Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

(a) The physical half-life depends only on the properties of the radioactive nuclide ✓

1

biological removal of the nuclide also occurs (thus removing the nuclide more quickly overall) WTTE ✓

1

(b) $A_t = A_o\, e^{-\lambda t}$ correct sub 1200 = 2700 $e^{-5\lambda}$ ✓

1

(λ_E = ln(2700 / 1200) / 5 = 0.1622)

T_E = ln(2) / 0.1622 = 4.273 ✓

1

1 / 4.273 = 1 / 20 + 1 / T_B ✓

1

T_B = 5.4 days ✓

1

(c) Beta more strongly ionising than gamma so ^{131}I more likely to damage cells / increase radiation dose ✓

1

Gamma rays for ^{131}I are over 4 x more energetic which can cause problems when imaging with a gamma camera ✓

1

190 h >> 6.0 h so with ^{131}I body will remain radioactive for longer posing a greater danger to patient and others he / she in contact with ✓

Half-life of $^{99}T^{m}$ may be too short for certain types of diagnosis to be undertaken ✓

1

Sensible conclusion based on above points✓

4 marks max

Conclusion may refer to radionuclide ending up at right place in body eg ^{131}I taken up by thyroid, $^{99}T^{m}$ taken up by bone and red blood cells

1

[10]

Q2.

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(a) (i) Ans C; Myopia or short sight

Auto marked

1

(ii) Concave / diverging lens drawn

1

(iii) Rays diverge at correcting lens

1

Rays converge at eye and are focussed at retina

1

(b) (i) So that rays (from a distant object)appear to come from the far point (of the defective eye)

OR to form (virtual) image at the (unaided) far point

1

(ii) f = - 0.75

P = 1 / f = - 1.3 (D)

Do not accept − 4 / 3

1

(iii) $1 / u = 1 / f - 1 / v = \frac{1}{-0.75} - \frac{1}{-0.15}$

1

u = 0.19 (m)

1

2 sig figs

1

[9]

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