Table 1. Initial values and default settings of the population synthesis simulation with COMPAS for our fiducial model. Cyan star symbols in front of a row indicate prescriptions and assumptions that we vary in this study.

	Description and name	Value/range	Note / setting
			Initial conditions
	Initial mass $m_{1,\mathrm{i}}$	$[5, 150]\,\mathrm{M}_\odot$	Kroupa (2001) IMF $\propto m_{1,\mathrm{i}}{}^{-\alpha}$ with $\alpha_{\mathrm{IMF}} = 2.3$ for stars above $5\,\mathrm{M}_\odot$
	Initial mass ratio $q_\mathrm{i} = m_{2,\mathrm{i}}/m_{1,\mathrm{i}}$	$[0, 1]$	We assume a flat mass ratio distribution $p(q_\mathrm{i}) \propto 1$ with $m_{2,\mathrm{i}} \geq 0.1\,\mathrm{M}_\odot$
	Initial semi-major axis a_i	$[0.01, 1000]$ AU	Distributed flat-in-log $p(a_\mathrm{i}) \propto 1/a_\mathrm{i}$
	Initial metallicity Z_i	$[0.0001, 0.03]$	Distributed using a close to uniform grid in $\log_{10}(Z_\mathrm{i})$ with 53 metallicities
	Initial orbital eccentricity e_i	0	All binaries are assumed to be circular at birth
			Fiducial parameter settings:
	Stellar winds for hydrogen rich stars	Belczynski et al. (2010a)	Based on Vink et al. (2000, 2001), including LBV wind mass loss with $f_{\mathrm{LBV}} = 1.5$.
	Stellar winds for hydrogen-poor helium stars	Belczynski et al. (2010b)	Based on Hamann & Koesterke (1998) and Vink & de Koter 2005.
	Max transfer stability criteria	ζ-prescription	Based on Vigna-Gómez et al. (2018) and references therein
★	Mass transfer accretion rate	thermal timescale	Limited by thermal timescale for stars Vigna-Gómez et al. (2018); Vinciguerra et al. (2020)
		Eddington-limited	Accretion rate is Eddington-limit for compact objects
	Non-conservative mass loss	isotropic re-emission	Massevitch & Yungelson (1975); Bhattacharya & van den Heuvel (1991); Soberman et al. (1997) Tauris & van den Heuvel (2006)
★	Case BB mass transfer stability	always stable	Based on Tauris et al. (2015, 2017); Vigna-Gómez et al. (2018)
	CE prescription	$\alpha - \lambda$	based on Webbink (1984); de Kool (1990)
★	CE efficiency α-parameter	1.0	
	CE λ-parameter	$\lambda_{\mathrm{Nanjing}}$	Based on Xu & Li (2010a,b) and Dominik et al. (2012)
★	Hertzsprung gap (HG) donor in CE	pessimistic	Defined in Dominik et al. (2012): HG donors don't survive a CE phase
	SN natal kick magnitude v_k	$[0, \infty)\,\mathrm{km\,s^{-1}}$	Drawn from Maxwellian distribution with standard deviation $\sigma_{\mathrm{rms}}^{\mathrm{1D}}$
	SN natal kick polar angle θ_k	$[0, \pi]$	$p(\theta_\mathrm{k}) = \sin(\theta_\mathrm{k})/2$
	SN natal kick azimuthal angle ϕ_k	$[0, 2\pi]$	Uniform $p(\phi) = 1/(2\pi)$
	SN mean anomaly of the orbit	$[0, 2\pi]$	Uniformly distributed
★	Core-collapse SN remnant mass prescription	delayed	From (Fryer et al. 2012), which has no lower BH mass gap
★	USSN remnant mass prescription	delayed	From (Fryer et al. 2012)
	ECSN remnant mass prescription	$m_\mathrm{f} = 1.26\,\mathrm{M}_\odot$	Based on Equation 8 in Timmes et al. (1996)
★	Core-collapse SN velocity dispersion $\sigma_{\mathrm{rms}}^{\mathrm{1D}}$	$265\,\mathrm{km\,s^{-1}}$	1D rms value based on Hobbs et al. (2005)
	USSN and ECSN velocity dispersion $\sigma_{\mathrm{rms}}^{\mathrm{1D}}$	$30\,\mathrm{km\,s^{-1}}$	1D rms value based on e.g., Pfahl et al. (2002); Podsiadlowski et al. (2004)
★	PISN / PPISN remnant mass prescription	Marchant et al. (2019)	As implemented in Stevenson et al. (2019)
★	Maximum NS mass	$\mathrm{max}_{\mathrm{NS}} = 2.5\,\mathrm{M}_\odot$	
	Tides and rotation		We do not include prescriptions for tides and/or rotation
			Simulation settings
	Total number of binaries sampled per metallicity	$\approx 10^6$	We simulate about a million binaries per Z_i grid point
	Sampling method	STROOPWAFEL	Adaptive importance sampling from Broekgaarden et al. (2019).
	Binary fraction	$f_{\mathrm{bin}} = 1$	Corrected factor to be consistent with e.g., Sana (2017)
	Solar metallicity $Z_\odot$	$Z_\odot = 0.0142$	based on Asplund et al. (2009)
	Binary population synthesis code	COMPAS	Stevenson et al. (2017); Barrett et al. (2018); Vigna-Gómez et al. (2018); Neijssel et al. (2019) Broekgaarden et al. (2019).

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