Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic : 10_Space

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Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	• All the stars are in the main sequence (1) • In an older cluster there would be red giant stars (1)		2
(ii)	**MAX 4** • The most massive stars experience much greater gravitational forces (1) • So core temperature and density is greatest (1) • The rate of fusion in the core is greatest (1) **Or** the power generated in the core is greatest (1) • The (surface) temperature is greatest • The surface area of these stars is greatest • So according to Stefan's Law the power radiated from these massive stars is greatest		4

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Q2.

Question Number	Answer		Mark
(a)	Calculate gradient of line Identify gradient with H **Or** use of v = Hd for a point on the line Use of t = 1/H $t = 4.5 \times 10^{17}$ s (accept answers in range 4.2×10^{17} s to 4.8×10^{17} s) **Alternative method:** Pair of d, v values read from the line Values chosen from the upper end of the line Use of t = d/v $t = 4.5 \times 10^{17}$ s [$\pm 0.3 \times 10^{17}$ s] [$t = 1.4 \times 10^{10}$ yr [$\pm 0.1 \times 10^{10}$ yr] Example of calculation $H = \text{gradient} = \frac{(11000-0)\times 10^3 \text{ m s}^{-1}}{(50-0)\times 10^{23} \text{ m}} = 2.2\times 10^{-18} \text{ s}^{-1}$ $t = \frac{1}{H} = \frac{1}{2.2\times 10^{-18} \text{ s}^{-1}} = 4.5\times 10^{17} \text{ s}$	(1) (1) (1) (1) (1) (1) (1) (1)	4
* (b)	**QWC – Work must be clear and organised in a logical manner using technical wording where appropriate** Measure wavelength of light (from the galaxy) Compare it to the wavelength for a source on the Earth Reference to spectral line **or** line spectrum Reference to Doppler effect/shift **Or** redshift *v* is found from: fractional change in wavelength equals ratio of speed of source to speed of light **Or** see reference to $\frac{\Delta\lambda}{\lambda} = \frac{v}{c}$ with terms defined **Or** see reference to $z = \frac{v}{c}$ with terms defined [accept answers in terms of frequency rather than wavelength]	 (1) (1) (1) (1) (1)	5
*(c)	**QWC – Work must be clear and organised in a logical manner using technical wording where appropriate** **Max 3** (Due to the) difficulty in making accurate measurements of distances to galaxies Hubble constant has a large uncertainty **Or** age = 1/H may not be valid as gravity is changing the expansion rate Because of the existence of dark matter Values of the (average) density/mass of the universe have a large uncertainty [accept not known] (Hence) measurements of the critical density of the Universe have a large uncertainty Dark energy may mean we don't understand gravity as well as we thought we did (so it's hard to predict how gravity will determine the ultimate fate)	 (1) (1) (1) (1) (1) (1)	3

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