**Radiation**

**Multiple Choice**

1 – B

2 – E

3 – A

4 – E

5 – C

6 – A

7 – E

8 – E

9 – E

10 – B

11 – B

12 – B

**Section 2**

1 a) Time for activity to fall by half (not radioactivity) or time for half the atoms to decay (1)

b) (i) Measure background count for 1 minute (1) Measure count from source for 1 min repeatedly (1) Subtract background count from source counts (1)

ii) 10 minutes (1) (iii) 88 halved 4 times (1) = 5.5 cpm (1)

2 a) (i) D=E/m (1) = 7.2 x 10-3/80 (1) = 9 x 10-5 Gy (1) (ii) H=DWR (1) = 9 x 10-5 x 1 (1) = 9 x 10-5 Sv (1)

b) Atoms becoming charged OR Atoms gaining/losing electrons (1)

3 a) Count rate will **increase** (1)

b) (i) **X** (1) Half life long enough for lengthy use (1) but not dangerously so like the others (1) OR gamma would not be stopped noticeably (1) and alpha would be completely stopped (1)

(ii) Time for activity to fall by half (not radioactivity) or time for half the atoms to decay (1)

(iii) An electromagnetic ray of short wavelength/high frequency/high energy (1)

c) 1.8 hours (+/- 0.1) (1)

4 a) A=N/t (1) = 7.92 x 1018/900 (1) = 8.8 x 1015 Bq (1)

b) 8.8 x 1015 x 4.49 x 10-14 (1) = 395W (1)

c) Gamma radiation is much more penetrating than alpha (1)

5 a)(i) D=E/m (1) = 9.6 x 10-5/0.5 (1) = 1.92 x 10-4 Gy (1)

(ii) H=DWR (1) 1.92 x 10-4 x 1 (1) = 1.92 x 10-4 Sv (1)

b) 144/36 = 4 half-lives (1) 12000 halved 4 times (1) = 750Bq (1)

6 OEQ. No understanding (0) Limited (1) Reasonable (2) Good (3)

7 a) Background count (1) b)(i) 4.4 mm (1) (ii) 4.4 x 3 (1) = 13.2 mm (1) (iii) Aluminium thicker (1)

c) t = H/Hdot (1) = 20 x 10-3/2.5 x 10-6 (1) = 8000 (hours) (1)