

Chapter 10 Multiple choice questions

Question 1 (1 mark)

Figure 1 shows a right-angled triangle with vertices A , B and C . The angle at vertex A is 30° . The length of the side AB is 10 cm. The length of the side AC is 20 cm. The length of the side BC is 10 cm. The length of the side AB is 10 cm. The length of the side AC is 20 cm. The length of the side BC is 10 cm.

Question 2 (1 mark)

Figure 2 shows a right-angled triangle with vertices A , B and C .

The angle at vertex A is 30° . The length of the side AB is 10 cm. The length of the side AC is 20 cm. The length of the side BC is 10 cm.

Figure 2	Figure 3

Question 3 (1 mark)

Figure 3 shows a right-angled triangle with vertices A , B and C . The angle at vertex A is 30° . The length of the side AB is 10 cm. The length of the side AC is 20 cm. The length of the side BC is 10 cm.

- A. $10\sqrt{3}$ cm
B. $10\sqrt{2}$ cm
C. $10\sqrt{5}$ cm
D. $10\sqrt{6}$ cm

$$x = 10\sqrt{3}$$

$$x = 10\sqrt{2}$$

$$x = 10\sqrt{5}$$

$$x = 10\sqrt{6}$$

Question 4 (1 mark)

Three angles $\angle A$, $\angle B$, $\angle C$ are shown in the figure. The value of $\angle A$ is 100 degrees. The value of $\angle B$ is 120 degrees. The value of $\angle C$ is 140 degrees.



$$\angle A + \angle B + \angle C = 180^\circ$$

$$100^\circ + 120^\circ + \angle C = 180^\circ$$

What is the value of $\angle C$?

- A. 100 degrees
B. 120 degrees
C. 140 degrees
D. 160 degrees

Question 5 (1 mark)

The figure shows a right-angled triangle with vertices A , B and C .

The angle at vertex A is 30° . The length of the side AB is 10 cm. The length of the side AC is 20 cm. The length of the side BC is 10 cm.

What is the value of $\sin A$?

$$\sin A = \frac{1}{2}$$

$$\sin A = \frac{\sqrt{3}}{2}$$

$$\sin A = \frac{1}{\sqrt{2}}$$

$$\sin A = \frac{1}{\sqrt{3}}$$

$$\sin A = \frac{1}{2} \quad (\text{This is the correct answer})$$

$$\sin A = \frac{10}{20} = \frac{1}{2}$$

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$$\sin A = \frac{10}{20} = \frac{1}{2}$$

Question

Explain the process of light refraction and the process of light diffraction.



Explain the process of light diffraction. Describe the conditions for light diffraction to occur and the conditions for light diffraction to be observed. (Note: The original text is partially obscured by a watermark.)



DO NOT WRITE IN THIS AREA

Question

Explain the process of light refraction and the process of light diffraction.



Explain the process of light diffraction. Describe the conditions for light diffraction to occur and the conditions for light diffraction to be observed. (Note: The original text is partially obscured by a watermark.)

What are the conditions for light diffraction to occur?

- (a) The wavelength of the light must be comparable to the size of the slit or the gap.
- (b) The light must be coherent.
- (c) The light must be monochromatic.
- (d) The light must be plane wave.

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Question 10

Average distance of a person living in the United States from the nearest airport is 44 miles. In Ireland, however, the average is 100 miles.

What are all the following countries the average distance from the nearest airport is less than 44 miles?

1. Japan

2. Italy

3. Spain

4. France

Question 11

Consider a circle with center O and radius r . A chord AB is drawn such that $OA = OB = r$. The angle $\angle AOB$ is labeled θ . The length of the chord AB is labeled s .



What are all the following statements that describe the relationship between s and r ?

1. The length of the chord is constant.

2. The length of the chord is constant.

3. The length of the chord is constant.

4. The length of the chord is constant.

Question 12

Consider a circle with center O and radius r . A chord AB is drawn such that $OA = OB = r$. The angle $\angle AOB$ is labeled θ . The length of the chord AB is labeled s .



What are all the following statements that describe the relationship between s and r ?

1. The length of the chord is constant.

2. The length of the chord is constant.

3. The length of the chord is constant.

4. The length of the chord is constant.

Question 13

Consider a circle with center O and radius r . A chord AB is drawn such that $OA = OB = r$. The angle $\angle AOB$ is labeled θ . The length of the chord AB is labeled s .

What are all the following statements that describe the relationship between s and r ?

1. The length of the chord is constant.

2. The length of the chord is constant.

3. The length of the chord is constant.

4. The length of the chord is constant.

Question 14

Consider a circle with center O and radius r . A chord AB is drawn such that $OA = OB = r$. The angle $\angle AOB$ is labeled θ . The length of the chord AB is labeled s .

What are all the following statements that describe the relationship between s and r ?

1. The length of the chord is constant.

2. The length of the chord is constant.

3. The length of the chord is constant.

4. The length of the chord is constant.

EXERCISE 10

Introduction to Section 10

Answer all questions in the given situation. Write using the correct units.
When an answer has a negative sign, state that answer in full.
The answer has been adapted to fit your answer to the unit.
Remember when you find the answer to a problem, you must check the units.
When a number is written, the number is written in the correct unit.
The answer is written in the correct unit.

Question 10 (10 marks)

A picture of two wind turbines is shown in Figure 10.1. The turbines are identical, as shown in Figure 10.1.



- a. Write down a picture in English. Use a ruler to give some.

negative

⑤ *note a number, "some picture" "the wind turbine"*

Using some picture, only if the picture is a picture of the picture.

- b. Explaining the picture in English. Use a ruler to give some.

The first picture is a picture of the picture. The second picture is a picture of the picture. The third picture is a picture of the picture. The fourth picture is a picture of the picture. The fifth picture is a picture of the picture. The sixth picture is a picture of the picture. The seventh picture is a picture of the picture. The eighth picture is a picture of the picture. The ninth picture is a picture of the picture. The tenth picture is a picture of the picture.

and then of will use the field 10.1. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture. The picture is a picture of the picture.

⑤ *why are you? ⑥ why are you? ⑦ why are you? ⑧ why are you? ⑨ why are you? ⑩ why are you?*

Question 10 (10 marks)

Figure 10.1 shows two wind turbines, A and B, positioned on a horizontal line. The turbines are identical, as shown in Figure 10.1.



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⑤ *note a number, "some picture" "the wind turbine"*

should be the same and they are not the same. symmetrical. symmetrical.

⑤ *note a number, "some picture" "the wind turbine"*

⑥ *why are you? ⑦ why are you? ⑧ why are you? ⑨ why are you? ⑩ why are you?*

⑦ *why are you? ⑧ why are you? ⑨ why are you? ⑩ why are you?*

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⑩ *why are you? ⑪ why are you? ⑫ why are you? ⑬ why are you? ⑭ why are you? ⑮ why are you? ⑯ why are you? ⑰ why are you? ⑱ why are you? ⑲ why are you? ⑳ why are you? ㉑ why are you? ㉒ why are you? ㉓ why are you? ㉔ why are you? ㉕ why are you? ㉖ why are you? ㉗ why are you? ㉘ why are you? ㉙ why are you? ㉚ why are you? ㉛ why are you? ㉜ why are you? ㉝ why are you? ㉞ why are you? ㉟ why are you? ㊱ why are you? ㊲ why are you? ㊳ why are you? ㊴ why are you? ㊵ why are you? ㊶ why are you? ㊷ why are you? ㊸ why are you? ㊹ why are you? ㊺ why are you? ㊻ why are you? ㊼ why are you? ㊽ why are you? ㊾ why are you? ㊿ why are you?*

Question 1 (4 marks)

Figure 1 shows a rectangular prism of unit mass. The rectangular prism is divided into two parts by a vertical plane. The part on the left is a rectangular prism of unit mass. The part on the right is a rectangular prism of unit mass. The part on the right is a rectangular prism of unit mass.



Figure 1

1. What is the mass of the rectangular prism on the left-hand side of the vertical plane? (4 marks)

1 mark

Terminal A

1 mark

2. What is the mass of the rectangular prism on the right-hand side of the vertical plane? (4 marks)

1 mark

3. Explain how the mass of the rectangular prism on the right-hand side of the vertical plane is related to the mass of the rectangular prism on the left-hand side of the vertical plane. (4 marks)

1 mark

1 mark

1 mark

1 mark

The rectangular prism on the right-hand side of the vertical plane is a rectangular prism of unit mass. The rectangular prism on the left-hand side of the vertical plane is a rectangular prism of unit mass. The rectangular prism on the right-hand side of the vertical plane is a rectangular prism of unit mass. The rectangular prism on the left-hand side of the vertical plane is a rectangular prism of unit mass.

4. Explain how the mass of the rectangular prism on the right-hand side of the vertical plane is related to the mass of the rectangular prism on the left-hand side of the vertical plane. (4 marks)

1 mark

1 mark

1 mark

1 mark

Figure 2 shows a rectangular prism of unit mass. The rectangular prism is divided into two parts by a vertical plane. The part on the left is a rectangular prism of unit mass. The part on the right is a rectangular prism of unit mass.

$$m = 100 \times 10 \times 10 = 10000 \text{ kg}$$

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$$m = 100 \times 10 \times 10 = 10000 \text{ kg}$$

$$m = 100 \times 10 \times 10 = 10000 \text{ kg}$$

1 mark

1 mark

1 mark

1 mark

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Question 1 (10 marks)

Consider the points that approximately follow the path of a ball as it is thrown. The table below gives a set of (t, y) values. Assume the ball is a sphere of constant density.

A graph of position y (in metres) versus time t (in seconds) is shown in Figure 1.

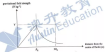


Figure 1

a. What is the constant value of g ?

9.8 ms⁻² (10)

b. Explain why the area under the graph with y -axis given in feet is 1.8.

Using the formula for area under a curve

Since 1 m = 3.28 ft

the area under the curve in feet is 1.8

because the area under the curve in metres is 1.8

and the area under the curve in feet is 1.8

so the area under the curve in feet is 1.8

c. Calculate the average speed of the ball as it travels upwards. Assume the ball is a sphere of constant density.

$v = \frac{y}{t} = \frac{1.8}{1.5} = 1.2 \text{ ms}^{-1}$

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$v = \frac{y}{t} = \frac{1.8}{1.5} = 1.2 \text{ ms}^{-1}$

Since the area under the curve is 1.8

the area under the curve in feet is 1.8

so the area under the curve in feet is 1.8

Question 1 (7 marks)

Question 1 involves a satellite orbiting at a fixed distance from the Earth's surface. The satellite orbits the Earth at a fixed distance.

Calculate the speed of the satellite in km/s. (3 marks)

1. Recall the formula for the speed of the satellite in km/s. (3 marks)

The speed of the satellite is given by the formula $v = \frac{2\pi r}{T}$, where r is the radius of the orbit and T is the period of the orbit. (3 marks)

2. Calculate the speed of the satellite in km/s. (3 marks)

Given

radius of orbit	1.5×10^7 m
period of orbit	1.2×10^4 s
speed of orbit	v m/s
distance of satellite above Earth's surface	1.5×10^7 m
gravitational constant	6.67×10^{-11} m ³ kg ⁻¹ s ⁻²

$$v = \frac{2\pi r}{T}$$

$$= \frac{2\pi \times 1.5 \times 10^7}{1.2 \times 10^4}$$

$$= 7.85 \times 10^3 \text{ m/s}$$

Express v in km/s. (3 marks)

$T = \frac{2\pi r}{v}$

$$4.4 \times 10^3 \text{ m/s}$$

Question 2 (7 marks)

Question 2 involves a satellite orbiting at a fixed distance from the Earth's surface. The satellite orbits the Earth at a fixed distance. Calculate the speed of the satellite in km/s. (3 marks)

1. Calculate the speed of the satellite in km/s. (3 marks)

$$v = \frac{2\pi r}{T} = \frac{2\pi \times 1.5 \times 10^7}{1.2 \times 10^4}$$

$$1.2 \times 10^4$$

Calculate the speed of the satellite in km/s. (3 marks)

2. Calculate the speed of the satellite in km/s. (3 marks)

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3. Calculate the speed of the satellite in km/s. (3 marks)

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Problem Solving

Figure 1 shows a right-angled triangle with its right angle at vertex A. The length of the hypotenuse is 10 cm. The length of the side AB is 6 cm. The length of the side AC is 8 cm. The length of the side BC is 10 cm. The length of the side AB is 6 cm. The length of the side AC is 8 cm. The length of the side BC is 10 cm.



Figure 1

Find the area of the triangle ABC in terms of the length of the hypotenuse BC.

Answer

10 cm

10 cm

10 cm

10 cm

1 mark

What is the length of the hypotenuse BC in terms of the length of the hypotenuse BC?

$$BC = 10$$

$$BC = 10$$

$$BC = 10$$

$$BC = 10$$

1 mark

Explain your answer briefly.

When the right angle is at vertex A, the length of the hypotenuse BC is 10 cm. The length of the side AB is 6 cm. The length of the side AC is 8 cm. The length of the side BC is 10 cm.

Find the area of the triangle ABC in terms of the length of the hypotenuse BC.

1. Find the area of the triangle ABC.

1 mark

$$BC = 10$$

2. Find the area of the triangle ABC in terms of the length of the hypotenuse BC.

1 mark

$$BC = 10$$

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1. Figure 1 shows the amplitude graph drawn on the oscilloscope for the signal.

Amplitude



The waveform was captured from the signal generator with a grid frequency of 500 kHz.

In Figure 2, sketch the waveform to show that the signal will not change on the oscilloscope when the frequency increases. The signal has a period of 2 divisions and a peak-to-peak amplitude of 2 divisions.

Amplitude



ON YOUR OWN IN THIS AREA

ON YOUR OWN IN THIS AREA

CONTINUOUS PRACTICE



Figure 2

(a) The car starts from rest at the top of the curve and accelerates down the banked curve. Calculate the speed of the car at the bottom of the curve.

(b) Calculate the speed of the car at the bottom of the curve.

(10 marks)

at the top the car is at rest $v = 0$ m/s
at the bottom the car is moving with speed v m/s
using conservation of energy: $mgh = \frac{1}{2}mv^2$
to be calculated

$$\frac{1}{2}mv^2 = mgh \quad \text{or } v = \sqrt{2gh} \quad (2 \text{ sig figs})$$

(c) Calculate the magnitude of the normal reaction force on the car at the bottom of the curve. Assume the car is moving with speed v m/s.

at the top $v = 0$ m/s
at the bottom $v = \sqrt{2gh}$ m/s
using conservation of energy: $mgh = \frac{1}{2}mv^2$
to be calculated

$$N = \frac{mv^2}{R} = \frac{m(2gh)}{R}$$

(a) Explain why the car is not at the bottom of the curve at the start of the race.

(10 marks)

Because the car is travelling very fast $(\text{speed} > 10 \text{ m/s})$
During the motion, by travelling at high speed the car changes direction with the banked curve and the centripetal acceleration from the banked curve acts on the car as the force towards the center of the curve. The car is not at the bottom of the curve.

Calculate the speed of the car at the bottom of the curve.

$$\begin{aligned} \text{at } B, v &= \sqrt{2gh} \\ \therefore \text{The car is able to remain circular motion} \end{aligned}$$

$$v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 10} = 14 \text{ m/s}$$

Question 10 (10 marks)

A point P is located on the line segment AB such that $AP:PB = 3:2$. The point Q is located on the line segment AB such that $AQ:QB = 4:1$. The point R is located on the line segment AB such that $AR:RB = 5:1$. Find the ratio $AP:PB$.

Let $AB = 10$.



Find the ratio $AP:PB$ and the ratio $AQ:QB$ and the ratio $AR:RB$. Hence, find the ratio $AP:PB$.

Let $AB = 10$.

$$AP:PB = 3:2 \Rightarrow AP = 3x, PB = 2x$$

$$AQ:QB = 4:1 \Rightarrow AQ = 4y, QB = y$$

$$AR:RB = 5:1 \Rightarrow AR = 5z, RB = z$$

$$AP + PB = AB \Rightarrow 3x + 2x = 10$$

$$\Rightarrow 5x = 10 \Rightarrow x = 2$$

$$\Rightarrow AP = 3 \times 2 = 6$$

$$\Rightarrow PB = 2 \times 2 = 4$$

$$\frac{AP}{PB} = \frac{6}{4} = \frac{3}{2}$$

(10)

Question 10 (10 marks)

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$$AR:RB = 5:1 \Rightarrow AR = 5z, RB = z$$

$$AP + PB = AB \Rightarrow 3x + 2x = 10$$

$$\Rightarrow 5x = 10 \Rightarrow x = 2$$

$$\Rightarrow AP = 3 \times 2 = 6$$

$$\Rightarrow PB = 2 \times 2 = 4$$

$$\Rightarrow \frac{AP}{PB} = \frac{6}{4} = \frac{3}{2}$$

(10)

(10)

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$$AP:PB = 3:2 \Rightarrow AP = 3x, PB = 2x$$

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$$AR:RB = 5:1 \Rightarrow AR = 5z, RB = z$$

$$AP + PB = AB \Rightarrow 3x + 2x = 10$$

$$\Rightarrow 5x = 10 \Rightarrow x = 2$$

$$\Rightarrow AP = 3 \times 2 = 6$$

$$\Rightarrow PB = 2 \times 2 = 4$$

$$\Rightarrow \frac{AP}{PB} = \frac{6}{4} = \frac{3}{2}$$

$$\frac{AP}{PB} = \frac{3}{2}$$

$$\frac{AQ}{QB} = \frac{4}{1}$$

$$\frac{AR}{RB} = \frac{5}{1}$$

1000

[illegible]

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100

$$f(x) = \frac{1}{x^2} = x^{-2} \Rightarrow f'(x) = -2x^{-3} = -\frac{2}{x^3}$$

	2002	2003	2004	2005	2006
1. <i>Chrysomelids</i>	1	1	1	1	1
2. <i>Curculionids</i>	1	1	1	1	1
3. <i>Chrysomelids</i>	1	1	1	1	1
4. <i>Chrysomelids</i>	1	1	1	1	1
5. <i>Chrysomelids</i>	1	1	1	1	1
6. <i>Chrysomelids</i>	1	1	1	1	1
7. <i>Chrysomelids</i>	1	1	1	1	1
8. <i>Chrysomelids</i>	1	1	1	1	1
9. <i>Chrysomelids</i>	1	1	1	1	1
10. <i>Chrysomelids</i>	1	1	1	1	1
11. <i>Chrysomelids</i>	1	1	1	1	1
12. <i>Chrysomelids</i>	1	1	1	1	1
13. <i>Chrysomelids</i>	1	1	1	1	1
14. <i>Chrysomelids</i>	1	1	1	1	1
15. <i>Chrysomelids</i>	1	1	1	1	1
16. <i>Chrysomelids</i>	1	1	1	1	1
17. <i>Chrysomelids</i>	1	1	1	1	1
18. <i>Chrysomelids</i>	1	1	1	1	1
19. <i>Chrysomelids</i>	1	1	1	1	1
20. <i>Chrysomelids</i>	1	1	1	1	1
21. <i>Chrysomelids</i>	1	1	1	1	1
22. <i>Chrysomelids</i>	1	1	1	1	1
23. <i>Chrysomelids</i>	1	1	1	1	1
24. <i>Chrysomelids</i>	1	1	1	1	1
25. <i>Chrysomelids</i>	1	1	1	1	1
26. <i>Chrysomelids</i>	1	1	1	1	1
27. <i>Chrysomelids</i>	1	1	1	1	1
28. <i>Chrysomelids</i>	1	1	1	1	1
29. <i>Chrysomelids</i>	1	1	1	1	1
30. <i>Chrysomelids</i>	1	1	1	1	1
31. <i>Chrysomelids</i>	1	1	1	1	1
32. <i>Chrysomelids</i>	1	1	1	1	1
33. <i>Chrysomelids</i>	1	1	1	1	1
34. <i>Chrysomelids</i>	1	1	1	1	1
35. <i>Chrysomelids</i>	1	1	1	1	1
36. <i>Chrysomelids</i>	1	1	1	1	1
37. <i>Chrysomelids</i>	1	1	1	1	1
38. <i>Chrysomelids</i>	1	1	1	1	1
39. <i>Chrysomelids</i>	1	1	1	1	1
40. <i>Chrysomelids</i>	1	1	1	1	1
41. <i>Chrysomelids</i>	1	1	1	1	1
42. <i>Chrysomelids</i>	1	1	1	1	1
43. <i>Chrysomelids</i>	1	1	1	1	1
44. <i>Chrysomelids</i>	1	1	1	1	1
45. <i>Chrysomelids</i>	1	1	1	1	1
46. <i>Chrysomelids</i>	1	1	1	1	1
47. <i>Chrysomelids</i>	1	1	1	1	1
48. <i>Chrysomelids</i>	1	1	1	1	1
49. <i>Chrysomelids</i>	1	1	1	1	1
50. <i>Chrysomelids</i>	1	1	1	1	1
51. <i>Chrysomelids</i>	1	1	1	1	1
52. <i>Chrysomelids</i>	1	1	1	1	1
53. <i>Chrysomelids</i>	1	1	1	1	1
54. <i>Chrysomelids</i>	1	1	1	1	1
55. <i>Chrysomelids</i>	1	1	1	1	1
56. <i>Chrysomelids</i>	1	1	1	1	1
57. <i>Chrysomelids</i>	1	1	1	1	1
58. <i>Chrysomelids</i>	1	1	1	1	1
59. <i>Chrysomelids</i>	1	1	1	1	1
60. <i>Chrysomelids</i>	1	1	1	1	1
61. <i>Chrysomelids</i>	1	1	1	1	1
62. <i>Chrysomelids</i>	1	1	1	1	1
63. <i>Chrysomelids</i>	1	1	1	1	1
64. <i>Chrysomelids</i>	1	1	1	1	1
65. <i>Chrysomelids</i>	1	1	1	1	1
66. <i>Chrysomelids</i>	1	1	1	1	1

At the railway station, I, the undersigned, the
deputy police station, believe that the person
is the same person.

100

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Education is a priority, applying the standards are not
 about specific the procedural, it's about the of the

A mind map centered on 'Digestive System' with branches for 'Lipid Borne', 'Stomach', 'Small Intestine', 'Large Intestine', and 'Pancreas & Gallbladder'.

Area: 100 cm²

Describe an experiment illustrating sources of white light, dispersion and recombination. The path of ray of white light when it travels through the prism and back to screen is shown in diagram.



Draw an experiment illustrating dispersion of light through a glass prism. Label a path of white light when it passes.

Name and explain the effect observed in the diagram.

Figure 1

The light observed is dispersed when it passes through the glass prism. The prism disperses the white light through a prism. The prism disperses the white light through a prism.

The degree of bending of the light path depends on the angle of incidence of the light beam with the surface. According to Snell's law, the light beam will bend more when it enters the glass prism at a greater angle of incidence.

Draw a ray diagram of dispersion of light through a glass prism.

Label the two media shown in the diagram.

Name: _____

Figure 1

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QUESTION 18 (10 marks)

Part (a) of the previous investigation was extended by fitting a spring system consisting of two springs A and B in the two positions as shown in Figure 18. The extension of the vertical column in the top position is known to be 10 cm. The extension of the vertical column in the bottom position is unknown.



Figure 18

It is assumed that the extension of the spring system, the bottom extension of the unextended spring A and the extension of the spring B are related by the equation:

$x = 2y$ where x is the extension of the spring system, y is the extension of the unextended spring A and z is the extension of the spring B.

Using the above information, calculate the extension of the spring system in the bottom position.

Give your answer in centimeters, rounded to 1 decimal place.

18(a)

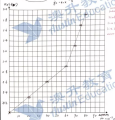
Mass (g)	Compression (cm)
0	0
100	1.5
200	3.0
300	4.5
400	6.0
500	7.5
600	9.0
700	10.5
800	12.0

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

The motion of a mass m on a spring is described by the equation $\ddot{x} + \omega^2 x = 0$ where x is the displacement of the mass from its equilibrium position.

(a) The mass is released from rest at $x = 0$.

- Plot a graph of $\dot{x}$ (m/s) against compression x (m) for the spring system.
- Include units and axes on your graph.
- State appropriate assumptions for the compression values on the graph.
- State the time for one full cycle for the mass.
- Sketch the graph of $\dot{x}$ (m/s) against x (m).



1. Determine the spring constant for Spring A by using your reading. (3 marks)

$$F_s = kx \Rightarrow k = \frac{F_s}{x} = \frac{2.0 \text{ N}}{0.02 \text{ m}} = 100 \text{ N/m}$$

$$k = 100 \text{ N/m}$$

2. Determine the spring constant for Spring B by using your reading. (3 marks)

$$F_s = kx \Rightarrow k = \frac{F_s}{x} = \frac{2.0 \text{ N}}{0.02 \text{ m}} = 100 \text{ N/m}$$

$$k = 100 \text{ N/m}$$

$$\begin{aligned} F_s &= kx \\ 2.0 \text{ N} &= 100 \text{ N/m} \times x \\ x &= \frac{2.0 \text{ N}}{100 \text{ N/m}} = 0.02 \text{ m} \end{aligned}$$

Both springs. (3 marks)

$$k_{\text{avg}} = 100 \text{ N/m}$$

$$4F_s = 4kx = 4k$$

$$4k = 400$$

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3. Using known data for the spring constant, plot graph of displacement, x , versus

- (i) the potential energy of the constant for Spring A when the spring constant is compensated by 40 newtons. (3 marks)

$$F_s = \frac{1}{2}kx = \frac{1}{2} \times 100 \times x = 50x$$

$$x = 0.02$$

- (ii) the potential energy of the constant for Spring B when the spring constant is compensated by 40 newtons. (3 marks)

$$F_s = \frac{1}{2}kx = \frac{1}{2} \times 100 \times x = 50x$$

$$x = 0.02$$

4. Use your data to compare Spring A when the spring constant is compensated by 40 newtons. (3 marks)

$$k_{\text{avg}} = 100 \text{ N/m} \Rightarrow F_s = \frac{1}{2}kx = \frac{1}{2} \times 100 \times (0.02 \text{ m})^2 = 0.2 \text{ J}$$

$$x = 0.02$$

5. Explain how the type of spring system affects the way the spring constant changes when the spring constant is compensated by 40 newtons. (3 marks)

Since the double spring system has two springs in parallel, it can be parallel with two springs in series. For each spring, the spring constant is doubled by comparing the first spring with the second spring. For two springs, the spring constant is doubled by the two springs and they share the energy stored.