Chemical Energetics – 2019 June

1. 0620/11/M/J/19/No.11

Dissolving ammonium chloride in water is an endothermic change.

Which row shows the energy change and temperature change of the mixture during the dissolving of ammonium chloride?

	energy change	temperature change
A	energy is absorbed	decrease
B	energy is absorbed	increase
C	energy is released	decrease
D	energy is released	increase

2. 0620/12/M/J/19/No.11

Which row describes the energy level diagram and energy change in an exothermic reaction?

	energy level diagram	energy is
A	reactants higher than products	absorbed
B	reactants higher than products	released
C	reactants lower than products	absorbed
D	reactants lower than products	released

3. 0620/13/M/J/19/No.11

Which row describes the changes that occur when metals burn in oxygen?

	temperature	metal is
A	decreases	oxidised
B	decreases	reduced
C	increases	oxidised
D	increases	reduced

4. 0620/21/M/J/19/No.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.

5. 0620/21/M/J/19/No.12

Nitrogen reacts with hydrogen to produce ammonia.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

The reaction is exothermic. The bond energies are shown in the table.

bond	bond energy in kJ / mol
N≡N	945
H–H	436
N–H	390

What is the energy change for this reaction?

A –1473 kJ / mol

B –87 kJ / mol

C 87 kJ / mol

D 1473 kJ / mol

6. 0620/22/M/J/19/No.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

7. 0620/22/M/J/19/No.12

Two elements, X and Y, react together to form a covalent molecule as shown.

The reaction is exothermic.

$$X_2(g) + Y_2(g) \rightarrow 2XY(g)$$

The bond energies are shown in the table.

bond	bond energy in kJ / mol
X–X	436
Y–Y	242
X–Y	431

What is the energy change for the reaction?

A +184 kJ / mol **B** –184 kJ / mol **C** +247 kJ / mol **D** –247 kJ / mol

8. 0620/23/M/J/19/No.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.

9. 0620/23/M/J/19/No.12

Methane burns in oxygen to form carbon dioxide and water.

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

The bond energies are shown in the table.

bond	bond energy in kJ / mol
C–H	410
C–O	360
C=O	805
O–H	460
O–O	146
O=O	496

What is the energy change for this reaction?

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

10. 0620/12/F/M/19/No.11

10 g of ammonium nitrate is added to water at 25 °C and the mixture stirred.

The ammonium nitrate dissolves and, after one minute, the temperature of the solution is 10 °C.

Which word describes this change?

A endothermic

B exothermic

C neutralisation

D reduction

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12. 0620/22/F/M/19/No.13

Hydrogen reacts with chlorine according to the following equation.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

The reaction is exothermic.

Which statement about this reaction is correct?

A Energy absorbed for bond breaking is greater than the energy released in bond making.

B Energy absorbed for bond breaking is less than the energy released in bond making.

C Energy released in bond breaking is greater than the energy absorbed in bond making.

D Energy released in bond breaking is less than the energy absorbed in bond making.

13. 0620/22/F/M/19/No.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.