Chemical Energetics – 2021 IGCSE 0620

1. June/2021/Paper_11/No.8

Methane burns in oxygen to produce carbon dioxide and water.

What is the balanced equation for this reaction?

A $CH_4 + 2O_2 \rightarrow 2CO_2 + 2H_2O$

B $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

C $CH_4 + 2O_2 \rightarrow CO_2 + H_2O$

D $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

2. June/2021/Paper_11&21/No.12

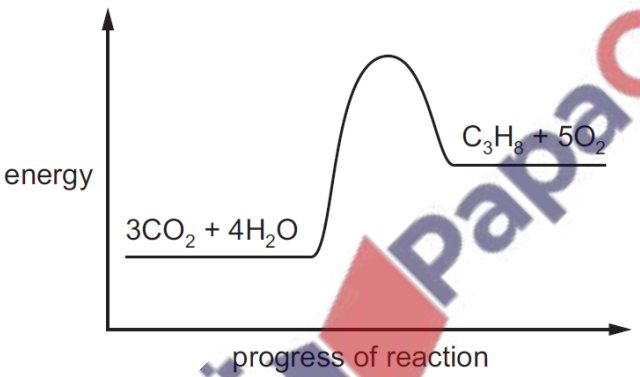
The complete combustion of propane is exothermic.

The equation for this reaction is shown.

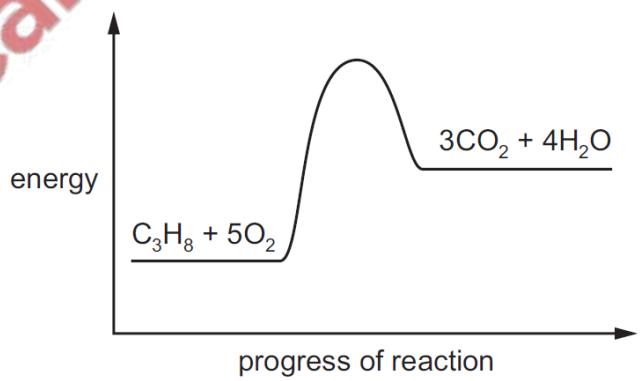
$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

Which energy level diagram represents the complete combustion of propane?

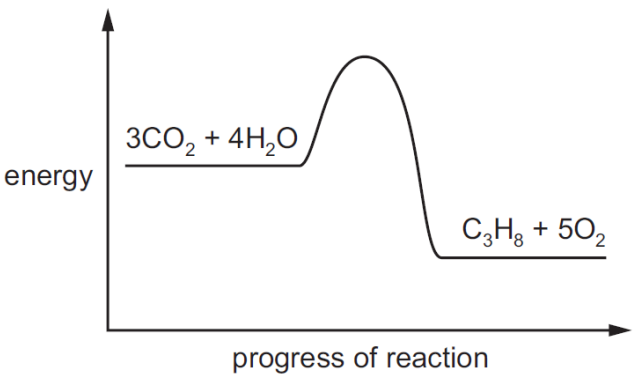
A



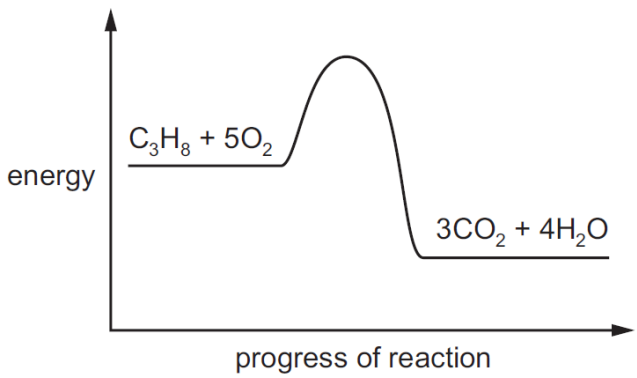
B



C



D



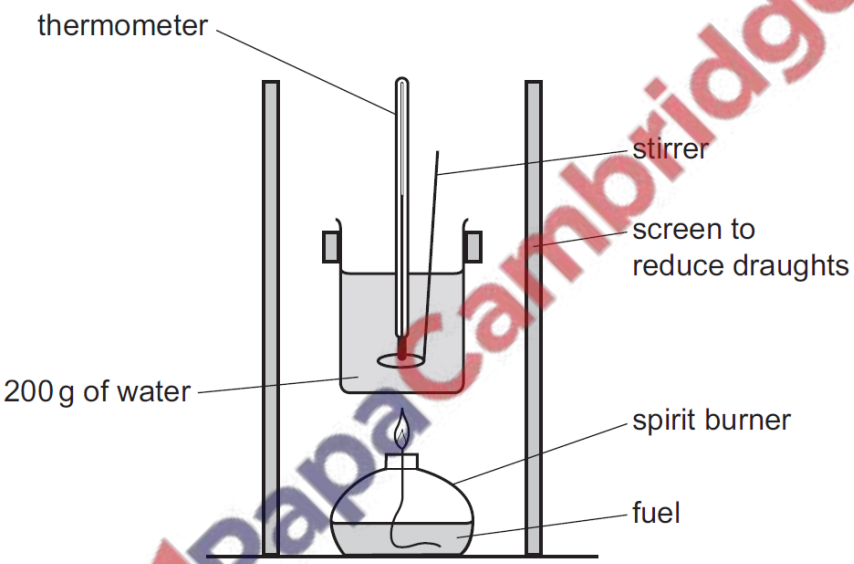
3. June/2021/Paper_11/No.13

Which changes occur when hydrogen is burned in oxygen?

	energy change	product
A	endothermic	H_2O only
B	endothermic	H_2O and CO_2
C	exothermic	H_2O only
D	exothermic	H_2O and CO_2

4. June/2021/Paper_12&22/No.12

Four different fuels are used to heat a beaker of water, for the same amount of time, using the apparatus shown.



The initial temperature of the water and the temperature after heating by the fuel are recorded.

Which fuel releases the most heat energy?

	initial temperature / °C	temperature after heating / °C
A	17	46
B	24	52
C	26	61
D	30	62

5. June/2021/Paper_12/No.13

Which substance is **not** used as a fuel?

A ethanol

B hydrogen

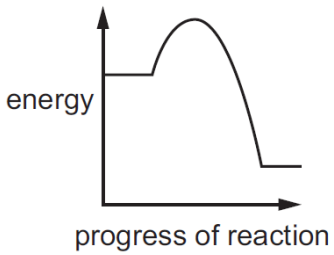
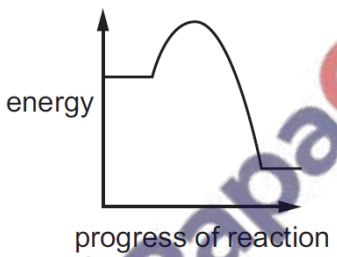
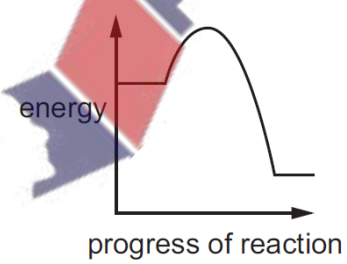
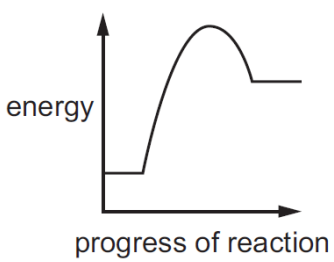
C methane

D oxygen

6. June/2021/Paper_13/No.12

Heat energy transfer during chemical reactions can be described using energy level diagrams.

In which row is the description correct?

	energy level diagram	description
1		exothermic
2		heat energy absorbed from environment
3		heat energy released to environment
4		endothermic

A 1 and 2 **B** 1 and 3 only **C** 1, 3 and 4 **D** 2 and 4

7. June/2021/Paper_13/No.13

The equations for two reactions are shown.

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

Which statement about the reactions is correct?

A Heat energy is released during both these reactions.

B Heat energy is absorbed during both these reactions.

C Heat energy is released during reaction 1 but absorbed during reaction 2.

D Heat energy is released during reaction 2 but absorbed during reaction 1.

8. June/2021/Paper_22/No.20

The equation shows the reaction between hydrogen and oxygen.

$$2\ H–H + O=O \rightarrow 2\ H–O–H$$

The bond energies are shown.

	bond energy in kJ / mol
H–H	436
O=O	495
O–H	463

Which row shows the energy change and the type of reaction?

	energy change in kJ / mol	type of reaction
A	441	exothermic
B	441	endothermic
C	485	exothermic
D	485	endothermic

9. June/2021/Paper_21/No.13

Which equation represents a reaction that takes place in a fuel cell?

A $C + O_2 \rightarrow CO_2$

B $2H_2 + O_2 \rightarrow 2H_2O$

C $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

D $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

10. June/2021/Paper_23/No.17

The equation for the decomposition of hydrogen iodide is shown.

$$2HI \rightarrow H_2 + I_2$$

Some bond energies are shown.

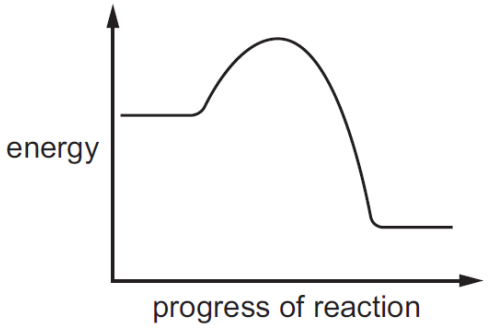
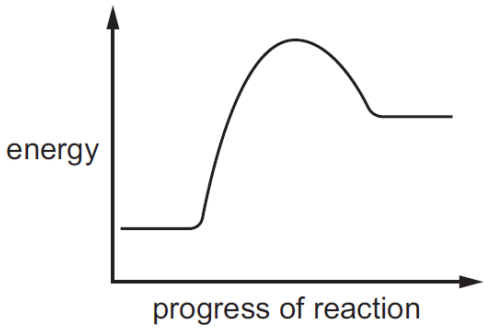
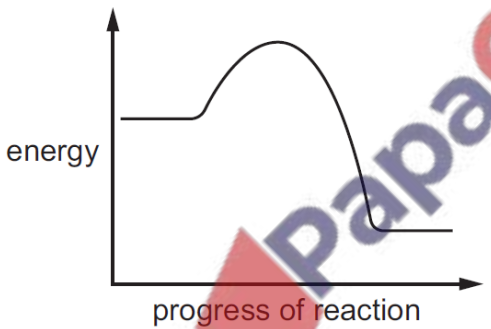
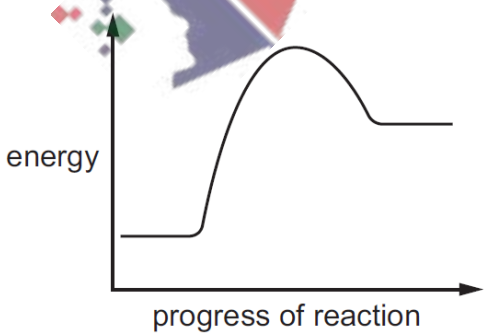
bond	bond energy in kJ / mol
H–H	440
I–I	150
H–I	300

What is the energy change for the reaction?

A –290 kJ / mol **B** –10 kJ / mol **C** +10 kJ / mol **D** +290 kJ / mol

11. March/2021/Paper_12&22/No.13

Which row describes an endothermic reaction?

	energy level diagram	energy transfer
A		energy is transferred from the surroundings to the reaction
B		energy is transferred from the surroundings to the reaction
C		energy is transferred from the reaction to the surroundings
D		energy is transferred from the reaction to the surroundings

12. March/2021/Paper_12/No.14

Fuels release heat energy when they burn.

Which substances are used as fuels?

1 argon

2 butane

3 hydrogen

4 methane

A 1 and 3 only **B** 1, 3 and 4 **C** 2, 3 and 4 **D** 2 and 4 only

13. March/2021/Paper_22/No.14

The equation for the complete combustion of methane is shown.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–H	+410
C=O	+805
O–H	+460
O=O	+496

What is the energy change for the reaction?

A –818 kJ / mol **B** –359 kJ / mol **C** –323 kJ / mol **D** +102 kJ / mol

14. March/2021/Paper_22/No.15

Hydrogen fuel cells can be used to power cars.

Which statements about a fuel cell are correct?

1 The balanced equation for the reaction is $H_2 + O_2 \rightarrow H_2O$.

2 The fuel cell generates electricity.

3 In the fuel cell hydrogen is reduced.

4 The reactants are gases at room temperature.

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4