8(a)	wavelength associated with a moving particle
8(b)	$\lambda = h / p$
	$= (6.63 \times 10^{-34}) / (9.11 \times 10^{-31} \times 4.9 \times 10^{7})$ $= 1.5 \times 10^{-11}$ m
8(c)	similarity: *any one point from*: • same mass • same magnitude of charge • both leptons
	difference: *any one point from*: • electron has negative charge, positron has positive charge • positron is anti-particle of electron • electron is a particle, positron is an anti-particle
8(d)(i)	(pair) annihilation
8(d)(ii)	their mass gets converted into energy
	(their mass–energy) becomes the energy of the gamma photons
8(d)(iii)	they travel in opposite directions to conserve momentum
8(d)(iv)	kinetic energy = $\frac{1}{2} \times 9.11 \times 10^{-31} \times (4.9 \times 10^{7})^2 = 1.1 \times 10^{-15}$ J
8(d)(v)	$E = mc^2$
	$E = hc / \lambda$ **or** $E = hf$ **and** $c = f\lambda$
	$(1.1 \times 10^{-15}) + (9.11 \times 10^{-31} \times (3.00 \times 10^{8})^2) = (6.63 \times 10^{-34} \times 3.00 \times 10^{8}) / \lambda$ $\lambda = 2.39 \times 10^{-12}$ m

9(a)(i)	electromagnetic wave can behave like a particle
	moving particle can behave like a wave
9(a)(ii)	$\lambda = h / p$
	h is the Planck constant
9(b)(i)	*Any two points from:* • pattern similar to diffraction of light • diffraction (pattern) is characteristic of wave behaviour • rings show constructive and destructive interference
9(b)(ii)	(de Broglie) wavelength decreases
	rings become closer together

9(a)	diffraction is characteristic of wave behaviour so shows that electrons can behave like waves
9(b)	$qV = \frac{1}{2}mv^2$
	$p = mv$
	$p = m \times \sqrt{(2qV / m)}$ $= \sqrt{(2qVm)}$
9(c)	(electrons have) greater momentum so smaller (de Broglie) wavelength
	fringes become closer together
9(d)(i)	straight line with positive gradient
	line with positive gradient passing through the origin
9(d)(ii)	Planck constant