

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

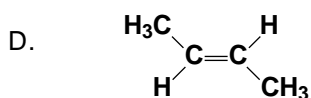
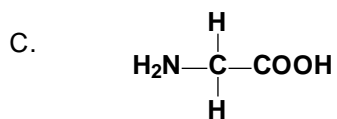
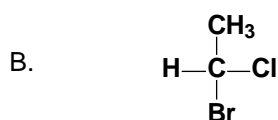
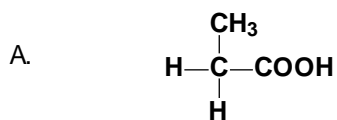
1. Reaction between butene and chlorine is:

- A. Addition;
- B. Condensation;
- C. Polymerisation;
- 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?



4. The subatomic particles found 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

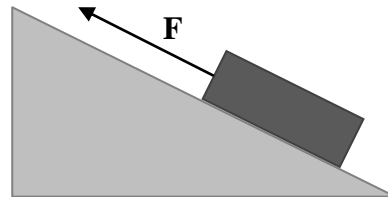
2. Calculate acceleration due to gravity at the surface of Mars (g_M).

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

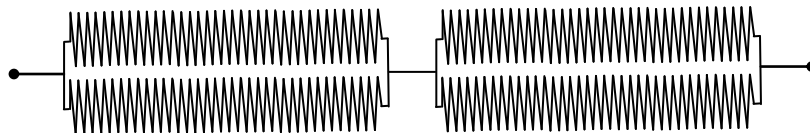
- A. $g_M = 3.7 \text{ m/s}^2$
- B. $g_M = 8.7 \text{ m/s}^2$
- C. $g_M = 10.7 \text{ m/s}^2$
- D. $g_M = 8.9 \text{ m/s}^2$

3. A brick of mass $m = 1 \text{ kg}$ 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: $f_{st}=0.50$, $f_k=0.45$. The values of force F applied to the brick which is at rest are: 1N, 5N or 9N. The body remains at rest:
(hint: $g = 10 \text{ m/s}^2$)

- A. only when $F = 1 \text{ N}$
- B. only when $F = 5 \text{ N}$
- C. only when $F = 9 \text{ N}$
- 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. $2\cdot k$
- C. $3\cdot k$
- D. $4\cdot k$

