6.2 Energy transfer

01. 0620_m21_qp_22 Q: 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

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02. 0620_w21_qp_21 Q: 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

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03. 0620_w21_qp_21 Q: 34

Fuel X produces carbon dioxide and water when it is burned in air. So does fuel Y.

What could X and Y be?

	X	Y
A	C	H_2
B	C	C_8H_{18}
C	CH_4	H_2
D	CH_4	C_8H_{18}

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04. 0620_w21_qp_22 Q: 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

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05. 0620_w21_qp_22 Q: 34

Fuel X produces carbon dioxide and water when it is burned in air. So does fuel Y.

What could X and Y be?

	X	Y
A	C	H_2
B	C	C_8H_{18}
C	CH_4	H_2
D	CH_4	C_8H_{18}

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06. 0620_w21_qp_23 Q: 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

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07. 0620_w21_qp_23 Q: 34

Fuel X produces carbon dioxide and water when it is burned in air. So does fuel Y.

What could X and Y be?

	X	Y
A	C	H_2
B	C	C_8H_{18}
C	CH_4	H_2
D	CH_4	C_8H_{18}

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08. 0620_m20_qp_22 Q: 13

Which statements about hydrogen fuel cells are correct?

1 The reaction between hydrogen and oxygen is endothermic.
2 The waste product in a hydrogen fuel cell is water.
3 A chemical reaction in the cell produces hydrogen which is used as the fuel.
4 A hydrogen fuel cell is used to generate electricity.

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

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09. 0620_s20_qp_21 Q: 13

Which statements about hydrogen fuel cells are correct?

1 Water is formed as the only waste product.
2 Both water and carbon dioxide are formed as waste products.
3 The overall reaction is $2H_2 + O_2 \rightarrow 2H_2O$.
4 The overall reaction is endothermic.

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

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10. 0620_w20_qp_21 Q: 16

Which substance does **not** require oxygen in order to produce energy?

A coal

B hydrogen

C natural gas

D ^{235}U

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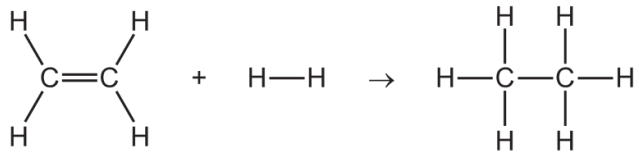
11. 0620_w20_qp_21 Q: 17

Ethene reacts with hydrogen to form ethane.



The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–C	+350
C–H	+410
H–H	+436
C=C	+614

What is the energy change for the reaction?

A –290 kJ / mol

B –120 kJ / mol

C +120 kJ / mol

D +290 kJ / mol

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12. 0620_w20_qp_22 Q: 16

Which substance does **not** require oxygen in order to produce energy?

A coal

B hydrogen

C natural gas

D ^{235}U

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13. 0620_w20_qp_23 Q: 16

The reaction between hydrogen and oxygen releases 486 kJ / mol of energy.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$$

The bond energy of H–H is 436 kJ / mol and that of H–O is 464 kJ / mol.

What is the bond energy of O=O?

A 430 kJ / mol

B 458 kJ / mol

C 498 kJ / mol

D 984 kJ / mol

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14. 0620_m19_qp_22 Q: 14

Hydrogen-oxygen fuel cells can be used to power cars. Platinum is used as a catalyst.

The amount of energy produced per gram is shown for three fuels.

fuel	energy produced per g of fuel / kJ
hydrogen	143
methane	55
petrol	44

Which statement is correct and is an advantage of a hydrogen-oxygen fuel cell?

A Hydrogen is difficult to store.

B Hydrogen produces less energy per gram than methane or petrol.

C Platinum is rare and expensive.

D The only product is water.

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15. 0620_s19_qp_21 Q: 11

Which statement about the hydrogen fuel cell is **not** correct?

A Chemical energy is converted into electrical energy.

B Hydrogen is oxidised.

C The reaction that takes place is endothermic.

D Water is the only product.

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16. 0620_s19_qp_22 Q: 11

Fuel cells are used as energy sources in cars.

Which row gives a fuel used in a fuel cell and the products formed?

	fuel in a fuel cell	products formed
A	hydrogen	carbon dioxide and water
B	hydrogen	water only
C	petrol	carbon dioxide and water
D	petrol	water only

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17. 0620_s19_qp_23 Q: 11

Which statement about a fuel cell in a car is correct?

A The fuel cell produces heat, which powers the car.

B The fuel cell is supplied with hydrogen directly from the air.

C The only emission from a fuel cell is nitrogen gas, which is non-polluting.

D The fuel cell produces electricity, which powers an electric motor.

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18. 0620_w19_qp_21 Q: 14

Which gases are used to generate electricity in a fuel cell?

A carbon dioxide and oxygen

B hydrogen and methane

C hydrogen and oxygen

D methane and carbon dioxide

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19. 0620_m18_qp_22 Q: 35

Statement 1 Hydrogen is used as a fuel.

Statement 2 When hydrogen burns in the air to form water, heat energy is produced.

Which is correct?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 2 is correct but statement 1 is incorrect.

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20. 0620_s17_qp_21 Q: 11

Some properties of four fuels are shown in the table.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

	fuel	formula	melting point /°C	boiling point /°C
A	hydrogen	H_2	–259	–253
B	methane	CH_4	–182	–164
C	octane	C_8H_{18}	–57	126
D	wax	$C_{31}H_{64}$	60	400

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21. 0620_s17_qp_21 Q: 12

Which statements about exothermic and endothermic reactions are correct?

1 During an exothermic reaction, heat is given out.

2 The temperature of an endothermic reaction goes up because heat is taken in.

3 Burning methane in the air is an exothermic reaction.

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

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22. 0620_s17_qp_22 Q: 11

Which statement about fuels is correct?

A Heat energy can only be produced by burning fuels.

B Hydrogen is used as a fuel although it is difficult to store.

C Methane is a good fuel because it produces only water when burned.

D Uranium is burned in air to produce energy.

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23. 0620_s17_qp_23 Q: 11

Heat energy is produced when hydrocarbons burn in air.

Which equations represent this statement?

1 $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

2 $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

3 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

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

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24. 0620_m16_qp_22 Q: 12

Which substance could **not** be used as a fuel to heat water in a boiler?

A ethanol

B hydrogen

C methane

D oxygen

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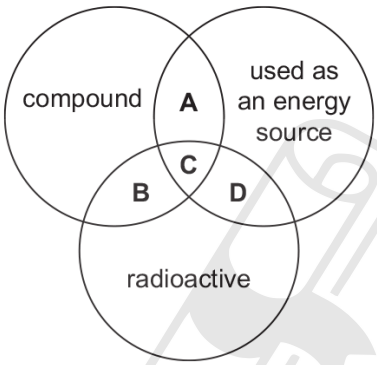
25. 0620_s16_qp_21 Q: 11

The diagram shows some properties that substances may have.

To which labelled part of the diagram does ^{235}U belong?



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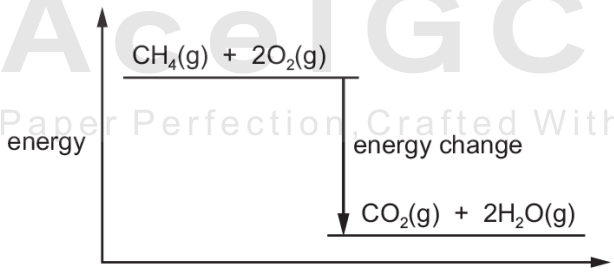
26. 0620_s16_qp_22 Q: 13

The energy level diagram for the combustion of methane is shown.



Which row gives the equation and energy change for this reaction?

	equation	energy change in kJ / mol
A	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	+891
B	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	–891
C	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$	+891
D	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$	–891

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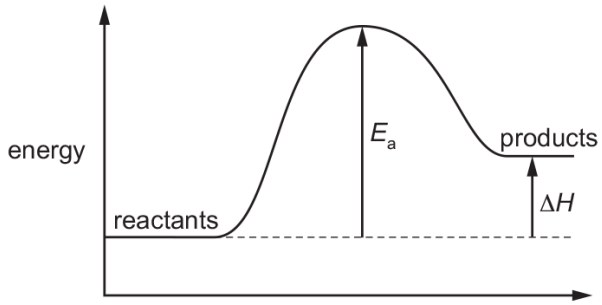
27. 0620_w16_qp_21 Q: 13

The energy level diagram for a reaction is shown.



Which statement is **not** correct for this energy level diagram?

A It could be the energy level diagram for the reaction when petrol is burnt.

B Less energy is released in bond forming than is needed for bond breaking.

C The activation energy, E_a, has a positive value.

D The energy change, ΔH, for the reaction is positive.

SN	Paper	Q. No.	Answer
01	0620_m21_qp_22	15	C
02	0620_w21_qp_21	12	B
03	0620_w21_qp_21	34	D
04	0620_w21_qp_22	14	A
05	0620_w21_qp_22	34	D
06	0620_w21_qp_23	14	B
07	0620_w21_qp_23	34	D
08	0620_m20_qp_22	13	C
09	0620_s20_qp_21	13	A
10	0620_w20_qp_21	16	D
11	0620_w20_qp_21	17	B
12	0620_w20_qp_22	16	D
13	0620_w20_qp_23	16	C
14	0620_m19_qp_22	14	D
15	0620_s19_qp_21	11	C
16	0620_s19_qp_22	11	B
17	0620_s19_qp_23	11	D
18	0620_w19_qp_21	14	C
19	0620_m18_qp_22	35	A
20	0620_s17_qp_21	11	B
21	0620_s17_qp_21	12	C
22	0620_s17_qp_22	11	B
23	0620_s17_qp_23	11	D
24	0620_m16_qp_22	12	D
25	0620_s16_qp_21	11	D
26	0620_s16_qp_22	13	B
27	0620_w16_qp_21	13	A