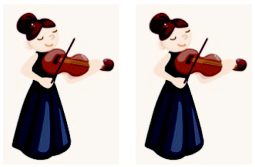
11th Physics (2017 – 18)

(4thQ, #2 Mini Test)

Class	No.	Name



In a calculation problem, describe equations clearly and systematically enough to show how to solve the problem. <u>If not enough, you won't get any point.</u>

Gravitational acceleration rate	$g = 9.80\ m/s^2$
The speed of sound in air	~~$V = 331.5 + 0.6t$ [m/s] t: ℃~~

In this test, use 343 m/s as the speed of sound in air.

The speed of light in vacuum	$c = 3.00 \times 10^8$ m/s
Elementary Charge	$e = 1.60 \times 10^{-19}$ C
Electron Mass	$m_e = 9.11 \times 10^{-31}$ kg
Proton Mass	$m_p = 1.673 \times 10^{-27}$ kg
Coulomb's Law Constant	$k = 8.99 \times 10^9\ N \cdot m^2/C^2$
Universal Gravitational Constant	$G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$
Avogadro's Number	$N_A = 6.022 \times 10^{23}\ mol^{-1}$
Refractive Index of Water	n = 1.33
Refractive Index of Ice	n = 1.31
Refractive Index of Diamond	n = 2.42
Refractive Index of Glass	n = 1.66

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4 pt/question x 13 questions = 52 pt Max 50 pt

／[Total 50 pt]

In this test, use 343 m/s as the speed of sound in air.

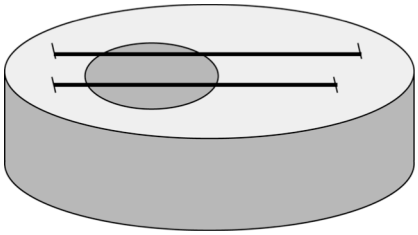
1) At Zion National Park a loud shout produces an echo 1.80 s later from a colorful sandstone cliff. How far away is the cliff?
(Equations)

(1) Answer

2) Two violinists, one directly behind the other, play for a listener directly in front of them. Both violinists sound concert A (440 Hz). What is the smallest separation between the violinists that will produce destructive interference for the listener?
(Equations)

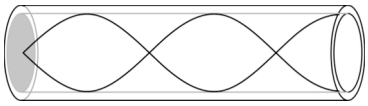
(2) Answer

(3) Two strings that are identical each other, except that one is 0.560 cm longer than the other. Waves on these strings propagate with a speed of 34.2 m/s. The fundamental frequency of the shorter string is 212 Hz. What beat frequency is produced if each string is vibrating its fundamental frequency?
(Equations)



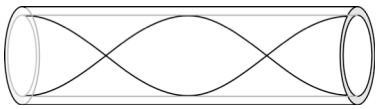
(3) Answer

(4) The organ pipe in the figure is 3.25 m long. What is the frequency of the standing wave shown in the pipe?



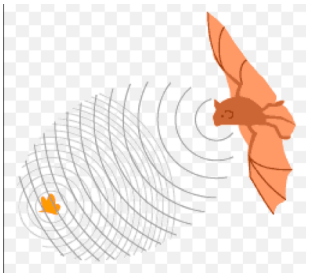
(4) Answer

(5) The frequency of the standing wave shown in the figure is 432 Hz. What is the length of the pipe?

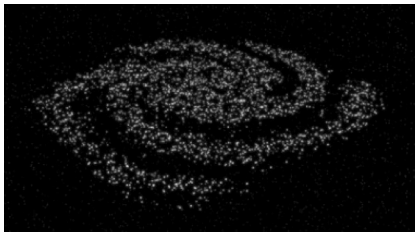


(5) Answer

(6-a) A bat is moving with a speed of 3.25 m/s and emitting sound of 35.0 kHz approaching a moth at rest on a tree trunk. What frequency is heard by the moth? (Equations)

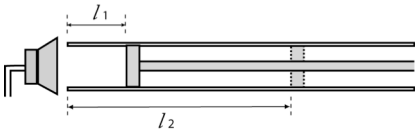


(6-b) A particular galaxy in the universe emits orange light with a frequency of 5.000×10^{14} Hz. If the galaxy is moving away from Earth with a speed of 3325 km/s, what is the frequency of the light when it is observed on Earth? (Equations)



(6-a) Answer
(6-b) Answer

(7,8) A sound is emitted at an open end as a piston is being pulled to the right. The first and second resonances are observed at l_1 = 23.5 cm and l_2 = 72.9 cm, respectively.



(7-a) Find the wavelength. Assume that there can be some difference between the opening place and the position of antinode of the sound.

(7-b) Find the frequency of the sound inside the pipe.

(8-c) Find the place that the density change is the smallest when the piston is placed at l_2, not including the opening place.

(8-d) When the piston is placed at l_2, the frequency is increased. Find the next resonance frequency.

(Equations)

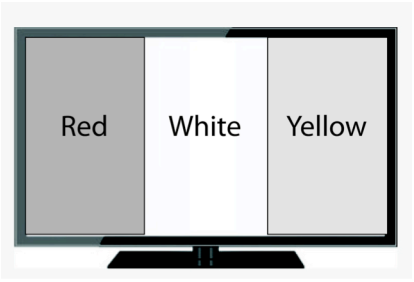
(7-a) Answer
(7-b) Answer

(8-c) Answer
(8-d) Answer

(9-a) What oscillates in an electromagnetic wave?

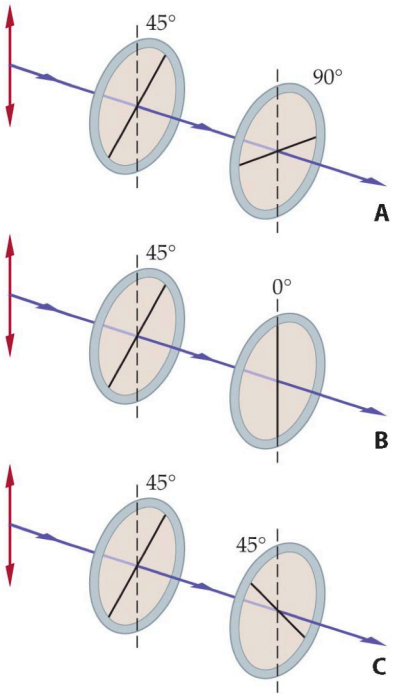
(9-b) Which waves have the smallest wavelength, yellow, blue, infrared or ultraviolet waves?

(10-c) A TV screen has 3,000,000 pixels. When the screen shows the image in the figure at the right, how many red color dots are lit?



(10-c)

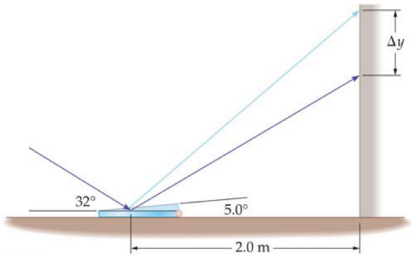
(10-d) A beam of vertically polarized light encounters two polarizing filters, as shown in the figure at the right. Rank the three cases, A, B and C, in order of increasing transmitted intensity. Indicate ties where appropriate.



(10-d)

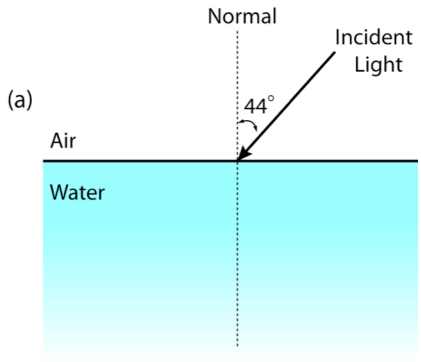
(9-a) Answer
(9-b) Answer
(10-c) Answer
(10-d) Answer

(11) Sunlight enters a room at an angle of 32° above the horizontal and reflected from a small mirror lying flat on the floor. The reflected light forms a spot on a wall that is 2.0 m behind the mirror, as shown in the figure. If you now place a pencil under the edge of the mirror nearer the wall, tilting it upward by 5.0° , how much higher on the wall (Δy) is the spot?
(Equations)



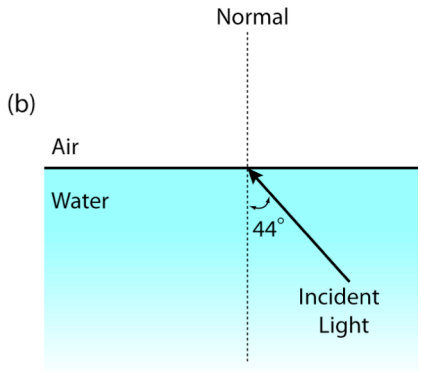
(11) Answer

(12-a) A beam of incident light in air strikes a surface of water (n = 1.33) at an angle of $\theta = 44^\circ$ relative to the normal as shown in the figure. How does the light propagate at the surface? Find the angle(s) between the propagation path(s) and the normal and draw line(s) inside the figure with the value(s) of angle(s).
(Equations)



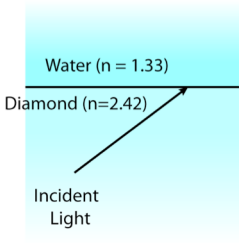
(12-a) Answer Draw lines and angles in the figure.

(12-b) A beam of incident light in water strikes a surface of at an angle of $\theta = 44^\circ$ relative to the normal as shown in the figure. How does the light propagate at the surface? Find the angle(s) between the propagation path(s) and the normal and draw line(s) inside the figure with the value(s) of angle(s).

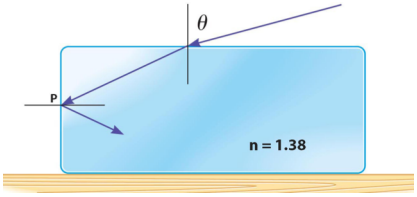


(12-b) Answer Draw lines and angles in the figure.

(13-a) Find the critical angle for light travelling from diamond (n = 2.42) to water (n = 1.33)
(Equations)



(13-b) A glass paperweight with an refractive index n = 1.38 rests on a desk. An incident ray of light traveling in air enters the horizontal top surface of the paperweight at an angle θ to the normal. Find the value of θ for which the reflection at P is total reflection.



(13-a) Answer
(13-b) Answer

Trigonometric Function Table

角	正弦 (sin)	余弦 (cos)	正接 (tan)
0.0°	0.0000	1.0000	0.0000
0.5°	0.0087	1.0000	0.0087
1.0°	0.0175	0.9998	0.0175
1.5°	0.0262	0.9997	0.0262
2.0°	0.0349	0.9994	0.0349
2.5°	0.0436	0.9990	0.0437
3.0°	0.0523	0.9986	0.0524
3.5°	0.0610	0.9981	0.0612
4.0°	0.0698	0.9976	0.0699
4.5°	0.0785	0.9969	0.0787
5.0°	0.0872	0.9962	0.0875
5.5°	0.0958	0.9954	0.0963
6.0°	0.1045	0.9945	0.1051
6.5°	0.1132	0.9936	0.1139
7.0°	0.1219	0.9925	0.1228
7.5°	0.1305	0.9914	0.1317
8.0°	0.1392	0.9903	0.1405
8.5°	0.1478	0.9890	0.1495
9.0°	0.1564	0.9877	0.1584
9.5°	0.1650	0.9863	0.1673
10.0°	0.1736	0.9848	0.1763
10.5°	0.1822	0.9833	0.1853
11.0°	0.1908	0.9816	0.1944
11.5°	0.1994	0.9799	0.2035
12.0°	0.2079	0.9781	0.2126
12.5°	0.2164	0.9763	0.2217
13.0°	0.2250	0.9744	0.2309
13.5°	0.2334	0.9724	0.2401
14.0°	0.2419	0.9703	0.2493
14.5°	0.2504	0.9681	0.2586
15.0°	0.2588	0.9659	0.2679
15.5°	0.2672	0.9636	0.2773
16.0°	0.2756	0.9613	0.2867
16.5°	0.2840	0.9588	0.2962
17.0°	0.2924	0.9563	0.3057
17.5°	0.3007	0.9537	0.3153
18.0°	0.3090	0.9511	0.3249
18.5°	0.3173	0.9483	0.3346
19.0°	0.3256	0.9455	0.3443
19.5°	0.3338	0.9426	0.3541
20.0°	0.3420	0.9397	0.3640
20.5°	0.3502	0.9367	0.3739
21.0°	0.3584	0.9336	0.3839
21.5°	0.3665	0.9304	0.3939
22.0°	0.3746	0.9272	0.4040
22.5°	0.3827	0.9239	0.4142

角	正弦 (sin)	余弦 (cos)	正接 (tan)
22.5°	0.3827	0.9239	0.4142
23.0°	0.3907	0.9205	0.4245
23.5°	0.3987	0.9171	0.4348
24.0°	0.4067	0.9135	0.4452
24.5°	0.4147	0.9100	0.4557
25.0°	0.4226	0.9063	0.4663
25.5°	0.4305	0.9026	0.4770
26.0°	0.4384	0.8988	0.4877
26.5°	0.4462	0.8949	0.4986
27.0°	0.4540	0.8910	0.5095
27.5°	0.4617	0.8870	0.5206
28.0°	0.4695	0.8829	0.5317
28.5°	0.4772	0.8788	0.5430
29.0°	0.4848	0.8746	0.5543
29.5°	0.4924	0.8704	0.5658
30.0°	0.5000	0.8660	0.5774
30.5°	0.5075	0.8616	0.5890
31.0°	0.5150	0.8572	0.6009
31.5°	0.5225	0.8526	0.6128
32.0°	0.5299	0.8480	0.6249
32.5°	0.5373	0.8434	0.6371
33.0°	0.5446	0.8387	0.6494
33.5°	0.5519	0.8339	0.6619
34.0°	0.5592	0.8290	0.6745
34.5°	0.5664	0.8241	0.6873
35.0°	0.5736	0.8192	0.7002
35.5°	0.5807	0.8141	0.7133
36.0°	0.5878	0.8090	0.7265
36.5°	0.5948	0.8039	0.7400
37.0°	0.6018	0.7986	0.7536
37.5°	0.6088	0.7934	0.7673
38.0°	0.6157	0.7880	0.7813
38.5°	0.6225	0.7826	0.7954
39.0°	0.6293	0.7771	0.8098
39.5°	0.6361	0.7716	0.8243
40.0°	0.6428	0.7660	0.8391
40.5°	0.6494	0.7604	0.8541
41.0°	0.6561	0.7547	0.8693
41.5°	0.6626	0.7490	0.8847
42.0°	0.6691	0.7431	0.9004
42.5°	0.6756	0.7373	0.9163
43.0°	0.6820	0.7314	0.9325
43.5°	0.6884	0.7254	0.9490
44.0°	0.6947	0.7193	0.9657
44.5°	0.7009	0.7133	0.9827
45.0°	0.7071	0.7071	1.0000

角	正弦 (sin)	余弦 (cos)	正接 (tan)
45.0°	0.7071	0.7071	1.0000
45.5°	0.7133	0.7009	1.0176
46.0°	0.7193	0.6947	1.0355
46.5°	0.7254	0.6884	1.0538
47.0°	0.7314	0.6820	1.0724
47.5°	0.7373	0.6756	1.0913
48.0°	0.7431	0.6691	1.1106
48.5°	0.7490	0.6626	1.1303
49.0°	0.7547	0.6561	1.1504
49.5°	0.7604	0.6494	1.1708
50.0°	0.7660	0.6428	1.1918
50.5°	0.7716	0.6361	1.2131
51.0°	0.7771	0.6293	1.2349
51.5°	0.7826	0.6225	1.2572
52.0°	0.7880	0.6157	1.2799
52.5°	0.7934	0.6088	1.3032
53.0°	0.7986	0.6018	1.3270
53.5°	0.8039	0.5948	1.3514
54.0°	0.8090	0.5878	1.3764
54.5°	0.8141	0.5807	1.4019
55.0°	0.8192	0.5736	1.4281
55.5°	0.8241	0.5664	1.4550
56.0°	0.8290	0.5592	1.4826
56.5°	0.8339	0.5519	1.5108
57.0°	0.8387	0.5446	1.5399
57.5°	0.8434	0.5373	1.5697
58.0°	0.8480	0.5299	1.6003
58.5°	0.8526	0.5225	1.6319
59.0°	0.8572	0.5150	1.6643
59.5°	0.8616	0.5075	1.6977
60.0°	0.8660	0.5000	1.7321
60.5°	0.8704	0.4924	1.7675
61.0°	0.8746	0.4848	1.8040
61.5°	0.8788	0.4772	1.8418
62.0°	0.8829	0.4695	1.8807
62.5°	0.8870	0.4617	1.9210
63.0°	0.8910	0.4540	1.9626
63.5°	0.8949	0.4462	2.0057
64.0°	0.8988	0.4384	2.0503
64.5°	0.9026	0.4305	2.0965
65.0°	0.9063	0.4226	2.1445
65.5°	0.9100	0.4147	2.1943
66.0°	0.9135	0.4067	2.2460
66.5°	0.9171	0.3987	2.2998
67.0°	0.9205	0.3907	2.3559
67.5°	0.9239	0.3827	2.4142

角	正弦 (sin)	余弦 (cos)	正接 (tan)
67.5°	0.9239	0.3827	2.4142
68.0°	0.9272	0.3746	2.4751
68.5°	0.9304	0.3665	2.5386
69.0°	0.9336	0.3584	2.6051
69.5°	0.9367	0.3502	2.6746
70.0°	0.9397	0.3420	2.7475
70.5°	0.9426	0.3338	2.8239
71.0°	0.9455	0.3256	2.9042
71.5°	0.9483	0.3173	2.9887
72.0°	0.9511	0.3090	3.0777
72.5°	0.9537	0.3007	3.1716
73.0°	0.9563	0.2924	3.2709
73.5°	0.9588	0.2840	3.3759
74.0°	0.9613	0.2756	3.4874
74.5°	0.9636	0.2672	3.6059
75.0°	0.9659	0.2588	3.7321
75.5°	0.9681	0.2504	3.8667
76.0°	0.9703	0.2419	4.0108
76.5°	0.9724	0.2334	4.1653
77.0°	0.9744	0.2250	4.3315
77.5°	0.9763	0.2164	4.5107
78.0°	0.9781	0.2079	4.7046
78.5°	0.9799	0.1994	4.9152
79.0°	0.9816	0.1908	5.1446
79.5°	0.9833	0.1822	5.3955
80.0°	0.9848	0.1736	5.6713
80.5°	0.9863	0.1650	5.9758
81.0°	0.9877	0.1564	6.3138
81.5°	0.9890	0.1478	6.6912
82.0°	0.9903	0.1392	7.1154
82.5°	0.9914	0.1305	7.5958
83.0°	0.9925	0.1219	8.1443
83.5°	0.9936	0.1132	8.7769
84.0°	0.9945	0.1045	9.5144
84.5°	0.9954	0.0958	10.385
85.0°	0.9962	0.0872	11.430
85.5°	0.9969	0.0785	12.706
86.0°	0.9976	0.0698	14.301
86.5°	0.9981	0.0610	16.350
87.0°	0.9986	0.0523	19.081
87.5°	0.9990	0.0436	22.904
88.0°	0.9994	0.0349	28.636
88.5°	0.9997	0.0262	38.188
89.0°	0.9998	0.0175	57.290
89.5°	1.0000	0.0087	114.59
90.0°	1.0000	0.0000	− − −

Square and Square Root Table

n	n^2	$\sqrt{n}$
1	1	1.0000
2	4	1.4142
3	9	1.7321
4	16	2.0000
5	25	2.2361
6	36	2.4495
7	49	2.6458
8	64	2.8284
9	81	3.0000
10	100	3.1623

(The solution will be shown on the Website of Physic Class tonight.)