

X813/76/12

# Chemistry Paper 1 — Multiple choice

Duration — 40 minutes

#### Total marks — 25

Attempt ALL questions.

You may use a calculator.

Instructions for the completion of Paper 1 are given on *page 02* of your answer booklet X813/76/02.

Record your answers on the answer grid on page 03 of your answer booklet.

You may refer to the Chemistry Data Booklet for Higher and Advanced Higher.

Space for rough work is provided at the end of this booklet.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.





## Total marks — 25

### **Attempt ALL questions**

1. Aluminium carbonate can be produced by the following reaction.

$$2AlCl_3(aq) + 3K_2CO_3(aq) \rightarrow Al_2(CO_3)_3(s) + 6KCl(aq)$$

The most suitable method for separating the aluminium carbonate from the mixture is

- A filtration
- B distillation
- C evaporation
- D collection over water.
- 2. The difference in the size of sodium and chlorine atoms is mainly due to the difference in the
  - A mass of each atom
  - B number of electrons
  - C number of neutrons
  - D number of protons.
- 3. Solid carbon dioxide is known as 'dry ice'. It changes directly to a gas when it is heated.

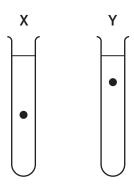
$$CO_2(s) \rightarrow CO_2(g)$$

The strongest bonds broken in this process are

- A polar covalent bonds
- B London dispersion forces
- C non-polar covalent bonds
- D permanent dipole-permanent dipole interactions.
- **4.** Which of the following statements is correct?
  - A Elements with high electronegativities tend to be reduced
  - B Elements with high electronegativities tend to act as reducing agents
  - C Elements with low electronegativities tend to gain electrons
  - D Elements with low electronegativities tend to act as oxidising agents

5. The viscosities of two liquids, X and Y, were investigated by dropping a metal ball into a tube of each liquid.

The diagram shows the position of the metal balls after 10 seconds.



Which line in the table correctly describes the viscosity and relative strengths of the van der Waals forces in liquids X and Y?

	Х	Υ
Α	most viscous	strongest van der Waals forces
В	least viscous	weakest van der Waals forces
С	least viscous	strongest van der Waals forces
D	most viscous	weakest van der Waals forces

**6.** What is the enthalpy change, in kJ mol<sup>-1</sup>, for the following reaction?

$$Be(g) \rightarrow Be^{2+}(g) + 2e^{-}$$

- A 900
- B 1757
- C 2657
- D 3514
- 7. Which of the following is an isomer of pentanoic acid?
  - A 2-methylpropanoic acid
  - B propyl methanoate
  - C 2-ethylbutanoic acid
  - D ethyl propanoate

[Turn over

8. The structures of two common painkillers are shown below.

Which of the following is true?

- A Both painkillers are ketones
- B Aspirin contains a carboxyl group and an ester link
- C Paracetamol contains a hydroxyl group and a carboxyl group
- D Neither painkiller contains an amide link
- **9.** Which two isomers would each produce an acid when warmed with acidified potassium dichromate solution?

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

Α	70
В	84
С	88
D	102.
	ich of the following compounds would react with sodium hydroxide solution to m the salt sodium propanoate?
Α	HCOOC <sub>2</sub> H <sub>5</sub>
В	CH <sub>3</sub> COOCH <sub>3</sub>
С	C <sub>2</sub> H <sub>5</sub> COOH
D	C <sub>3</sub> H <sub>7</sub> COOH
Wh	en a protein is denatured
Α	it is broken into amino acids
В	hydrogen bonds are broken
С	peptide links are hydrolysed
D	water molecules are eliminated.
Cor	npared with oils, fats are
Α	less saturated and have higher melting points
В	less saturated and have lower melting points
С	more saturated and have higher melting points
D	more saturated and have lower melting points.
\/it:	amin C is an antioxidant used to preserve food and lengthen shelf-life.
	ich of the following does <b>not</b> describe an antioxidant?
Α	Electron donor
$\overline{}$	
В	Oxidising agent
	Oxidising agent Reducing agent
В	
B C	Reducing agent
	B C D White

10. When an aldehyde is converted into the corresponding alcohol a reduction reaction

Reduction of 2-methylbutanal (GFM = 86) produces a compound with a GFM of

takes place.

15. On exposure to UV light, methane and chlorine undergo a chain reaction.

Which of the following is a propagation step in this reaction?

$$\mathsf{A} \quad \cdot \mathsf{CH_3} \quad + \quad \mathsf{Cl} \cdot \quad \rightarrow \quad \mathsf{CH_3Cl}$$

$${\rm B} \quad {\rm Cl_2} \ \rightarrow \ 2{\rm Cl} \cdot$$

$$\mathsf{C} \quad \mathsf{H} \cdot \ + \ \mathsf{Cl} \cdot \ \to \ \mathsf{HCl}$$

D 
$$CH_4 + Cl \rightarrow \cdot CH_3 + HCl$$

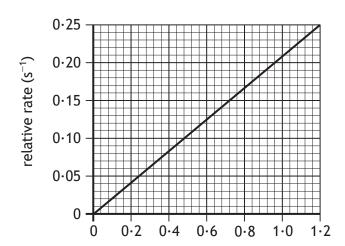
**16.** A reaction was carried out at four different temperatures. The table shows the times taken for the reaction to occur.

Temperature (°C)	20	30	40	50
Time (s)	60	30	14	5

The results show that

- A a small rise in temperature results in a large increase in the rate of the reaction
- B the activation energy increases with increasing temperature
- C doubling the temperature of the reaction doubles the rate of the reaction
- D the reaction is slowing down with increasing temperature.

**17.** The graph shows the effect of increasing the concentration of potassium iodide solution on reaction rate.



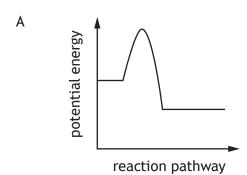
concentration of potassium iodide (mol l<sup>-1</sup>)

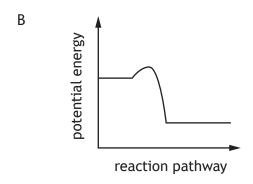
What was the concentration, in  $mol l^{-1}$ , of the potassium iodide solution used in a reaction that took 5 s to complete?

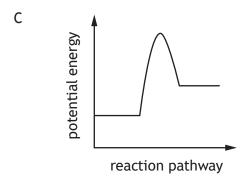
- A 0.04
- B 0.20
- C 0.24
- D 0.96

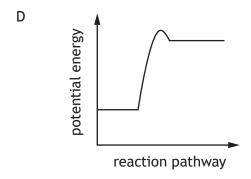
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**18.** Which of the following diagrams represents an exothermic reaction that is more likely to take place at room temperature?









**19.** Which of the following will result in the volume of the products being half the volume of the reactants?

$$A \hspace{0.4cm} 2SO_2(g) \hspace{0.4cm} + \hspace{0.4cm} O_2(g) \hspace{0.4cm} \rightarrow \hspace{0.4cm} 2SO_3(g)$$

$$\label{eq:definition} \begin{array}{lclcrcl} D & C(s) & + & H_2O(g) & & \rightarrow & H_2(g) & + & CO(g) \end{array}$$

20. The ester ethyl ethanoate is produced by the following reaction.

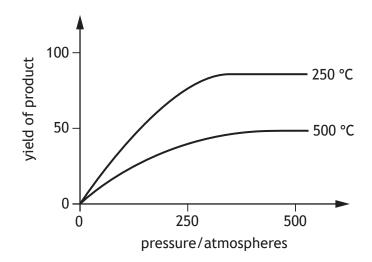
$$CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$$

Which of the following mixtures would produce 0.8 moles of ester if the yield was 80%?

	moles of CH <sub>3</sub> COOH	moles of C <sub>2</sub> H <sub>5</sub> OH
Α	0.4	0.4
В	0.5	0.5
С	0.8	0.8
D	1.0	1.0

[Turn over

**21.** The graph shows how the yield of product in a reversible reaction varies with pressure at two different temperatures.



From this information it can be concluded that

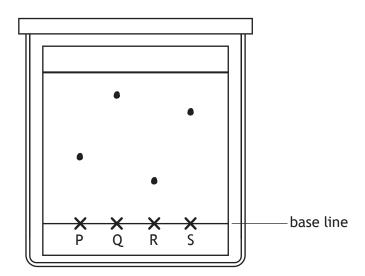
- A the reaction is exothermic
- B all reactants are converted to products at 250 °C and 300 atmospheres
- C increasing the temperature increases the yield
- D increasing the pressure above 200 atmospheres has no effect on yield.

22. 
$$2KOH(aq) + H2SO4(aq) \rightarrow K2SO4(aq) + 2H2O(\ell)$$

How many moles of potassium hydroxide, KOH, neutralise 50 cm $^3$  of 0.2 mol  $l^{-1}$  sulfuric acid,  $H_2SO_4$ ?

- A 0.01
- B 0.02
- C 0·10
- D 0.40

23. Four amino acids, P, Q, R and S were analysed by chromatography. Larger molecules travel a shorter distance from the base line. Less polar molecules travel a greater distance from the base line.



Which of the following statements is correct?

- A P is less polar than S
- B Q is a larger molecule than P
- C R is more polar than P
- D S is a smaller molecule than Q
- **24.** A student produced the following results for a redox titration.

Sample	Volume of solution added (cm <sup>3</sup> )
1	21.0
2	20.3
3	20.7
4	20·4

The volume of solution, in cm³, that should be used in the titration calculation is

- A 20.35
- B 20.50
- C 20.55
- D 20.60

**25.** An equilibrium mixture of  $NO_2$  and  $N_2O_4$  in a sealed gas syringe has a pale brown colour.

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

Increasing the pressure causes the mixture to become paler.

Increasing the temperature causes the mixture to become darker.

Which line in the table correctly identifies the colour of  $NO_2$  and the enthalpy change for the forward reaction?

	Colour of NO <sub>2</sub>	Enthalpy change for the forward reaction
Α	brown	exothermic
В	brown	endothermic
С	colourless	exothermic
D	colourless	endothermic

[END OF QUESTION PAPER]

## **SPACE FOR ROUGH WORK**

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