GCSE Chemistry A (Gateway Science)

J248/04 Chemistry A C4-C6 and C7 (Higher Tier)

Question Set 2

C5: Monitoring and controlling chemical reactions

Multiple Choice Questions

1 Which statement about **atom economy** is correct?

A A reaction that has only one product has a higher atom economy than a reaction that has two products, one of them being a waste product.

B A reaction with a low atom economy is more sustainable than a reaction with a high atom economy.

C A reaction with a low atom economy will usually produce less waste products than a reaction with a high atom economy.

D To calculate the atom economy of a reaction you need to know the expected yield and the actual yield of the products.

Your answer  **[1]**

2 Which statement describes what happens when a reaction **reaches** equilibrium?

A The forward reaction happens at a faster rate than the backwards reaction.

B The forward and backward reactions happen at the same rate.

C The forward and backward reactions stop happening.

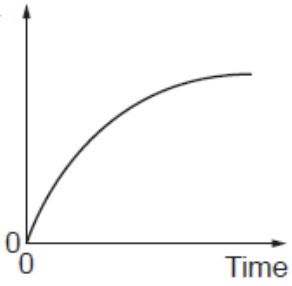
D The backward reaction happens at a faster rate than the forward reaction.

Your answer  **[1]**

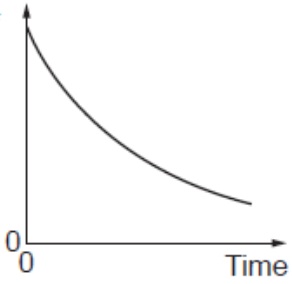
3 A catalyst can be used to increase the rate of a reaction.

Which graph shows the **mass of the catalyst** as the reaction takes place?

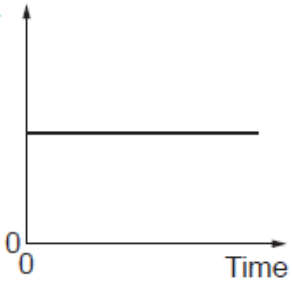
A



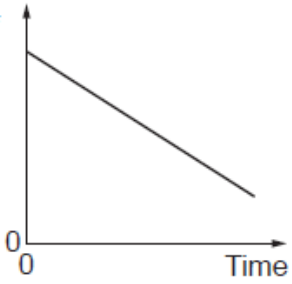
B



C



D



Your answer C **[1]**

4 Which of the following is the expression used to calculate concentration in g/dm^3?

A $\text{Concentration} = \dfrac{\text{mass of solute in g}}{\text{volume of solution in dm}^3}$

B $\text{Concentration} = \dfrac{\text{mass of solvent in g}}{\text{volume of solution in dm}^3}$

C $\text{Concentration} = \text{mass of solute in g} \times \text{volume of solution in dm}^3$

D $\text{Concentration} = \dfrac{\text{mass of solute in g} \times \text{volume of solution in dm}^3}{1000}$

Your answer A **[1]**

5 Which statement is true for a reversible reaction when it is at dynamic equilibrium?

A The concentration of the products is increasing.

B The rate of the backward reaction is greater than the rate of the forward reaction.

C The rate of the forward reaction is equal to the rate of the backward reaction.

D The rate of the forward reaction is greater than the rate of the backward reaction.

Your answer C **[1]**

6 Look at the equation for a reversible reaction.

cool hot exothermic

$$4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O(g) \quad \Delta H = -950\,\text{kJ mol}^{-1}$$

LP HP

The reversible reaction forms a dynamic equilibrium in a sealed container.

Which of the following would move the position of equilibrium to the **right**?

A Decreasing the pressure and decreasing the temperature.

B Increasing the pressure and decreasing the temperature.

C Increasing the pressure and increasing the temperature.

D Increasing the pressure and using a catalyst.

Your answer A **[1]**

7 How much 0.2 mol / dm^3 hydrochloric acid solution could you make from 100 cm^3 of 1.0 mol / dm^3 hydrochloric acid?

A 20 cm^3

B 200 cm^3

C 500 cm^3

D 600 cm^3

c = m/v
so mol at the start $1 \times \frac{100}{1000} = 0.1$

v=m/c so v=0.1/0.2
=0.5 dm^3

Your answer C **[1]**

8 Urea, $(NH_2)_2CO$, is a fertiliser.

A student makes 1 mole of urea from 2 moles of ammonia.

What is the mass of urea that the student makes?

A 43.0 g

B 44.0 g

C 58.0 g

D 60.0 g

N = 14 C = 12
H = 1 O = 16

$M_r = 14+2+14+2+12+16$
$= 60$

Your answer D **[1]**

mass = $M_r \times$ mol
$= 60 \times 1 = 60g$

9 A student is making a fertiliser called potassium nitrate, KNO_3.

Look at the equation for the reaction she uses.

$$KOH + HNO_3 \rightarrow KNO_3 + H_2O$$

The relative formula masses, M_r, of each compound are shown in the table.

Compound	Formula	Relative formula mass
potassium hydroxide	KOH	56.1
nitric acid	HNO_3	63.0
potassium nitrate	KNO_3	101.1
water	H_2O	18.0

What is the atom economy for the reaction to make potassium nitrate?

Assume that water is a waste product.

$$\frac{101.1}{101.1+18} \times 100$$

A 15.1%

B 47.1%

C 52.9%

D 84.9%

Your answer D **[1]**

10 Zinc nitrate thermally decomposes to give two gases.

$$2Zn(NO_3)_2(s) \rightarrow 2ZnO(s) + 4NO_2(g) + O_2(g)$$ 2 : 5 ratio

A student heats 1.89 g of zinc nitrate until there is no further reaction.

What is the **total** volume of gas measured at room temperature and pressure, made in this reaction?

- Assume that one mole of gas occupies a volume of 24 dm^3 at room temperature and pressure.
- The molar mass of zinc nitrate is 189 g/mol.

A 0.12 dm^3

B 0.48 dm^3

C 0.60 dm^3

D 1.20 dm^3

$n_{nitrate} = \frac{m}{mr} = \frac{1.89}{189} = 0.01$

$\therefore n_{gas\ produced} = 0.01 \times \frac{5}{2} = 0.025\ mol$

$\therefore Volume = n \times V_A = 0.025 \times 24$

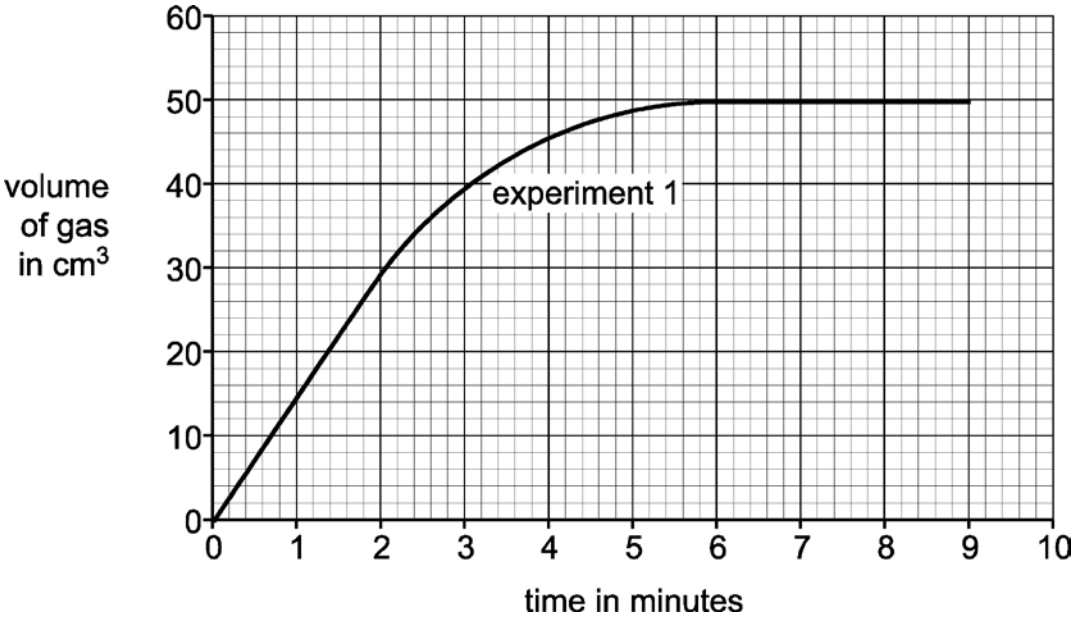
$= 0.60$

Your answer C **[1]**

11 A student investigates the reaction between calcium carbonate and hydrochloric acid.

He measures the total volume of gas made every minute.

Look at the graph. It shows his results for the experiment.



What is the rate of reaction between 0 and 2 minutes, in cm^3/minute?

A 7.5

B 15

C 30

D 60

$\frac{30}{2} = 15\ cm^3/min$

Your answer B

[1]

12 A student investigates the reaction between 1.0 g of calcium carbonate and 20 cm^3 of 1.0 mol/dm^3 hydrochloric acid at 25 ºC.

The student does two experiments.

- He uses **different** sized pieces of calcium carbonate for each experiment.
- The rate of reaction is greater in the first experiment.

Which is the best explanation for this result?

A Large pieces of calcium carbonate have a larger surface area resulting in less frequent collisions.

B Large pieces of calcium carbonate have a smaller surface area resulting in more frequent collisions.

C Small pieces of calcium carbonate have a larger surface area resulting in less frequent collisions.

D Small pieces of calcium carbonate have a larger surface area resulting in more frequent collisions.

Your answer  **[1]**

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Your answer  **[1]**

Total Marks for Question Set 2: 13

The Periodic Table of the Elements

(1)	(2)											(3)	(4)	(5)	(6)	(7)	(0)
1																	18
1 **H** hydrogen 1.0	2											13	14	15	16	17	2 **He** helium 4.0
3 **Li** lithium 6.9	4 **Be** beryllium 9.0											5 **B** boron 10.8	6 **C** carbon 12.0	7 **N** nitrogen 14.0	8 **O** oxygen 16.0	9 **F** fluorine 19.0	10 **Ne** neon 20.2
11 **Na** sodium 23.0	12 **Mg** magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 **Al** aluminium 27.0	14 **Si** silicon 28.1	15 **P** phosphorus 31.0	16 **S** sulfur 32.1	17 **Cl** chlorine 35.5	18 **Ar** argon 39.9
19 **K** potassium 39.1	20 **Ca** calcium 40.1	21 **Sc** scandium 45.0	22 **Ti** titanium 47.9	23 **V** vanadium 50.9	24 **Cr** chromium 52.0	25 **Mn** manganese 54.9	26 **Fe** iron 55.8	27 **Co** cobalt 58.9	28 **Ni** nickel 58.7	29 **Cu** copper 63.5	30 **Zn** zinc 65.4	31 **Ga** gallium 69.7	32 **Ge** germanium 72.6	33 **As** arsenic 74.9	34 **Se** selenium 79.0	35 **Br** bromine 79.9	36 **Kr** krypton 83.8
37 **Rb** rubidium 85.5	38 **Sr** strontium 87.6	39 **Y** yttrium 88.9	40 **Zr** zirconium 91.2	41 **Nb** niobium 92.9	42 **Mo** molybdenum 95.9	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	● 57–71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium 204.4	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	● 89–103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		

Key
atomic number
Symbol
name
relative atomic mass