2023 IUT Admission Test(SOCIE Scholarship)

Physics Examination(Sample)

<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.

Answers: 1. ②, 2. ①, 3. ④

1. [1 point]

The object and image relation is given by $\frac{1}{o}+\frac{1}{i}=\frac{1}{f}$. According to this relation, $\frac{1}{i}=\frac{1}{f}-\frac{1}{o}=\frac{1}{5}-\frac{1}{10}=\frac{1}{10}$. Therefore $i=10$ cm.

The magnification ratio is $m=\frac{i}{o}=10/10=1$, so the size of the image is the same as the size of the candle.

Answer) ② **5 cm**

2. [1 point]

We apply Newton's 2nd law in component form to the 1-kg block with the choice of the upward direction as positive:

$\sum F_x = 0$

$\sum F_y = T-(1\text{kg})(10\ \text{m/s}^2)=(1\text{kg})a,$

where T is tension of the cord and a is the acceleration.

Applying the same method to the 4-kg block with the choice of the positive direction x' to be down the incline gives

$\sum F_{x'} = (4\text{kg})(10\,\text{m/s}^2)\sin 30^\circ - \text{T} = (4\text{kg})a$

$\sum F_{y'} = 0$

Using above equations, we solve for a and obtain

$$a=\frac{(4\text{kg})(10\text{m/s}^2)\sin 30^\circ-(1\text{kg})(10\text{m/s}^2)}{1\text{kg}+4\text{kg}}=2\,\text{m/s}^2$$

Answer) ① **2 m/s^2**

3. [2 points]

The equivalent resistance of two resistors in parallel, $6\,\Omega$ and $3\,\Omega$ is obtained from the equation: $\frac{1}{R_{6,3}} = \frac{1}{6\,\Omega} + \frac{1}{3\,\Omega}$, from which $R_{6,3}$ is calculated to be $2\,\Omega$. Therefore, the equivalent resistance of the circuit is equal to $4\,\Omega$ $(= 2\,\Omega + 2\,\Omega)$. Then, the total current of the circuit is obtained as $(12\,\mathrm{V})/(4\,\Omega) = 3\,\mathrm{A}$. Since the voltage across the 6-Ω and the 3-Ω resistor is the same, the 3-A current is divided into 1 A and 2 A in the 6-Ω and the 3-Ω resistor, respectively. Consequently, the power dissipated in the 6-Ω resistor is obtained as $(1\,\mathrm{A})^2 \times 6\,\Omega = 6\,\mathrm{W}$.

Answer) ④ **6 W**