

AS Level Chemistry A
H032/01 Breadth in chemistry

MCQ Question Set 4
3.1 Physical chemistry

Multiple Choice Questions

1. 50.0 cm³ of 1.00 mol dm⁻³ NaOH is neutralised by 50.0 cm³ of 1.00 mol dm⁻³ HNO₃.
The temperature increases by 6.0 °C.

The experiment is repeated using:
25.0 cm³ of 1.00 mol dm⁻³ NaOH and 25.0 cm³ of 1.00 mol dm⁻³ HNO₃.

What is the increase in temperature in the second experiment?

- A 1.5 °C
- B 3.0 °C
- C 6.0 °C
- D 12.0 °C

Your answer

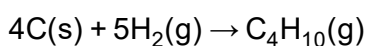
B

[1]

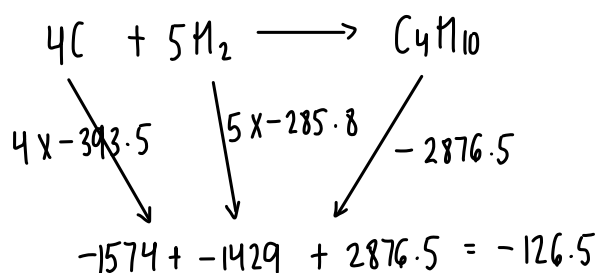
2. The table shows standard enthalpy changes of combustion, $\Delta_c H$.

Substance	$\Delta_c H / \text{kJ mol}^{-1}$
C(s)	-393.5
H ₂ (g)	-285.8
C ₄ H ₁₀ (g)	-2876.5

What is the enthalpy change for the following reaction?



- A -2197.2 kJ mol⁻¹
- B -126.5 kJ mol⁻¹
- C +126.5 kJ mol⁻¹
- D +2197.2 kJ mol⁻¹



Your answer

B

[1]

3. The reversible reaction below is allowed to reach equilibrium.



Which change in conditions would be expected to shift the equilibrium position towards the products?

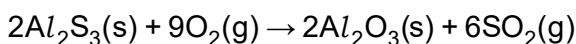
- A decrease the pressure
- B decrease the temperature
- C increase the pressure
- D increase the temperature

Your answer

B

[1]

4. The equation for the reaction of aluminium sulfide, Al_2S_3 , with oxygen is shown below.



The table shows standard enthalpy changes of formation, $\Delta_f H^\ominus$.

Substance	$\text{Al}_2\text{S}_3(\text{s})$	$\text{O}_2(\text{g})$	$\text{Al}_2\text{O}_3(\text{s})$	$\text{SO}_2(\text{g})$
$\Delta_f H^\ominus / \text{kJ mol}^{-1}$	-723.8	0	-1675.7	-296.8

What is the standard enthalpy change of combustion of $\text{Al}_2\text{S}_3(\text{s})$, in kJ mol^{-1} ?

- A -3684.6
 - B -1842.3
 - C +1842.3
 - D +3684.6
- $$- (-723.8 \times 2) + (2 \times -1675.7) + (6 \times -296.8)$$
$$= -3684.6$$

Your answer

A

[1]

5. A student carried out an experiment to measure the enthalpy change of combustion of methanol.

The energy from the combustion of methanol was used to heat a beaker containing water.

The student's calculated enthalpy change of combustion was **more** exothermic than the value in data books.

Which error could have caused this difference?

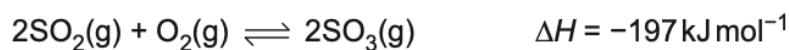
- A Some methanol had evaporated from the wick before the final weighing.
- B In the calculation, the student used the molar mass of ethanol instead of methanol.
- C There was incomplete combustion.
- D The water boiled for 5 minutes before the final temperature was taken.

Your answer

A

[1]

6. The reversible reaction below is at equilibrium.



Which changes in pressure and temperature would shift the equilibrium position towards the products?

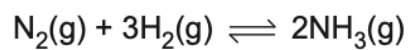
	Pressure	Temperature
A	Decrease	Decrease
B	Decrease	Increase
C	Increase	Decrease
D	Increase	Increase

Your answer

C

[1]

7. The reversible reaction below is at equilibrium.



What is the expression for K_c ?

$$K_c = \frac{[\text{NH}_3]^2}{[\text{N}_2][\text{H}_2]^3}$$

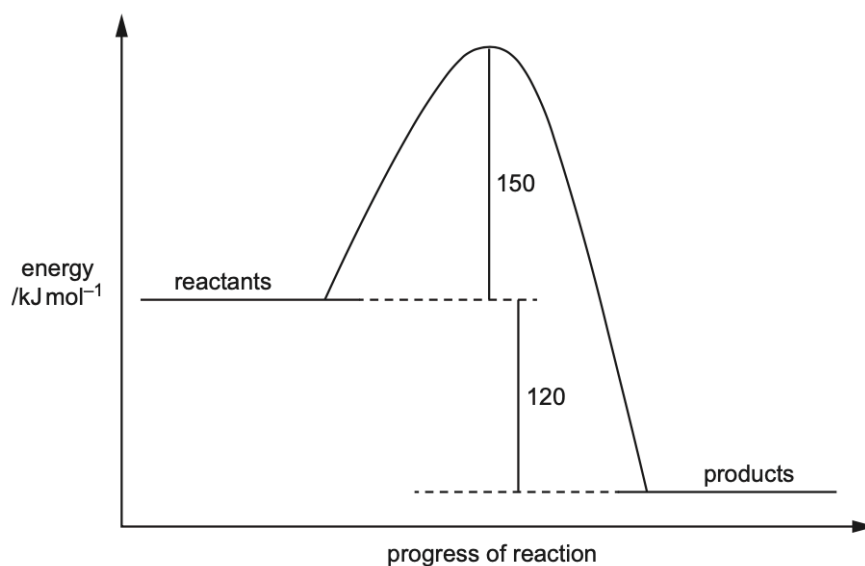
- A** $\frac{[\text{N}_2(\text{g})][\text{H}_2(\text{g})]^3}{[\text{NH}_3(\text{g})]^2}$
- B** $\frac{[\text{NH}_3(\text{g})]^2}{[\text{N}_2(\text{g})][\text{H}_2(\text{g})]^3}$
- C** $\frac{[\text{N}_2(\text{g})] + 3[\text{H}_2(\text{g})]}{2[\text{NH}_3(\text{g})]}$
- D** $\frac{2[\text{NH}_3(\text{g})]}{[\text{N}_2(\text{g})] + 3[\text{H}_2(\text{g})]}$

Your answer

B

[1]

8. A reversible reaction has the enthalpy profile diagram shown below.



Which statement about this reaction is correct?

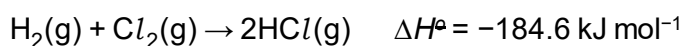
- A The activation energy of the forward reaction is 120 kJ mol^{-1} .
- B The activation energy of the reverse reaction is 270 kJ mol^{-1} .
- C The enthalpy change of the forward reaction is -30 kJ mol^{-1} .
- D The reverse reaction is exothermic.

Your answer

B

[1]

9. Hydrogen and chlorine react as shown below.



Which statement about this reaction is correct?

- A Less energy is released on bond making than is taken in during bond breaking.
- B The enthalpy change for the reverse equation is $+184.6 \text{ kJ mol}^{-1}$.
- C The enthalpy change of formation of $\text{HCl}(\text{g})$ is $-184.6 \text{ kJ mol}^{-1}$.
- D The temperature decreases during the reaction.

Your answer

B

[1]

10

What is the **main** reason for the increase in reaction rate with increasing temperature?

- A The activation energy decreases.
- B The activation energy increases.
- C More molecules have an energy greater than the activation energy.
- D The molecules collide more frequently.

Your answer

C

[1]

11.

A catalyst is added to a system in equilibrium.

What is the effect on the rates of the forward and reverse reactions?

- A There is no effect on the rate in either direction.
- B Both rates increase by the same factor.
- C The rate in the forward direction increases by a greater factor than the reverse direction.
- D The rate in the reverse direction increases by a greater factor than the forward direction.

Your answer

B

[1]

Total Marks for Question Set 4: 11

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