Chemical Reactions – 2019 Nov

1. 0620/11/O/N/19/No.12

Equations for the formation of anhydrous cobalt(II) chloride and anhydrous copper(II) sulfate are shown.

$$CoCl_2 \cdot 6H_2O \rightarrow CoCl_2 + 6H_2O$$

$$CuSO_4 \cdot 5H_2O \rightarrow CuSO_4 + 5H_2O$$

Which statement about the reactions is **not** correct?

A Both reactions are exothermic.

B Both reactions are reversible.

C Hydrated cobalt(II) chloride changes colour from pink to blue.

D Hydrated copper(II) sulfate changes colour from blue to white.

2. 0620/11/O/N/19/No.13

A method used to investigate the rate of reaction of calcium carbonate with dilute hydrochloric acid under different conditions is shown.

- Place 50 cm^3 of dilute hydrochloric acid in a conical flask.
- Add a known volume of water to the conical flask.
- Heat the conical flask to the required temperature.
- Add 1.0 g of calcium carbonate to the conical flask.
- Measure the time taken for the reaction to finish.

Which volume of water and which temperature gives the shortest time taken for the reaction to finish?

	volume of water added / cm^3	temperature / °C
A	10	30
B	10	50
C	40	30
D	40	50

3. 0620/11/O/N/19/No.14

Which is a chemical change?

A boiling water

B cooking an egg

C dissolving sugar

D melting ice cubes

4. 0620/11/O/N/19/No.15

Mercury(II) oxide, HgO, decomposes when heated.

The equation is shown.

$$2HgO \rightarrow 2Hg + O_2$$

Why is this a reduction reaction?

A The products weigh less than the reactants.

B There are fewer reactants than products.

C There is a gain of oxygen.

D There is a loss of oxygen.

5. 0620/12/O/N/19/No.12

Which reaction produces a white-coloured substance?

A adding water to anhydrous cobalt(II) chloride

B adding water to anhydrous copper(II) sulfate

C heating hydrated cobalt(II) chloride

D heating hydrated copper(II) sulfate

6. 0620/12/O/N/19/No.14

Four students collect the gas produced from the reaction of calcium carbonate with dilute hydrochloric acid. Each student records the time taken to collect a volume of gas.

Which results show the highest average rate of reaction?

A 15 cm^3 of gas collected in 20 seconds

B 50 cm^3 of gas collected in 40 seconds

C 75 cm^3 of gas collected in 80 seconds

D 90 cm^3 of gas collected in 100 seconds

7. 0620/12,22/O/N/19/No.14,15

Which row identifies a chemical and a physical change?

	chemical change	physical change
A	boiling ethanol	burning ethanol
B	burning ethanol	evaporating ethanol
C	dissolving ethanol in water	burning ethanol
D	evaporating ethanol	dissolving ethanol in water

8. 0620/12/O/N/19/No.15

When magnesium is heated with zinc oxide a reaction occurs.

The equation is shown.

$$Mg + ZnO \rightarrow MgO + Zn$$

Which substance is oxidised?

A magnesium

B magnesium oxide

C zinc

D zinc oxide

9. 0620/13/O/N/19/No.12

Hydrated cobalt(II) chloride decomposes when heated.

$$CoCl_2 \cdot 6H_2O \longrightarrow CoCl_2 + 6H_2O$$

Which statements about this reaction are correct?

1 $CoCl_2$ is anhydrous cobalt(II) chloride.

2 Heat is released when water is added to $CoCl_2$.

3 $CoCl_2 \cdot 6H_2O$ is blue.

4 The reaction is not reversible.

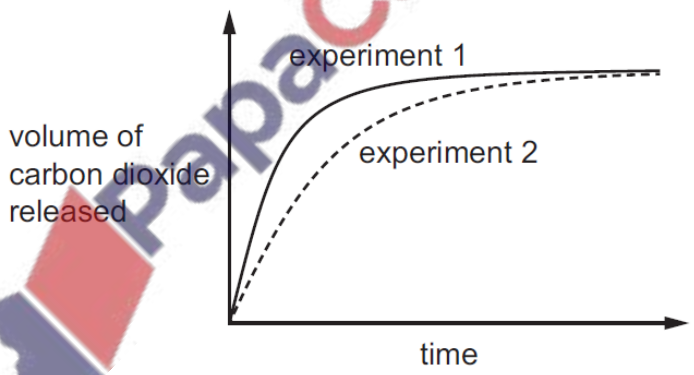
A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

10. 0620/13/O/N/19/No.13

In experiment 1, small lumps of limestone are added to dilute hydrochloric acid at 40 °C.

The volume of carbon dioxide released is measured at regular time intervals.

The results are shown.



Which changes give the results shown in experiment 2?

	limestone	temperature / °C
A	large lumps	40
B	powder	40
C	powder	60
D	small lumps	60

11. 0620/13,23/O/N/19/No.14,15

A sequence of changes involving sulfur is shown.

$$S(s) \xrightarrow{\text{change 1}} S(l) \xrightarrow{\text{change 2}} SO_2(g)$$

Which row describes the changes?

	change 1	change 2
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

12. 0620/13/O/N/19/No.15

In which equation is the iron oxidised?

A $C + FeO \rightarrow CO + Fe$

B $3CO + Fe_2O_3 \rightarrow 3CO_2 + 2Fe$

C $Fe_2O_3 + H_2 \rightarrow 2FeO + H_2O$

D $PbO + Fe \rightarrow Pb + FeO$

13. 0620/21/O/N/19/No.15

Which is a chemical change?

A boiling water

B cooking an egg

C dissolving sugar

D melting ice cubes

14. 0620/21/O/N/19/No.16

The rate of reaction between magnesium and dilute hydrochloric acid is increased by increasing the concentration of the acid.

How does this affect the reacting particles?

	collision rate of particles	proportion of particles with sufficient energy to react
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

15. 0620/21/O/N/19/No.17

Dinitrogen tetroxide, N_2O_4, is converted into nitrogen dioxide, NO_2, in a reversible reaction.

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

The forward reaction is endothermic.

Which conditions give the highest equilibrium yield of nitrogen dioxide?

	pressure / atmospheres	temperature
A	2	high
B	2	low
C	50	high
D	50	low

16. 0620/21/O/N/19/No.18

The equation for the reaction between iron(II) sulfate and bromine is shown.

$$6FeSO_4 + 3Br_2 \rightarrow 2Fe_2(SO_4)_3 + 2FeBr_3$$

Which row identifies the oxidising agent and the reducing agent?

	oxidising agent	reducing agent
A	Br_2	$FeSO_4$
B	$FeSO_4$	Br_2
C	$FeBr_3$	$Fe_2(SO_4)_3$
D	$Fe_2(SO_4)_3$	$FeBr_3$

17. 0620/22/O/N/19/No.16

A sample of dilute nitric acid is added to lumps of limestone in a conical flask. The conical flask is placed on a balance and the loss in mass is measured.

A second sample of nitric acid of a different concentration is separately tested. All other conditions are kept the same.

The loss in mass in 1 minute at each concentration of nitric acid is shown.

concentration in mol/dm^3	loss in mass in 1 minute / g
0.5	0.15
1.0	0.25

Which row describes and explains the results obtained using $1.0\,mol/dm^3$ nitric acid compared with $0.5\,mol/dm^3$ nitric acid?

	description	explanation
A	decrease in reaction rate	decrease in particle collision energy
B	decrease in reaction rate	increase in particle collision rate
C	increase in reaction rate	increase in particle collision rate
D	increase in reaction rate	increase in particle collision rate and collision energy

18. 0620/22/O/N/19/No.17

When carbon monoxide reacts with hydrogen, methanol is formed.

$$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$$

The forward reaction is exothermic.

Which statements are correct?

1 There are more moles of gas on the left-hand side of the reaction.

2 Increasing the temperature increases the amount of methanol at equilibrium.

3 Increasing the pressure increases the amount of methanol at equilibrium.

4 Increasing the initial amount of hydrogen decreases the amount of methanol at equilibrium.

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

19. 0620/22/O/N/19/No.18

In the blast furnace, iron is formed when iron(III) oxide reacts with carbon monoxide in a redox reaction.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

Which substance is the oxidising agent and which substance is the reducing agent?

	oxidising agent	reducing agent
A	CO	Fe_2O_3
B	CO_2	Fe
C	Fe	CO_2
D	Fe_2O_3	CO

20. 0620/23/O/N/19/No.16

Magnesium reacts with dilute hydrochloric acid.

Which statement about the particles in the reaction is correct?

A Increasing the concentration of dilute hydrochloric acid increases the collision rate but has no effect on the activation energy.

B Increasing the concentration of dilute hydrochloric acid increases the collision rate and the activation energy.

C Increasing the temperature of the reaction increases the activation energy.

D Increasing the temperature of the reaction causes all collisions to lead to a reaction.

21. 0620/23/O/N/19/No.17

Two molecules of nitrogen dioxide combine in a reversible reaction to form dinitrogen tetroxide.

The forward reaction is exothermic.

$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$

Which changes in reaction conditions would **both** increase the amount of dinitrogen tetroxide at equilibrium?

A decreasing the temperature and decreasing the pressure

B decreasing the temperature and increasing the pressure

C increasing the temperature and decreasing the pressure

D increasing the temperature and increasing the pressure

22. 0620/23/O/N/19/No.18

Chlorine displaces bromine from aqueous potassium bromide.

The ionic equation for the reaction is shown.

$$Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$$

Which statement about this reaction is correct?

A Bromide ions act as an oxidising agent.

B Bromide ions are oxidised when electrons are lost.

C Chlorine acts as a reducing agent.

D Chlorine is reduced when electrons are lost.