

Name of the Student: \_\_\_\_\_

Max. Marks : 19 Marks

Time : 19 Minutes

**Q1.**

- (a) Explain why the effective half-life of a radionuclide in a biological system is always less than the physical half-life.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

- (b) The physical half-life of a radionuclide is 20 days. The nuclide was administered to a patient. Initially the corrected count rate at the patient's body was  $2700 \text{ counts s}^{-1}$ . Five days later, the corrected count rate at the same place on the patient was  $1200 \text{ counts s}^{-1}$ .

Calculate the biological half-life of the nuclide.

biological half-life = \_\_\_\_\_ days

(4)

(c) The table below gives the properties of two radionuclides.

	Technetium 99 m	Iodine 131
emitted radiation	gamma	beta <sup>-</sup> and gamma
half-life / hours	6.0	190
energy of gamma ray / keV	140	610

By considering information in the table suggest which of these nuclides is more suitable for use as a tracer in medical diagnosis.

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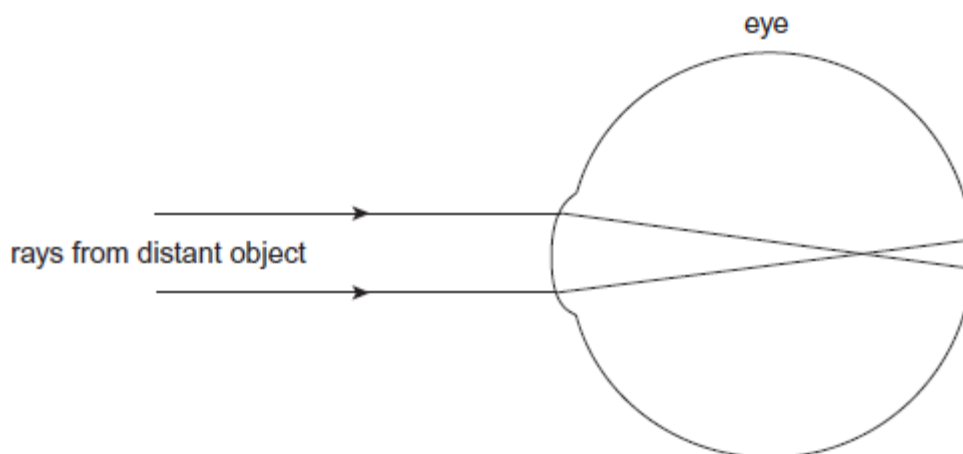


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(4)  
(Total 10 marks)

**Q2.**

(a) The diagram below is a simplified ray diagram which shows light rays from a distant object being focused at a point in front of the retina.



(i) What is this defect of vision?  
Tick (✓) the correct answer.

astigmatism	<input type="checkbox"/>
hypermetropia / long sight	<input type="checkbox"/>

myopia / short sight	
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(1)

(ii) On the diagram above, draw in front of the eye a suitable lens to correct this type of defect of vision.

(1)

(iii) Complete the new diagram by drawing the path of the two rays from the distant object as they pass through the correcting lens and the eye.

(2)

(b) The unaided far point of the defective eye is 0.75 m.

(i) Explain why the focal length of the correcting lens used should be  $-0.75$  m.

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(1)

(ii) Calculate the power of this correcting lens.

power = \_\_\_\_\_ D

(1)

(iii) The unaided near point of the defective eye is 0.15 m.

Calculate the distance of the aided near point from the eye when the lens of focal length  $-0.75$  m is used. Give your answer to a suitable number of significant figures.

aided near point distance = \_\_\_\_\_ m

(3)

(Total 9 marks)