REFRACTION

1. D
2. A
3. B
4. A

5.

$\eta = \sin i / \sin r$

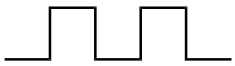
$= \sin 45 / \sin 28$ [2m] {from air to glass}

$= 1.51$[1m] Answer to 2d.p

6.

(a) red B1
(b) (i) equal to B1
(ii) less than B1
(c) two correct refractions on Fig. 6.2 M1
no dispersion and ray ends close to P A1 [5]

7.

(a)	(i)	total internal reflection;	1	
	(ii)	should show more reflections;	1	
	(iii)	An explanation to include: · more reflections/hits side more often: A. · greater distance to travel;		
(b)	(i)	 ; (sharp on/off pulses)		
	(ii)	continuously variable (or diag)/voltage changing all the time/ can have any value (allow mark if shown on diagram);	1	
(c)	(i)	decreases/dims/less intense;	1	
	(ii)	limits range/travels less/ cannot go as far/amplitude less;	1	

[8]

8.

(a) (i) incident ray, refracted ray and normal drawn C1
all correct and meeting at a point A1
(ii) angle of incidence and refraction correctly identified B1
(iii) values correct within agreed limits B1 4
(b) use of sini/sinr C1
correct substitution from candidates values C1
value correct within agreed limits from candidate's values A1 3

[Total 7m]

9.

(a) (condone discontinuities at boundaries)

mirror:

equally spaced reflected waves, approx. same spacing as incident (by eye) B1

IGNORE reflected waves to left of arrowhead

correct angle to surface, by eye B1

block:

reduced wavelength in block B1

ACCEPT refracted waves to left of arrowhead

at sensible angle of refraction B1

CONDONE reflected waves shown as well as refracted

(b) (i) 3×10^8/speed in glass = 1.5 C1

2×108 m/s A1

(ii) sin70°/sinr = 1.5 C1

38.7895° to 2 or more sig figs A1

[8]