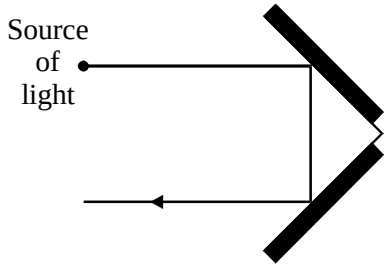
1. X-rays { infrared / radiation } { radio / waves }

for 1 mark each

[3]

2. (a) first reflection vertically down to the fourth hatch line or just to the left of it reaching mirror (must come from incident ray given) 1



second reflection back parallel to incident ray must be linked to first part of ray 1

appropriate arrow on a part of the ray (may be given if lines wrong) 1

(must come from source of light)

maximum of one mark to be lost for poor diagrams not using a ruler for straight lines

first time you come across wavy line, it is penalised

(b) ray in block bent downwards, not beyond the normal 1

do not credit if exactly on normal

emergent ray parallel to incident ray 1

do not credit a continuation of the line straight through the block these are independent

[5]

3. (a) amplitude marked as approximately half a wave height 1

great precision is not required

wavelength marked as a trough to trough distance **or** a peak to peak distance 1

accept an equivalent repeat distance anywhere on the wave

(b) the number of waves each second 1

accept cycles per second
accept 25 waves pass each second

(c) any **pair** from 2

microwave	cooking **or** communication **or** mobile phone
radio	communication **or** entertainment
infra-red	cooking **or** heating **or** remote control **or** security **or** night sights **or** thermal imaging

accept sensible specific uses

[5]

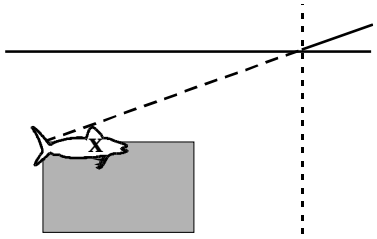
4. (a) line (from fish) to complete ray to eye 2

[mark awarded even if begins outside the box]
[credit only if fish shown to left of normal]

- fish within the region shown or X or start of ray

(i. e. not necessarily directly below x)

each for 1 mark



(b) bent/refracted/deviated/speeded up 1

for 1 mark

[3]

5. (a) any two successive peaks labelled **W** 1

accept any 2 points on same part of adjacent waves
correct by eye

half 'height' of wave labelled **A** 1

correct by eye
N.B. at least one of the answers must be labelled

(b) 0.2 2

correct answer with no working = 2
allow 1 mark for s = f x w or correct working i.e., 2 × 0.1
N.B. correct answer from incorrectly recalled relationship = 0

m/s (unit) 1

independent mark
*do **not** allow mps **or** mHz*

[5]

6. (i) Speed = wavelength × frequency 3

$3.108 = 1.5.10_6 \times$ wavelength

Wavelength = 200m

for 1 mark each

(ii) 8 1

(iii) The radio signal gets weaker 1

(iv) The radio signal gets weaker then stronger (then weaker then stronger etc…) 1

Because of interference (or superposition) of the waves from the two sources. 1

[7]