

**Q5** It is thought that the SNC meteorites originate on Mars. Select from the key three statements about SNC meteorites that are correct and that provide evidence in favour of this theory. Pencil across three cells in row 5.

KEY for Q5

- ☒ A They contain abundant calcium-aluminium-rich inclusions (CAIs).
- ☒ B They contain chondrules showing signs of hydrothermal alteration.
- ☒ C Their crystallization ages are about 3–4 billion years younger than for most other meteorites.
- ☒ D When cut, polished and etched, their Widmanstätten pattern is different from that of most other meteorites.
- ☒ E The  $^{14}\text{N}/^{15}\text{N}$  ratio of gases trapped within them appears to represent a mixture of nitrogen from the martian atmosphere and the martian crust and mantle.
- ☒ F Their oxygen isotope compositions do not plot on the terrestrial fractionation line (TFL).
- ☒ G They contain hydrated minerals that appear to be low-temperature weathering products formed near the surface of Mars.
- ☒ H They contain silicon carbide grains whose trapped xenon has an isotopic ratio consistent with s-process nucleosynthesis.

**Q6** Select from the key the two statements that are TRUE. Pencil across two cells in row 6.

KEY for Q6

- ☒ A Vibrational spectroscopy can be used to detect  $\text{O}_2$  in the atmospheres of planets.
- ☒ B The amount of  $\text{CO}_2$  in the volatile inventory of Mars is much greater than that for Earth.
- ☒ C If the partial pressure of a component of an atmosphere is much less than its saturation vapour pressure at that temperature, then that component will not condense to form clouds.
- ☒ D The chemical compositions of planetary atmospheres above the topmost cloud layers are determined by chemical equilibrium.
- ☒ E At sufficiently high temperatures and pressures, hydrogen has metallic properties.
- ☒ F Wind speeds at the surface of Venus are very high, over  $100 \text{ m s}^{-1}$ .

**Q7** Select from the key the two statements about galaxies that are TRUE. Pencil across two cells in row 7.

KEY for Q7

- ☒ A Starburst galaxies are so called because jets of stars are escaping from the galaxies.
- ☒ B Starburst galaxies are elliptical galaxies.
- ☒ C Starburst galaxies have stronger emission lines than normal galaxies.
- ☒ D The broadband spectra of starburst galaxies peak in the visible region, as do the broadband spectra of stars.
- ☒ E Emission lines are more common in the spectra of normal spiral galaxies than normal elliptical galaxies.
- ☒ F If a galaxy has lines in its spectrum, these lines are found only in the optical (i.e. ultraviolet, visible and infrared) range of wavelengths.

**Q8** If our Universe has flat geometry, when is its expansion expected to cease? Select the most appropriate phrase from the key and pencil across one cell in row 8.

KEY for Q8

- ☒ A It has already ceased.
- ☒ B This year.
- ☒ C Next year.
- ☒ D Sometime, but more information is needed to be more specific.
- ☒ E Its expansion is not expected to cease.
- ☒ F The expansion will finally come to a halt at time  $t = \infty$ .
- ☒ G None of A–F.