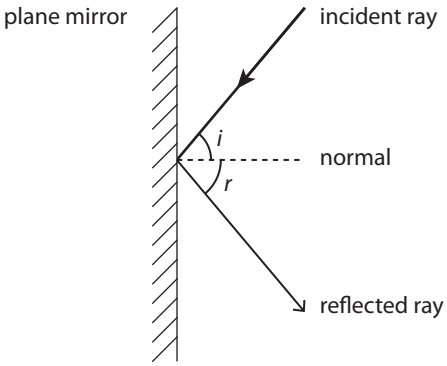
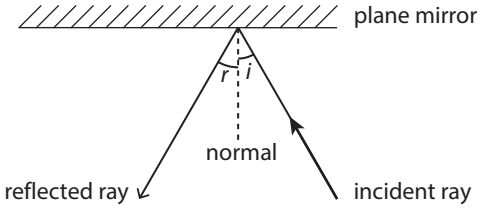
Exercise 6.1C Accurate ray diagrams

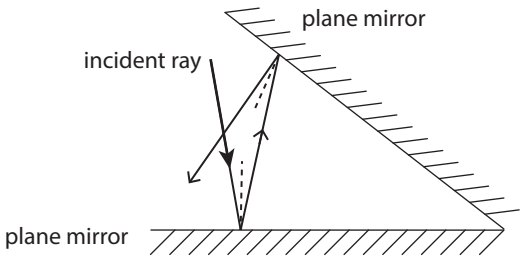
1 a



b



2 First angle of incidence in range 20–23°. First angle of reflection should be equal to this. Second angle of incidence should be smaller than first. Second angle of reflection should be equal to second angle of incidence.



Topic 6.2 Refraction

Exercise 6.2A Causes of refraction

1 medium

2 a When light passes from air into water, the light **slows down**.

b When light passes from glass into air, the light **speeds up**.

c When light passes from water into glass, the light **slows down**.

3 When light changes direction, the change in direction can be caused by a change in **speed**.

When light changes direction passing from air into glass, this is called **refraction**.

Exercise 6.2B Predicting refraction

1 When light changes speed (caused by) passing from one transparent substance/medium to another.

2 a diamond

b air and diamond

c corn oil and glycerol

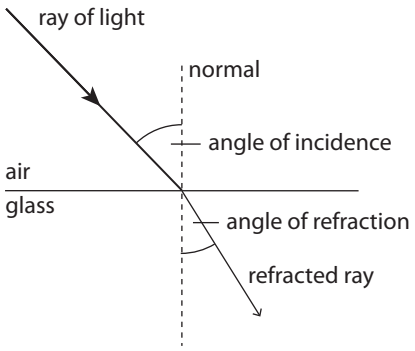
3 When light passes into a medium where it slows down, the light bends **towards** the normal.

When light passes into a medium where it speeds up, the light bends **away from** the normal.

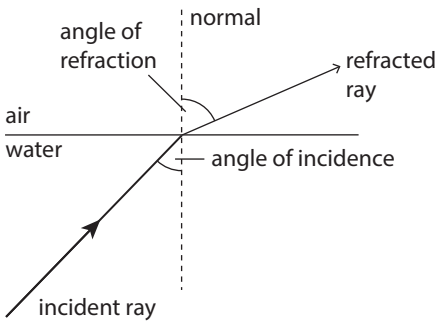
4 Raindrops refract light; raindrops are curved; raindrops refract light in different directions.

Exercise 6.2C Refraction ray diagrams

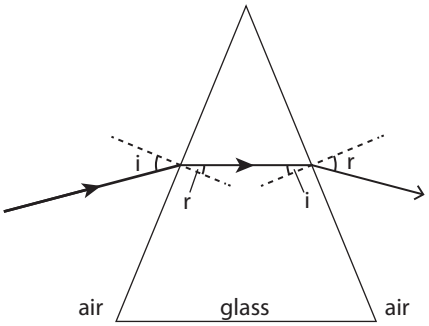
1 a



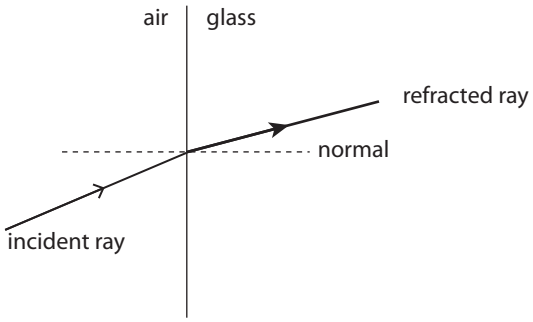
b



c



2



Topic 6.3 Making rainbows

Exercise 6.3A Colours of the rainbow

1 spectrum

2 red, **orange**, yellow, green, **blue**, indigo, **violet**

3 **a** white

b dispersion

c Each colour merges into the next one with no space.

Exercise 6.3B Making a spectrum 1

1 **a** triangular prism

b violet; because violet bends through the largest angle

c **i** Move the screen closer to the prism.

ii The colours get closer together / merge together more.

Exercise 6.3C Making a spectrum 2

1 Violet light slows the most when passing from air into plastic; violet is refracted the most; violet travels slowest in plastic; red light travels fastest in plastic and is refracted the least; other 5 colours listed in order of speed, either increasing or decreasing (increasing speed starts with violet, decreasing speed starts with red).

Topic 6.4 Colours of light

Exercise 6.4A Adding primary colours

1 Colours of light that cannot be made by adding other colours.

2 **a** Adding red light and green light makes **yellow** light.

b Adding green light and blue light makes **cyan** light.

c Adding red light, green light and blue light makes **white** light.

3 All seven colours are given out together; all seven colours are of (approximately) equal brightness; all seven colours mix to give white light.

Exercise 6.4B Subtracting colours of light

1 **a** any one from orange, yellow, blue, indigo, violet

b The green light has been **absorbed** by the red filter. Red light passes through the filter because red light is **transmitted** by the filter.

2 **a** blue
All other colours except blue are subtracted/absorbed/removed from the white light, so only blue remains.

b The remaining blue light will be absorbed by the green filter.

3 A yellow filter is used; all other colours except yellow are subtracted/absorbed/removed from the white light, so only yellow is transmitted.

Exercise 6.4C Seeing colours

1 **a** The green T-shirt **reflects** only green light.
The green T-shirt **absorbs** all the other colours of light.

b black

2 **a** red or white

b blue

c red or blue

3 **a** Black does not reflect light of any colour / black is the absence of light.

b White reflects all colours equally / white light contains all colours.