OCR
Oxford Cambridge and RSA

AS Level Chemistry A

H032/01 Breadth in chemistry

MCQ Question Set 4
3.1 Physical chemistry

Multiple Choice Questions

1. 50.0 cm^3 of 1.00 mol dm^{-3} NaOH is neutralised by 50.0 cm^3 of 1.00 mol dm^{-3} HNO_3.
The temperature increases by 6.0 °C.

The experiment is repeated using:
25.0 cm^3 of 1.00 mol dm^{-3} NaOH and 25.0 cm^3 of 1.00 mol dm^{-3} HNO_3.

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	$\Delta_c H$ / kJ mol^{-1}
C(s)	–393.5
$H_2(g)$	–285.8
$C_4H_{10}(g)$	–2876.5

What is the enthalpy change for the following reaction?

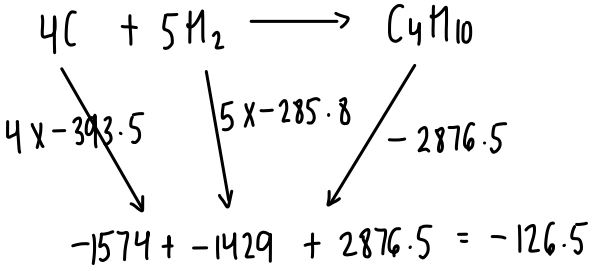
$4C(s) + 5H_2(g) \rightarrow C_4H_{10}(g)$

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.

$$H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \qquad \Delta H = -9.4\,kJ\,mol^{-1}$$

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.

$$2Al_2S_3(s) + 9O_2(g) \rightarrow 2Al_2O_3(s) + 6SO_2(g)$$

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

Substance	$Al_2S_3(s)$	$O_2(g)$	$Al_2O_3(s)$	$SO_2(g)$
$\Delta_f H^\ominus$ **/ kJ mol^{-1}**	−723.8	0	−1675.7	−296.8

What is the standard enthalpy change of combustion of $Al_2S_3(s)$, 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.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -197\,kJ\,mol^{-1}$$

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.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

What is the expression for K_c?

$$K_C = \frac{[NH_3]^2}{[N_2][H_2]^3}$$

A $\dfrac{[N_2(g)]\,[H_2(g)]^3}{[NH_3(g)]^2}$

B $\dfrac{[NH_3(g)]^2}{[N_2(g)]\,[H_2(g)]^3}$

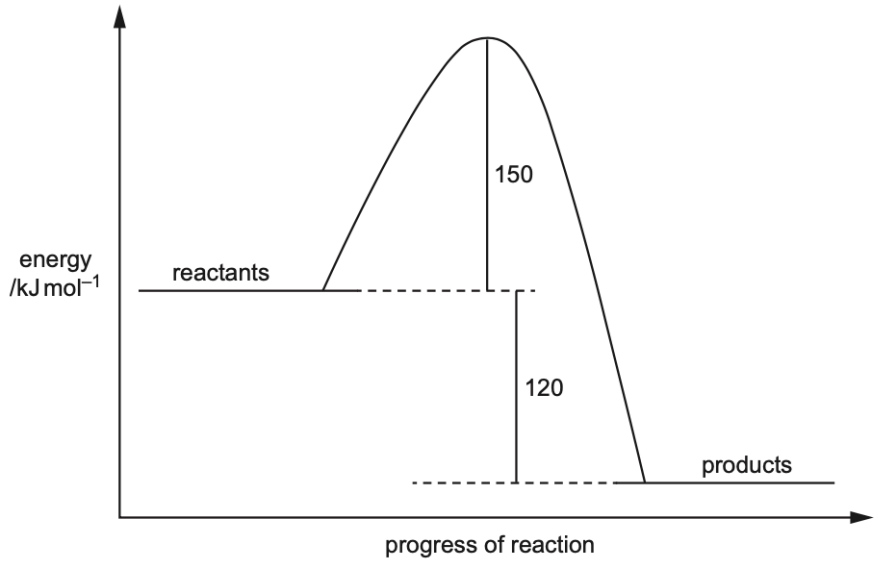
C $\dfrac{[N_2(g)] + 3[H_2(g)]}{2[NH_3(g)]}$

D $\dfrac{2[NH_3(g)]}{[N_2(g)] + 3[H_2(g)]}$

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.

$H_2(g) + Cl_2(g) \rightarrow 2HCl(g) \quad \Delta H^{\ominus} = -184.6$ kJ mol^{-1}

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 kJ mol^{-1}.

C The enthalpy change of formation of $HCl(g)$ is –184.6 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