you have calculated. Pencil across *one* cell in row 7.

KEY for Q7

A	0.7 million years	E	110 million years
B	1.9 million years	F	140 million years
C	5.5 million years	G	1.6 billion years
D	30 million years	H	5.3 billion years

Q8 Select from the key *two* statements that are *true*. Pencil across *two* cells in row 8.

KEY for Q8

A Molecular nitrogen, N_2, is readily detected in the atmosphere of Mars by infrared spectroscopy.

B A small mass spectrometer on a lander on Mars would easily distinguish between the common isotopic forms of carbon dioxide, CO_2, and propane, C_3H_8, in the atmosphere.

C An asteroid that has an orbital radius greater than that of Mars must have an effective temperature T_e less than 217 K.

D Ozone, O_3, in the Earth's troposphere will contribute to the greenhouse effect because it strongly absorbs ultraviolet radiation.

E Ethane, C_2H_6, in the Earth's troposphere will contribute to the greenhouse effect because it is transparent to solar radiation, but absorbs infrared radiation.

F If the surface temperature of Venus were to fall (improbably) to 250 K, liquid carbon dioxide, CO_2, would begin to condense at the surface.

Q9 Select from the key *two* statements that are *false*. Pencil across *two* cells in row 9.

KEY for Q9

A The escape speed at the surface of Mercury is 4 250 m s^{-1}.

B An atom of helium, He, at the surface of Mercury at the average surface temperature has a root mean square speed that is less than the escape speed.

C The terrestrial planets in their early evolution are likely to have lost initial atmospheres of hydrogen and helium by thermal escape.

D Enrichment by deuterium, ^{2}H, in hydrogen-containing molecules in the atmosphere of Venus is evidence of loss of water, H_2O, from the planet.

E The action of the intense u.v. flux of the early Sun is the likely cause of the loss of much carbon dioxide, CO_2, from the Earth's atmosphere.

F Photodissociation of H_2O by the early Sun probably caused loss of H_2O from Venus but resulted in the formation of a small partial pressure of oxygen, O_2, on Earth.

Q10 A cloud on Neptune at the equator is moving with a wind velocity of −500 m s^{-1}. At what velocity (with respect to a non-rotating observer in space) is it moving? (You should ignore the planet's orbital motion.) Pencil across *one* cell in row 10.

KEY for Q10

A	1.7×10^{10} m s^{-1}	E	−498 km s^{-1}
B	2 800 m s^{-1}	F	−500 m s^{-1}
C	1 800 m s^{-1}	G	−1 800 m s^{-1}
D	500 m s^{-1}	H	−2 800 m s^{-1}

Q11 Select from the key for Q11 the most likely source of the excess internal heat of Neptune? Pencil across *one* cell in row 11.

KEY for Q11

A Radioactivity

B Separation of helium from metallic hydrogen

C Absorption of sunlight by clouds

D Differentiation of icy and rocky materials

E Tidal heating