2022 IUT 2nd Admission Test(SBL)

Math Examination(TYPE A)

< Multiple choice Types > There is only one correct answer for each question. Mark your choice on the OMR answer sheet.

○ The points for each question are listed next to the question number.

○ You can use the right side of each page for your memo.

1. [4 points]

When $x=\frac{4}{5}$, compute $\sqrt{x^2-x\sqrt{1-x^2}}$.

① $\frac{1}{10}$ ② $\frac{1}{5}$ ③ $\frac{3}{10}$ ④ $\frac{2}{5}$ ⑤ $\frac{1}{2}$

2. [4 points]

When $x^2-x+1=0$, compute $\frac{5+x^{12}}{x^{2022}}$.

① 5 ② 6 ③ 7 ④ 8 ⑤ 9

3. [4 points]

Compute $\frac{1}{\log_{15}4}-\frac{1}{\log_{3}4}$.

① $\frac{\log_{10}5}{\log_{10}2}$ ② $\frac{\log_{10}5}{\log_{10}3}$ ③ $\frac{\log_{10}5}{\log_{10}4}$

④ $\frac{\log_{10}5}{\log_{10}6}$ ⑤ $\frac{\log_{10}5}{\log_{10}8}$

4. [4 points]

When $x^{22}-20x+15$ is divided by $(x-1)^2$, the remainder is $ax+b$. Find a^2+b^2.

① 26 ② 29 ③ 32 ④ 37 ⑤ 40

5. [4 points]

When $18^x=9$, $4^y=3$, find $\frac{2}{x}-\frac{1}{2y}$.

① $\frac{1}{3}$ ② $\frac{1}{2}$ ③ 1 ④ 2 ⑤ 3

6. [5 points]

When $\begin{pmatrix}1&2\\0&1\end{pmatrix}\begin{pmatrix}3&5\\1&2\end{pmatrix}^{-1}=\begin{pmatrix}a&b\\c&d\end{pmatrix}$, find $a+b+c+d$.

① 2 ② 3 ③ 4 ④ 5 ⑤ 6

7. [5 points]

Compute $\dfrac{3^{\log_2 25}\times 12^{\log_2 3}}{5^{\log_2 3}\times 3^{\log_2 15}}$.

① 5 ② 6 ③ 7 ④ 8 ⑤ 9

8. [5 points]

When α, β are two solutions of $9^x-2\cdot 3^{x+1}+8=0$ $(\alpha<\beta)$, find $\dfrac{\beta}{\alpha}$.

① $\dfrac{3}{2}$ ② 2 ③ $\dfrac{5}{2}$ ④ 3 ⑤ $\dfrac{7}{2}$

9. [5 points]

When $\sin A$ and $\cos A$ are the solutions of $6x^2+3x+a=0$, find a.

① $-\dfrac{5}{4}$ ② $-\dfrac{7}{4}$ ③ $-\dfrac{9}{4}$ ④ $-\dfrac{11}{4}$ ⑤ $-\dfrac{13}{4}$

10. [5 points]

Compute $\displaystyle\sum_{n=1}^{100}\frac{1}{4n^2-1}$.

① $\dfrac{25}{201}$ ② $\dfrac{50}{201}$ ③ $\dfrac{100}{201}$ ④ $\dfrac{150}{201}$ ⑤ $\dfrac{200}{201}$

11. [5 points]

When $\cos\alpha=\dfrac{1}{3}$ and $\sin\beta=\dfrac{1}{4}$ $\left(0<\alpha<\dfrac{\pi}{2},\ \dfrac{\pi}{2}<\beta<\pi\right)$, find $\sin\alpha\cos\beta$.

① $-\dfrac{\sqrt{30}}{6}$ ② $-\dfrac{\sqrt{28}}{6}$ ③ $-\dfrac{\sqrt{26}}{6}$
④ $-\dfrac{\sqrt{24}}{6}$ ⑤ $-\dfrac{\sqrt{22}}{6}$

12. [5 points]

Compute $\left(\dfrac{(\sqrt{6}+\sqrt{2})+(\sqrt{6}-\sqrt{2})i}{4}\right)^{36}$.

① -1 ② 1 ③ i
④ $\dfrac{-1+\sqrt{3}i}{2}$ ⑤ $\dfrac{1+\sqrt{3}i}{2}$

13. [5 points]

Find the sum of all integer solutions of $\dfrac{x}{x+2}<\dfrac{x+3}{3x+1}$.

① -3 ② -1 ③ 0 ④ 1 ⑤ 3

14. [5 points]

Find the sum of all solutions of $2\cos 2x+3=8\sin x$ for $0 \leq x \leq 2\pi$.

① π ② $\frac{3\pi}{2}$ ③ 2π ④ $\frac{5\pi}{3}$ ⑤ 3π

15. [5 points]

Find the limit $\lim_{x \to 0} \frac{x+\sin x}{x^4+3x}$.

① $\frac{1}{3}$ ② $\frac{2}{3}$ ③ 1 ④ $\frac{3}{2}$ ⑤ 3

16. [6 points]

When $y=ax+b$ is the tangent line to $y=\frac{x^2+5}{x+1}$ at $x=2$, find $a+b$.

① $\frac{2}{3}$ ② $\frac{4}{3}$ ③ 2 ④ $\frac{8}{3}$ ⑤ $\frac{10}{3}$

17. [6 points]

Find the minimum value of the function

$$f(x)=3x^4+2x^3+3x^2-6x+2.$$

① $\frac{1}{16}$ ② $\frac{3}{16}$ ③ $\frac{5}{16}$ ④ $\frac{7}{16}$ ⑤ $\frac{9}{16}$

18. [6 points]

When $f(x)=\frac{x}{\sqrt[3]{2x+4}}$, find $f'(2)$.

① $\frac{5}{4}$ ② $\frac{5}{6}$ ③ $\frac{5}{8}$ ④ $\frac{5}{12}$ ⑤ $\frac{5}{14}$

19. [6 points]

Find $\int_1^2 \left(3x^2+\frac{1}{x^2}\right) dx$.

① $\frac{9}{2}$ ② $\frac{11}{2}$ ③ $\frac{13}{2}$ ④ $\frac{15}{2}$ ⑤ $\frac{17}{2}$

20. [6 points]

Find the area of the region enclosed by $y=(1-\sqrt{x})^2$ $(0 \leq x \leq 1)$, $x=0$ and $y=0$.

① $\frac{1}{2}$ ② $\frac{1}{4}$ ③ $\frac{1}{6}$ ④ $\frac{1}{8}$ ⑤ $\frac{1}{10}$

2022 IUT 2nd Admission Test SBL Answer Sheet

Type A

1	2	3	4	5	6	7	8	9	10
④	②	③	⑤	④	②	⑤	②	③	③
11	12	13	14	15	16	17	18	19	20
①	①	⑤	①	②	④	②	④	④	③

2022 IUT 2nd Admission Test(SOCIE Non-Scholar)

Math Examination(TYPE A)

< Multiple choice Types > There is only one correct answer for each question. Mark your choice on the OMR answer sheet.

○ The points for each question are listed next to the question number.

○ You can use the right side of each page for your memo.

1. [4 points]

When $\alpha=\dfrac{1}{\sqrt{\sqrt{3}+\sqrt{2}}}$ and $\beta=\dfrac{1}{\sqrt{\sqrt{3}-\sqrt{2}}}$, find $\alpha^4+\beta^4$.

① 10 ② 11 ③ 12 ④ 13 ⑤ 14

2. [4 points]

When α,β,γ are the solutions of $3x^3+2x^2-4x+1=0$, find $\alpha^2+\beta^2+\gamma^2$.

① $\dfrac{19}{9}$ ② $\dfrac{22}{9}$ ③ $\dfrac{25}{9}$ ④ $\dfrac{28}{9}$ ⑤ $\dfrac{31}{9}$

3. [4 points]

When $3^a=5^b=7$, find $\dfrac{b}{2a}$.

① $\dfrac{\ln 3}{4\ln 5}$ ② $\dfrac{\ln 3}{2\ln 5}$ ③ $\dfrac{\ln 3}{\ln 5}$ ④ $\dfrac{2\ln 3}{\ln 5}$ ⑤ $\dfrac{4\ln 3}{\ln 5}$

4. [4 points]

When $\sin^2\theta+2\sin\theta=\cos(2\theta)$ for $0<\theta<\dfrac{\pi}{2}$, find $tg\,\theta$, where $tg\,\theta=\dfrac{\sin\theta}{\cos\theta}$.

① $\dfrac{1}{2\sqrt{2}}$ ② $\dfrac{1}{3}$ ③ 1 ④ $2\sqrt{2}$ ⑤ 3

5. [5 points]

Let $A=\begin{pmatrix}2 & -3\\ 1 & 0\end{pmatrix}$ and $A^{-2}=\begin{pmatrix}a & b\\ c & d\end{pmatrix}$. Find $a+b+c+d$.

① $\dfrac{1}{9}$ ② $\dfrac{2}{9}$ ③ $\dfrac{4}{9}$ ④ $\dfrac{5}{9}$ ⑤ $\dfrac{7}{9}$

6. [5 points]

When $\omega=\dfrac{2}{1+\sqrt{3}\,i}$, find $\displaystyle\sum_{n=1}^{2022}\omega^n$.

① 0 ② $-\sqrt{3}i$ ③ $\sqrt{3}i$ ④ $\dfrac{1-\sqrt{3}i}{2}$ ⑤ $\dfrac{-1+\sqrt{3}i}{2}$

7. [5 points]

When the maximum value of $f(x)=a^{-4x^2-4x+1}$ for $a>1$ is 8, find a.

① $\sqrt{2}$ ② 2 ③ $2\sqrt{2}$ ④ 4 ⑤ $4\sqrt{2}$

8. [5 points]

Find the limit $\displaystyle\lim_{x\to 2}\frac{\sin(x-2)}{x^3-8}$.

① $\dfrac{1}{4}$ ② $\dfrac{1}{6}$ ③ $\dfrac{1}{8}$ ④ $\dfrac{1}{10}$ ⑤ $\dfrac{1}{12}$

9. [5 points]

Find the minimum value of

$f(t)=3\cos^2 t+8\sin t-2\sin t\cos^2 t-7$.

① -20 ② -15 ③ -10 ④ -5 ⑤ 0

10. [5 points]

When $f(x)=\sqrt[3]{2x+2}$, find $f'(3)$.

① $\dfrac{1}{2}$ ② $\dfrac{1}{3}$ ③ $\dfrac{1}{4}$ ④ $\dfrac{1}{5}$ ⑤ $\dfrac{1}{6}$

11. [6 points]

When $y=ax+b$ is the tangent line to $y=\ln(2\sin^2 x+3)$ at $x=\dfrac{\pi}{4}$, find $a+b$.

① $\dfrac{1}{2}-\pi+\ln 4$ ② $\dfrac{1}{2}-\dfrac{\pi}{2}+\ln 4$ ③ $\dfrac{1}{2}-\dfrac{\pi}{4}+\ln 4$

④ $\dfrac{1}{2}-\dfrac{\pi}{8}+\ln 4$ ⑤ $\dfrac{1}{2}-\dfrac{\pi}{12}+\ln 4$

12. [6 points]

Compute $\displaystyle\int_0^{\ln 2}\frac{1}{1+e^x}\,dx$.

① $\ln 2$ ② $\ln\dfrac{3}{2}$ ③ $\ln\dfrac{4}{3}$

④ $\ln\dfrac{5}{4}$ ⑤ $\ln\dfrac{6}{5}$

13. [6 points]

Find the area of the region enclosed by $y=x^3-2x^2+2x+3$ and $y=x^3-x^2+3x+1$.

① $\dfrac{1}{2}$ ② $\dfrac{3}{2}$ ③ $\dfrac{5}{2}$ ④ $\dfrac{7}{2}$ ⑤ $\dfrac{9}{2}$

14. [6 points]

Let A be the region enclosed by $y=\sin^2 x$, $(0\le x\le\pi)$ and $y=0$. Find the volume of the solid obtained by rotating the region A about the x-axis.

① $\dfrac{\pi^2}{8}$ ② $\dfrac{\pi^2}{4}$ ③ $\dfrac{3\pi^2}{8}$ ④ $\dfrac{\pi^2}{2}$ ⑤ $\dfrac{5\pi^2}{8}$

2022 IUT 2nd Admission Test SOCIE Non-Scholar Answer Sheet

Type A

1	2	3	4	5	6	7	8	9	10
①	④	②	①	②	①	③	⑤	②	⑤
11	12	13	14						
④	③	⑤	③						

2022 IUT Admission Test(SOCIE)

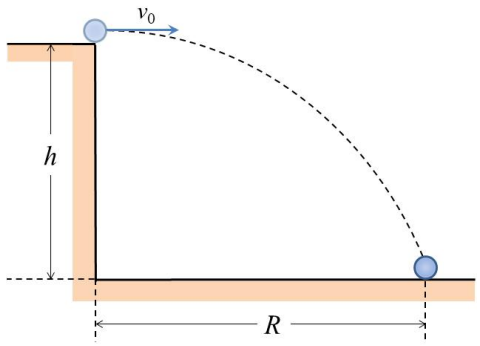
Physics Examination(A TYPE)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

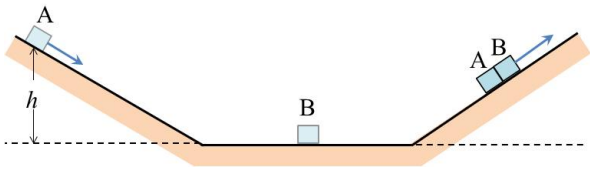
○ No penalty point is applied to an incorrect answer.

1. [5 points]
As shown in the figure, an object is thrown from a height h at a speed $v_0 = 5\,\mathrm{m/s}$ in the horizontal direction, and it falls at a horizontal distance $R = 10\,\mathrm{m}$. What is the height h at which the object is thrown? (Assume that the gravitational acceleration is $g = 10\,\mathrm{m/s^2}$)



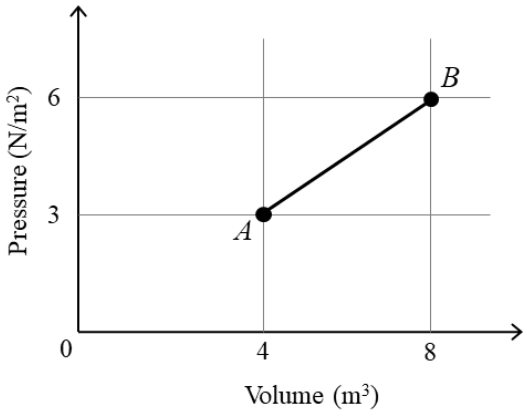
① 10 m ② 15 m ③ 20 m
④ 25 m ⑤ 30 m

2. [6 points]
As shown in the figure, when object A is placed on a slope at height $h = 10\,\mathrm{m}$ initially at rest, it slides down and collides with object B with the same mass at the point of height 0, then sticks together and climbs the opposite slope. What is the maximum height that the objects A and B can reach? (Assume that all the surfaces are frictionless)



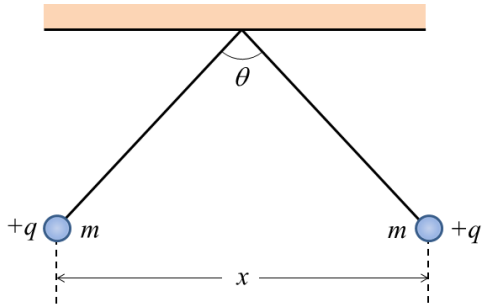
① 2.0 m ② 2.5 m ③ 4.0 m
④ 5.0 m ⑤ 10 m

3. [4 points]
The figure below shows the relationship between pressure and volume when the state of a certain amount of an ideal gas changes from A to B. How much is work done by the gas in this process?



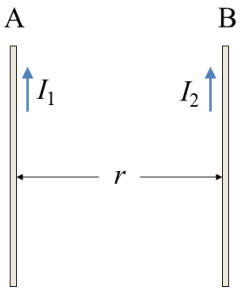
① 12 J ② 15 J ③ 16 J
④ 18 J ⑤ 24 J

4. [6 points]
As shown in the figure, two spheres of mass $m = 1.0$ kg are charged with the same charge $q = 1.0\ \mu$C and are hung on strings of same length. If the angle between the two strings is $\theta = 90^\circ$, what is the distance x between the two spheres? (Assume that the gravitational acceleration is $g = 10\,\mathrm{m/s^2}$ and $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9\ \mathrm{N\,m^2/C^2}$)



① 0.2 cm ② 0.5 cm ③ 0.9 cm
④ 2.0 cm ⑤ 3.0 cm

5. [5 points]
Two long straight conducting wires A and B are separated by a distance r, and the currents flowing in two wires are I_1 and I_2, respectively. If the currents I_1 and I_2 are both doubled, and the distance r is also doubled, how many times will the force between the wires be compared to the initial force?



① 0.5 ② 1 ③ 2 ④ 3 ⑤ 4

6. [4 points]
When light enters a water surface at an oblique angle from air and travels into water, which of the following does not change?

① frequency ② wavelength ③ speed
④ amplitude ⑤ direction

2022 IUT Admission Test(SOCIE)

Physics Examination(A TYPE)

Answers

1. ③
2. ②
3. ④
4. ⑤
5. ③
6. ①

2022 IUT Admission Test (SOCIE, Scholarship)

Math Examination (A TYPE)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

○ No penalty point is applied to an incorrect answer.

1. [2 points]

Simplify $\log_2 \sqrt{2\sqrt{2\sqrt{2}}}$.

① $\frac{3}{8}$ ② $\frac{1}{2}$ ③ $\frac{5}{8}$
④ $\frac{3}{4}$ ⑤ $\frac{7}{8}$

2. [2 points]

Evaluate $\sum_{n=1}^{10}\sum_{k=1}^{n} k$.

① 220 ② 225 ③ 230 ④ 235 ⑤ 240

3. [2 points]

When a polynomial $x^{11}-1$ is divided by x^2-1, the remainder is $ax+b$. Find $|a|+|b|$.

① 1 ② 2 ③ 3 ④ 4 ⑤ 5

4. [2 points]

Simplify $\left(\frac{\sqrt{3}+i}{\sqrt{3}-i}\right)^{15}$.

① 1 ② i ③ 0
④ $-i$ ⑤ -1

5. [2 points]

When $\sin\theta=\frac{5}{13}$, $\sin\theta\cos\theta<0$, find $tg\left(\frac{\theta}{2}\right)$.

① 1 ② 3 ③ 5 ④ 7 ⑤ 9

6. [3 points]

Find the angle between two lines

$y=2x-1$, $y=-3x+2$.

① $\frac{\pi}{12}$ ② $\frac{\pi}{6}$ ③ $\frac{\pi}{4}$ ④ $\frac{\pi}{3}$ ⑤ $\frac{\pi}{2}$

7. [3 points]

Find the area of a triangle ABC with

$\overline{AB}=2$, $\overline{BC}=2\sqrt{3}$, $\angle A=\frac{2\pi}{3}$.

① 2 ② $\sqrt{3}$ ③ $2\sqrt{3}$
④ $2-\sqrt{3}$ ⑤ $2+\sqrt{3}$

8. [3 points]
When a sequence a_n satisfies

$$a_{n+1}=2a_n+1,\ a_1=1,$$

find a_{10}

① 256 ② 511 ③ 512
④ 1023 ⑤ 1024

9. [3 points]
Find $\lim_{x\to 0}\frac{e^{x^2}-\cos x}{x^2}$.

① 0 ② $\frac{1}{2}$ ③ 1 ④ $\frac{3}{2}$ ⑤ 2

10. [3 points]
When $A=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$, $B=\begin{pmatrix}1 & -1\\ -1 & -1\end{pmatrix}$, find the sum of all entries of $A(3A^{-1}+B^{-1})B^2$.

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

11. [4 points]
When α, β are solutions of

$$\log_2(2x)\times\log_2(3x)=1,$$

find $\alpha\beta$.

① $\frac{1}{6}$ ② $\frac{1}{5}$ ③ $\frac{1}{3}$ ④ $\frac{1}{2}$ ⑤ 1

12. [4 points]
When $f(x)=\sin x+\cos x$, find

$$\lim_{x\to 0}\frac{f(3x)-f(x)}{x}.$$

① -2 ② -1 ③ 0 ④ 1 ⑤ 2

13. [4 points]
When a polynomial $p(x)$ satisfies

$$\lim_{x\to\infty}\frac{p(x)}{x^2+1}=2,\ \lim_{x\to 0}\frac{p(x)+x}{p(x)-x}=3,$$

find $p(1)$.

① 2 ② 4 ③ 6
④ 8 ⑤ 10

14. [4 points]
Let $f(x)=x^3+5x-1$. When g is the inverse function of f, find $g'(5)$.

① $\frac{1}{8}$ ② $\frac{1}{4}$ ③ $\frac{1}{2}$ ④ 1 ⑤ 2

15. [4 points]
Evaluate $\int_0^1 (x+1)e^x\,dx$.

① $e-1$ ② e ③ $2(e-1)$
④ $e+1$ ⑤ $2(e+1)$

16. [5 points]

Evaluate $\int_0^1 x^2\sqrt{1-x^2}\,dx$.

① $\frac{\pi}{16}$ ② $\frac{\pi}{8}$ ③ $\frac{3\pi}{16}$ ④ $\frac{\pi}{4}$ ⑤ $\frac{5\pi}{16}$

17. [5 points]

Evaluate

$$\lim_{n\to\infty}\left(\frac{2^2-1^2}{1^2}+\frac{3^2-2^2}{1^2+2^2}+\cdots+\frac{(n+1)^2-n^2}{1^2+2^2+\cdots+n^2}\right).$$

① 3 ② 4 ③ 5 ④ 6 ⑤ 7

18. [5 points]

Find the distance from a point $(1,1,1)$ to the plane passing through three points $(1,2,3)$, $(1,-1,6)$, $(2,3,1)$.

① $\frac{\sqrt{3}}{2}$ ② $\sqrt{3}$ ③ $\frac{\sqrt{6}}{2}$
④ $\sqrt{6}$ ⑤ $2\sqrt{3}$

19. [5 points]

When two graphs

$$y=x^3+x^2+ax+12,\ y=x^2+6x-4$$

meet at two distinct points, find the real number a.

① -2 ② -4 ③ -6
④ -8 ⑤ -10

20. [5 points]

When a twice differentiable function f satisfies

$$f(x)=2x^2-\int_0^x (x-t)f''(t)dt,$$

find $f(2)$.

① -4 ② -2 ③ 0
④ 2 ⑤ 4

Answers (SOCIE, Scholarship)

Type A

1	2	3	4	5	6	7	8	9	10
⑤	①	②	⑤	③	③	②	④	④	③
11	12	13	14	15	16	17	18	19	20
①	⑤	②	①	②	①	④	②	③	⑤

2022 IUT Admission Test(SOCIE)

Physics Examination(A TYPE)

<Multiple choice Types> There is only one correct answer per each question. Mark your answer choice on the OMR answer sheet.

○ For each correct answer, you will get the points indicated next to each question number.

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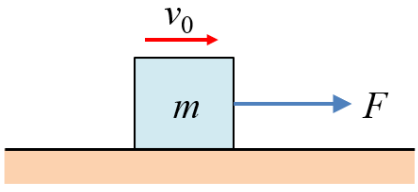
1. [2 point]
There is an airplane flying from point A to point B which is 400 km north of point A. In the absence of wind, the plane can fly at 50 m/s. If the plane flies straight from point A to point B when the wind blows from east to west at 30 m/s, how long will it take to fly from point A to point B?

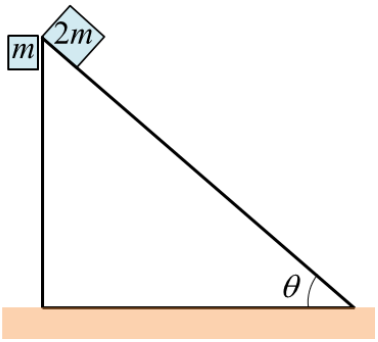
① 8000 s ② 10000 s ③ 12000 s
④ 15000 s ⑤ 16000 s

2. [1 point]
As shown in the figure below, there is an object of mass $m = 1.0\,\mathrm{kg}$ moving at an initial velocity $v_0 = 4\,\mathrm{m/s}$ on a frictionless horizontal plane. What is the speed of the object when it is dragged 6 m by applying a force $F = 4\,\mathrm{N}$ in the direction of motion?



① 5 m/s ② 6 m/s ③ 7 m/s
④ 8 m/s ⑤ 9 m/s

3. [2 point]
An object of mass m is free-falling as shown in the figure below. At the same time, an object of a mass $2m$ descends an inclined frictionless plane with a slope of $\theta = 60^\circ$ from the same height. How many times longer does it take for the object of mass $2m$ to reach the floor than for the object of mass m?

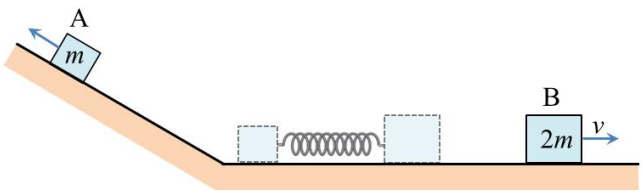


① 1 ② $\sqrt{2}$ ③ $\frac{2\sqrt{3}}{3}$
④ $\sqrt{3}$ ⑤ 2

4. [1 points]
The gravitational acceleration on the Moon's surface is 1/6 of the Earth's. Assuming that the radius of the Moon is 1/4 of the Earth's, how many times is the average density of the Moon to the Earth's average density?

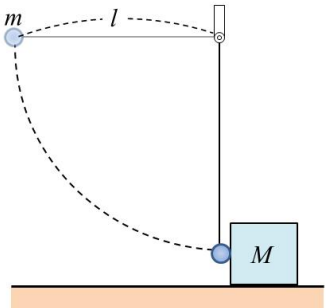
① 1/3 ② 1/4 ③ 1/2 ④ 2/3 ⑤ 1

5. [2 points]
As shown in the figure below, on a frictionless horizontal surface, object A with mass m and object B with mass $2m$ are in contact with both ends of the spring inbetween, and the spring is compressed. After the spring is released, object A rises along the frictionless slope, and object B moves in the horizontal plane with constant speed $v = 4.0\ \mathrm{m/s}$. What is the maximum height at which object A goes up the slope? (Assume that the magnitude of gravitational acceleration is $10\ \mathrm{m/s^2}$ and ignore the mass of the spring)



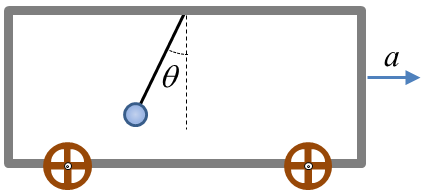
① 2.0 m ② 2.2 m ③ 2.5 m
④ 3.0 m ⑤ 3.2 m

6. [2 point]
As shown in the figure, a small ball of mass $m = 1.0\ \mathrm{kg}$ suspended on a string of length $l = 1.0\ \mathrm{m}$ is lifted horizontally at an angle of 90° and then released. The ball descends and collides elastically with an object of mass $M = 3.0\ \mathrm{kg}$ lying on a frictionless horizontal surface. What is the maximum rise height of the bounced ball after impact?



① 0.20 m ② 0.25 m ③ 0.30 m
④ 0.40 m ⑤ 0.45 m

7. [1 points]
As shown in the figure below, a pendulum suspended from a train accelerating with acceleration a forms a constant angle $\theta = 30^\circ$ with the vertical direction. What is the acceleration of the train? (the magnitude of gravitational acceleration is g)

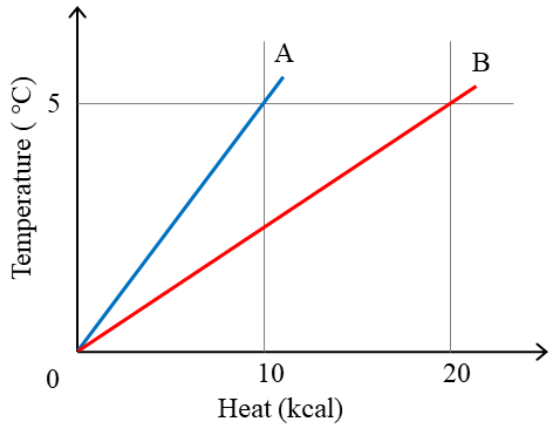


① $\frac{g}{\sqrt{3}}$ ② $\frac{g}{2}$ ③ $\frac{\sqrt{3}g}{2}$
④ $\sqrt{3}g$ ⑤ $\frac{2g}{\sqrt{3}}$

8. [1 point]
A spring stretches $0.10\ \mathrm{m}$ when a force of $1\ \mathrm{N}$ is applied. It is placed on a frictionless horizontal surface, and one end is fixed. An object with a mass of $0.10\ \mathrm{kg}$ is suspended at the other end of the spring and oscillates in the horizontal direction. What is the period of this simple harmonic oscillator?

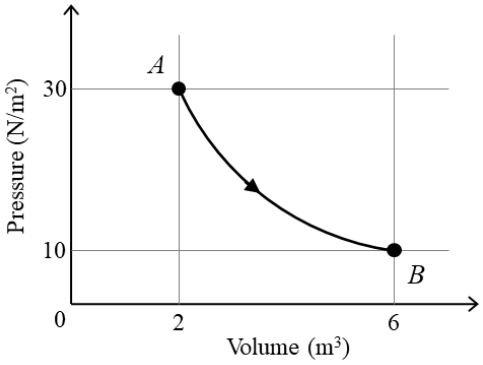
① $\frac{\pi}{5}$ s ② $\frac{\pi}{4}$ s ③ $\frac{\pi}{2}$ s ④ π s ⑤ 2π s

9. [1 points]
The graph below shows the relationship between the amount of heat and temperature when two substances A and B are heated. Masses of A and B are m_A and m_B, and specific heats of A and B are c_A and c_B, respectively. If the mass ratio is $\frac{m_A}{m_B}=2$, what is the specific heat ratio $\frac{c_A}{c_B}$ of two substances?



① 1 ② $\frac{1}{2}$ ③ $\frac{1}{3}$ ④ $\frac{1}{4}$ ⑤ $\frac{1}{8}$

10. [2 points]
The figure below shows the relationship between pressure and volume when the state of a certain amount of an ideal gas changes from A to B in the isothermal process. How much is work done by the gas in this process?



① $30\ln 2$ J ② $30\ln 2$ J ③ $60\ln 3$ J
④ $30\ln 6$ J ⑤ $60\ln 6$ J

11. [1 point]
If a 60-W light bulb operates at a voltage of 120 V, what is the resistance of the bulb?

① 0.5 Ω ② 2 Ω ③ 30 Ω
④ 240 Ω ⑤ 7200 Ω

12. [1 point]
Which of the following properties of light is NOT changed when a beam of light is refracted into a medium with a different index of refraction?

① speed ② frequency ③ wavelength
④ amplitude ⑤ direction

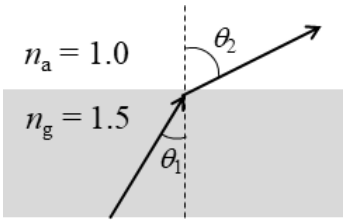
13. [1 point]
A positive charge q = 2.0 C, initially at rest, is driven by an electric field of magnitude $E = 6.0\ \mathrm{N/C}$. When the charge is moved by 5.0 cm by the electric field, what is the charge's kinetic energy?

① 0.1 J ② 0.3 J ③ 0.6 J
④ 1.2 J ⑤ 2.4 J

14. [1 point]
What is the minimum energy to ionize a hydrogen atom in the n = 4 state? Note that the energy of the ground state (n = 1) is − 13.6 eV.

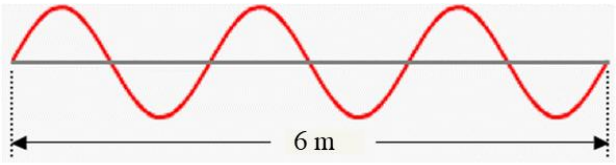
① 0.85 eV ② 1.7 eV ③ 3.4 eV
④ 6.8 eV ⑤ 10.2 eV

15. [1 point]
As shown in the diagram below, a ray of light is incident from glass to air. The refractive indices of air and glass are 1.0 and 1.5, respectively. The angle of incidence is θ_1 and the angle of refraction is θ_2. If θ_1 is 30°, determine $\sin(\theta_2)$.



① 1/2 ② $1/\sqrt{2}$ ③ 2/3
④ $\sqrt{3}/2$ ⑤ 3/4

16. [2 points] A standing wave pattern is established in a 6-m long rope. A snapshot of the rope at a given moment in time is shown as below. The vibrations travel within the rope at a speed of 2 m/s. Determine the frequency of vibrations of the rope.

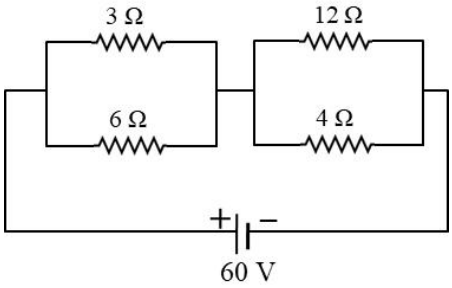


① 1 Hz ② 2 Hz ③ 3 Hz ④ 4 Hz ⑤ 6 Hz

17. [2 points]
In a parallel-plate capacitor, a uniform electric field of 1000 V/m exists between the plates. The distance between the plates is 0.5 mm. If the charge on a parallel-plate capacitor is 6 μC, what is the capacitance of this parallel-plate capacitor?

① 3 μF ② 6 μF ③ 9 μF
④ 12 μF ⑤ 15 μF

18. [2 points] In a circuit shown below, determine the current flowing through the 3-Ω resistor.



① 2 A ② 3 A ③ 4 A ④ 6 A ⑤ 8 A

19. [2 points]
A charge moves in a circular orbit of radius R due to a uniform magnetic field. The period of the circular motion is T. What will become the period of the circular orbit if the radius R is doubled?

① $T/4$ ② $T/2$ ③ T ④ $2T$ ⑤ $4T$

20. [2 points] A ultraviolet light with a wavelength 310 nm strikes an unknown metal in vacuum, causing electrons to be ejected. The kinetic energy of the ejected electron is 1.5 eV. What is the work function of the metal? (Assume that the product of Plank constant h and speed of light in vacuum c is $hc = 1240\,\text{eV}\cdot\text{nm}$.)

① 2 eV ② 2.5 eV ③ 3 eV
④ 3.5 eV ⑤ 4 eV

2022 IUT Admission Test(SOCIE)

Physics Examination(A TYPE)

Answers

1. ②
2. ④
3. ③
4. ④
5. ⑤
6. ②
7. ①
8. ①
9. ④
10. ③
11. ④
12. ②
13. ③
14. ①
15. ⑤
16. ①
17. ④
18. ⑤
19. ③
20. ②