	Total	K+E	I+O
Student	34	16	18
Average	28.5/50	28.1/50	28.9/50
Best	42.5/50 (3 students)	42.5/50	42.5/50

11th Physics (2018 – 19)

(4thQ, #1 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 points.</u>

Gravitational acceleration rate $g = 9.80$ m/s

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

／[Total 50 pt]

4/18/2019 *By Tohei Moritani*

Keio Academy of New York

(1) You dribble a basketball with a frequency of 1.8 Hz.
(1-a) What is the period of the dribble?
(1-b) How long does it take for you to complete 15 dribbles?
(Equations)

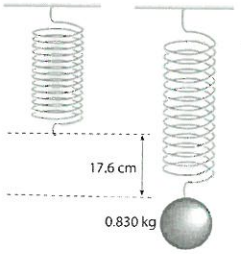
(a) $T = \frac{1}{f} = \frac{1}{1.8} = 0.556 \rightarrow 0.56$

(b) $t = 0.556 \times 15 = 8.33 \rightarrow 8.3$

(1-a) Answer	0.56 s
(1-b) Answer	8.3 s

(89%)

(2) When a 0.830-kg mass is attached to a vertical spring, the spring stretches by 17.6 cm. What is the frequency of oscillation of this spring?



(Equations)

$k = \frac{F}{x} = \frac{mg}{x} = \frac{0.830 \times 9.80}{0.176}$

$= 46.216$

$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{0.830}{46.216}} = 0.8421$

$f = \frac{1}{T} = \frac{1}{0.8421} = 1.187 \rightarrow 1.19$

$k = \frac{mg}{x}$

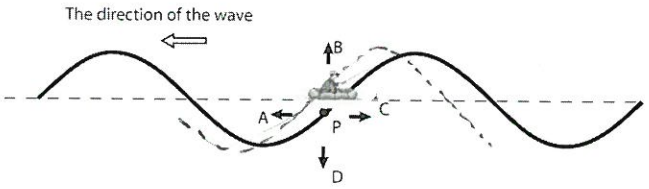
$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$

$= \frac{1}{2\pi}\sqrt{\frac{\frac{mg}{x}}{m}} = \frac{1}{2\pi}\sqrt{\frac{g}{x}}$

$= \frac{1}{2\pi}\sqrt{\frac{9.80}{0.176}} = 1.187 \rightarrow 1.19$

(2) Answer	1.19 Hz

(85%)



Use ***two significant figures*** in this page

(3) You are enjoying boat-fishing at sea and moving up and down on periodic waves. You are periodically on the crest of the wave at the rate of every 8.5 seconds.
(3-a) What is the frequency of the wave?
(3-b) As the wave moves to the left, you, at P on the wave, are moving towards which position, A~D?

(a) $f = \frac{1}{T} = \frac{1}{8.5} = 0.118 \rightarrow 0.12$

(b)

(3-a) Answer	0.12 Hz
(3-b) Answer	B

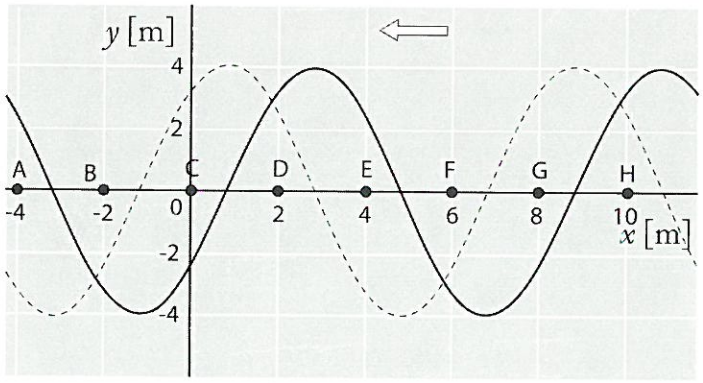
(64%)

(4~5) 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:
(4-c) Wavelength
(4-d) Frequency
(5-e) Speed
(5-f) The points that are out-of-phase with the point B.
(Equations)

(e) $v = \frac{2.0\ m}{0.40\ s} = 5.0\ m/s$

(d) $v = f\lambda \quad f = \frac{v}{\lambda} = \frac{5.0}{8.0} = 0.625 \rightarrow 0.62$

(f) D, H



(4-c) Answer	8.0 m
(4-d) Answer	0.62 Hz

(55%)

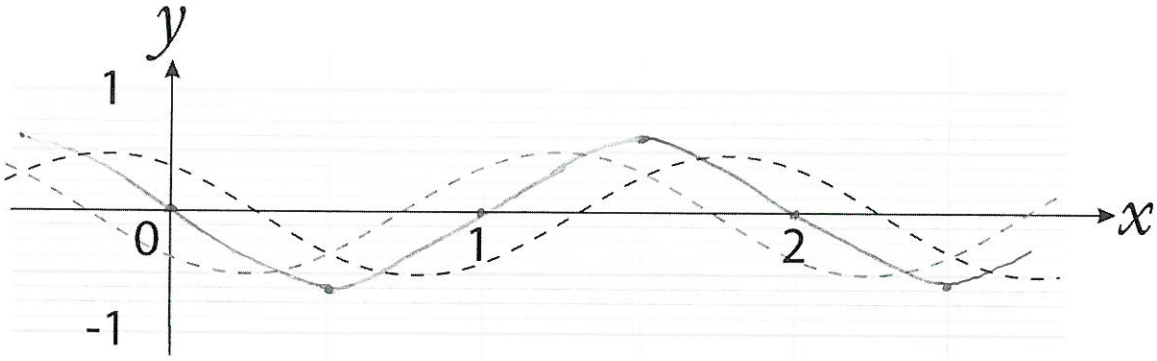
(5-e) Answer	5.0 m/s
(5-f) Answer	D, H

(49%)

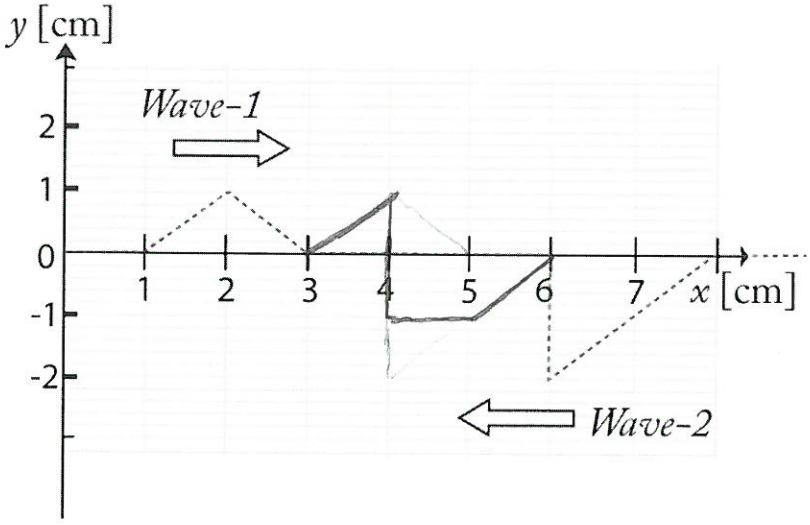
(6) Two waves are superposed as shown. Draw the resultant pattern formed by the superposition of the two waves.

(6) Answer
Draw in the figure below.

(75%)



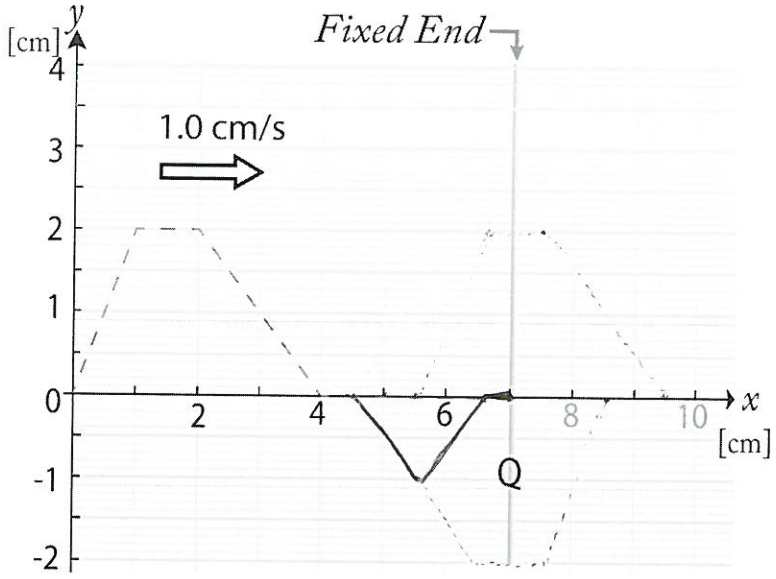
(7) Two pulse waves move at the speed of 1 cm/s as shown. Draw the pattern of the waves after 2 seconds.



(7) Answer
Draw in the figure.

(80%)

(8) A pulse approaches toward a fixed end Q with a speed of 1.0 cm/s.
Draw the pattern for the wave at a time 5.5 seconds later.



(8) Answer
Draw in the figure at the left.

(43%)

(9) A tsunami travelling across deep water can have speed of 800 km/h and a wavelength of 340 km.
(9-a) What is the frequency of such a wave?
(9-b) What is the period of the wave?
(Equations)

$v = 800\ km/h \times \frac{10^3\ m}{1\ km} \times \frac{1\ h}{3.6\times10^3\ s} = \frac{800}{3.6}$

$= 228\ m/s$

$\lambda = 3.4\times10^5\ m$

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{228}{3.4\times10^5} = 67.0\times10^{-5}\ [Hz]$

$T = \frac{1}{f} = \frac{1}{67.0\times10^{-5}}$

$= 1493 \longrightarrow 1500$

(9-a) Answer
$67\times10^{-5}\ Hz$

(9-b) Answer
1500 s

(38%)

$6.70\times10^{-4}\ Hz$

1490 s

(10) The figure shows a standing wave of a string 1.20 m long and at a frequency of 1200 Hz (1.20×10^3 Hz).

(10-a) How many nodes and antinodes are represented?
(10-b) What is the wavelength of the standing wave?
(10-c) What is the fundamental frequency?
(10-d) Find the speed of wave on this string.
Equations

$L = 1.20\ m$

$f = 1.20 \times 10^3\ Hz$

(a)

(b) $\frac{\lambda}{2} \times 4 = 1.20$

$\lambda = \frac{1.20}{2} = 0.600$

(c) $v = f\lambda$

$= 1.20 \times 10^3 \times 0.600$

$= 720.0\ [m/s]$

$\lambda_1 = 2L = 2.40\ [m]$

$f_1 = \frac{v}{\lambda_1} = \frac{720.0}{2.40} = 300.0$

(d)

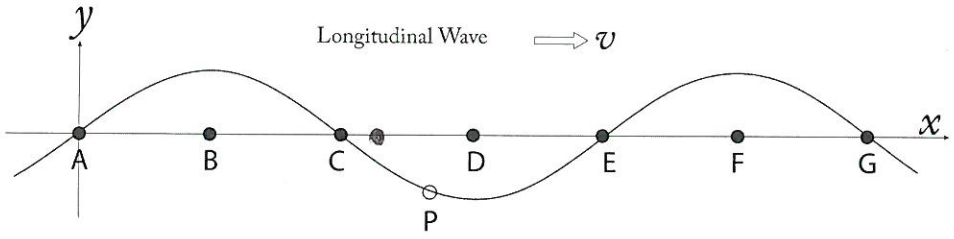
(10-a) Answer Node	5
Antinode	4
(10-b) Answer	0.600 m
(10-c) Answer	300 Hz
(10-d) Answer	720 m/s

(54%)

(11) The figure shows the graph of a longitudinal wave expressed as a transverse wave.
(11-a) Which points are in the highest density?
(11-b) Which point has the speed of zero?
(11-c) Concerning the point P, show its location in the original longitudinal wave by a black circle.

(11-a) Answer C, G
(11-b) Answer B, D, F
(11-c) Answer Draw in the figure below.

(38%)



(12) The figure below shows the wave fronts of a wave of 3.0 m wavelength traveling from a medium 1 to another medium 2. The wave travels at 3.0m/s and 2.0 m/s in the medium 1 and 2, respectively. (12-a) Find the relative refractive index of the medium 2 with respect to the medium 1. (12-2) Find the wavelength of the refracted wave. (12-c) Illustrate the wave front of the refracted wave.

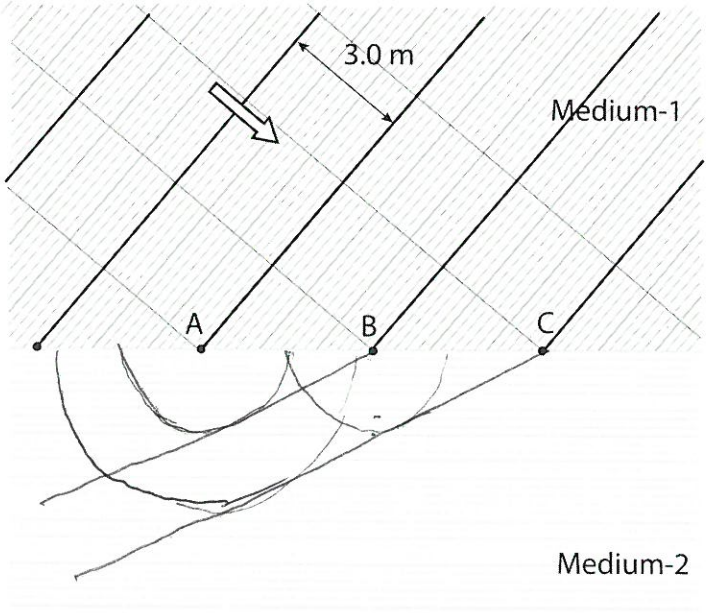
Equations

$$n_{1\to 2} = \frac{v_1}{v_2} = \frac{3.0}{2.0} = 1.5$$

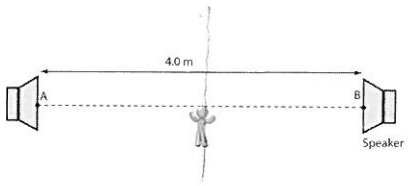
$$n = \frac{\lambda_1}{\lambda_2} \qquad \lambda_2 = \frac{\lambda_1}{n} = \frac{3.0}{1.5} = 2.0$$

(12-a) Answer 1.5
(12-b) Answer 2.0 m
(12-c) Answer Illustrate in the figure. 図中に描け

(35%)



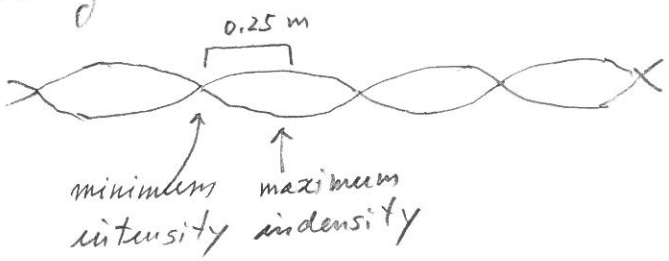
(13) Two loudspeakers, 4.0 meters apart and facing each other, play identical sounds of the same frequency. You stand halfway between them, where there is a maximum of sound intensity. Moving from this point towards one of the speakers, you encounter a minimum of sound intensity when you have moved 0.25 meters. What is the frequency of the sound?



$V = 343\ m/s$

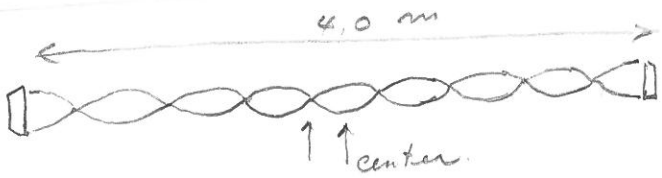
(Equations)

The two in-phase sounds traveling to opposite direction make a standing wave



$\frac{\lambda}{4} = 0.25\ m \rightarrow \lambda = 1.0\ m$

$f = \frac{V}{\lambda} = \frac{343}{1.0} = 343 \rightarrow 340\ Hz$



$|l_1 - l_2| = \frac{\lambda}{2}(2m+1)$

$2.25 - 1.75 = \frac{\lambda}{2}$

$0.50 = \frac{\lambda}{2}$

$m = 0 \quad \lambda = 1.0$

$m = 1 \quad \lambda = \frac{1}{3}\ m$

$\frac{\lambda}{4} = \frac{1}{12}\ m$

(13) Answer