

Chemistry

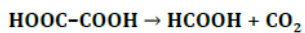
1. Choose the correct equation for formation of lead chloride from lead nitrate:

- A) $\text{Pb}^{2+} + 2 \text{Cl}^- \rightarrow \text{PbCl}_2$
- b) $\text{PbNO}_3 + \text{Cl}^- + \text{Na}^+ \rightarrow \text{Pb}^+ + \text{NO}_3^- + \text{NaCl}$
- c) $\text{PbNO}_3 + \text{Cl}^- + \text{Na}^+ \rightarrow \text{Pb}^+ + \text{NO}_3^- + \text{Na}^+ + \text{Cl}^-$
- d) $\text{Pb}^+ + \text{NO}_3^- + \text{NaCl} \rightarrow \text{Pb}^+ + \text{NO}_3^- + \text{Na}^+ + \text{Cl}^-$

2. What is the product of hydrogenation of pyridine?

- a) Aminobenzene
- b) Nitrobenzene
- c) Pyrimidine
- D) Piperidine

3. Consider the reaction



An enzyme catalysing this reaction belongs to

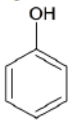
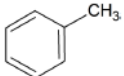
- A) lyases
- b) transferases
- c) ligases
- d) oxidoreductases

4. How many grams of HCl must react with ferrous sulfide to obtain 44.8 liters of sulfane?

$A_r(\text{Cl}) = 35.5$; the reaction proceeds at standard temperature and pressure.

- a) 63 g
- b) 73 g
- c) 126 g
- D) 146 g

5. Which of these compounds most easily cleaves a proton?

- a) $\text{CH}_3\text{-OH}$
- b) $\text{H}_3\text{C-CH}_2\text{-OH}$
- c) 
- d) 

Biology

1. **Water eutrophication leads in its final phase to**
 - A) oxygen depletion.
 - b) improvement of water quality.
 - c) increase of nutrient content.
 - d) increase of oxygen content.

2. **Blood pressure in a standing human reaches its minimum in**
 - A) the right atrium.
 - b) skeletal muscle capillaries.
 - c) veins of lower extremities.
 - d) caval veins.

3. **Collateral circulation is able to provide sufficient blood supply in the:**
 - a) brain.
 - b) heart muscle.
 - C) skeletal muscles.
 - d) retina.

4. **What is causing structural chromosome aberrations?**
 - A) DNA double stranded breaks.
 - b) Multiplication of the whole chromosome set.
 - c) Loss of one or more chromosomes.
 - d) Gain of an extra chromosome.

5. **What could be said about human hemophilia A?**
 - a) It leads to a hypercoagulation state.
 - b) The molecular cause is an atypical hemoglobin structure.
 - c) It is inherited in gonosomal (X-linked) dominant fashion.
 - D) It can cause severe internal bleeding (e.g. into joints or muscles).

Physics

- To heat an ice cube weighing 10 kg by 10 °C we need to supply 210 kJ of heat.
How much heat do we need to supply to heat 10 kg of water by 5 °C, if the specific heat capacity of water is $4.2 \text{ kJ} \cdot \text{kg}^{-1} \cdot \text{K}^{-1}$?

 - The same amount as to heat the ice cube.
 - Twice as much as to heat the ice cube.
 - Half less than to heat the ice cube.
 - Four times as much as to heat the ice cube.
- The heat supplied to an ideal gas is zero during the

 - isothermal process.
 - isochoric process.
 - isobaric process.
 - adiabatic process.
- Work W performed by applying pressure $p = 40 \text{ kPa}$ of the liquid on a piston with an area of 2000 cm^2 , which has shifted by 50 cm, is

 - $W = 400 \text{ J}$
 - $W = 800 \text{ J}$
 - $W = 4 \text{ kJ}$
 - $W = 40 \text{ kJ}$
- Assuming that v is phase velocity, T period, λ wavelength, and f frequency of mechanical waves, which of the following relationships is correct?

 - $\lambda = v \cdot T$
 - $\lambda = v / T$
 - $\lambda = v \cdot f$
 - $v = \lambda / f$
- To control the power of a nuclear reactor, the control rods are inserted among the fuels cells. In order for regulation to be effective, the control rods should be from

 - carbon
 - cadmium
 - lead
 - copper