ST ANDREW'S SECONDARY SCHOOL

NAME | CLASS

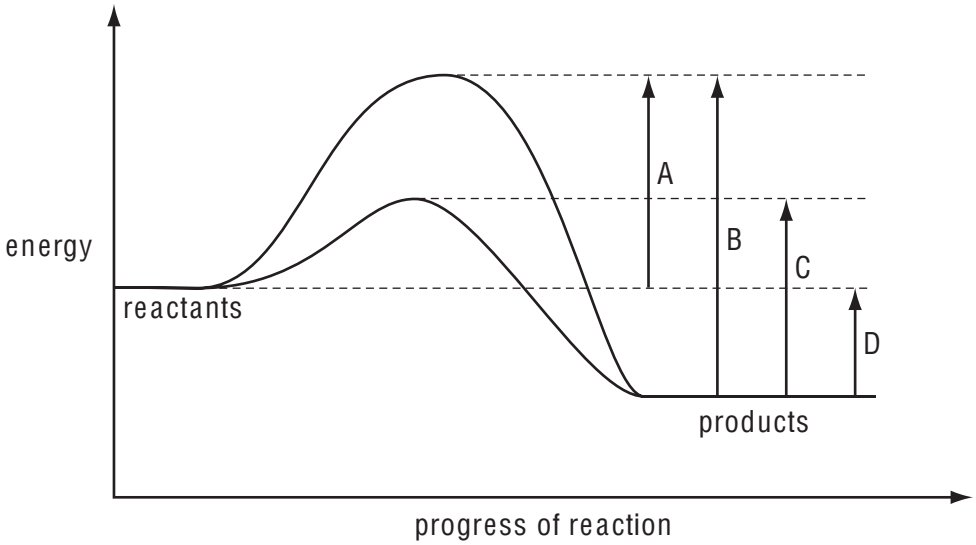
CHEMISTRY **6092/01**

Paper 1 REVISION PACKAGE **+**

MULTIPLE CHOICE QUESTIONS

1 The diagram shows the energy profile for a reaction both with and without a catalyst present.

What is the activation energy of the uncatalysed reverse reaction?



2 The metal niobium, Nb, has a relative atomic mass of 92.9 and is used in various stainless steel alloys. It is made by reducing niobium chloride with sodium. In this reaction, 54.08 g of niobium chloride produces 18.58 g of niobium.

What is the formula of the niobium chloride used?

A $NbCl_2$ **B** $NbCl_3$ **C** $NbCl_4$ **D** $NbCl_5$

3 12.5 cm^3 of 0.0500 mol dm^{-3} sodium hydroxide is added to 25.0 cm^3 of 0.100 mol dm^{-3} hydrochloric acid.

Which concentration of hydrochloric acid remains in the reaction mixture?

A 0.0019 mol dm^{-3}

B 0.0333 mol dm^{-3}

C 0.0500 mol dm^{-3}

D 0.0750 mol dm^{-3}

4 Four compounds of period 3 elements are listed.

Na_2O $SiCl_4$ SO_2 $NaCl$

Water is added to each of the four compounds.

Pairs of the resulting solutions are mixed together.

From which pair of solutions is it possible to get a solution with a pH of 7?

A $NaCl$ and Na_2O

B $NaCl$ and SO_2

C Na_2O and $SiCl_4$

D $SiCl_4$ and SO_2

5 Which mixture of gaseous oxygen and nitrogen would occupy 0.12 dm^3 at room temperature and pressure?

A 0.032 g O_2 and 0.084 g N_2

B 0.096 g O_2 and 0.028 g N_2

C 0.096 g O_2 and 0.056 g N_2

D 0.096 g O_2 and 0.084 g N_2

6 How many neutrons are present in 0.13 g of ^{13}C?
[L = the Avogadro constant]

A 0.06 L **B** 0.07 L **C** 0.13 L **D** 0.91 L

7 Phosphorus sulfide, P_4S_3, is used in small amounts in the tips of matches. On striking a match this compound burns to produce an oxide of phosphorus in the +5 oxidation state and an oxide of sulfur in the +4 oxidation state.

How many moles of oxygen gas are needed to burn one mole of P_4S_3 in this way?

A 6 **B** 7.5 **C** 8 **D** 16

8 In the analysis of an oxide of nitrogen, 0.10 mol of the oxide were reacted with excess hydrogen under suitable conditions.

$$N_xO_y \xrightarrow{H_2(g)} xNH_3 + yH_2O$$

3.6 g of water were formed in this reaction, while the ammonia produced required 100 cm^3 of 1.0 mol dm^{-3} $HCl(aq)$ for neutralisation.

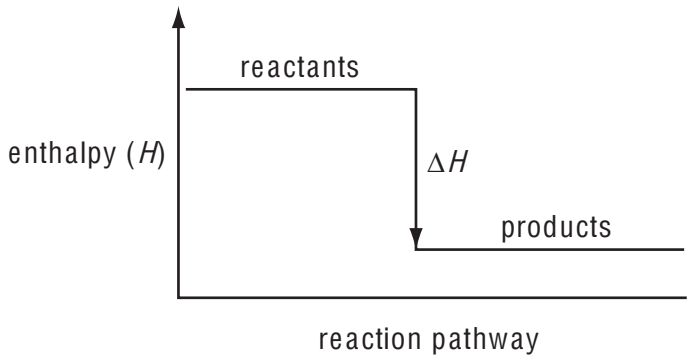
What is the formula of the oxide of nitrogen analysed?

A N_2O **B** NO **C** NO_2 **D** N_2O_5

9 Which set of solid elements contains a simple molecular structure, a giant covalent (macromolecular) structure and a giant metallic structure?

A Mg, P, S **B** P, Si, C **C** S, P, Si **D** S, Si, Al

10 Which enthalpy change could **not** be correctly represented by the enthalpy diagram shown?



A standard enthalpy change of atomisation

B standard enthalpy change of combustion

C standard enthalpy change of hydration

D standard enthalpy change of neutralisation

11 25.00 cm^3 of a solution of acidified iron(II) sulfate, $FeSO_4$, were titrated with 0.0200 mol dm^{-3} potassium manganate(VII). The mean titre was 27.40 cm^3.

The equation for the reaction is shown.

$$MnO_4^- + 8H^+ + 5Fe^{2+} \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$$

What is the concentration of iron(II) sulfate solution?

A 4.38×10^{-3} mol dm^{-3}

B 2.19×10^{-2} mol dm^{-3}

C 9.12×10^{-2} mol dm^{-3}

D 1.10×10^{-1} mol dm^{-3}

12 An ionic compound Q

- has an empirical formula NH_2O,
- reacts with NaOH(aq) to produce ammonia gas.

How many electrons are present in the anion of Q?

A 23 **B** 24 **C** 31 **D** 32

13 When anhydrous sodium carbonate, a white solid, is heated in a roaring Bunsen flame, it turns into a colourless liquid.

Which statement explains this change?

A It has absorbed water from the atmosphere.

B It has melted to form liquid sodium carbonate.

C It has reacted with the air, with water as one of the products.

D It has thermally decomposed to sodium oxide.

14 At room temperature, hydrogen peroxide decomposes slowly according to the equation.

$$2H_2O_2(aq) \rightarrow O_2(g) + 2H_2O(l)$$

Which statement correctly explains the result of carrying out this decomposition in the presence of a catalyst such as MnO_2?

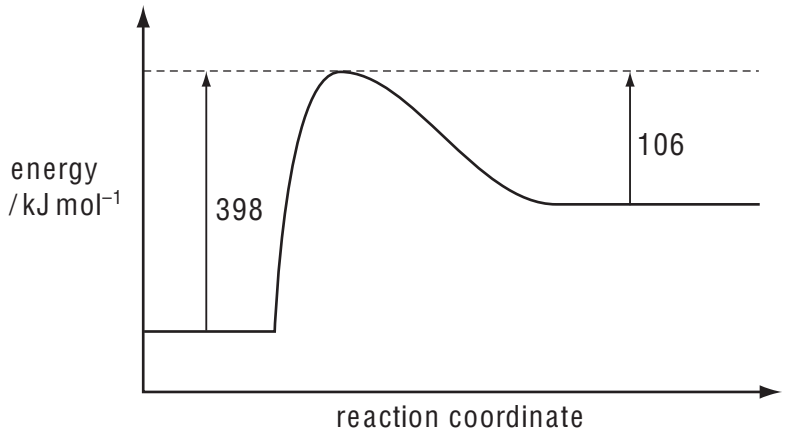
A The reaction rate increases because the collision frequency increases due to a decrease in the activation energy.

B The reaction rate increases because the collision frequency increases due to an increase in the average energy of the molecules.

C The reaction rate increases because the proportion of successful collisions increases due to a decrease in the activation energy.

D The reaction rate increases because the proportion of successful collisions increases due to an increase in the average energy of the molecules.

15 The diagram shows the energy profile for a simple reaction.



Which statement about the reaction is correct?

A The reaction is endothermic and the enthalpy change of reaction ($\Delta_r H$) is +292 kJ mol^{-1}.

B The reaction is endothermic and the enthalpy change of reaction ($\Delta_r H$) is +504 kJ mol^{-1}.

C The reaction is exothermic and the enthalpy change of reaction ($\Delta_r H$) is –292 kJ mol^{-1}.

D The reaction is exothermic and the enthalpy change of reaction ($\Delta_r H$) is –504 kJ mol^{-1}.

16 The famous 'volcano' chemical demonstration involves ammonium dichromate and can be summarised by the equation.

$$(NH_4)_2Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + 4H_2O$$

In this reaction, the ammonium ion acts as

A an acid.

B a base.

C an oxidising agent.

D a reducing agent.

17 A large excess of aqueous silver nitrate is added to aqueous barium chloride and the precipitate removed by filtration.

What are the most abundant ions in the filtrate?

A Ag^+, $Ba^{2+}$and NO_3^-

B Ag^+ and NO_3^- only

C Ba^{2+}, NO_3^- and Cl^-

D Ba^{2+} and NO_3^- only

18 A chemist has samples of solutions of aluminium nitrate and lead(II) nitrate.

Which reagent will **not** be able to distinguish clearly between these two substances? (All reagents are soluble in water.)

A HCl **B** KI **C** NaOH **D** Na_2SO_4

19 When iron reacts with aqueous iron(III) ions, iron(II) ions are formed as the only product.

A final mixture, after the reaction has taken place, contains equal numbers of moles of Fe^{2+}(aq) and Fe^{3+}(aq). Assuming the reaction has gone to completion, how many moles of Fe(s) and Fe^{3+}(aq) were in the starting mixture?

	moles of Fe(s)	moles of Fe^{3+}(aq)
A	1	2
B	1	3
C	1	5
D	2	3

20 Which molecule contains eight bonding electrons?

A CO_2 **B** C_2H_4 **C** C_3H_6 **D** NH_3

21 A medal has a total surface area of 150 cm^2. It is evenly coated with silver by electrolysis. Its mass increases by 0.216 g.

How many atoms of silver are deposited per cm^2 on the surface of the medal?

A 8.0×10^{18} **B** 1.8×10^{19} **C** 8.7×10^{20} **D** 1.2×10^{21}

22 Solutions containing chlorate(I) ions are used as household bleaches and disinfectants. These solutions decompose on heating as shown.

$$3ClO^- \rightarrow ClO_3^- + 2Cl^-$$

Which oxidation states are shown by chlorine in these three ions?

	ClO^-	ClO_3^-	Cl^-
A	+1	+3	–1
B	–1	+3	+1
C	+1	+5	–1
D	–1	+5	+1

23 4.0 g of powdered calcium carbonate, M_r = 100, are added to 100 cm^3 of 0.10 mol dm^{-3} hydrochloric acid. The volume of carbon dioxide produced is recorded every 30 seconds.

time / s	30	60	90	120	150	180	210	240
total volume of carbon dioxide given off / cm^3	40	70	88	101	110	116	120	120

Which row of the table is correct?

	why the rate of the reaction changes with time	why the reaction stops
A	fewer collisions between reacting molecules occur	the calcium carbonate is used up
B	fewer collisions between reacting molecules occur	the hydrochloric acid is used up
C	more collisions between reacting molecules occur	the calcium carbonate is used up
D	more collisions between reacting molecules occur	the hydrochloric acid is used up

24 An excess of MgO is shaken with water. The resulting mixture is filtered, this is filtrate W. Two drops of dilute sulfuric acid are added and any observation is noted.

An excess of BaO is shaken with water. The resulting mixture is filtered, this is filtrate X. Two drops of dilute sulfuric acid are added and any observation is noted.

Which row is correct?

	filtrate of **higher** pH	observation on addition of sulfuric acid to the filtrate of **higher** pH
A	W	no change
B	W	white precipitate
C	X	no change
D	X	white precipitate

25 Samples of magnesium carbonate, $MgCO_3$, are placed in crucibles R and S. The sample in crucible R is heated until there is no further loss in mass, and then allowed to cool. The sample in crucible S is left unheated.

Dilute hydrochloric acid is then added to both crucibles.

On adding the dilute hydrochloric acid, which observations are correct?

	R	S
A	gas produced	gas produced
B	gas produced	no gas produced
C	no gas produced	gas produced
D	no gas produced	no gas produced

26 The temperature of a sample of an inert gas is increased.

What effect does this have on the number of molecules with the most probable energy and on the number of molecules with high energy?

	number of molecules with the most probable energy	number of molecules with high energy
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

27 Hydrogen iodide gas decomposes reversibly producing iodine vapour and hydrogen.

$$2HI(g) \rightleftharpoons I_2(g) + H_2(g) \qquad \Delta H = +12\,kJ\,mol^{-1}$$

The position of the equilibrium for this reaction may be altered by changing the external conditions.

Which row correctly describes the change in position of equilibrium?

	effect of increasing the pressure	effect of increasing the temperature
A	moves to the right	moves to the right
B	moves to the right	moves to the left
C	no change	moves to the right
D	no change	moves to the left

28 How does a catalyst function?

A by providing the same reaction pathway and increasing the average energy of the molecules

B by providing an alternative reaction pathway and increasing the average energy of the molecules

C by providing the same reaction pathway with a lower activation energy

D by providing an alternative reaction pathway with a lower activation energy

29 The nickel-cadmium rechargeable battery is based upon the following overall reaction.

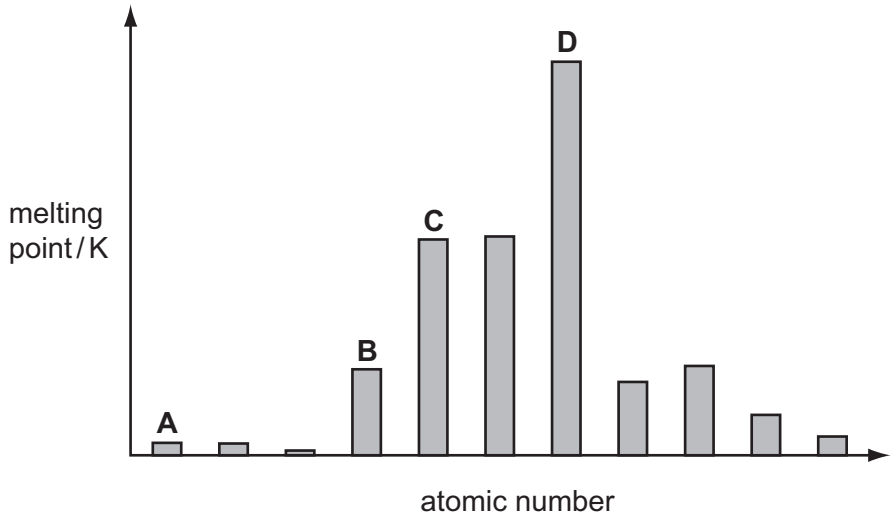
$$Cd + 2NiO(OH) + 4H_2O \rightarrow Cd(OH)_2 + 2Ni(OH)_2.H_2O$$

What is the oxidation number of nickel at the beginning and at the end of the reaction?

	beginning	end
A	+1.5	+2
B	+2	+3
C	+3	+2
D	+3	+4

30 The bar chart shows the melting points of a series of consecutive elements arranged in order of increasing atomic number. The elements sodium to chlorine form part of this series.

Which bar represents sodium?



Good luck!!