BIOLOGY

1. Cells store energy when:
   A. they break down sucrose to glucose and fructose
   B. the third phosphate group breaks off from an ATP molecule
   C. a third phosphate group is bonded to an ATP molecule
   D. ions are released into the bloodstream

2. Organisms that do not use oxygen and die in the presence of oxygen are called:
   A. obligate aerobes
   B. facultative aerobes
   C. obligate anaerobes
   D. facultative anaerobes

3. Which vector and pathogen are correct?
   A. mosquito — sleeping sickness
   B. tick — Chagas disease
   C. mosquito — malaria
   D. fly — Lyme disease

4. Ovulation is a process where:
   A. sperm are ejected from the penis
   B. an egg is produced and brought to maturity
   C. a zygote implants on the uterine wall
   D. an egg is released from the ovary

CHEMISTRY

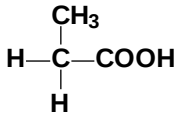
1. Reaction between butene and chlorine is:

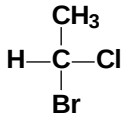
   A. Addition;
   B. Condensation;
   C. Polimerisation;
   D. Free radical substitution.

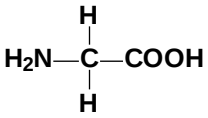
2. How many hydrogen atoms are contained in one mole of ethanol, C2H5OH?

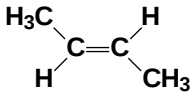
   A. 5;
   B. 6;
   C. 1.0×10^{23};
   D. 3.6×10^{24}.

3. Which one of the following molecules exhibits optical activity?

   A. 

   B. 

   C. 

   D. 

4. The subatomic particles fund in the nucleus of atom are:

   A. neutrons and electrons;
   B. electrons and protons;
   C. protons and neutrons;
   D. β-particles and protons.

PHYSICS

1. An image given by a convex (diverging) mirror is always:

   A. real, upright, magnified
   B. virtual, upright, diminished
   C. real, inverted, magnified
   D. virtual, inverted, diminished

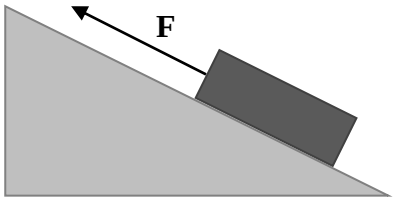
2. Calculate acceleration due to gravity at the surface of Mars (g_M).

   Data: $G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$,
   radius of Mars: $R_M = 3.4 \times 10^6$ m,
   mass of Mars: $m_M = 6.42 \times 10^{23}$ kg

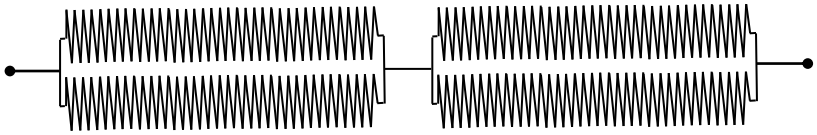
   A. $g_M = 3.7\ m/s^2$
   B. $g_M = 8.7\ m/s^2$
   C. $g_M = 10.7\ m/s^2$
   D. $g_M = 8.9\ m/s^2$

3. A brick of mass m = 1 kg is placed on an inclined plane that makes an angle of 30° with the horizontal (see the figure below). The static and kinetic friction coefficients between the brick and the plane are: fst=0.50, fk=0.45. The values of force F applied to the brick which is at rest are: 1N, 5N or 9N. The body remains at rest: (hint: g = 10 m/s2)

   A. only when F = 1 N
   B. only when F = 5 N
   C. only when F = 9 N
   D. for all three values of applied force



4. The force constant of a single spring that obeys the Hook law is k. The effective force constant of the springs system shown in the figure, composed of four identical springs joined by rigid elements is:



A. k B. 2·k C. 3·k D. 4·k