16.2 Activation Energy

Question Paper

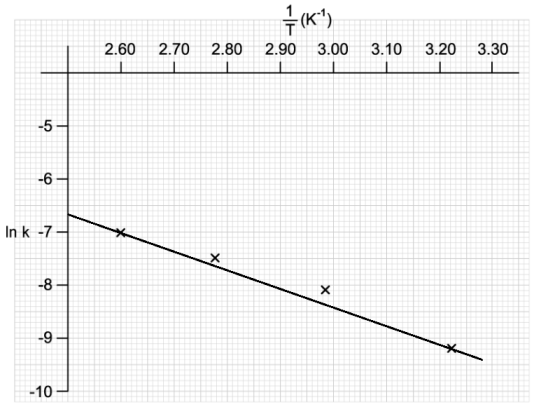
Course	DP IB Chemistry
Section	16. Chemical Kinetics (HL only)
Topic	16.2 Activation Energy
Difficulty	Medium

Time allowed: 10

Score: /5

Percentage: /100

Question 1



Which of the following statements about the Arrhenius plot are correct?

I. The gradient has a value of E_a / R
II. The intercept on the y-axis is ln A
III. The Arrhenius plot will give a value for activation energy in J mol^{-1}

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

[1 mark]

Question 2

The following information was obtained for the rate constant, k, for a reaction at 25 ◦C

A	E_a	R
2.57×10^9 s^{-1}	96.2 kJ mol^{-1}	8.31 J K^{-1} mol^{-1}

Which expression correctly represents how to calculate the rate constant, k?

A. $k = (2.57 \times 10^9) \times e^{(-96.2 / 8.31 \times 25)}$

B. $k = (2.57 \times 10^9) \times e^{(-96.2 / 8.31 \times 298)}$

C. $k = (2.57 \times 10^9) \times e^{(-96200 / 8.31 \times 25)}$

D. $k = (2.57 \times 10^9) \times e^{(-96200 / 8.31 \times 298)}$

[1 mark]

Question 3

The following experimental data was collected.

Activation energy, E_a	111 kJ mol^{-1}
Rate constant, k	1.30×10^{-4} mol^{-1} dm^3 s^{-1}
Arrhenius constant, A	4.55×10^{13} mol^{-1} dm^3 s^{-1}

Which expression correctly calculates the temperature of the reaction?

A. $T = \dfrac{111}{8.31 \times (ln\ 4.55 \times 10^{13} - ln\ 1.30 \times 10^{-4})}$

B. $T = \dfrac{111 \times 10^3}{8.31 \times (ln\ 4.55 \times 10^{13} - ln\ 1.30 \times 10^{-4})}$

C. $T = \dfrac{111 \times 10^3}{8.31 \times (ln\ 1.30 \times 10^{-4} - ln\ 4.55 \times 10^{13})}$

D. $T = \dfrac{111 \times 10^3}{(8.31 \times 10^{-3}) \times (ln\ 4.55 \times 10^{13} - ln\ 1.30 \times 10^{-4})}$

[1 mark]

Question 4

Consider the following statements:

I. Many reactions show a doubling of the rate with a temperature increase of 10K
II. The units of k for a second order reaction are mol^{-1} dm^3 s^{-1}
III. In the Arrhenius equation, A relates to the energy requirements of the collisions

Which statements are correct?

A. I and II only

B. I and III only

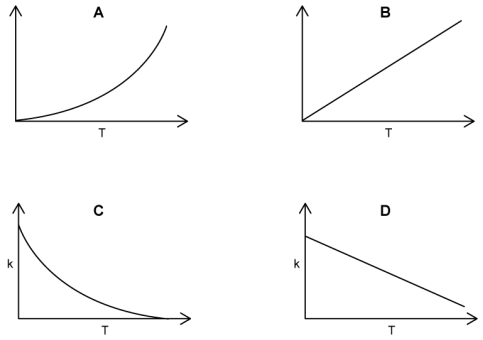
C. II and III only

D. I, II and III

[1 mark]

Question 5

Which graph shows the correct relationship between the rate constant, *k*, and temperature?



[1 mark]