Chemical Energetics – 2021 IGCSE 0620

1. Nov/2021/Paper_11/No.11

The temperature decreases when aqueous ethanoic acid reacts with solid sodium carbonate to form a salt.

Which type of reaction and energy change occur?

	type of reaction	energy change
A	neutralisation	endothermic
B	neutralisation	exothermic
C	redox	endothermic
D	redox	exothermic

2. Nov/2021/Paper_11/No.12

Which gas is used as a fuel?

A helium

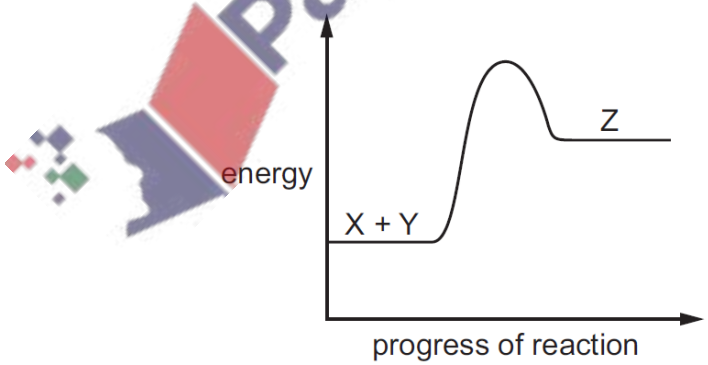
B hydrogen

C nitrogen

D oxygen

3. Nov/2021/Paper_12/No.11

An energy level diagram for the reaction between substance X and substance Y to form substance Z is shown.



Which statement is correct?

A Energy is released as substance Z is formed.

B Substance Z has more energy than substance X and substance Y.

C The reaction is exothermic.

D When substance X and substance Y react, the temperature increases.

4. Nov/2021/Paper_12/No.12

Which reactions are exothermic?

1 $C + O_2 \rightarrow CO_2$

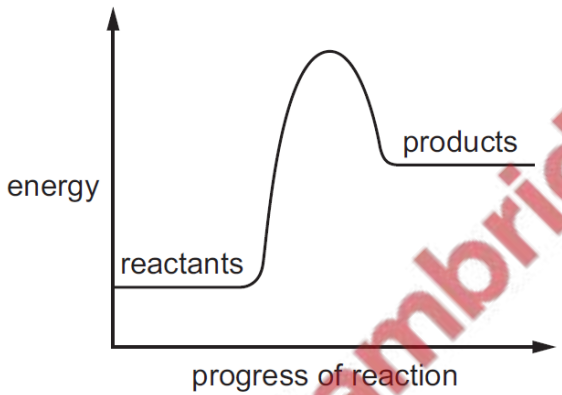
2 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

3 $2H_2 + O_2 \rightarrow 2H_2O$

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

5. Nov/2021/Paper_13&23/No.11

The energy level diagram for a chemical reaction is shown.



Which statement about this reaction is correct?

A The reaction is endothermic and energy is given out to the surroundings.

B The reaction is endothermic and energy is taken in from the surroundings.

C The reaction is exothermic and energy is given out to the surroundings.

D The reaction is exothermic and energy is taken in from the surroundings.

6. Nov/2021/Paper_13/No.12

Which property explains why methane is used as a fuel?

A It is an alkane.

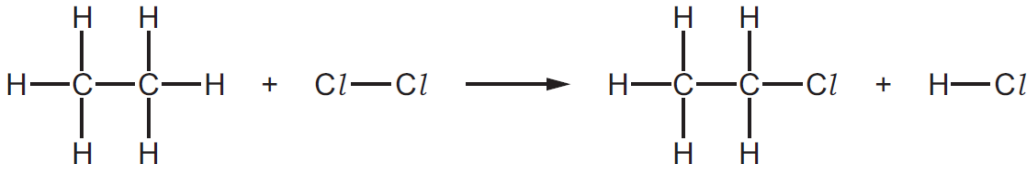
B It forms carbon dioxide when it burns.

C It is a gas at room temperature.

D It releases heat energy when it burns.

7. Nov/2021/Paper_21,22&23/No.11,12

Chlorine reacts with ethane to produce chloroethane and hydrogen chloride.



The reaction is exothermic.

The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–C*l*	+340
C–C	+350
C–H	+410
C*l*–C*l*	+240
H–C*l*	+430

What is the energy change for the reaction?

A –1420 kJ / mol

B –120 kJ / mol

C +120 kJ / mol

D +1420 kJ / mol

8. Nov/2021/Paper_21/No.12

Hydrogen is used as a fuel in rockets and is also used in hydrogen fuel cells.

Which statements are correct?

1 Both uses produce water vapour.

2 Burning hydrogen produces polluting gases.

3 A fuel cell produces electricity.

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

9. Nov/2021/Paper_22/No.14

Which statements about hydrogen are correct?

1 When hydrogen is burned, heat energy is released.

2 When hydrogen is used in a fuel cell, electrical energy is generated.

3 When hydrogen is used as a fuel, water is the only product.

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

10. Nov/2021/Paper_23/No.14

A fuel cell is used to generate electricity.

Which chemicals are used in a fuel cell?

A hydrogen and methane

B hydrogen and oxygen

C nitrogen and methane

D nitrogen and oxygen

11. Nov/2021/Paper_42/No.4

Chlorine reacts with carbon monoxide to produce phosgene gas, $COCl_2(g)$. A catalyst is used.

$$Cl_2(g) + CO(g) \rightleftharpoons COCl_2(g)$$

The reaction is exothermic.

(a) Explain why the reaction is exothermic in terms of the energy changes of bond breaking and bond making.

.....

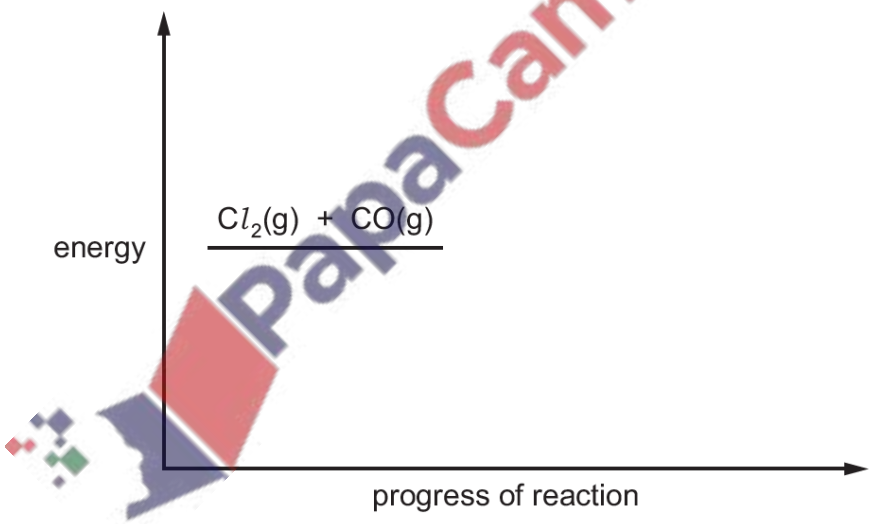
.....

..... [3]

(b) (i) Complete the energy level diagram for this reaction.

On your diagram show:

- the product of the reaction
- an arrow representing the energy change, labelled ΔH
- an arrow representing the activation energy, labelled A.



[3]

(ii) State why a catalyst is used.

..... [1]

(c) Describe and explain the effect, if any, on the position of equilibrium when:

(i) the pressure is increased

.....

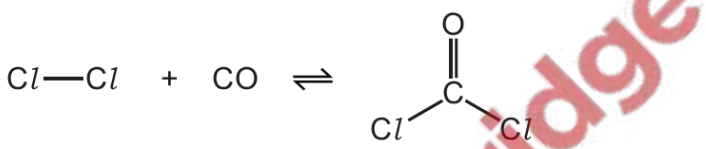
..... [2]

(ii) the temperature is increased.

.....

..... [2]

(d) The reaction between chlorine and carbon monoxide can be represented as shown.



When one mole of chlorine reacts with one mole of carbon monoxide, 230 kJ of energy is released.

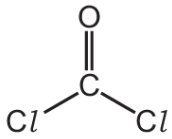
Some bond energies are shown in the table.

bond	bond energy in kJ / mol
C*l*–C*l*	240
C=O	745
C–C*l*	400

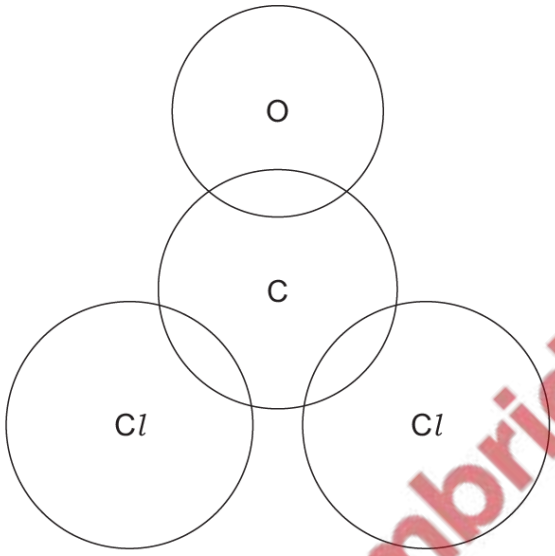
Use the information to calculate the energy of the bond between the C and the O in carbon monoxide, CO.

bond energy in carbon monoxide, CO = ... kJ / mol [3]

(e) Complete the dot-and-cross diagram to show the electron arrangement in a molecule of $COCl_2$.



Show outer electrons only.



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