1 **(a (i) 1.** compressions and/or rarefactions closer together
OR more compressions and/or rarefactions B1
ignore wavelength shorter

2. layers closer together at compressions B1
layers farther apart at rarefactions B1
OR
compressions narrower (B1)
rarefactions wider (B1)
ignore wavelength shorter ignore 'amplitude greater' ignore 'maximum displacement greater'

(ii) distance between 2 compressions or 2 rarefactions shown with reasonable accuracy

(b) time taken by sound in air = 200 / 343 = 0.583 s C
time taken by sound in steel = 0.583 – 0.544 = 0.039 s C
5128 m/s A1 [7]

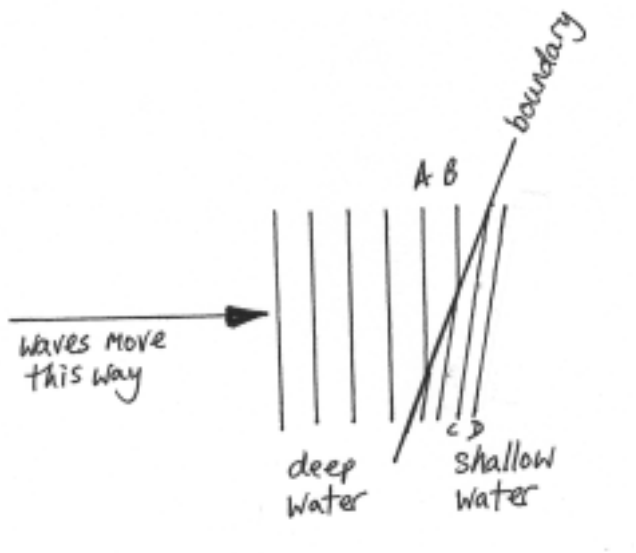
2 **(a (i)** same / unchanged / nothing B1

(ii) reduced / slows down B1

(iii) reduced B1

(b) v = fλ in any form or in words [not numbers]
OR f =1/T in any form or in words [not numbers] B1
0.12 = f × 0.08 OR T = 0.08 / 0.12 C1
1.5 Hz / cycles per sec / c.p.s. / per s
[only 2 marks if B1 mark above not scored] A1

(c)



(ignore length of waves)
waves bending in correct direction (be generous) M1
A and B correct by eye, straight and parallel A1
C and D parallel to A and B by eye A1 [9]

3 **(a)** **(i)** R in correct position, by eye B1

(ii) 3 reflected waves correctly meeting mirror)
3 reflected wave equidistant, by eye) -1 e.e.o.o B2
3 reflected waves centred on candidate's R)

(b) 1st ray + reflection correct by eye B1
2nd ray + reflection correct by eye B1
reflected rays projected back, to meet behind mirror
OR labelled I **and** in correct position B1

[Total: 6]

4 **(a)** clear attempt at arcs of circles, at least 3 — B1
same wavelength as incoming waves, by eye
(ignore shape ignore distance to first wave) — B1
centre of curvature of arcs at centre of gap, by eye — B1

(b) speed/wavelength or 20/2.5 or $v = f\lambda$ — C1
8 Hz or 8 s^{-1} or 8 waves/second — A1

(c) his **(b)** or "the same" — B1 [6]

5 **(a** straight not circular or WTTE
waves not same wavelength/same distance apart
waves should extend into shadow area (more) any 2 — B2 [2]

(b) diagram showing large flat piece — M1
with circular edges (ignore any wavelength changes) but straight part must be (very) nearly equal to slit width — A1 [2]

(c) speed = 1.2 x 8 — C1
= 9.6 cm/s — A1 [2]

[Total: 6]

6 (a) 3 more roughly circular — **B1**
all drawn clearly circular, stop (well) clear of barrier and centred on slit — **B1**
wavelength constant throughout, both sides of barrier — **B1** **3**

(b) wavelength – speed/frequency in any form — **C1**
values substituted correctly — **C1**
answer 6 x 10 m — **A1** **3**

[6]