AQA AS Physics exam practice answers

2 Particles and radiation

**1 (a)** *a* = 231; *b* = 90

**(b)** *a* – the number of nucleons in the nucleus; *b* – the number of protons in the nucleus

**2** B

**3 (a)** charge, baryon number, lepton number, strangeness

**(b)** 1 + 1 ≠ 1 + 1 – 1

It does not obey the nuclear conservation laws and so would not take place.

**4 (a) (i)** three

**(ii)** two

**(b)** beta minus emission (neutron decay): ddu = uud + 0 + 0

**5** C

**6** D

**7 (a) (i)** The minimum energy of a quantum of radiation that will cause

photoelectric emission from a surface.

**(ii)** free electrons

**(b) (i)** work function = 2.0 eV = 2.0 × 1.6 × 10−19 J = 3.2 × 10−19 J

energy of incoming quantum = *hc*/** = 1.989 × 10−25/180 × 10−9 = 11.1 × 10−19 J

½*mv*2= *hf* − *hf*0 = *hc*(1/** − 1/**0)= 11.1 × 10−19 − 3.2 × 10−19 = 7.9 ×

10−19 J

**(ii)** *hc*/** = 1.989 × 10−25/**0 = 3.2 × 10−19 J

Therefore:

**0 = 1.989 × 10−25/3.2 × 10−19 = 6.22 × 107 m = 622 nm

**8 (a)** energy transition, *E* = (1.5 – 0.85) × 1.6 × 10−19 = 1.04 × 10−19 J

wavelength of radiation = *hc*/*E* = 6.63 × 10−34 × 3 × 108/1.04 × 10−19 = 1.91 × 10−6 m = 1910 nm

**(b)** infrared

**9** D

**10 (a)** wavelength, ** = *h*/*mv*

rest mass, *m* = *h*/*v* = 6.63 × 10−34/(0.155 × 10−9 × 4.7 × 106) = 9.1 × 10−31 kg

**(b)** The diameter of the rings would increase.

**(c)** The spacing of the atoms is very small.

angle of refraction (**2) = 25.4°

**(b)** wavelength = 600 × 2/3 = 400 nm

**(c)** sin**c = *n*2/*n*1 = 1.45/1.5 = 0.96

Therefore:

critical angle = 75.2°

**7** D

**8** The light will refract after diffracting and so the diffracted angle measured as light emerges from the grating will be affected.