

Multiple Choice Answers

Q38: A

Q39: A

Q40: B

6(a)(i)	numbers of protons and electrons both = 1
	number of neutrons = 2
6(a)(ii)	diagram shows 2 neutrons and 1 proton labelled and forming a nucleus
	diagram shows 1 electron labelled and separated from the nucleus (not touching the proton and neutrons)
6(b)(i)	helium nucleus: top line = 3 and bottom line = 2
	beta particle: top line = 0 and bottom line = -1
6(b)(ii)	(electron) antineutrino
6(c)	proton: up up down or neutron: up down down
	(tritium:) 4 up, 5 down

Multiple Choice Answers

Q40: A

Multiple Choice Answers

Q40: D

8(a)	flavour	charge / e
	up / u	$-\frac{2}{3}$
	down / d	$(+)\frac{1}{3}$
	down / d	$(+)\frac{1}{3}$
	3 correct quark flavours	
	Charge on anti-up quark $-\frac{2}{3}(e)$	
	Charge on anti-down quark $(+)\frac{1}{3}(e)$	
8(b)	particle: (electron) neutrino	
	antiparticle: positron	

8(a)	wavelength associated with a moving particle
8(b)	$\lambda = h / p$
	$= (6.63 \times 10^{-34}) / (9.11 \times 10^{-31} \times 4.9 \times 10^7)$
	$= 1.5 \times 10^{-11} \text{ m}$
8(c)	similarity: <i>any one point from:</i> • same mass • same <u>magnitude</u> of charge • both leptons
	difference: <i>any one point from:</i> • 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 = $\frac{1}{2} \times 9.11 \times 10^{-31} \times (4.9 \times 10^7)^2 = 1.1 \times 10^{-15} \text{ J}$
8(d)(v)	$E = mc^2$
	$E = hc / \lambda$ or $E = hf \text{ and } c = f\lambda$
	$(1.1 \times 10^{-15}) + (9.11 \times 10^{-31} \times (3.00 \times 10^8)^2) = (6.63 \times 10^{-34} \times 3.00 \times 10^8) / \lambda$ $\lambda = 2.39 \times 10^{-12} \text{ m}$