2023 IUT Admission Test(SOCIE)

Physics Examination(Sample) Solutions

<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.

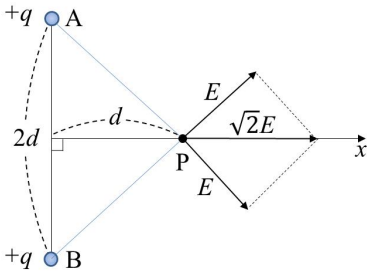
○ No penalty point is applied to an incorrect answer.

Answers: 1. ③, 2. ②, 3. ①

1. Since the speed of the car increases by 4 m/s for 2 seconds after starting, the acceleration is $a = \frac{4\ \mathrm{m/s}}{2\ \mathrm{s}} = 2\ \mathrm{m/s^2}$. Since the car moves in a straight line with constant acceleration at an acceleration of $2\ \mathrm{m/s^2}$, the speed at 3 seconds is $v = v_0 + at = 2\ \mathrm{m/s} + 2\ \mathrm{m/s^2} \times 3\ \mathrm{s} = 8\ \mathrm{m/s}$.

Answer) ③ **8 m/s**

2. Since the distance from point A to point P is $\sqrt{2}d$, the electric field at point P caused by the charge +q at point A is $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2} = \frac{1}{4\pi\varepsilon_0}\frac{q}{(\sqrt{2}d)^2} = \frac{1}{4\pi\varepsilon_0}\frac{q}{2d^2}$. As sown in the figure, the magnitude of the electric field produced by the two charges at points A and B is $\sqrt{2}E = \frac{1}{4\pi\varepsilon_0}\frac{q}{\sqrt{2}d^2}$.



Answer) ② $\frac{1}{4\pi\varepsilon_0}\frac{q}{\sqrt{2}d^2}$

3. If the mass of A is m, the mass of B is M, and the initial velocity of B is $v_0 = 2\ \mathrm{m/s}$, the two bodies will have the same speed when the spring is compressed to its maximum. If the speed of them at this time is V, the following equation is established according to the law of conservation of linear momentum, $Mv_0 = (m+M)V$.

$\therefore (3\ \mathrm{kg}) \times (2\ \mathrm{m/s}) = (1\ \mathrm{kg} + 3\ \mathrm{kg}) \times V$. Therefore, $V = 1.5\ \mathrm{m/s}$. According to the law of conservation of energy before and after the collision, the following equation is established,

$$\frac{1}{2}Mv_0^2 = \frac{1}{2}(m+M)V^2 + \frac{1}{2}kx^2.$$

$$\therefore \frac{1}{2}(3\ \mathrm{kg})(2\ \mathrm{m/s})^2 = \frac{1}{2}(1\ \mathrm{kg}+3\ \mathrm{kg})(1.5\ \mathrm{m/s})^2 + \frac{1}{2}(48\ \mathrm{N/m})x^2$$

$$\therefore x = 0.25\ \mathrm{m}$$

Answer) ① **0.25 m**