وزارة التربية والتعليم العالي
المديرية العامّة للتربية
دائرة الامتحانات الرسميّة

امتحانات الشهادة الثانوية العامة
فرعا: الاجتماع والاقتصاد والآداب والإنسانيات

دورة العام ٢٠٢٣ العاديّة
الخميس ١٣ تموز ٢٠٢٣

مسابقة في الثقافة العلمية: مادة الفيزياء
المدة: ساعة واحدة

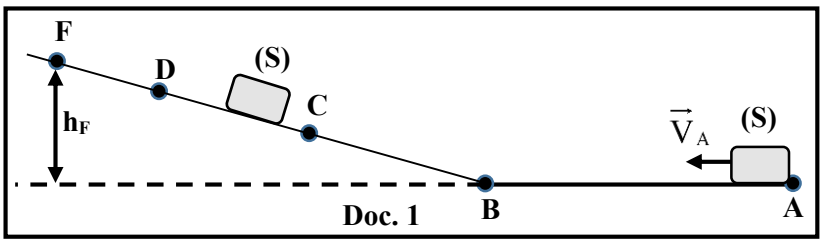
الاسم:
الرقم:

This exam is formed of three obligatory exercises in two pages.
The use of non-programmable calculator is recommended.

Exercise 1 (7 pts)

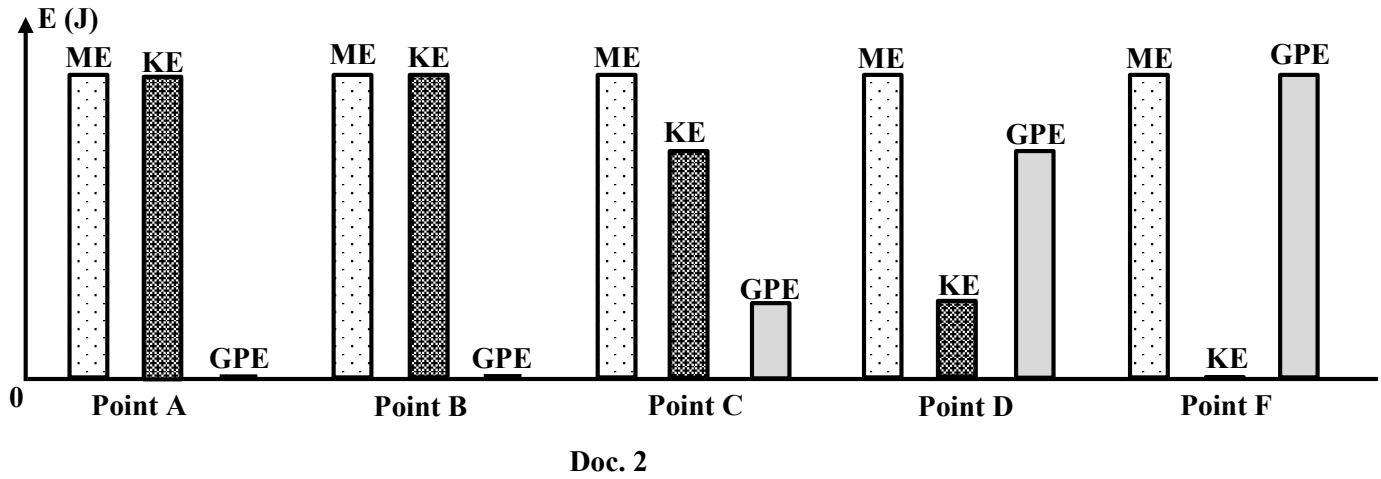
Mechanical energy

An object (S), considered as a particle of mass m = 500 g, moves on the track ABF situated in a vertical plane. (S) is launched from point A with a horizontal velocity $\overrightarrow{V_A}$ of magnitude $V_A = 6$ m/s (Doc. 1).
(S) moves on the horizontal part AB of the track, and then moves on the inclined part and passes through points C, D and F.
Take: g = 10 m/s^2.



Doc. 1

The bar graph of document 2, shows the kinetic energy KE of (S), the mechanical energy ME and the gravitational potential energy GPE of the system [(S), Earth] at A, B, C, D and F.



Doc. 2

1) Calculate the kinetic energy KE_A of (S) at A.
2) Referring to document 2, show that the horizontal plane containing (AB) is taken as a reference level for the gravitational potential energy of the system [(S), Earth].
3) Deduce the value of the mechanical energy ME_A of the system [(S), Earth] at A.
4) Using document 2, show that:
4.1) the motion of (S) along the track ABF takes place without friction;
4.2) the speed V_C of (S) at C is greater than the speed V_D of (S) at D;
4.3) point F is the highest point reached by (S) on the inclined plane.
5) Determine, by applying the principle of conservation of mechanical energy of the system [(S), Earth] the height h_F, of point F, reached by (S).

Exercise 2 (6 pts) Energy

Read carefully the selection of document 3 and then answer the questions.

"Stored in objects, molecules, atoms, energy appears in many ways. Whether it is kinetic, thermal, chemical, radiant… energy can be converted from one form to another. Chemical energy is the energy associated with the bonds between the atoms that make up the molecules.
During combustion, oil, gas, coal or biomass convert their chemical energy into thermal energy and often into light energy. In batteries, the electrochemical reactions that take place produce electricity."

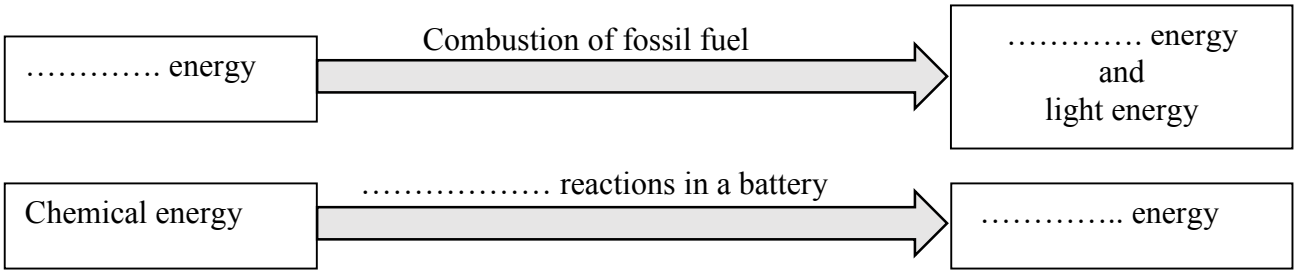
Doc. 3 https://www.planete-energies.com

Questions

1) The text of document 3 mentions many forms of energy.
- **1.1)** Pick out three forms of these energies.
- **1.2)** Name two forms of energy that are not mentioned in the document.

2) Pick out from document 3 the definition of chemical energy.

3) Copy and then complete, using document 3, the following energy conversions.



Exercise 3 (7 pts) Wind turbines

Read carefully the selection of document 4 and then answer the questions.

"The impact of human activity on the global environment endangers the survival of the biosphere* and future generations. Global warming proves this endanger, year after year with rising water due to melting ice.
The use of renewable energies is one of the main solutions to this problem. Wind is one of the cleanest sources of energy… In Lebanon, wind turbines have really been around for a short time. Certainly the wind energy could not in any way provide the needs of electricity for Lebanon till now. But wind turbines respect nature, nothing ejected from it, this advantage cannot be ignored."

* biosphere: all living organisms and their habitats **Doc. 4**

Questions

1) Document 4 mentions the impact of human activity on the environment. Give two human activities that have bad impact on the environment.

2) Global warming is caused by the increase of greenhouse gases in the atmosphere.
- **2.1)** Name the main gas responsible for the greenhouse effect.
- **2.2)** Draw out from document 4 one of the consequences of global warming.
- **2.3)** Pick out from document 4 the sentence that gives a solution to face global warming.

3) Wind turbines, which are mentioned in document 4, use a renewable source of energy.
- **3.1)** Name the source of energy used by wind turbines.
- **3.2)** Draw out from document 4, one disadvantage and one advantage of wind turbines in the production of electrical energy.
- **3.3)** A wind farm, project on the peaks of the Akroum-Akkar mountain, can produce an electrical energy of 142.5×10^6 J every second. Assuming that a home consumes an average of 950 J of electrical energy every second, calculate the number of homes that the energy produced by this wind farm can meet their electrical energy needs.

مسابقة في الثقافة العلمية: مادة الفيزياء
اسس التصحيح - إنكليزي

Part	Exercise 1 (7 pts) Mechanical energy	Note
1	$KE_A = \frac{1}{2} m\ V_A^2 = \frac{1}{2} \times 0.5 \times 6^2 = 9$ J	1
2	$GPE_A = GPE_B = 0$ J So the horizontal plane containing (AB) is the reference level of the GPE	1
3	$ME_A = KE_A + GPE_A = 9 + 0 = 9$ J	1
4.1	The mechanical energy is the same at A, B, C, D and F , hence there is no friction.	1
4.2	$KE_C > KE_D$ so $\frac{1}{2} m\ V_C^2 > \frac{1}{2} m\ V_D^2$, hence $V_C > V_D$	1
4.3	At point F, GPE_F is the maximum, $GPE_F = m.g.h_F$; then h_F is the maximum. **Or** : $KE_F = 0$ J so $\frac{1}{2} m\ V_F^2 = 0$ Hence, the speed at F is zero , so F is the highest point reached by (S) on the inclined plane.	1
5	$ME_A = ME_F$ $9 = GPE_F + KE_F = GPE_F + 0$ $9 = m.g.h_F$; $9 = 0.5 \times 10 \times h_F$, hence $h_F = 1.8$ m	1

Part	Exercise 2 (6 pts) Energy	Note
1.1	Kinetic energy /Thermal energy / Chemical energy/Radiant energy/ Electrical energy	1.5
1.2	Gravitational potential energy / Nuclear energy	1
2	Chemical energy is the energy associated with the bonds between the atoms that make up the molecules.	1.5
3	Chemical energy → (Combustion of fossil fuel) → Thermal energy, light energy Chemical energy → (Electrochemical reactions in a battery) → Electrical energy	2

Part	Exercise 3 (7 pts) Wind turbines	Note
1	Deforestation / Industries / transportation	1
2.1	Carbon dioxide	0.5
2.2	Rising water due to melting ice.	1
2.3	The use of renewable sources of energy is one of the main solution to this problem.	1
3.1	Wind	0.5
3.2	Disadvantage: Certainly the wind energy could not in any way provide the needs of electricity of Lebanon till now. Advantage: respect nature, nothing ejected from it/Wind is one of the cleanest sources of energy	1 1
3.3	$N = 142.5 \times 10^6 / 950 = 150\ 000$ homes	1