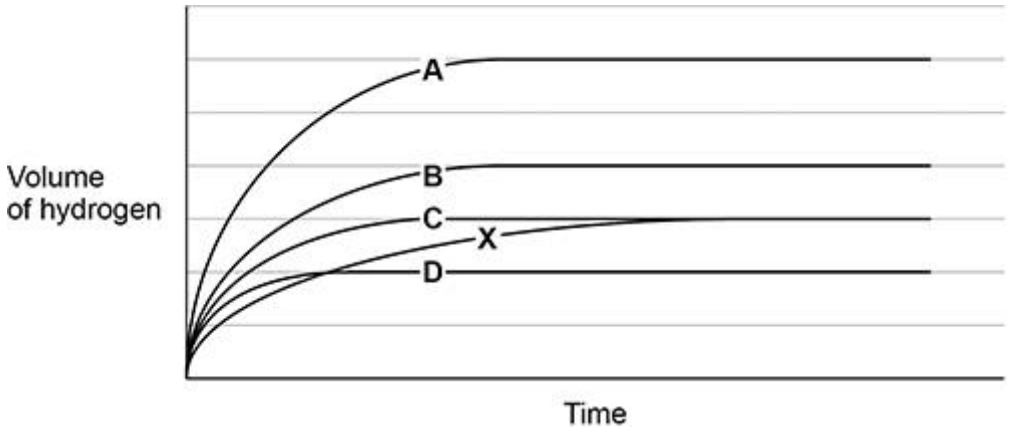
Q1.

An excess of magnesium reacts with hydrochloric acid to form hydrogen gas.

Line **X** on the graph shows how the volume of hydrogen produced changes with time as magnesium reacts with 30 cm^3 of 1.0 mol dm^{-3} hydrochloric acid.

The reaction is repeated using 20 cm^3 of 2.0 mol dm^{-3} hydrochloric acid, with all other conditions the same.

Which line shows how the volume of hydrogen produced changes with time?



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q2.

A mixture of 2 dm^3 of hydrogen and 1 dm^3 of oxygen is at room temperature.

Which statement is correct?

A There is no reaction to form water because the molecules do not collide with sufficient energy. ⬭

B There is no reaction to form water because the molecules do not collide with sufficient frequency. ⬭

C The mean velocity of the hydrogen molecules is less than that of the oxygen molecules. ⬭

D The partial pressure of each gas is the same. ⬭

(Total 1 mark)

Q3.

Which statement about the molecules in a sample of a gas is correct?

A At a given temperature they all move at the same speed. ⬭

B At a given temperature their average kinetic energy is constant. ⬭

C As temperature increases, there are more molecules with the most probable energy. ⬭

D As temperature decreases, there are fewer molecules with the mean energy. ⬭

(Total 1 mark)

Q4.

Which statement is correct for the distribution curve of molecular energies in a gas?

A The curve is symmetrical about the maximum. ⬭

B There are always some molecules with zero energy. ⬭

C The position of the maximum of the curve is not dependent on the temperature. ⬭

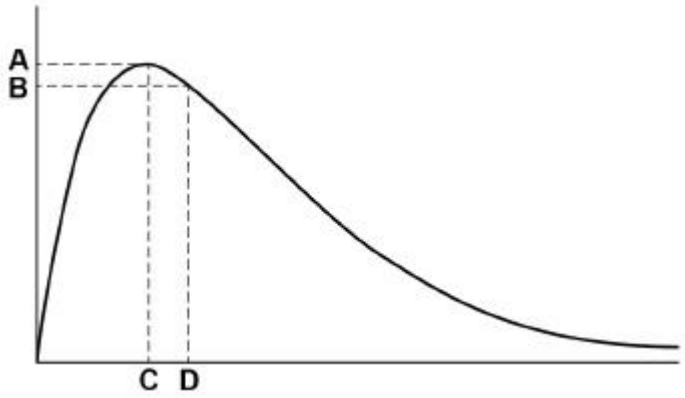
D The mean energy of the molecules is greater than the most probable energy of the molecules. ⬭

(Total 1 mark)

Q5.

The Maxwell–Boltzmann distribution of molecular energies in a sample of gas at a fixed temperature is shown.

Which letter represents the mean energy of the molecules?



A ⬭

B ⬭

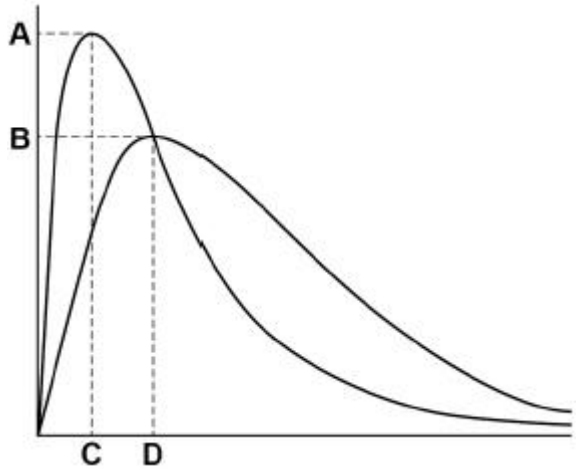
C ⬭

D ⬭

(Total 1 mark)

Q6.

The diagram shows the Maxwell−Boltzmann distribution of molecular energies in a gas at two different temperatures.



Which letter represents the most probable energy of the molecules at the higher temperature?

A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

Q7.

Which statement about the distribution curve of molecular energies in an ideal gas at a given temperature is correct?

A There are no molecules with zero energy. ⬭

B The curve is symmetrical about the maximum. ⬭

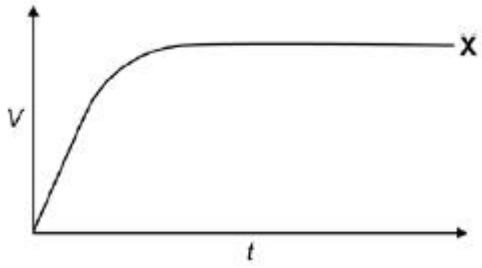
C Changing the temperature has no effect on the position of the maximum. ⬭

D Most molecules have the mean energy. ⬭

(Total 1 mark)

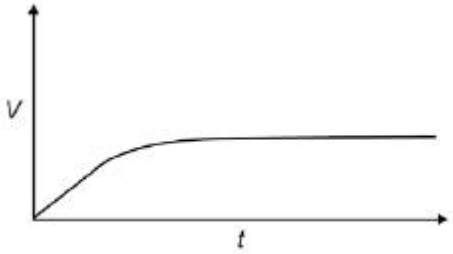
Q8.

Line **X** in the diagram represents the volume (V) of gas formed with time (t) in a reaction between an excess of magnesium and aqueous sulfuric acid.

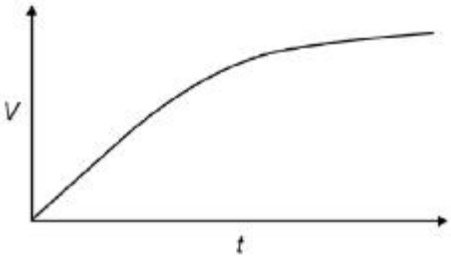


Which line represents the volume of hydrogen formed, at the same temperature and pressure, when the concentration of sulfuric acid has been halved?

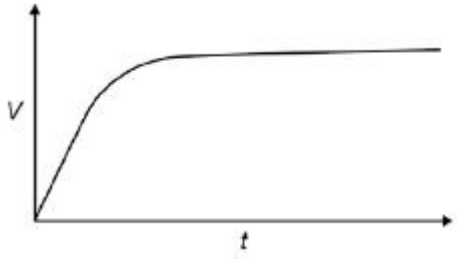
A



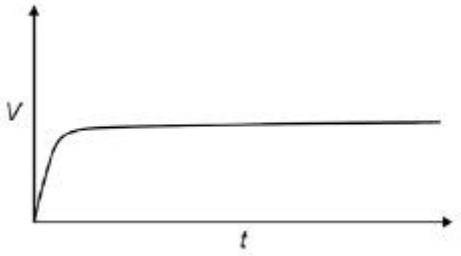
B



C



D

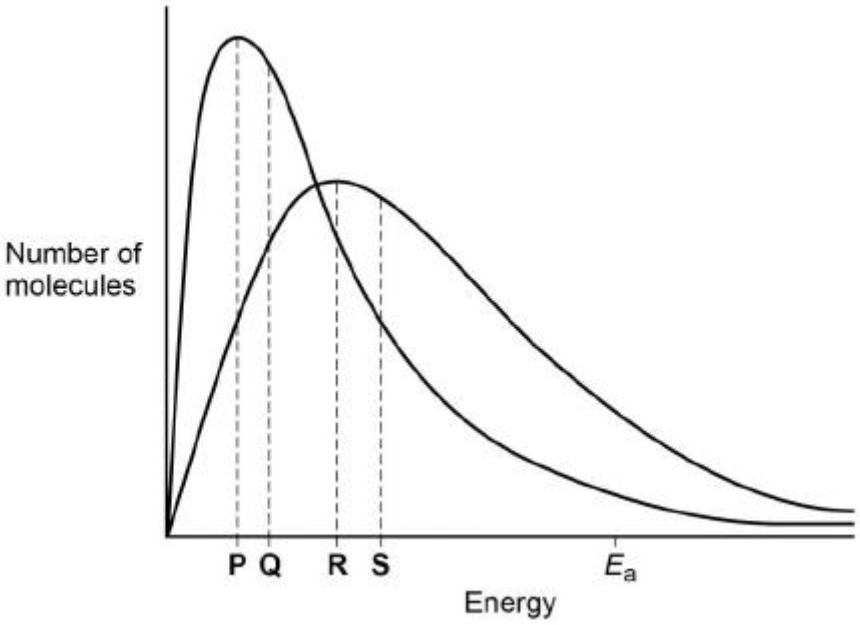


○

(Total 1 mark)

Q9.

The question below is about the Maxwell–Boltzmann distribution shown for a sample of a gas, X, at two different temperatures.



Which letter shows the mean energy of the molecules at the higher temperature?

A P ○

B Q ○

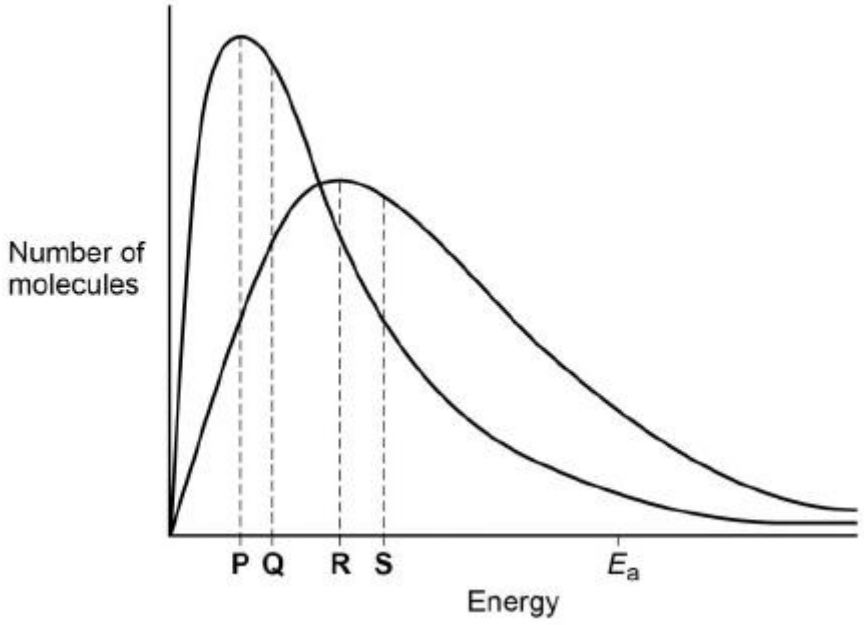
C R ○

D S ○

(Total 1 mark)

Q10.

The question below is about the Maxwell–Boltzmann distribution shown for a sample of a gas, X, at two different temperatures.



Which statement is correct for the higher temperature?

A The area under the curve to the left of E_a decreases. ⬭

B The total area under the curve increases. ⬭

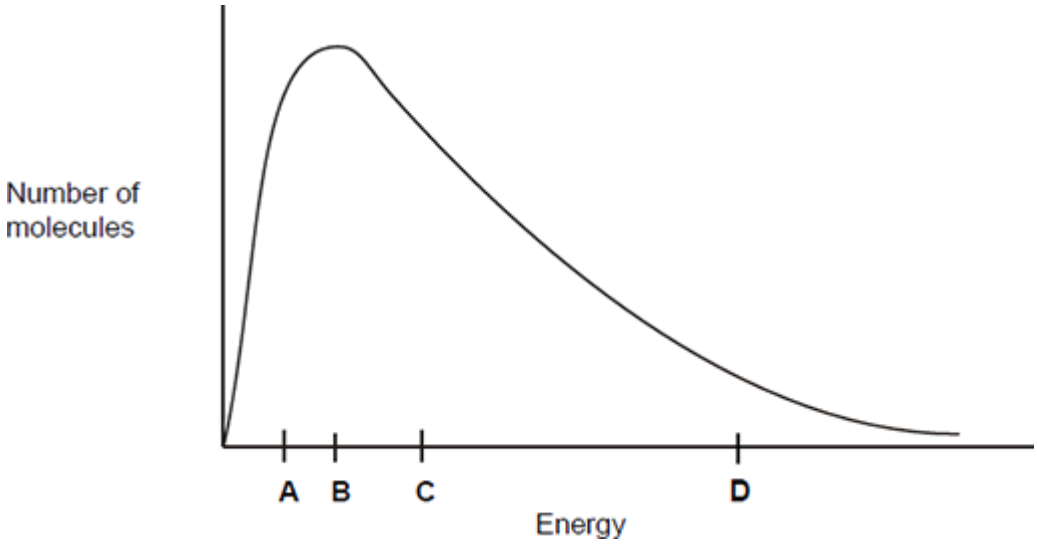
C The activation energy decreases. ⬭

D More molecules have the mean energy. ⬭

(Total 1 mark)

Q11.

This question is about the Maxwell–Boltzmann distribution of molecular energies in a sample of a gas shown in the figure below.



Which letter best represents the mean energy of the molecules?

A ⬭

B ⬭

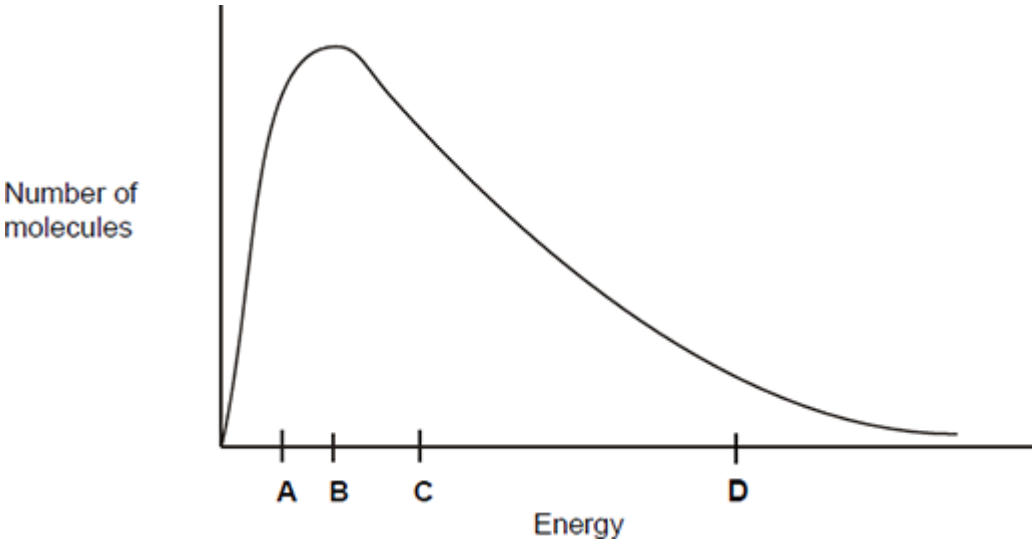
C ⬭

D ⬭

(Total 1 mark)

Q12.

This question is about the Maxwell–Boltzmann distribution of molecular energies in a sample of a gas shown in the following figure.



What does the area under the curve represent?

A The total energy of the particles. ⬭

B The total number of particles. ⬭

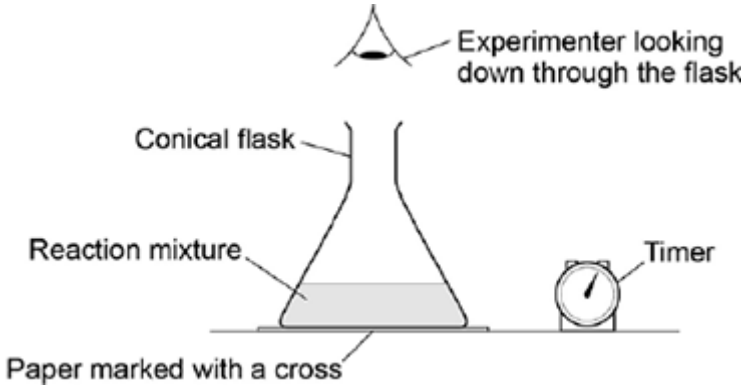
C The number of particles that can react with each other. ⬭

D The total number of particles that have activation energy. ⬭

(Total 1 mark)

Q13.

The apparatus in the figure below was set up to measure the time taken for 20.0 cm^3 of sodium thiosulfate solution to react with 5.0 cm^3 of hydrochloric acid in a 100 cm^3 conical flask at 20 °C. The timer was started when the sodium thiosulfate solution was added to the acid in the flask. The timer was stopped when it was no longer possible to see the cross on the paper.



What is likely to decrease the accuracy of the experiment?

A Rinsing the flask with acid before each new experiment. ⬭

B Stirring the solution throughout each experiment. ⬭

C Using the same piece of paper for each experiment. ⬭

D Using different measuring cylinders to measure the volumes of acid and sodium thiosulfate. ⬭

(Total 1 mark)

Q14.

The experiment was repeated at 20 °C using a 250 cm^3 conical flask.

Which statement is correct about the time taken for the cross to disappear when using the larger conical flask?

A The time taken will **not** be affected by using the larger conical flask. ⬭

B The time taken will be decreased by using the larger conical flask. ⬭

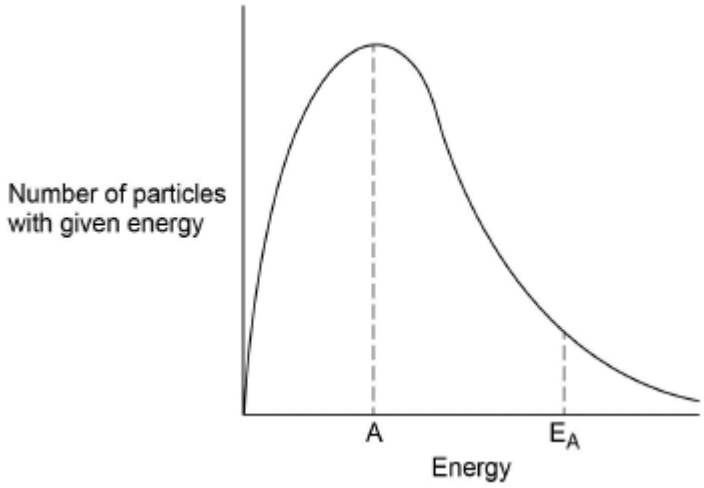
C The time taken will be increased by using the larger conical flask. ⬭

D It is impossible to predict how the time taken will be affected by using the larger conical flask. ⬭

(Total 1 mark)

Q15.

The graph below shows a typical energy distribution for particles of an ideal gas in a sealed container at a fixed temperature.



Which of the following statements is true?

A Position A represents the mean energy of a molecule in the container. ⬭

B Addition of a catalyst moves the position of E_A to the right. ⬭

C The area under the curve to the right of E_A represents the number of molecules with enough energy to react. ⬭

D The position of the peak of the curve at a higher temperature is further away from both axes. ⬭

(Total 1 mark)