Q13 G $q = \dfrac{-1}{H^2}\left(\dfrac{1}{R}\dfrac{\mathrm{d}^2\mathrm{R}}{\mathrm{dt}^2}\right)$. It follows from this that if $R = At^{2/3}$, where A is a positive constant, then q is a positive constant. In fact, $q = 1/2$ in this case, as shown in SAQ 13 of Unit 15.

Q14 C $\rho^c(t) = 3c^2H^2(t)/8\pi G$, so $\rho^c(t) \propto \dfrac{1}{R^3}$.

Q15 B,D k vanishes, so space is flat. But R varies as $\mathrm{t}^{2/3}$ in such a Universe, so spacetime is curved by the analysis of Unit 14 Section 3.4.

Q16 E All statements are true (or thought to be true at the time of writing) except for the claim that intergalactic non-baryonic matter would have zero mass-to-light ratio.

Q17 A All the statements are supported by Section 6 of Unit 15 apart from the claim in item A that ρ and ρ^c must agree to one part in 10^{15} at the time of decoupling. Such precise agreement is required at the earlier time of nucleosynthesis. A lesser degree of agreement would be adequate at the time of decoupling.

Q18 C From the figure showing element production in Section 5 of Unit 15, it is clear that, in the given range, the proportion of deuterium (^{2}H) is the fastest changing and hence the most sensitive.

Q19 C,D A is false, the Universe is thought to have been radiation dominated at the time of nucleosynthesis. B is false, decoupling happens after nucleosynthesis. C and D are supported by the text. E is false, it is the *presence* of neutrinos that is relevant.