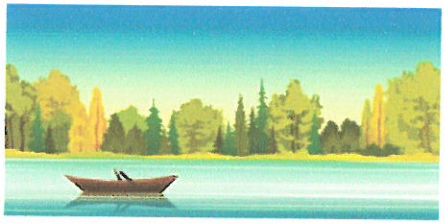
	Total	K+E	I+O
Student	34	16	18
Average	55.2/100	55.7/100	54.8/100
Best	83.0/100	81.5/100	83.0/100

11thG Physics (2018– 19)

4thQ Final Exam

(May 31, 2018)

Class	No.	Name Solutions



In calculation problems, describe equations clearly and systematically enough to show how to solve the problems. If not enough, you won't get any points.

5point/question x 21questions=105points
Max 100 points

Exam ／[Total 100 points]

Lab Reports	Homework
Average 65.1	60.2

Gravitational acceleration rate	$g = 9.80\ m/s^2$
Universal Gravitational Constant	$G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$
Elementary Charge	$e = 1.60 \times 10^{-19}\ C$
Electron Mass	$m_e = 9.11 \times 10^{-31}\ kg$
Proton Mass	$m_p = 1.673 \times 10^{-27}\ kg$
Avogadro's Number	$N_A = 6.022 \times 10^{23}\ mol^{-1}$
Speed of Light in vacuum	$c = 3.00 \times 10^8\ m/s$
Refractive index of water	$n = 1.33$
Refractive index of diamond	$n = 2.42$

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

Trigonometric 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

(1-a) A tennis ball is hit back and forth between two players. If it takes 2.3 s for the ball to go from one player to the other, what are the period and frequency of the ball's motion?
(Equations)

$T = 2.3(s) \times 2 = 4.6\ (s)$

$f = \frac{1}{T} = \frac{1}{4.6} = 0.217 \rightarrow 0.22\ (Hz)$

(1-b) When a 0.321-kg mass is attached to a vertical spring, it causes the spring to stretch d. If the mass is displaced from equilibrium, it makes 106 oscillations in 76.5 s. Find the stretch distance, d.
(Equations)

$k = \frac{F}{x} \rightarrow k = \frac{0.321 \times 9.80}{d}$

$T = 2\pi\sqrt{\frac{m}{k}}$, $T = \frac{76.5}{106} = 0.7217$

$m = 0.321$

$\frac{T^2}{4\pi^2} = \frac{m}{k}$ $\quad k = \frac{4\pi^2 m}{T^2} = \frac{4\pi^2 \times 0.321}{0.7217^2} = 24.337$ +1

$\frac{0.7217^2}{4\pi^2} = \frac{0.321}{\frac{0.321 \times 9.80}{d}}$

$d = \frac{0.7217^2 \times 9.80}{4\pi^2}$

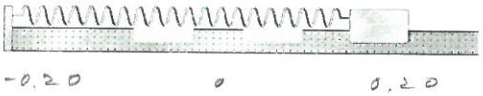
$= 0.1293\ (m)$

$\rightarrow 12.9\ cm$

(1-a) Answer	
Period:	4.6 s
Frequency:	0.22 Hz
(1-b) Answer	
	12.9 cm

(52%)

(2-a) An air-track cart attached to a spring completes on oscillation every 2.8 s. At t=o the cart is released from rest at a distance of 0.20 m from its equilibrium position. What is the position of the cart at 2.1 s?

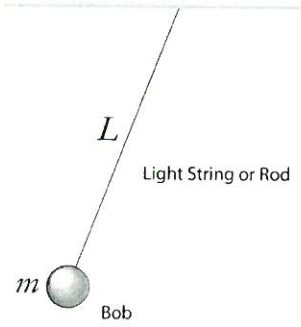


(Equations) pr x=0.18

$\frac{2.1}{2.8} = 0.75$ ⟹

(2-b) A simple pendulum of length 2.5 m makes 5.0 complete swings in 16 s. What is the acceleration rate due to gravity at the location of the pendulum?

(Equations)



$T = 2\pi\sqrt{\frac{L}{g}}$

$\frac{T^2}{4\pi^2} = \frac{L}{g}$

$g = \frac{4\pi^2 L}{T^2}$

$= \frac{4\pi^2 \times 2.5}{\frac{16^2}{5.0^2}}$

$= \frac{4\pi^2 \times 2.5 \times 5.0^2}{16^2}$

$= 9.64 \longrightarrow 9.6$

(2-a) Answer	$x = 0$
(2-b) Answer	$9.6\ m/s^2$

(48 %)

$9.7\ m/s^2$ ok

(3) In the figure below, the solid and broken lines represent the wave at t=0 s and t=0.40 s, respectively. Find the followings:

(3-a) Amplitude.

(3-b) Wavelength

(3-c) Period.

$$v = \frac{\lambda}{T} \rightarrow T = \frac{\lambda}{v} = \frac{4.0}{6.25} = 0.640$$

(3-d) Speed

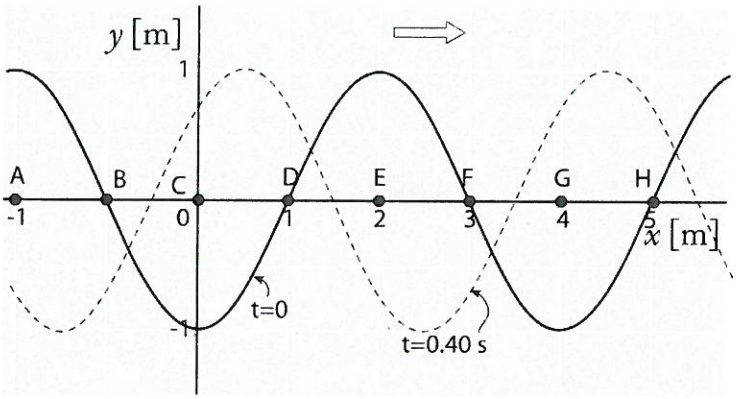
$$v = \frac{d}{t} = \frac{2.5}{0.40} = 6.25 \rightarrow 6.2$$

(3-e) The points that are in opposite phase with the point C.

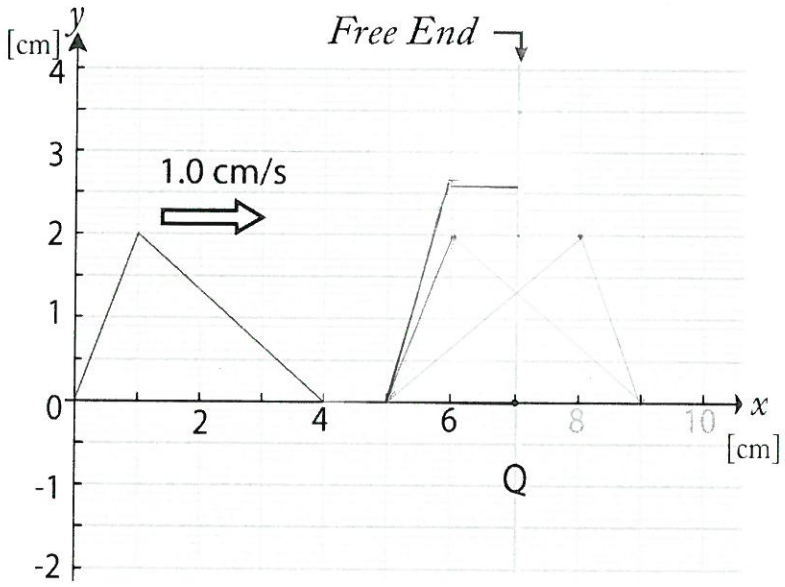
(3-a) Answer	1.0 m
(3-b) Answer	4.0 m
(3-c) Answer	0.64 s
(3-d) Answer	6.2 m/s
(3-e) Answer	A, E

(63%)

Equations



(4) A pulse approaches toward a free end Q with a speed of 1.0 cm/s. Draw the pattern for the wave at a time 5 seconds later.



(4) Answer

Draw in the figure at the left.
左のグラフに描け

(38%)

(5) Multiplechoice.
In the following questions, you can choose more than one.

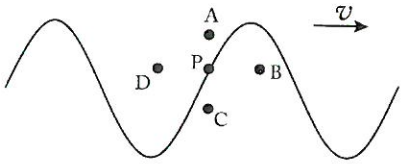
(5-1) Which waves are NOT electromagnetic?
(A) Light, (B) microwave, (C) ultrasound, (D) gamma ray

(5-2) A single pulse in a uniform medium transfer
(A) Energy, (B) mass, (C) standing wave, (D) wavelength.

(5-3) Which is an example of a longitudinal wave?
(A) Gamma ray, (B) ultrasound wave, (C) X ray, (D) Ripple.

(5-4) Which color of light has the lowest frequency?
(A) Green, (B) yellow, (C) violet, (D) red

(5-5) In the diagram below, the solid line represents a wave generated in a rope.

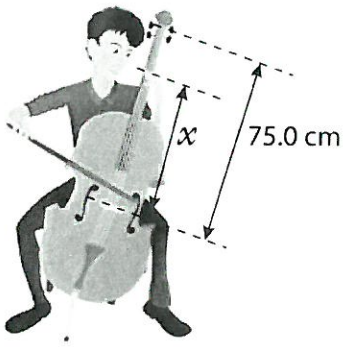


As the wave moves to the right, point P on the rope is moving toward which position?
(A) A, (B) B, (C) C, (D) D

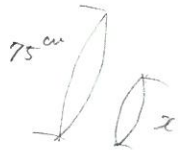
(5-1) Answer	C
(5-2) Answer	A
(5-3) Answer	B
(5-4) Answer	D
(5-5) Answer	C

(61 %)

(6) A cell string between the bridge and upper end is 75.0 cm long, and this sound A_4 note (440 Hz) when played. Where must the cellist put a finger (what distance x from bridge) to play D_5 note (587 Hz)? For both the A_4 and D_5 notes the string vibrates in its fundamental mode.



Equations



$\lambda = 2 \times 0.75 = 1.5$ m

$\lambda' = 2x$

$v = f\lambda = f'\lambda'$, $f = 440$, $f' = 587$

$2x = \frac{f}{f'}\lambda = \frac{440}{587} \times 1.5$

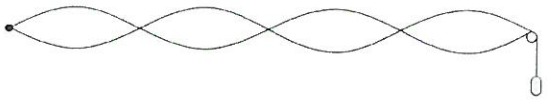
$x = \frac{440 \times 1.5}{587 \times 2} = 0.5622\ m \longrightarrow 56.2\ cm$

(6) Answer

56.2 cm

(55%)

(7) The figure shows a standing wave of a string 5.50 m long and at a frequency of 854 Hz.



(7-a) What is the wavelength of the standing wave?

(7-b) What is the fundamental frequency of this string?

(Equations)

(a) $L = 5.50\ m$, $f_1 = 854\ Hz$

$\frac{\lambda}{2} \times 4 = 5.50 \longrightarrow \lambda = 5.50 \times \frac{2}{4} = 2.750 \longrightarrow 2.75$

(b) $f_1 = \frac{854}{4} = 213.5 \longrightarrow 214$

$v = f\lambda = 854 \times 2.75$

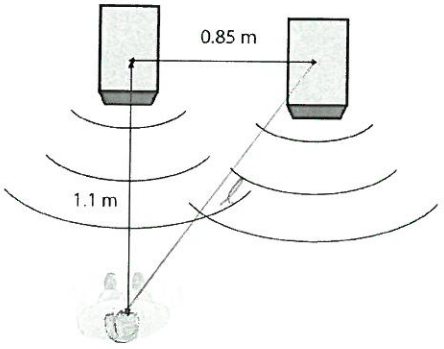
$\lambda_1 = 2L = 5.50 \times 2$

$f_1 = \frac{v}{\lambda_1} = \frac{854 \times 2.75}{5.50 \times 2} = 213.5$

(7-a) Answer	2.75 m
(7-b) Answer	214 Hz

(63%)

(8) A pair of in-phase stereo speakers is placed side by side, 0.85 m apart. You stand directly in front of one of the speakers, 1.1 m from the speaker. What is the lowest frequency that will produce constructive interference at your location?



$\ell = \sqrt{1.1^2 + 0.85^2} = 1.390$

$|\ell_1 - \ell_2| = m\lambda$

$\lambda = \frac{|1.390 - 1.1|}{m} = \frac{0.290}{m} = \frac{V}{f}$

$f = \frac{m \times 343}{0.290} = 1183 \times m$

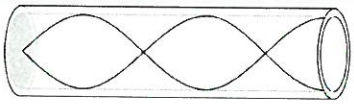
$f_{min} = 1183 \longrightarrow 1200\ Hz$

(8) Answer

1200 Hz

(37%)

(9) The organ pipe open at one end in the figure is 6.35 m long. What is the frequency of the standing wave shown in the pipe?
(Equations)



$\frac{\lambda}{4} \times 5 = 6.35$

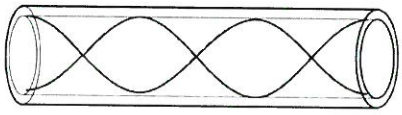
$\lambda = 6.35 \times \frac{4}{5}$ $(= 5.080\ m)$ + 2.5

$f = \frac{V}{\lambda} = \frac{343 \times 5}{6.35 \times 4} = 67.52 \rightarrow 67.5$

(9) Answer

67.5 Hz (72 %)

(10) The frequency of the standing wave in a pipe open at both ends shown in the figure is 722 Hz. What is the length of the pipe?
(Equations)



$\frac{\lambda}{2} \times 6 = L$

$\lambda = \frac{V}{f} = \frac{343}{722}$ $(= 0.4751)$

$\therefore L = \frac{343}{722} \times \frac{6}{4} = 0.7126$

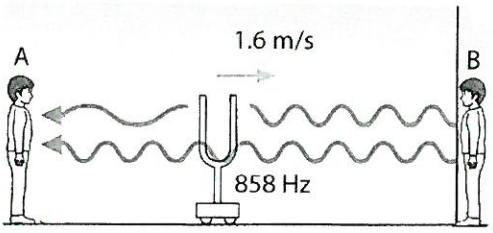
$\rightarrow 0.713\ (m)$

0.713 m +4

(10) Answer

0.713 m (56 %)

(11, 12) A tune fork on a cart is approaching a wall at a speed of 1.6 m/s. The frequency is 858 Hz.



(11) What frequency is heard by an observer B standing near the wall?

(12) The observer A hears beats that is produced by the direct sound from the tune fork and reflected sound from the wall. Find how many beats the observer A hears.

(Equations)

what beat frequency

(11) $f' = \frac{V}{V - u_s} f = \frac{343.0}{343.0 - 1.6} 858 = 862.0 \rightarrow 862$

(12) $f'' = \frac{V}{V + u_s} f = \frac{343.0}{343.0 + 1.6} \cdot 858 = 854.0$ +1.5

$f_{beat} = |f' - f''| = |862.0 - 854.0| = 8$

(11) Answer

862 Hz (85 %)

(12) Answer

8 Hz (48 %)

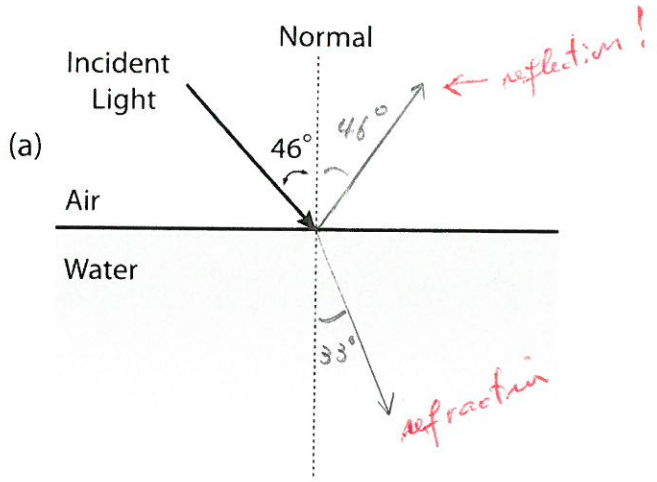
(13) A beam of incident light in air strikes a surface of water (n = 1.33) at an angle of $\theta = 46^\circ$ relative to the normal as shown in the figure. How does the light propagate at the surface? Find the angle(s) between the propagation path(s) and the normal and draw lines inside the figure with the value(s) of angle(s).
(Equations)

$1 \sin 46^\circ = 1.33 \sin\theta$

$\sin\theta = \frac{\sin 46^\circ}{1.33} = 0.5409$

$\theta = 32.7^\circ \rightarrow 33^\circ$

(13) Answer Draw lines and angles in the figure. (50 %)



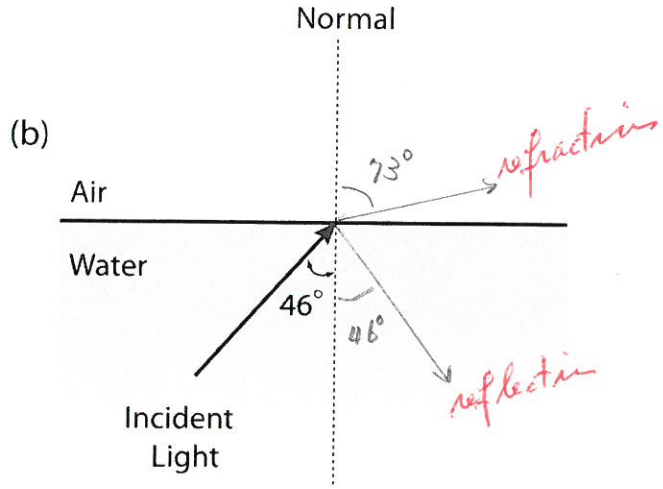
(14) A beam of incident light in water strikes a surface of at an angle of $\theta = 46^\circ$ relative to the normal as shown in the figure. How does the light propagate at the surface? Find the angle(s) between the propagation path(s) and the normal and draw lines inside the figure with the value(s) of angle(s).
(Equations)

$1.33 \sin 46^\circ = 1 \sin\theta$

$\sin\theta = 0.9567$

$\theta = 73.1^\circ \rightarrow 73^\circ$

(14) Answer Draw lines and angles in the figure. (51 %)



(15) An object 13.0 mm high is 12.0 mm from a convex lens whose focal length is 18.0 mm.

(15-a) Calculate the location (the direction and distance from the lens), the type (real or virtual) and the size of the image formed.

(15-b) Illustrate ray diagram showing how image is formed in the figure.
(Equations)

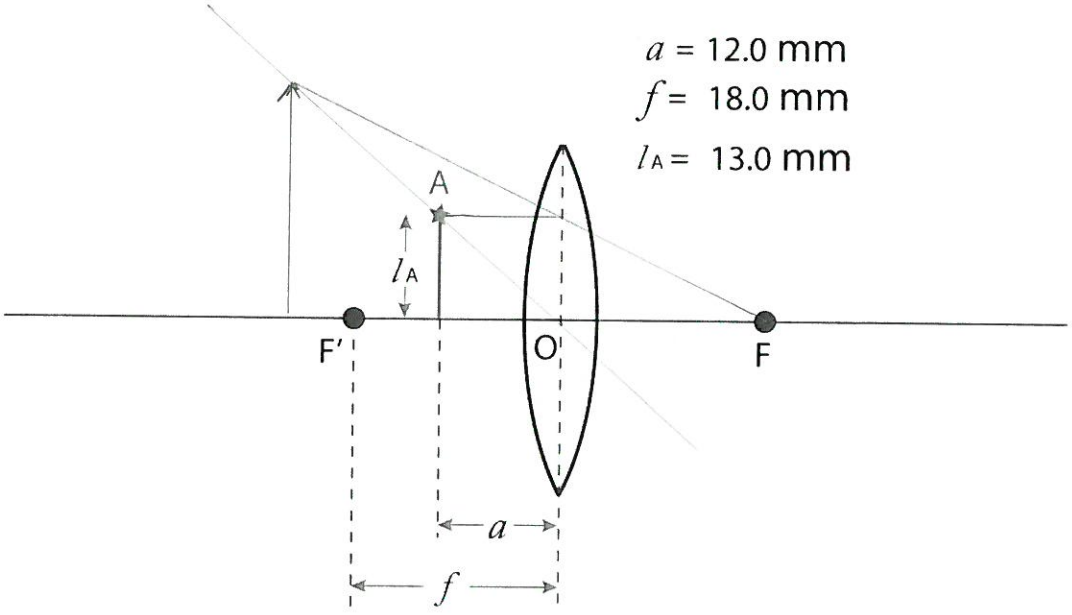
$$\frac{1}{a}+\frac{1}{b}=\frac{1}{f} \rightarrow \frac{1}{b}=\frac{1}{18.0}-\frac{1}{12.0} \qquad b=-36.00$$

$$m=\left|\frac{b}{a}\right|=\frac{36.0}{12.0}=3.00$$

$$h'=3.00\times 13.0=39.0 \text{ mm}$$

(15-a) Answer	
Location	Left side, 36.0 mm
Type	Virtual
Size	39.0 mm
(15-b) Illustrate in the figure.	

(62 %)



(16) An object 16.5 mm high is 55.1 mm from a concave lens whose focal length is 25.0 mm.

(16-a) Calculate the location (the direction and distance from the lens), the type (real or virtual) and the size of the image formed.

(16-b) Illustrate ray diagram showing how image is formed in the figure.

(Equations)

$$\frac{1}{a}+\frac{1}{b}=\frac{1}{f} \qquad \frac{1}{b}=-\frac{1}{25.0}-\frac{1}{55.1}$$

$$b=-17.20$$

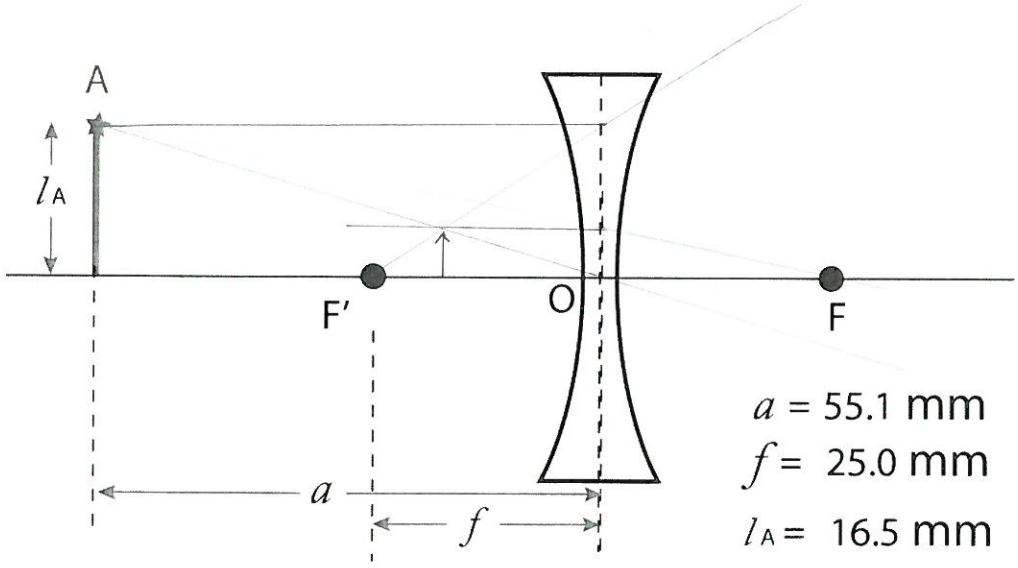
$$m=\left|\frac{b}{a}\right|=\left|\frac{-17.2}{55.1}\right|=0.3121$$

$$h'=h\cdot m=16.5\times 0.3121$$

$$=5.1498 \longrightarrow 5.15$$

(16-a) Answer	
Location	Left, 17.2 mm
Type	Virtual
Size	5.15mm
(16-b) Illustrate in the figure.	

(48%)

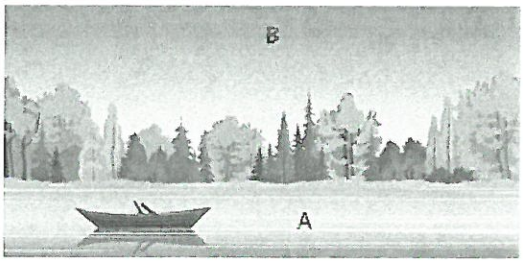


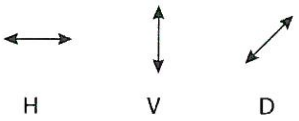
(17) You are standing at the shore of lake around at noon and observing the polarization of light with a polarizer.

What polarization angle, horizontal (H), vertical (V) or diagonal (D), does the light have at the following points?

(17-A) The surface of the lake

(17-B) The sky





(17-A) Answer
H
(17-B) Answer
H

(56 %)

(18) The figure below shows four different cases where light of wavelength λ reflects from both the top and the bottom of a thin film of thickness d. The indices of refraction of the film and the materials above and below it are indicated in the figure. In which of the four cases will light reflected from the top and bottom of the film interfere constructively if $d = \lambda/2$?

(Equations)

- In case of in-phase interference

$2d = \frac{\lambda}{2} \cdot 2m$, $d = \frac{\lambda}{2}$ $\longrightarrow$ $\lambda = m\lambda$ $\rightarrow m = 1$ possible.

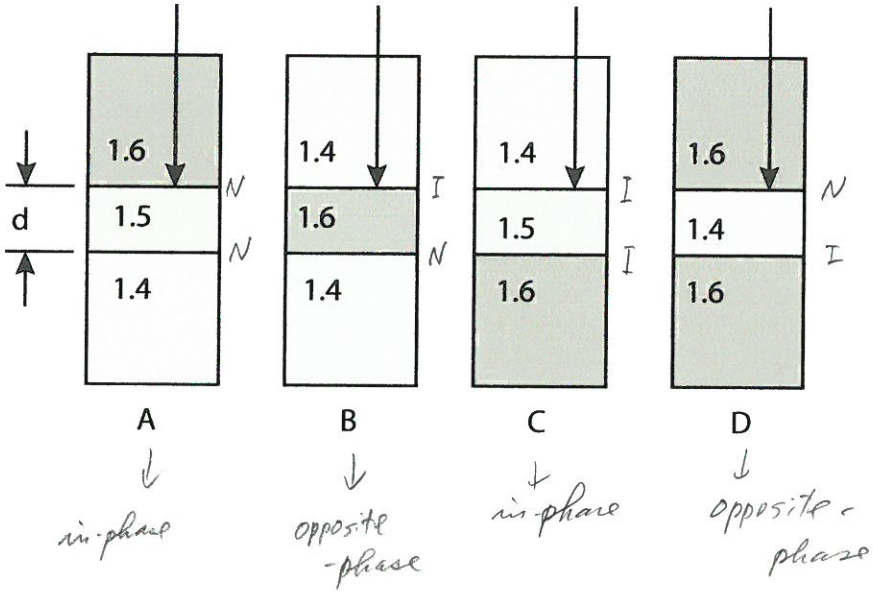
- In case of opposite-phase interference

$2d = \frac{\lambda}{2}(2m-1)$, $d = \frac{\lambda}{2}$ $\longrightarrow$ $\lambda = \frac{\lambda}{2}(2m-1)$ $\rightarrow m = 1.5$ impossible

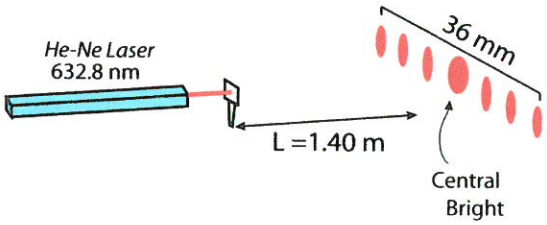
(18) Answer

B , D

(28%)



(19) Light from a He-Ne laser (λ =632.8 nm) strikes a pair of slits at normal incidence, forming a double-slit interference pattern, as shown in the figure, on a screen located 1.40 m from the slits. What is the slit separation?



(Equations)

$$d \sin\theta = m\lambda$$

$$\sin\theta \doteqdot \tan\theta = \frac{x}{L}$$

$$d = \frac{m\lambda L}{x}$$

$m = 3$

$\lambda = 632.8 \times 10^{-9}$

$L = 1.40$

$x = \frac{36}{2} \times 10^{-3} = 18 \times 10^{-3}$

$$d = \frac{3 \times 632.8 \times 10^{-9} \times 1.40}{18 \times 10^{-3}} = 147.7 \times 10^{-6}\ (m)$$

$\rightarrow 148\ \mu m$

$$\tan\theta = \frac{6 \times 10^{-3}}{1.40}$$

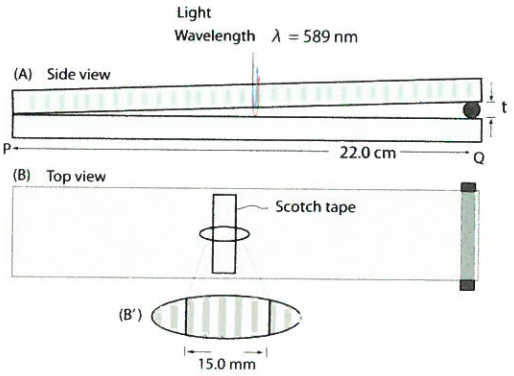
$\theta = 0.2455^\circ$

(19) Answer
148 μm

(18 ½)

(20) As shown in the Figure (A), an air wedge is formed by placing a thin material between two glass plates 22.0 cm long on one end Q, and allowing them to touch on the other end P. When this wedge is illuminated with light (wavelength: $\lambda = 589$ nm) stripes are observed on the glass.

Five dark lines are observed in the Scotch tape (15.0 mm wide) put on the glass, as shown in Figure (B'). Find the thickness of the thin material, t.



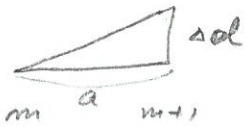
(Equations)

$$2d = \frac{\lambda}{2} \cdot 2m = m\lambda$$

$$d_m = \frac{\lambda}{2} m \qquad d_{m+1} = \frac{\lambda}{2}(m+1)$$

$$\Delta d = d_{m+1} - d_m = \frac{\lambda}{2} = \frac{589 \times 10^{-9}}{2}$$

$$a = \frac{15.0 \times 10^{-3}}{5} = 3.00 \times 10^{-3} \text{ m}$$



$$a : \Delta d = L : t$$

$$t = \frac{\Delta d \cdot L}{a} = \frac{589 \times 10^{-9} \times 0.220}{2 \times 3.00 \times 10^{-3}}$$

$$= 21.60 \times 10^{-6} \longrightarrow 21.6 \ \mu m$$

(20) Answer

21.6 μm

(13 %)

You have one more question next.

(21) Did you study 11th grade physics seriously and enjoy it?

(21) Answer

Circle your answer.

Yes No Neutral

(100 %)

Opinions 意見、感想など

Your name:

I am very happy to meet you! 今年一年、印象深いクラスだった。いつでも Physics Room に寄ってください。 健闘を祈る。 Tohei