



**Paper 4H**

1.	(a)	RA = 7 h 45 min [40 min – 50 min] OR 7.75 h	✓	
		dec = +28° [27° – 29°]	✓	2
	(b)	32° (N) [31° – 33°]	✓	1
	(c)	Path of Sun during 1 year	✓	1
	(d)	Parallel to ecliptic	✓	
		Equidistant from ecliptic	✓	
		Approximately correct width [~10°]	✓	3
	(e)	Sun at ecliptic at 6 h	✓	1
	(f)	Sun lies in Gemini during summer	✓	
		so only visible at best 6 months later/visible during daytime	✓	2
				10
<hr/>				
2.	(a)	Diameter or width of objective (mirror) [NOT size]	✓	1
	(b)	Improve resolution	✓	
		and collect as much light as possible ∴ brighter	✓	2
	(c)	Poor contrast for photograph	✓	
		and fainter stars invisible/sky is too bright	✓	2
	(d)	Any two from:		
		<ul style="list-style-type: none"> <li>• stiller air</li> <li>• above clouds</li> <li>• less atmosphere</li> </ul>	✓✓	2
		[NOT light pollution or skyglow]		
	(e)	Diagram of Cassegrain	✓✓ ✓	3
		[1 for two mirrors in Cassegrain sense; 1 for hole in primary; 1 all correct with rays]		10

3.	(a)	Darker central (umbra)	✓	
		Lighter (penumbra) surrounding	✓	2
	(b)	(i) Increase then decrease [Allow reversal]	✓	
		(ii) High latitude moving to lower latitude	✓	2
	(c)	(i) 15 million K $\pm$ 2 [Allow °C or no unit]	✓	
		(ii) 5800 K (6000 K) [5600 – 6000]	✓	
		(iii) 2 million K [1.5 – 2.5 million]	✓	3
	(d)	Fusion	✓	
		of H into He	✓	
		Loss in mass releases energy	✓	3
				10
<hr/>				
4.	(a)	(i) Oct/Nov	✓	
		(ii) Sunset times suggest Autumn	✓	
		Sunset times still becoming earlier so not Dec [No e.c.f. here if spring month.]	✓	3
	(b)	Crescent	✓	1
	(c)	(i) Crescent moon drawn [either  or  ]	✓	
		(ii) Moon rises/sets soon after Sun	✓✓	3
	(d)	(i) 14/15/16 <sup>th</sup>	✓	
		(ii) Moonrise and sunrise times similar	✓✓	3
				10

5.	(a)	(i) Elliptical orbits/no epicycles	✓	
		(ii) Predicted positions of planets did not agree with observed positions	✓	2
	(b)	Phases or sizes of Venus	✓	
		and moons around Jupiter	✓	2
	(c)	Any two from:		
		• Reflecting telescope		
		• Dispersion of white light		
		• Calculus	✓✓	2
	(d)	4.1 days	✓✓ ✓✓	4
		[Correct use of equation (1); correct substitution (1); progress (1); correct answer (1)]		<u>10</u>
<hr/>				
6.	(a)	S, RG, WD correctly placed [1 each] [S in band, above G]	✓✓ ✓	3
	(b)	Any two from:		
		• size [meaningful]		
		• temperature		
		• evolutionary stage	✓✓	2
	(c)	Any two from:		
		• size [meaningful]		
		• temperature		
		• evolutionary stage	✓✓	2
	(d)	Send light through prism or diffraction grating/use spectroscopy	✓	
		Locate and determine wavelengths of lines	✓	
		Match to known elements	✓	3
				<u>10</u>

7.	(a)	(Theoretical) spherical cloud of cometary nuclei	✓	
		Approximately 1 light year from Sun [or beyond Pluto]	✓	2
	(b)	Deviation by massive planet [e.g. Jupiter]	✓	
		Diagram	✓✓	3
	(c)	3600 or $60^2$	✓✓	2
	(d)	Illuminated by Sun	✓	
		so closest to Sun at perihelion	✓	
		and also close to Earth	✓	3
				<hr style="width: 100%; margin-bottom: 5px;"/> 10
<hr style="width: 100%;"/>				
8.	(a)	Apparent change in wavelength or frequency of a wave	✓	
		due to relative motion of source or observer	✓	2
	(b)	31 000 km/s	✓✓	2
		[i.e. attempt at using formula (1); correct answer (1)]		
	(c)	Distant galaxies show redshift	✓✓	2
	(d)	Obtain spectrum of one limb	✓	
		at a particular latitude	✓	
		Determine radial velocity or redshift	✓	
		Obtain similar spectra at different latitudes	✓	4
		[Velocities (or redshifts) should differ]		<hr style="width: 100%; margin-bottom: 5px;"/> 10