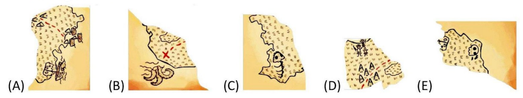
Math

Q: A monkey has torn off a piece of Captain Jack's map. What does the piece the monkey has torn off look like?

<image1>:

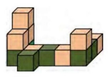
<image2>:



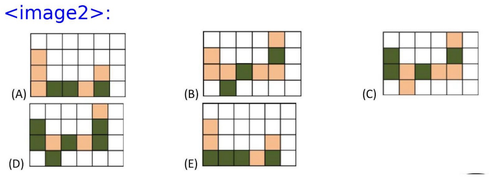
2D Transformation

Q: Janaína made the construction on a grid, using some lighted colored cubes and others darker. Looking from above the construction, what can she see?

<image1>:

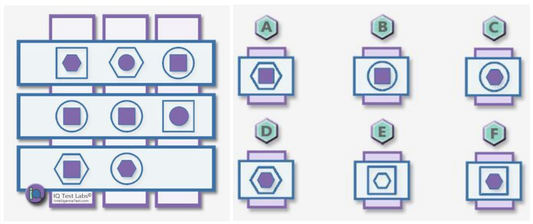


<image2>:



3D Spatial Simulation

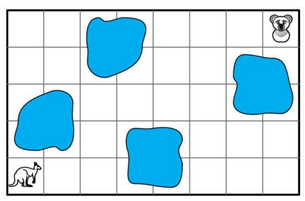
Q: Complete the matrix.



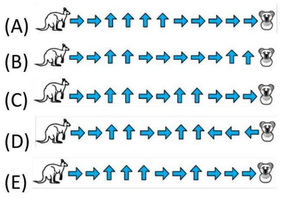
Pattern Inference

Q: The kangaroo wants to visit the koala. On its way it is not allowed to jump through a square with water. Each arrow shows one jump on to a neighbouring field. Which path is the kangaroo allowed to take?

<image1>:

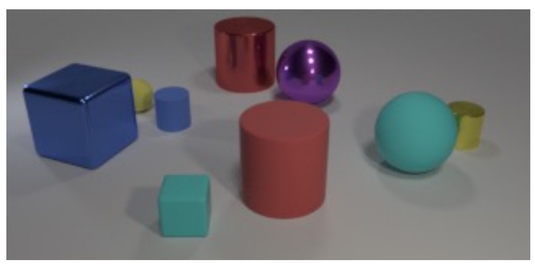


<image2>:



Path Tracing/Change of view simulation

Q: Subtract all large rubber spheres. Subtract all big shiny cylinders. How many objects are left?

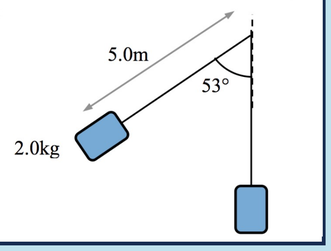


Multi-hop Visual Object Counting

Physics

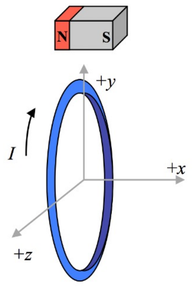
Q: A mass of 2.0 kg is attached to the end of a light cord to make a pendulum 5.0 meters in length. The mass is raised to an angle of $53°$ relative to the vertical, as shown, and released. The speed of the mass at the bottom of its swing is:

a. 60 m/s
b. 7.7 m/s
c. 40 m/s
d. 6.3 m/s
e. 10 m/s



Visual Decomposition Simulation

Q: A long bar magnet is placed above a current loop oriented as shown. In which direction will the North pole of the bar magnet feel a force due to the current loop?

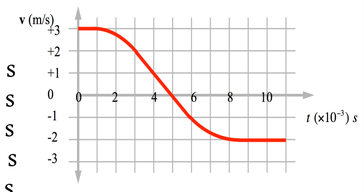


a. +x b. –x c. +y d. -y
e. The bar magnet will feel no force due to the current loop.

3D Field Simulation

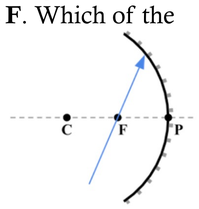
Q: A billiard ball rolling across a table in the **+x** direction at 3 meters per second hits the edge of the table at a perpendicular angle, and bounces back in the **-x** direction, now traveling at 2 meters per second in the opposite direction. The greatest magnitude of acceleration for the billiard ball was at time:

a. $t = 1 \times 10^{-3}$ s
b. $t = 2 \times 10^{-3}$ s
c. $t = 5 \times 10^{-3}$ s
d. $t = 7 \times 10^{-3}$ s
e. $t = 9 \times 10^{-3}$ s

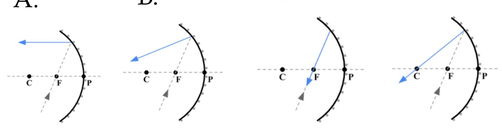


Graph Reasoning

Q: A ray of light is incident on a spherical mirror after passing through its focus **F**. Which of the following diagrams shows the reflected ray correctly? Note: The smooth side is the reflecting part of the mirror, and the dotted side is the back.

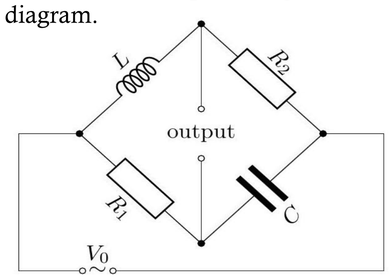


A. B. C. D.



Path Tracing

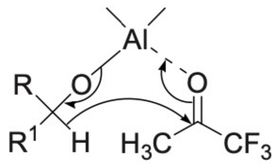
Q: In the circuit shown below, a capacitor $\boldsymbol{C} = 4\mathbf{F}$, inductor $\boldsymbol{L}$=5**H**, and resistors $R_1 = 3\,\Omega$ & $R_2 = 2\,\Omega$ are placed in a diamond-shaped configuration. This circuit is fed with an alternating current of unknown frequency with a peak voltage $V_0 = 1\,\mathrm{V}$. Determine the magnitude of the maximum instantaneous output voltage as shown in the diagram.



A. 0.85
B. 0.65
C. 0.2 V
D. 0.4 V

Multi-hop Visual Reasoning

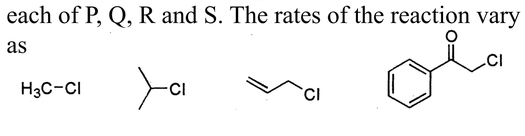
Chemistry



Q: In the transition-state structure shown in the image, calculate the total number of bonds in the structure, including single, double, and triple bonds but excluding those involving hydrogen. Note: Disregard arrows. Consider all components present in the transition-state structure shown in the image.

Knowledge-based Counting

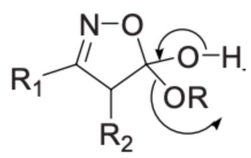
Q: KI in acetone, undergoes S_{N2} reaction with each of P, Q, R and S. The rates of the reaction vary as



P ***Q*** ***R*** ***S***

A. P > Q > R > S B. P > Q > R > S
C. P > R > Q > S D. R > P > S > Q

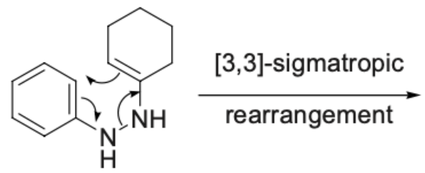
Structure Recognition



Q: An 'arrow-pushing' diagram is a common type of chemical image used to illustrate electron flow in mechanistic steps. Please provide the SMILES expression for the molecule after the electron has been relocated, as depicted in the image.

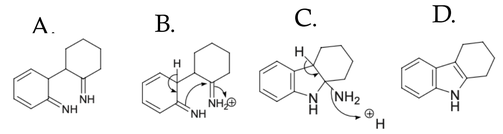
A. [*]C(C1[*])=NOCC1=O B. [*]C(C1[*])=NOC1=O
C. [*]C(C1[*])=NOC1O. D. [*]C(C1[*])=NNC1=O

Reaction Simulation



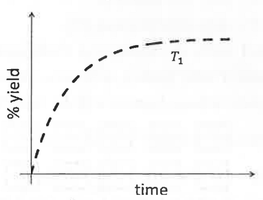
Q: An 'arrow-pushing' diagram is a common type of chemical image used to illustrate electron flow in mechanistic steps. The molecule undergoes changes after the electron has been relocated or reacted. Which of the following options shows the molecule after the change?

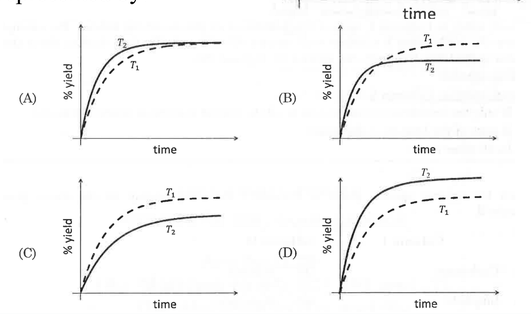
A. B. C. D.



Reaction Simulation-Pro

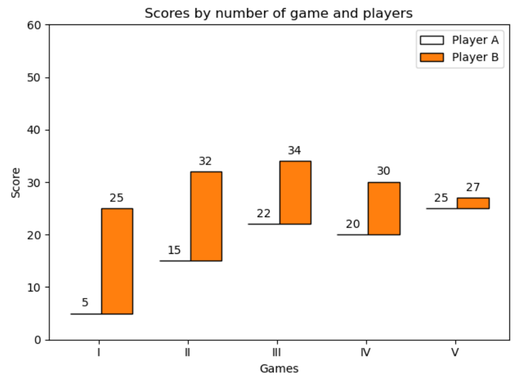
Q: The *%yield* of ammonia as a function of time in the reaction $\mathrm{N_2(g) + 3\,H_2(g) \rightleftharpoons 2\,NH_3(g)}, \quad \Delta H < 0$ at (P, T_1) is given below. If this reaction is conducted at (P, T_2) with $T_2 > T_1$, the *%yield* of ammonia as a function of time is represented by:





Graph Reasoning

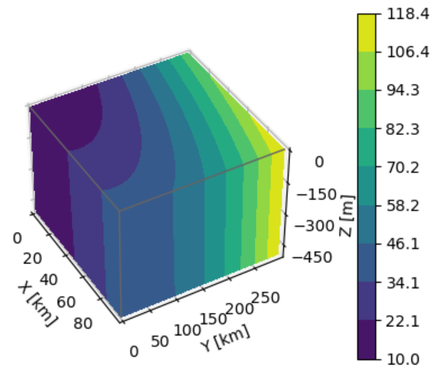
Coding



Q: Which code snippet will generate the visualization shown?

A. </> B. </> C. </> D. </>

Advanced Chart Type

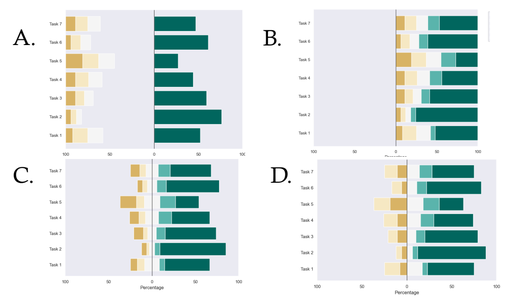


Q: How can we change the code snippet below to create the visualization shown?

A. </> B. </> C. </> D. </>

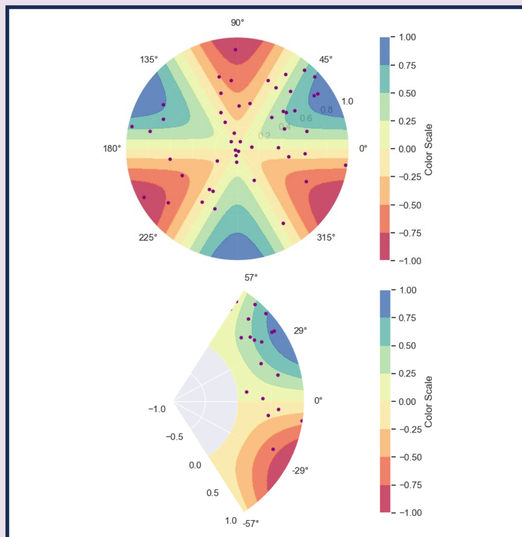
3D

...



Q: Which visualization will the following code snippet generate? </>

Alignment, Orientation, & Position



Q: How can we change the code snippet below, which generates the first image, so that it generates the second image shown? </>

A. </> B. </> C. </> D. </>

Polar coordinates