Application ID:

NAME:

2020 INHA-BEU DDP Test Answer Sheet for Physics

1. [5 points]

The electrical energy converted into heat: $Q = I^2 Rt$ (*I:* current, *R:* resistance, *t:* time).

Therefore,

$Q = (0.2\,\mathrm{A})^2 \times 50\,\Omega \times 60\,\mathrm{sec.} = 120\ \mathrm{J}$

Answer: 120 J

2. [5 points]

The average acceleration $a = \frac{\Delta v}{\Delta t}$.

Therefore,

$$a = \frac{(20-0)\,\mathrm{m/s}}{60\,\mathrm{s}} = \frac{1}{3}\,\mathrm{m/s^2}$$

Answer: $\frac{1}{3}\,m/s^2$

3. [5 points]

For constant acceleration a,

the distance $d = \frac{1}{2}at^2$.

Thus, the time $t = \sqrt{\frac{2d}{a}}$

$$\therefore\ t = \sqrt{\frac{80\mathrm{m}}{5\,\mathrm{m/s^2}}} = \sqrt{16}\,\mathrm{s} = 4\,\mathrm{s}$$

Answer: $4\ s$

4. [5 points]

Ideal gas law: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$, (*P*: pressure, *V*: volume, *T*: absolute temperature)

As the pressure is unchanged in this case, *V* is proportional to *T*. Therefore, the new volume of the gas is

$$V_2 = \left(\frac{T_2}{T_1}\right)V_1 = 2 \times 2\,\mathrm{m^3} = 4\,\mathrm{m^3}$$

Answer: $4\,m^3$

5. [10 points]

Since the total momentum is conserved before and after collision.

-Before collision:

$1\,\mathrm{kg}(10\,\mathrm{m/s}) + m_{wood}(0\,m/s) = 10\,kg\,m/s$,

-After collision:

$(1\,\mathrm{kg} + m_{wood})(2\,\mathrm{m/s})$.

$\therefore\ (1\,\mathrm{kg} + m_{wood})(2\,\mathrm{m/s}) = 10\,kg\,m/s$

$$m_{wood} = \frac{10\,(\mathrm{kg})(\mathrm{m/s}) - 2\,(\mathrm{kg})(\mathrm{m/s})}{2\,\mathrm{m/s}} = 4\,\mathrm{kg}$$

Answer: 4 kg

6. [10 points]

(The area of the *F-x* graph) = (the work done on the object).

$$\therefore\ W = \int_0^{10\,\mathrm{m}} F dx = 5\,\mathrm{J}.$$

By the work-kinetic energy theorem, $W = \frac{1}{2}m(v_2^2 - v_1^2)$.

Since m = 0.5 kg, v_1= 4.0 m/s,

$$5\,\mathrm{J} = \frac{1}{2} \times 0.5\,\mathrm{kg} \times (v_2^2 - (4.0\,\mathrm{m/s})^2)$$

Therefore, the speed at x = 10 m, v_2=6 m/s.

Answer: 6 m/s