



A-Level Chemistry

Kinetics

(Multiple Choice)

Question Paper

Time available: 24 minutes

Marks available: 21 marks

www.accesstuition.com

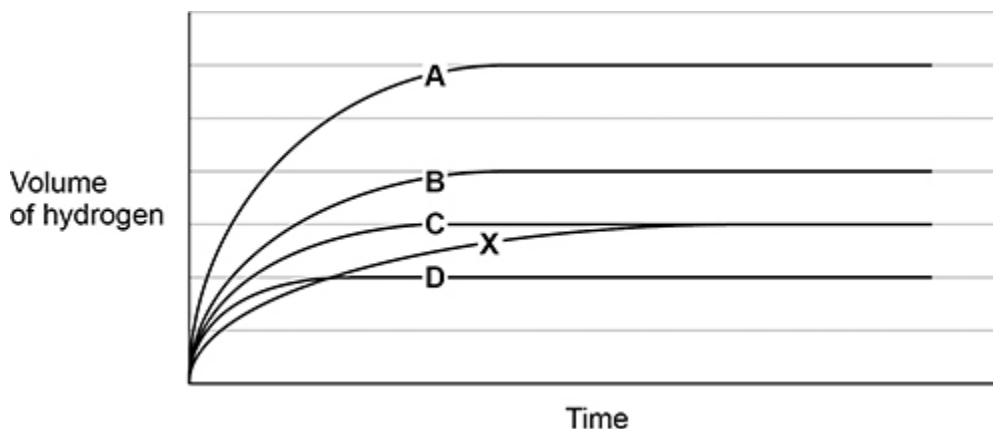
1.

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 cm³ of 1.0 mol dm⁻³ hydrochloric acid.

The reaction is repeated using 20 cm³ 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)

2.

A mixture of 2 dm³ of hydrogen and 1 dm³ 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)

3.

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)

4.

Which statement about the addition of a catalyst to an equilibrium mixture is correct?

A The activation energy for the reverse reaction increases.

☐

B The equilibrium constant for the forward reaction increases.

☐

C The rate of the reverse reaction increases.

☐

D The enthalpy change for the forward reaction decreases.

☐

(Total 1 mark)

5.

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)

6.

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.

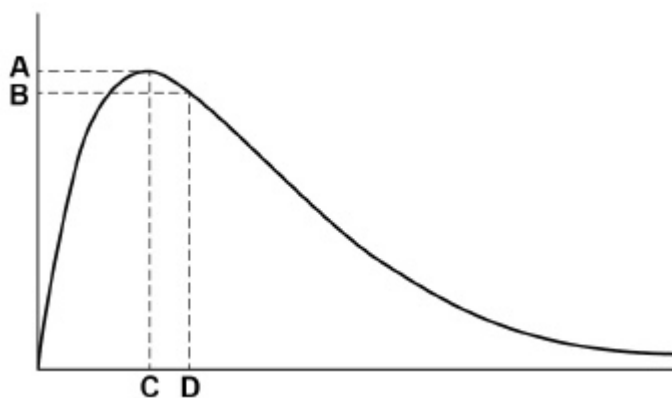
☐

(Total 1 mark)

7.

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

☐

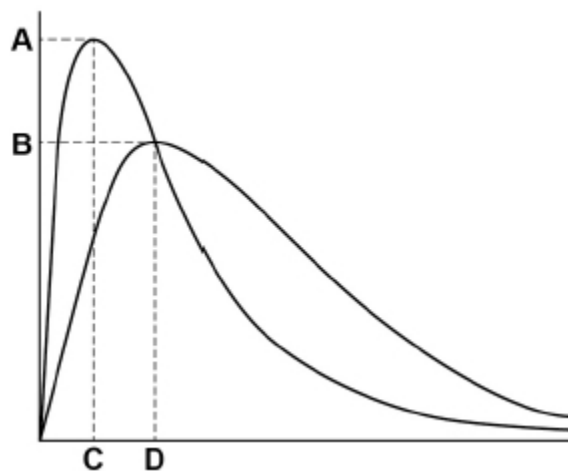
D

☐

(Total 1 mark)

8.

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

☐

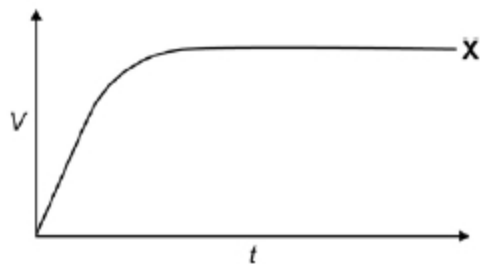
D

☐

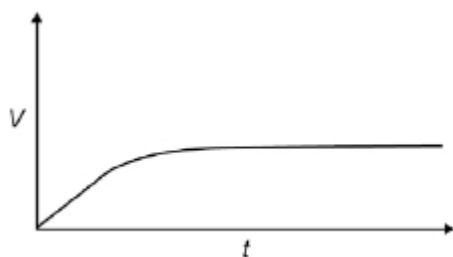
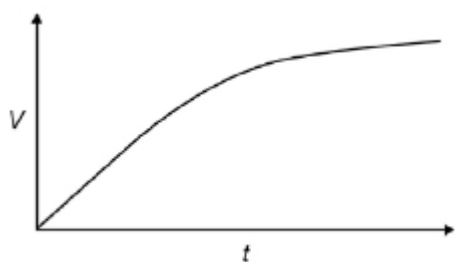
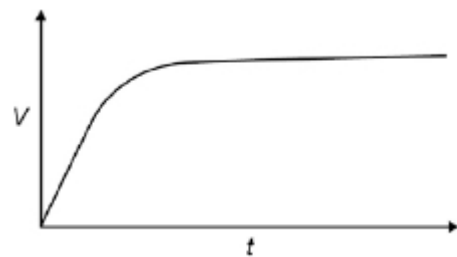
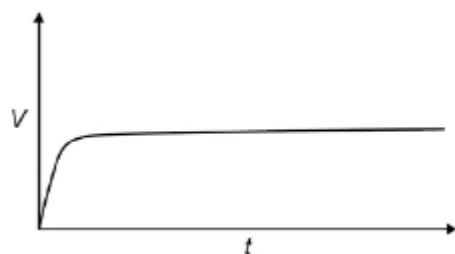
(Total 1 mark)

9.

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.

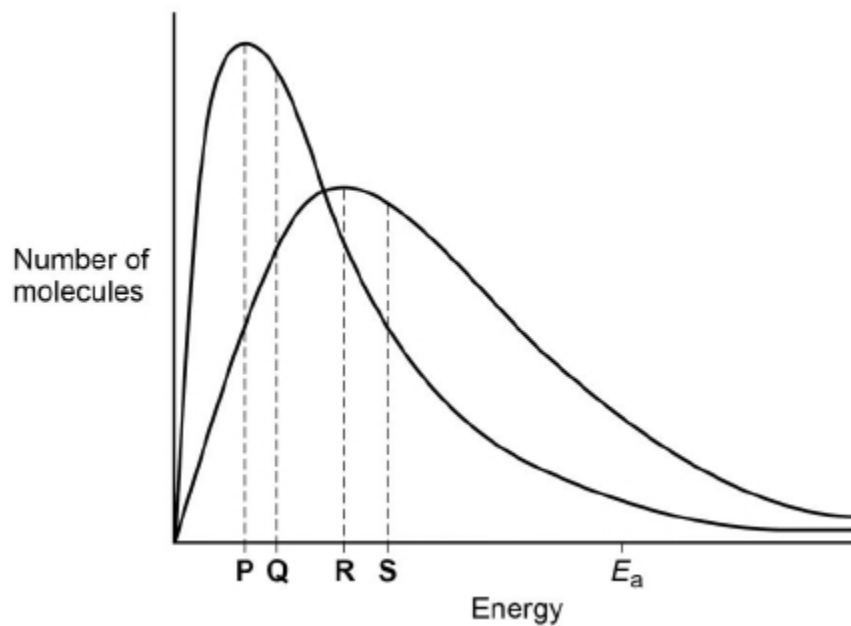


Which line represents the volume of hydrogen formed, at the same temperature and pressure, when the concentration of sulfuric acid has been halved?

A**B****C****D**

10.

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 ☐

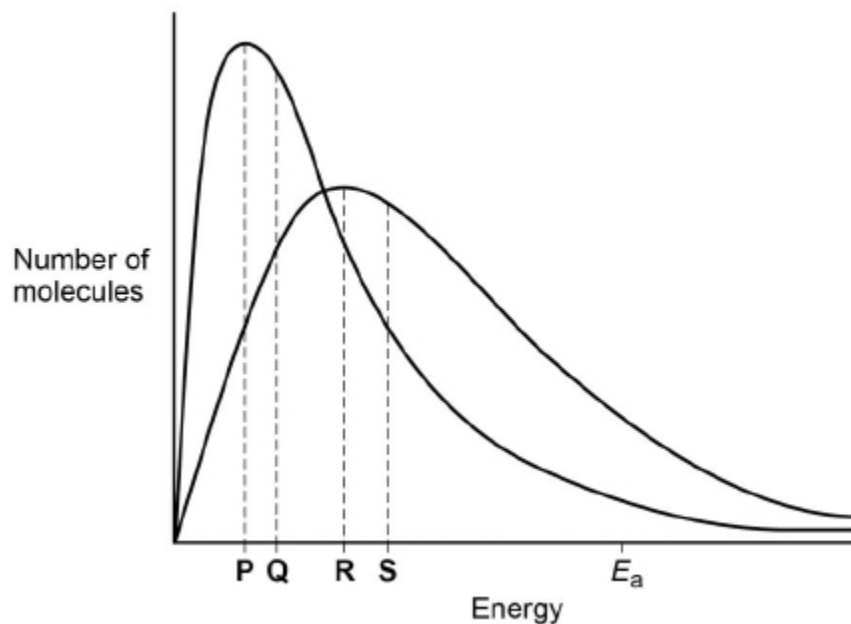
C R ☐

D S ☐

(Total 1 mark)

11.

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.

☐

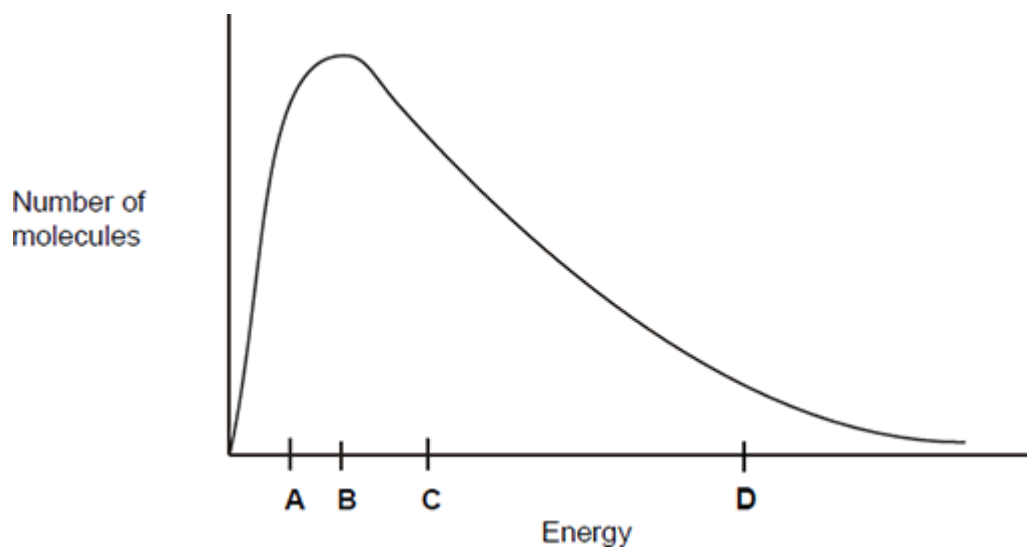
D More molecules have the mean energy.

☐

(Total 1 mark)

12.

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



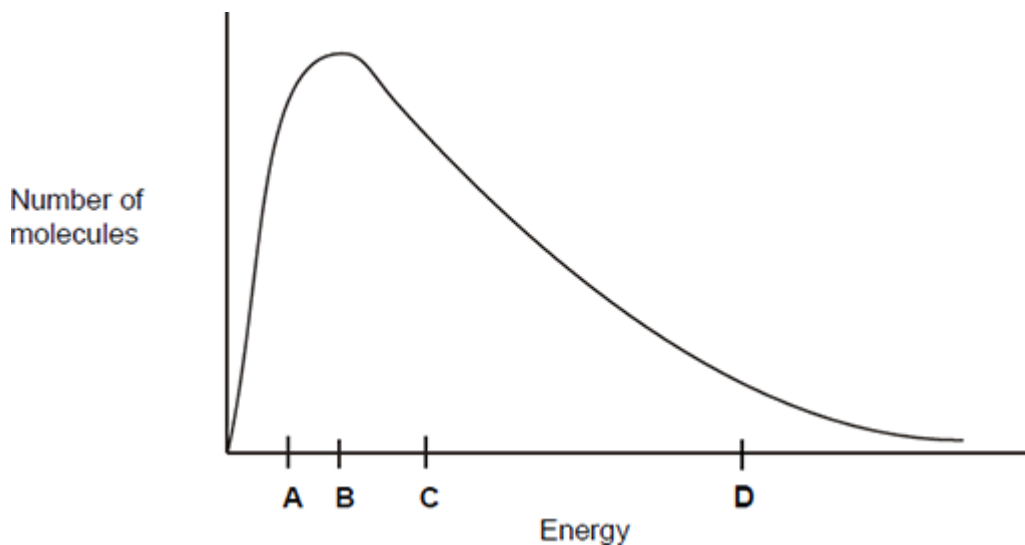
Which letter best represents the mean energy of the molecules?

- A ☐
- B ☐
- C ☐
- D ☐

(Total 1 mark)

13.

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



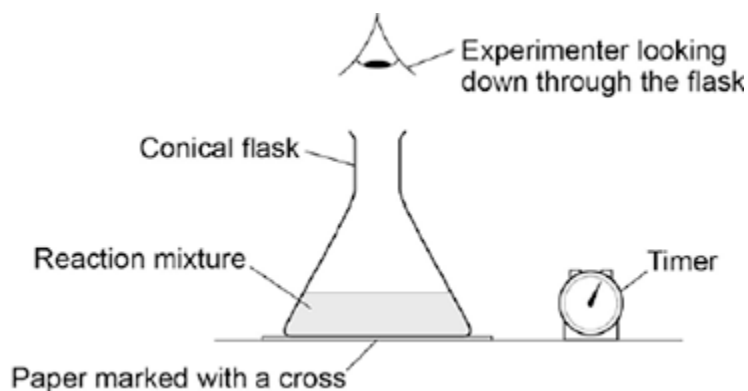
What does the area under the curve represent?

- 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)

14.

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)

15.

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

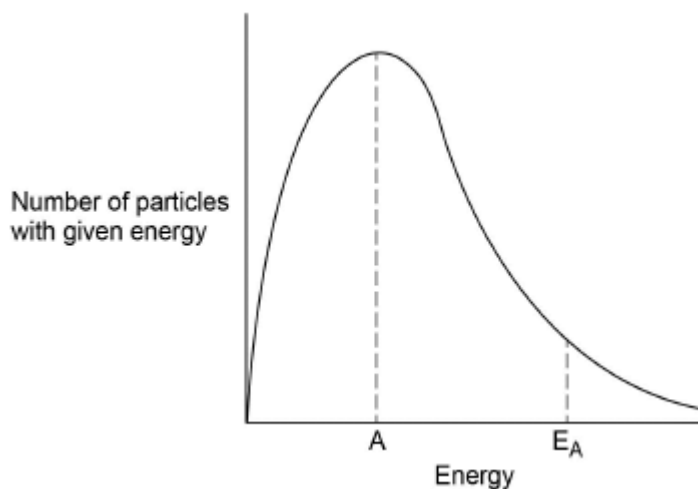
Which statement is correct about the time taken for the cross to disappear when using the larger conical flask?

- 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)

16.

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)

17.

This question is about the reaction given below.



Enthalpy data for the reacting species are given in the table below.

Substance	CO(g)	H ₂ O(g)	CO ₂ (g)	H ₂ (g)
$\Delta H_f^\ominus / \text{kJ mol}^{-1}$	-110	-242	-394	0

Which one of the following statements is **not** correct?

- A The value of K_p changes when the temperature changes.
- B The activation energy decreases when the temperature is increased.
- C The entropy change is more positive when the water is liquid rather than gaseous.
- D The enthalpy change is more positive when the water is liquid rather than gaseous.

(Total 1 mark)

18.

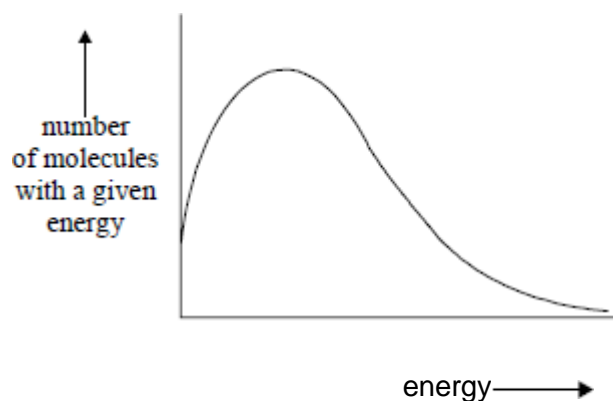
The compound lithium tetrahydridoaluminate(III), LiAlH_4 , is a useful reducing agent. It behaves in a similar fashion to NaBH_4 . Carbonyl compounds and carboxylic acids are reduced to alcohols. However, LiAlH_4 also reduces water in a violent reaction so that it must be used in an organic solvent.

Which one of the following concerning the violent reaction between LiAlH_4 and water is **false**?

- A A gas is produced.
- B The activation energy for the reaction is relatively high.
- C The reaction has a negative free-energy change.
- D Aqueous lithium ions are formed.

(Total 1 mark)

19.



The total area under the distribution curve represents

- A total energy.
- B activation energy.
- C total number of reacting molecules.
- D total number of molecules present.

(Total 1 mark)

20.

Which statement about molecules in a gas is correct?

- A At a fixed temperature they all move at the same speed.
- B At a fixed 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)

21.

Consider the change that occurs in the shape of the curve for the distribution of molecular energies in a gas when the temperature of the gas is increased.

Which is a correct statement about the gas molecules at a higher temperature?

- A There are more molecules with any given energy. ☐
- B There are more molecules with the mean energy. ☐
- C There are more molecules with the most probable energy. ☐
- D There is an increase in the most probable energy of the molecules. ☐

(Total 1 mark)