This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 03
FEB2023

Do NOT write in this box. Your MARK will be placed here.

Subject :	Physics	
Class :	12SE	
Teacher :	Mr. Ali Moukalled	
Duration :	1 hour	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

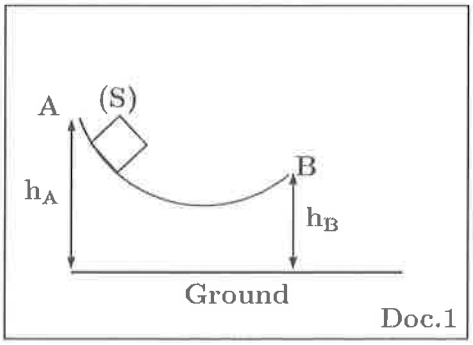
EXERCISE 1 (7points)

Motion on two different ramps

A block (S), considered as a particle of mass $\mathbf{m = 0.5kg}$, is released from point A at a height $\mathbf{h_A = 3.25m}$ above the ground. (S) slides without friction along a ramp AB, and it reaches point B situated at a height $\mathbf{h_B = 2m}$ with a speed $\mathbf{V_B}$.
Take:

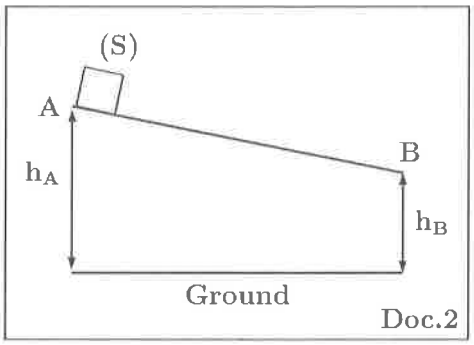
- the ground as a reference level for the gravitational potential energy of the system [(S), Earth].
- $\mathbf{g = 10m/s^2}$.

1. **First Case: Curved Ramp**
   (S) is released from rest from the top A of a curved ramp AB as shown in document 1.
   (a) Calculate the values of the gravitational potential energy of the system [(S), Earth] at A and B.
   (b) Deduce that the value of the mechanical energy of the system [(S), Earth] at A is $\mathbf{ME_A = 16.25J}$.
   (c) Determine the value of the kinetic energy $\mathbf{KE_B}$ of (S) at point B by applying the conservation of the mechanical energy for the system [(S), Earth].
   (d) Show that the speed of (S) at B is $\mathbf{V_B = 5m/s}$.



Doc.1

2. **Second Case: Plane Ramp**
   (S) is released from rest from the top A of a plane ramp AB as shown in document 2.
   Choose the correct answer. Justify your answer without calculation.
   (a) The speed of (S) at B is $\mathbf{V_B < 5m/s}$.
   (b) The speed of (S) at B is $\mathbf{V_B = 5m/s}$.
   (c) The speed of (S) at B is $\mathbf{V_B > 5m/s}$.



Doc.2

EXERCISE 2 (7points)

Hydroelectric Power Plant

Read carefully the below selection and then answer the questions:
Heat from the Sun turns water into water vapor thus forming clouds. The water vapor of the clouds turns into water as rains falls. Water stored in mountain lakes or behind dams is directed at the blades of huge turbines in order to produce electricity in hydroelectric power plants. Some countries like Norway have many natural lakes high in the mountains. In other countries rivers have to be dammed.

Questions

1. Pick out from the above selection:

(a) the source of energy used in hydroelectric power plants;

(b) the statement that shows the transformation of mechanical energy into electrical energy.

2. Name two sources of energy, one renewable and one non-renewable.
3. Electricity is a secondary source of energy. Why?
4. Some electric power plants in Lebanon are hydroelectric.
   (a) Name one of these power plants.
   (b) Write two advantages of hydroelectric power plants.
5. The efficiency of a hydroelectric power plant is: $\mathbf{r} = \frac{\text{Furnished power}}{\text{Received power}} = \mathbf{0.4}$. The output electric power of this power plant is **100MW**. Calculate the mechanical power received by this power plant.

EXERCISE 3 (6points)

Seeking New Sources of Energy

"Each century is marked with the source of energy that dominates in it. In the $\mathbf{19^{th}}$, the coke (coal) was the main source of energy used by man...
Since the $\mathbf{20^{th}}$ century, coke was gradually replaced by petroleum (easier to be made use of) The consumption of petroleum increased faster after 1940. The will to reduce the consumption of petroleum in many countries was manifested in two ways:

- Research in saving energy...
- Revitalization of the research for new sources of energy or the use of neglected sources of energy that were considered not efficient.

Other than solar, wind and hydraulic energy, scientists are mainly interested in three new sources of energy: nuclear, geothermal and biomass.."

Answer the following questions:

1. (a) According to the text, why was coke replaced by petroleum?
   (b) Each century was marked with the source of energy that dominated in it. What is the source of energy used by man long before the $\mathbf{19^{th}}$ century?
2. Name the sources of energy, mentioned in the text that are:
   (a) Renewable
   (b) Non-renewable
   (c) Fossil
3. Among the sources of energy, some are polluting.
   (a) Name two polluting sources and two non-polluting sources mentioned in the text.
   (b) The polluting sources are of two types. Name these two types. How can they be distinguished?
4. The waste of energy increases the consumption. Give two ways that may help in reducing the wasting energy.
5. The energies mentioned in the text may be converted into electric energy. Choose two of these energies and name the apparatus that may allow this conversion.

GOOD LUCK

SE03: 12 SE Solution

Exercise 1

$m = 0.5\,kg$ $\quad h_B = 2m$

$h_A = 3.25m$ $\quad g = 10m/s^2$

1. First Case: Curved Ramp

$V_A = 0m/s$

a) $G.P.E_A = m \times g \times h_A$

$= 0.5 \times 10 \times 3.25$

$= 16.25\,J$ (1) $\quad G.P.E_A = 16.25\,J$

$G.P.E_B = m \times g \times h_B$

$= 0.5 \times 10 \times 2$

$= 10\,J$ (1) $\quad G.P.E_B = 10\,J$

b) $M.E_A = K.E_A + G.P.E_A$

$= 0 + 16.25$

$= 16.25\,J$ (1) $\quad M.E_A = 16.25\,J$

c) In the absence of M.E (1)

$M.E_A = M.E_B$

$16.25 = K.E_B + G.P.E_B$

$16.25 = K.E_B + 10$

$K.E_B = 16.25 - 10$

$= 6.25\,J$ (1) $\quad K.E_B = 6.25\,J$

d) $K.E_B = 6.25$

$\frac{1}{2} m V_B^2 = 6.25$

$\frac{1}{2} (0.5) V_B^2 = 6.25$ (1)

$V_B^2 = 25$

$V_B = 5m/s$ (1)

2. Second Case : Plane Ramp

(b) $V_B = 5 m/s$ (1)

In both cases, the mechanical energy does not change and the gravitational potential energy remains the same (same height). So, the kinetic energy is the same, hence V_B is the same in both cases.

Exercise 2

1) a) Falling water (1)

b) Water stored in mountain lakes or behind dams is directed at the blades of huge turbines in order to produce electricity. (1)

2) Renewable source: Sun. Wind. Waves. Tides

Non-Renewable source: Nuclear Fuel - Fossil Fuels (1)

3) Because electricity is generated from a primary energy source (1)

4)

4.1) Markaba

Charles Helou (1)

Nahr Ibrahim

4.2) - Water is a non-polluting energy source.

- water is a renewable source of energy. (1)
- Water is available in many areas all over the world.
- Water is inexpensive energy source

5) $r = \frac{\text{Furnished power}}{\text{Recieved power}}$

$0.4 = \frac{100\,MW}{P_{mechanical}}$

$\Rightarrow P_{mechanical} = 250\,MW$ (1)

Exercise 3

1) a) Petroleum has progressively replaced by coal due to the fact that is easier to exploit. (0.5)

b) Long before the 19th century, man has used wood as a main source of energy. (0.5)

2) a) Renewable: Sun, wind, water and geothermal energy. (0.5)

b) Non-Renewable: Coal, petroleum, and the atomic nucleus. (0.5)

c) Fossil: Coal and Petroleum. (0.5)

3) a) The polluting sources: coal and petroleum.
The non-polluting sources: the wind and the Sun. (1)

b) * Pollutants are: Biodegradable
Non-Biodegradable (1)

* Biodegradable: decompose easily in nature.
* Non-Biodegradable: do not decompose or not easily decomposed.

4) Among the means that help reducing the waste of energy: (0.5)
- The control of the abused usage in water and electricty
- Urging the public use of transportation

5) Solar energy using photocell.
hydraulic energy using hydroelectric turbine alternator. (1)