Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic: Section B(Section 10_ Medical Physics)

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

(a) A point source of sound has a power of 17 W.

Calculate, in dB, the intensity level at a distance of 12 m from the source.

intensity level = _____ dB

(3)

(b) The frequency of a sound is increased from 3.0 kHz to 8.0 kHz with no change in intensity.

One change in the sound perceived by a person with normal hearing is an increase in pitch.

Explain **one** other change to the sound perceived by the person as the frequency is increased from 3.0 kHz.

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(2)

(Total 5 marks)

Q2.

(a) State and explain **two** differences between the perceived image of a brightly coloured object in bright light and the perceived image of the same object when viewed in very dark conditions.

In your answer you should refer to the visual receptors in the eye.

Difference 1 _____

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_____

_____

_____

_____

_____

Difference 2 _____

_____

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(5)

According to some legends, in the 17th century a pirate with two healthy eyes covered one eye with a patch to keep the eye in the dark. The patch was removed when going from bright conditions outside to the very dark conditions below decks in an enemy ship.

It was necessary for the pirate to put the patch on about 45 minutes before going into the very dark conditions inside the ship.

(b) What is the name of the process which occurs when the pirate's eye is covered by the patch? Tick (✓) **one** box.

aberration	☐
accommodation	☐
adaptation	☐
adjustment	☐

(1)

(c) Discuss why it was necessary to wear the eye patch for 45 minutes before entering the ship.

_____

_____

(3)
(Total 9 marks)

Q3.

X-ray photons can be used to treat cancerous tumours in radiotherapy.
Some photons are absorbed by healthy tissue before they reach the tumour.

Photons with a range of energies are generated in an X-ray machine.

Table 1 shows the linear attenuation coefficient of brain tissue for photons of energy 100 keV and 500 keV.

Table 1

Energy / keV	Linear attenuation coefficient of brain tissue / cm^{-1}
100	0.15
500	0.087

(a) Deduce whether photons of energy 100 keV or 500 keV are better for treating a brain tumour at a depth of 11 cm.

(4)

(b) Metal filters are used in X-ray machines to limit the damage to healthy tissues.

Table 2 gives data for possible filter materials.

Table 2

Energy / keV	Linear attenuation coefficient / cm^{-1}	
	Aluminium	**Copper**
100	0.44	3.8
500	0.23	0.73

Discuss whether it would be better to use aluminium or copper to filter the X-rays in part (a). No calculations are required.

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_____

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(2)

(c) State and explain **one** other method used to limit exposure of healthy cells during X-ray radiotherapy.

Method _____

Explanation _____

_____

_____

_____

(2)

(Total 8 marks)