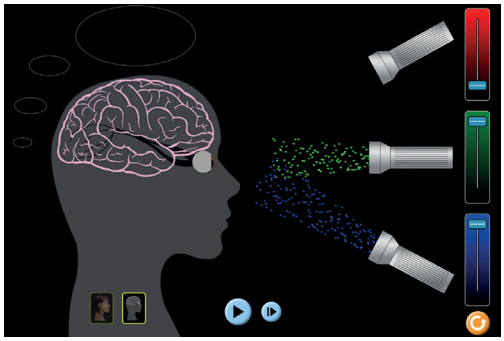


The person in the figure above receives blue and green RGB photons at the same time.

Under the circumstances, which one of the following colours does he perceive?

A)

Magenta

B)

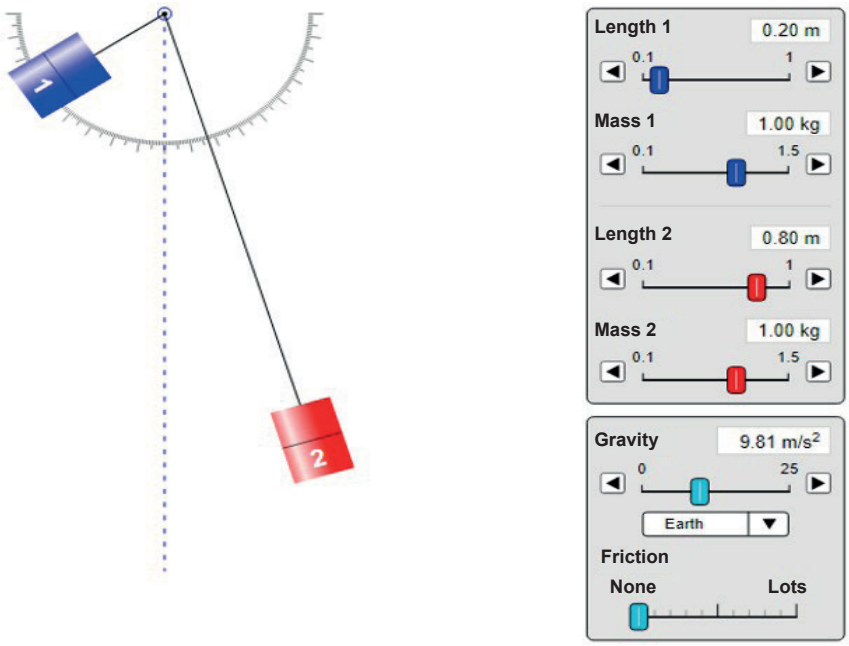
Yellow

C)

Cyan

D)

Red



Brian creates two different pendulums in a simulation. The masses of the blue and red objects are 1 kg each, while the length of the rope of the red object is 80 cm and the length of the rope of the blue object is 20 cm. Brian releases the pendulums at the same time from the same height. An instant picture of the two pendulums swinging is as given in the figure above.

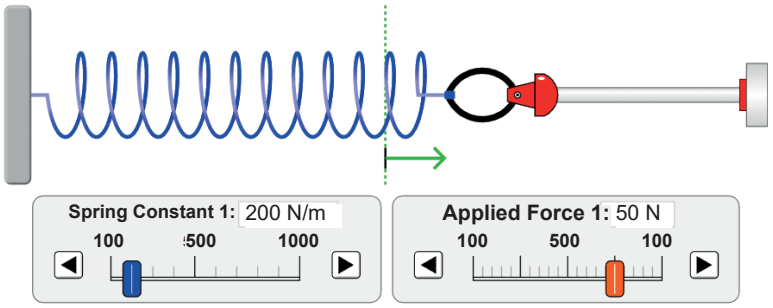
Which of the following is false?

A) During one whole swing of the red object, the blue object does two whole swings.

B) If Brian changes the masses of the objects, their periods do not change.

C) Period of the blue object is four times shorter than the period of the red object.

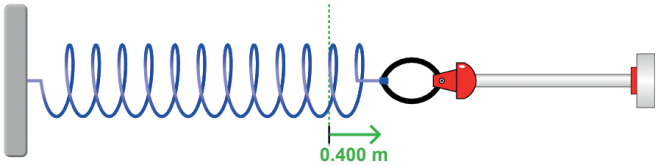
D) If Brian did the same experiment on the moon, the periods of the objects would be longer.



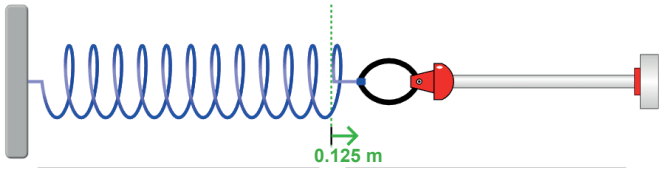
"Hooke's Law is a principle of Physics that states that the force needed to extend or compress a spring by some distance is proportional to that distance."

If a force of 50 N is applied to stretch the spring with a spring constant of 200 N/m, what is the displacement of the spring from the equilibrium position?

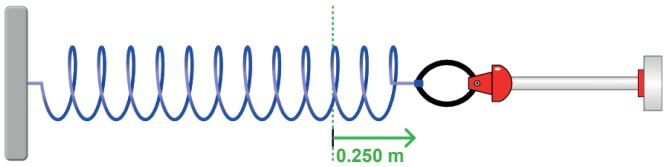
A)



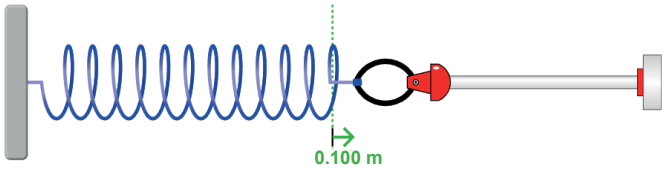
B)

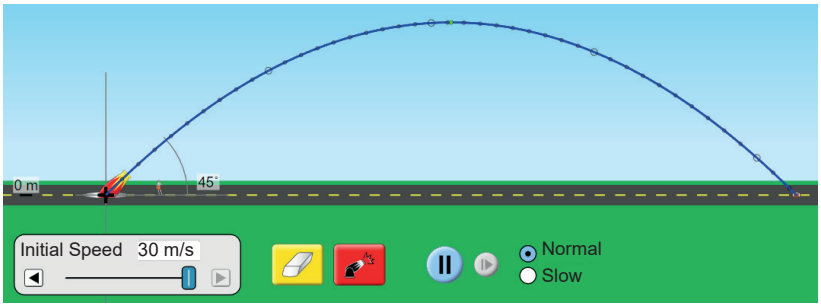


C)



D)

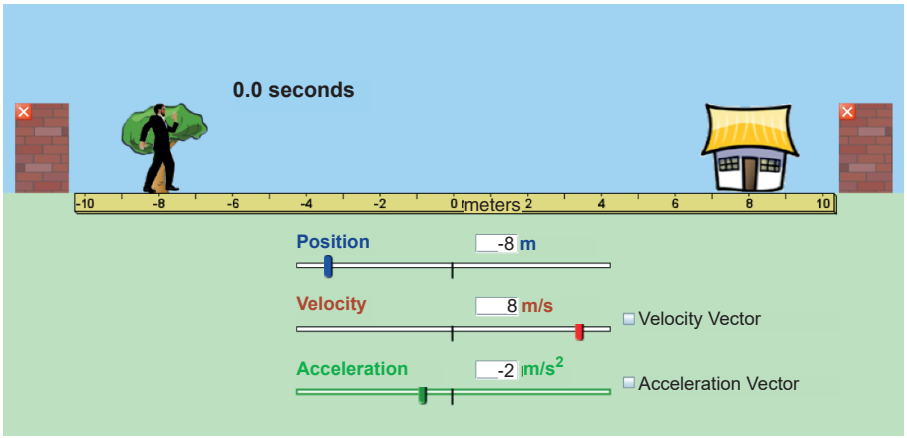




A cannon ball is thrown with an initial speed of 30 m/s and an angle of 45° with horizontal.

Given that air friction is zero, what is the flight time of the cannon ball?
(sin 45°=0.7, cos 45°=0.7 and g=10m/s^2)

A) 4.2 s B) 2.1 s C) 8.4 s D) 1.4 s

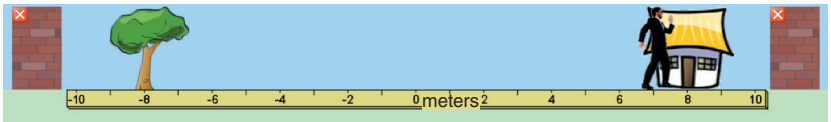


The position, velocity and acceleration of a person is as given in the figure above.

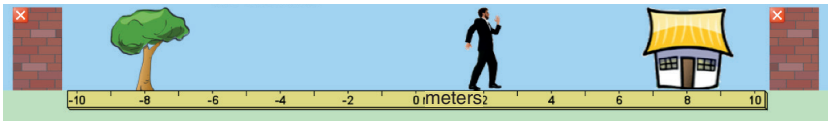
(position: -8 m, velocity: 8 m/s, acceleration: -2 m/s^2)

Where will he be in 3 seconds?

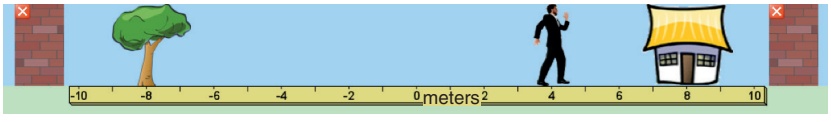
A)



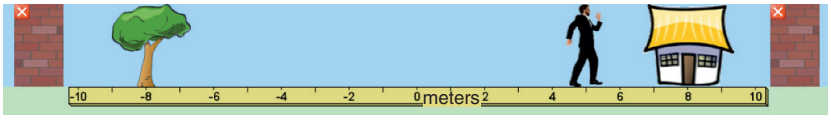
B)

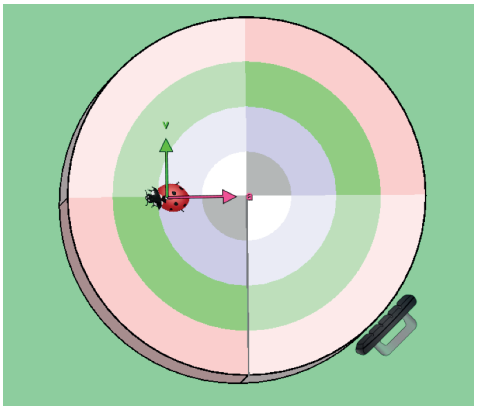


C)



D)





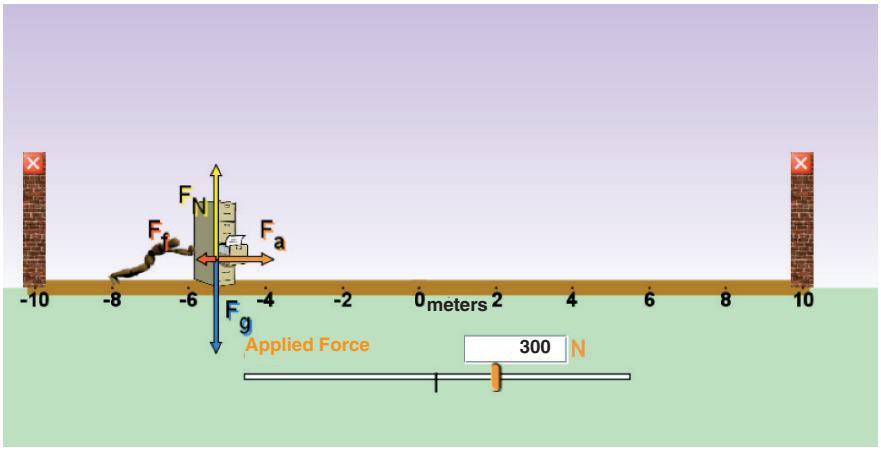
What can we say about the centripetal acceleration of an object moving with uniform circular motion?

A) It is zero.

B) It is circular.

C) It is perpendicular to the plane of the motion.

D) It is directed toward the centre of the motion.



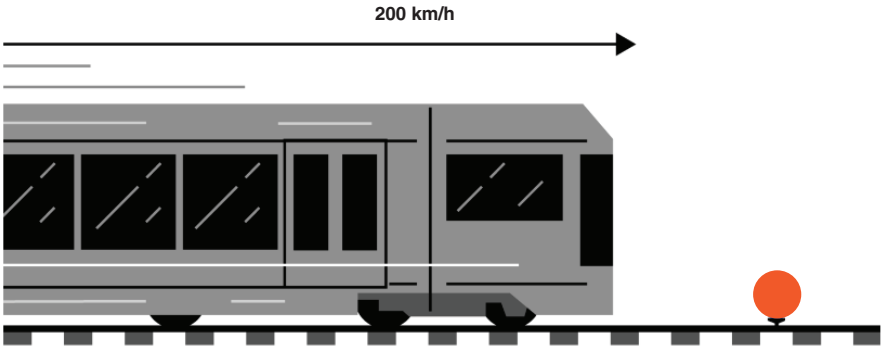
A person applies a force of 300N to a file cabinet of 50 kg and the cabinet starts to move. Given that the coefficient of kinetic friction is 0.2, what is the magnitude of the acceleration acting on the file cabinet?

A) 1 m/s^2

B) 2 m/s^2

C) 4 m/s^2

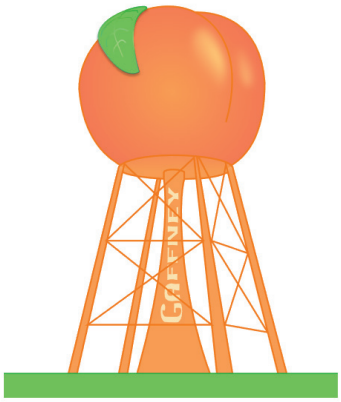
D) 6 m/s^2



A train is moving with a speed of 200 km/h toward a pilates ball sitting on the tracks.

How fast will the ball move, after the ball and the train collide?

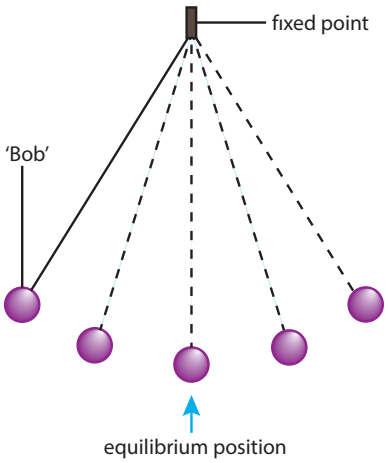
A) 0 km/h
B) 100 km/h
C) 200 km/h
D) 400 km/h



Farmer Benny wants to build a water tower to provide running water for his farm house.

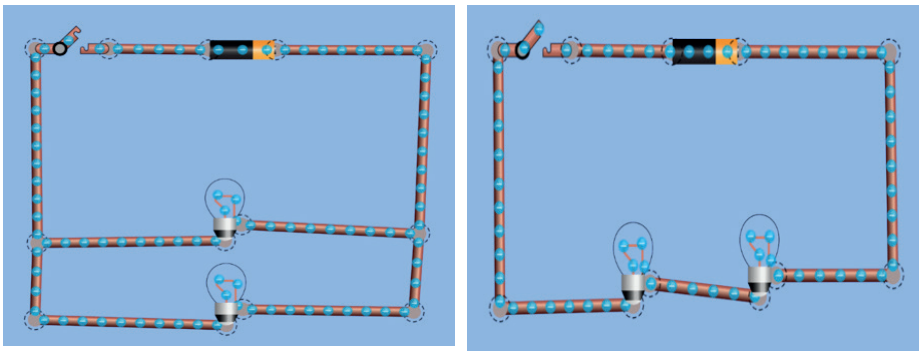
What is the necessary height for the tower so that the pressure of the water is 300 kpa? (d_{water}: 1000 kg/m^3 , g: 10 m/s^2, 1 kpa=1000 pa)

A) 3 m B) 10 m C) 30 m D) 100 m



If a pendulum moves through its equilibrium position once every 2.0 seconds, what is the period (T) of the pendulum?

A) 1 s B) 2 s C) 4 s D) 8 s



Circuit 1 **Circuit 2**

The light bulbs and batteries in the circuits above are identical.

After the circuit switches are closed, which of the following statements is false?

A) The battery of the first circuit depletes sooner.

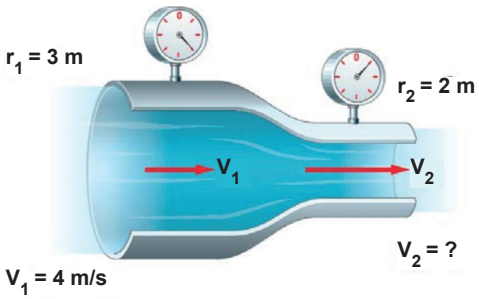
B) The current on the second circuit is higher.

C) The light bulbs on the first circuit are much brighter.

D) The total resistance of the second circuit is greater.

Looking through a glass jar will make an object look smaller and slightly lifted. What is this phenomenon called?

A) Refraction
B) Interference
C) Diffraction
D) Reflection



'Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy.'

A water tunnel has a circular cross section where its radius diminishes from 3 m to 2 m. Given that the velocity of water is 4 m/s in the larger part of the tunnel as shown in the figure above, what is the velocity of the water in the smaller part of the tunnel?

A) 4 m/s
B) 9 m/s
C) 12 m/s
D) 16 m/s

Atoms are overall neutral objects that are made up of positively charged particles called protons, negatively charged particles called electrons, and neutral particles called neutrons.

Look at the chemical reaction below, as an example of dissociation:

$KBr \rightarrow K^+ + Br^-$

Which one(s) of the followings is/are correct?

I. The reactant compound KBr has the same atoms as the products.

II. The total charge has increased after the reaction.

III. The overall amount of charge in a chemical reaction does not change is so important that chemists refer to it as the principle of charge conservation.

IV. Whatever may happen to the K and Br in this reaction, at the end of the day their fundamental identities have not changed, so their respective number of protons must have remained constant.

A) Only I
B) I and II
C) I, III and IV
D) I, II, III and IV

We humans have been conducting one particular type of chemical reaction and have derived both light and energy from it.

Some chemical reactions - like burning fuel - release energy.

$C_8H_{18} + O_2 \rightarrow CO_2 + H_2O$

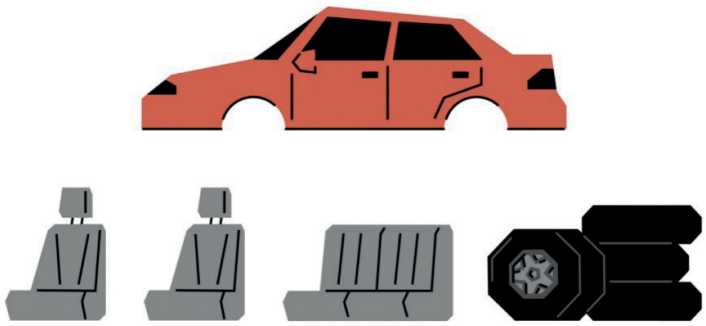
Which of the given statements is incorrect according to the reaction above?

A) When we think of common fuels, one that may come to mind is octane. Octane is a chemical component of gasoline, but many people also use its name to refer to anything that is powerful, intense, or high-energy as in the phrase “high-octane”.

B) Chemists call this reaction combustion, and whether we are talking about burning logs, coal, or oil, this term refers broadly to any reaction in which a substance combines with oxygen to form carbon dioxide and water.

C) The following equation is the complete combustion reaction of octane.

D) All it takes is a spark and oxygen for octane to release energy as heat and light. That energy has to come from somewhere. During combustion it is derived from the particular arrangement of atoms in octane’s molecular structure, much as energy is stored in a battery.



A complete car needs four doors, three mirrors, and one engine.

What will be the total number of hydrogens to build smallest complete primary alcohol molecule?

A) 1 B) 2 C) 3 D) 4

Sodium vapour is used in lamps for street lighting. A mixture of sodium and mercury produces a white light, and is used for bright lighting such as the ones used in sport stadiums.

If Na atom has 11 protons, which of the following is the electron configuration of Na atom?

A) $1s^2\ 2s^2\ 2p^6$
B) $1s^2\ 2s^2\ 2p^6\ 3s^2$
C) $1s^2\ 2s^2\ 2p^6\ 3s^1$
D) $1s^2\ 2s^2\ 2p^5$

sugar alcohol

salt

A substance that ionises in aqueous solution is electrolyte. Some substances do not produce any ions in water, so they are called non-electrolyte.

Which one(s) of the followings is/are non-electrolyte, so they dissolve as molecules in water?

I. Sugar

II. Salt

III. Alcohol

A) I B) III C) I-II D) I-III

A chef buys some groceries to make pickles and fried chicken for his restaurant menu. He bought cooking oil, mineral water, bottle gas (butane) and vinegar.

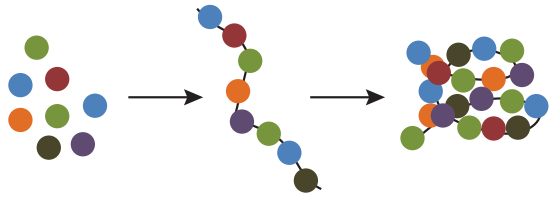
Which of these items is a hydrocarbon?

A) Cooking oil

B) Mineral water

C) Bottle gas

D) Vinegar



Proteins are made up of a chain of amino acids that fold over and around each other. There are twenty different known amino acids, one of which is cysteine. It is believed that when proteins fold, the only bonds that hold the structure together are cysteine-cysteine bonds.

Scientists wanted to find patterns in the cysteine-cysteine bonds so they studied different bonding and folding configurations.

If a short strand of amino acids consists of 10 cysteine amino acids, how many total possible arrangements of 5 cysteine-cysteine bonds are there?

A) 10 B) 32 C) 45 D) 120

Which of the following statements about DNA is NOT correct?

A) All of an organism's DNA forms its genome and is made of a string of nucleotides.

B) An organism's DNA contains instructions for how that organism responds to its environment.

C) An organism's DNA contains blueprints for how to make other cells.

D) All of an organism's DNA contains codes for making proteins.

The life of a cell is usually completely focused on one task. What is this task?

A) Making more cells

B) Nutrition

C) Photosynthesis

D) Creating energy

A knock-out cell study is when a complete gene is removed from a cell's genome. This allows scientists to learn about the specific location of each gene within the genome, the gene sequence that leads to a fully functional cell, and the function of each gene.

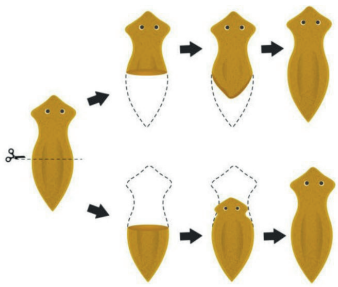
Sometimes, when a gene is knocked out, the cellular function of that gene still works. Why?

A) Important cellular functions often have redundant genes.

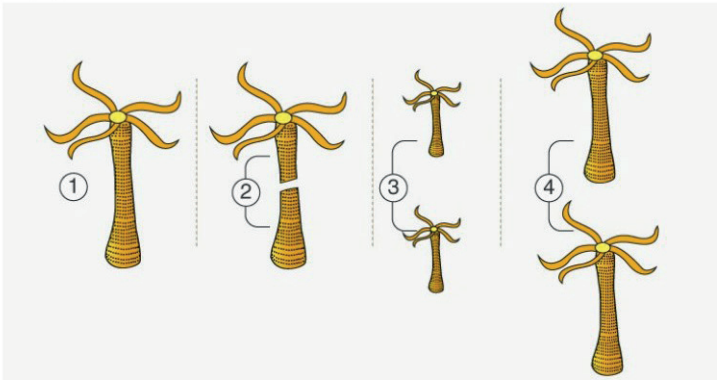
B) Not every cellular function requires a gene.

C) Some cellular functions require multiple genes.

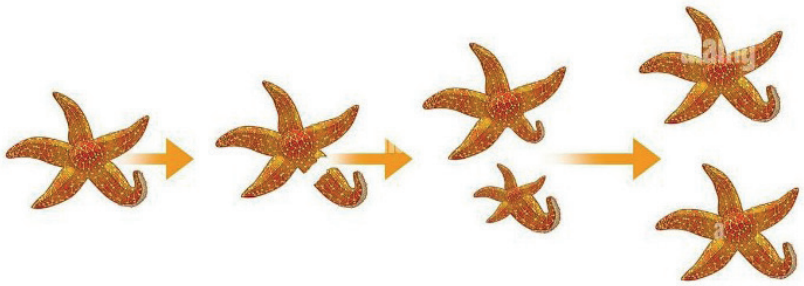
D) After the knock-out, the cell repairs itself and re-builds the gene.



Planarya



Hydra



Starfish

Which type of asexual reproduction regrows part of an animal (ex: hydra, planaria, starfish)

A) Parthenogenesis

B) Regeneration

C) Binary fission

D) Budding

The human nervous system consists of .....

A) the central nervous system and the peripheral nervous system
B) the central nervous system and the somatic nervous system
C) the sympathetic and the parasympathetic nervous systems
D) the autonomic and the somatic nervous systems