



Chemistry Higher level Paper 1A

15 May 2026

Zone A afternoon | Zone B afternoon | Zone C afternoon

2 hours [Paper 1A and Paper 1B]

Instructions to students

- Do not open this examination paper until instructed to do so.
- Answer all questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- A calculator is required for this paper.
- A clean copy of the **chemistry data booklet** is required for this paper.
- The maximum mark for paper 1A is **[40 marks]**.
- The maximum mark for paper 1A and paper 1B is **[75 marks]**.

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A005

Section A

1. What is correct about the species $^{108}\text{Ag}^+$?

	Number of protons	Number of neutrons	Number of electrons
A.	108	108	107
B.	47	61	46
C.	47	108	48
D.	108	61	46

2. What will be the volume of 2.00 dm^3 of gas that has had the pressure increased from 100 kPa to 200 kPa , and its temperature decreased from 50.0°C to 25.0°C ?

- A. 2.00 dm^3
 B. 1.85 dm^3
 C. 0.923 dm^3
 D. 0.500 dm^3

3. What is the correct electron configuration of the bromine atom?

- A. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$
 B. $1s^2 1p^6 2s^2 2p^6 3s^2 3p^6 4s^2 4p^5$
 C. $1s^2 2s^2 2p^6 2d^{10} 3s^2 3p^6 3d^{10} 4s^2 4p^5$
 D. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^7$

4. Which element has these successive ionization energies?

Ionization energy number	kJ mol^{-1}
1st	999
2nd	2252
3rd	3363
4th	4556
5th	7004
6th	8495
7th	27 108
8th	31 724
9th	36 649
10th	43 196

- A. Oxygen
- B. Fluorine
- C. Sulfur
- D. Chlorine

5. How many ions are present in 100 g of CaCO_3 ?

- A. 1
- B. 2
- C. 6×10^{23}
- D. 1.2×10^{24}

6. What is the empirical formula of an alcohol with 52% mass carbon and 13% mass hydrogen?

- A. C_2H_5
- B. C_5H_{13}
- C. C_2H_6O
- D. CH_4O

7. Which properties are expected for the compound potassium fluoride?

	Soluble in water?	Melting point	Conducts electricity when solid?	Conducts electricity when molten?
A.	No	Low	No	No
B.	No	Low	Yes	No
C.	Yes	High	Yes	Yes
D.	Yes	High	No	Yes

8. What is the correct electron domain geometry and molecular geometry of BrF_5 ?

	Electron domain geometry	Molecular geometry
A.	trigonal bipyramidal	trigonal bipyramidal ✓
B.	trigonal bipyramidal	square pyramidal
C.	octahedral	trigonal bipyramidal
D.	octahedral	square pyramidal

9. Which species contains a coordination bond?

- A. BF_3
- B. NH_3
- C. $[H_3O]^+$
- D. CH_3COO^-

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10. Which molecules are polar?

- I. CH_2Cl_2
- II. CH_3Cl
- III. CCl_4

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

11. How many sigma and pi bonds are present in but-1-yne, C_4H_6 ?

	Sigma bonds	Pi bonds
A.	8	3
B.	9	2
C.	3	2
D.	10	1

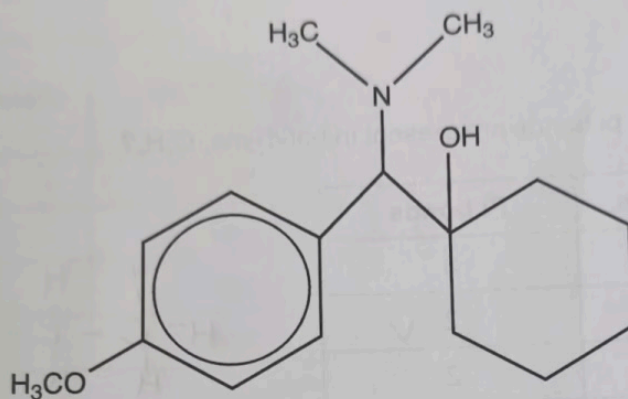
12. Which classification is correct?

	Alkali metal	Transition element	Halogen	Noble gas
A.	caesium	tungsten	krypton	iodine
B.	caesium	tungsten	iodine	krypton
C.	tungsten	caesium	iodine	krypton
D.	tungsten	caesium	krypton	iodine

13. Which oxide will react with water to produce the most basic solution?

- A. Sodium oxide
- B. Magnesium oxide
- C. Carbon dioxide
- D. Sulfur dioxide

14. Which functional groups are present in this molecule?



- A. Secondary amino, hydroxyl, alkoxy
- B. Tertiary amino, alcohol, carbonyl
- C. Tertiary amino, hydroxyl, alkoxy
- D. Secondary amino, alcohol, carbonyl

15. Which of these molecules are isomers of each other?

- I. Pentanal
- II. 2,2-dimethylpropan-1-ol
- III. Pentan-2-ol

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

B

16. Which statement about these complex ions and their colours is correct?

Complex ion	Colour of complex
$[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$	blue
$[\text{CuCl}_4]^{2-}$	green
$[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$	violet

- A. Splitting of the d-orbitals is greatest in $[\text{CuCl}_4]^{2-}$.
- B. Splitting of the d-orbitals is greatest in $[\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$.
- C. The wavelength of light absorbed by $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ is the shortest.
- D. The wavelength of light absorbed by $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ is the longest.

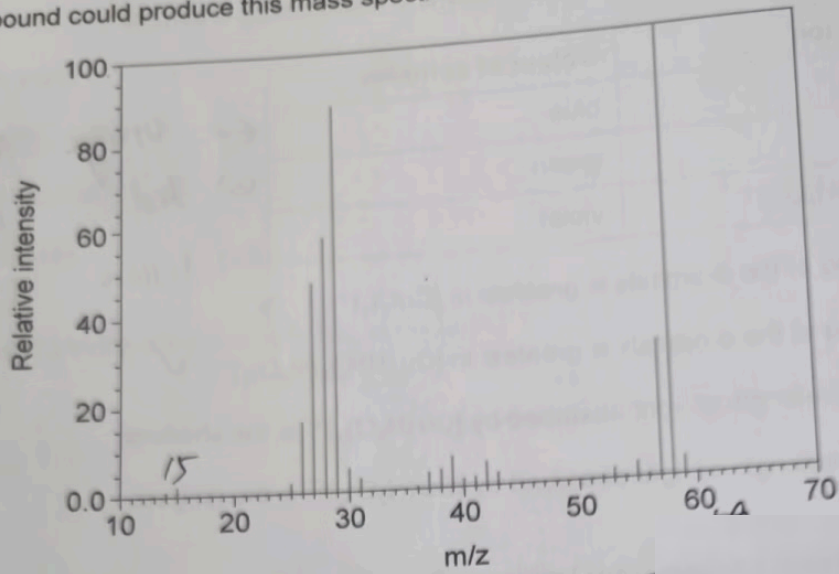
17. Which molecules exhibit *cis-trans* isomerism?

- I. But-2-ene ✓
- II. 1,2-dichloroethene
- III. But-1-ene

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

Structure	Isomerism	Number
$\text{CH}_3\text{CH}=\text{CHCH}_3$	✓	29
$\text{CH}_2=\text{CHCH}_2\text{CH}_3$	✓	30
$\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$	✓	31
$\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$		32

18. Which compound could produce this mass spectrum?

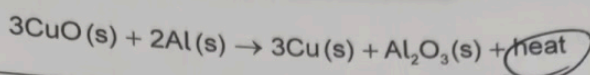


Mass lost (M_r)	Possible neutral fragment lost
15	$\bullet\text{CH}_3$
17	$\bullet\text{OH}$
18	H_2O
28	$\text{CH}_2 = \text{CH}_2$ CO
29	$\bullet\text{CH}_2\text{CH}_3$ $\bullet\text{CHO}$
31	$\bullet\text{OCH}_3$
45	$\bullet\text{COOH}$

- A. Propanal
 B. Propanone
 C. Propan-1-ol
 D. Propan-2-ol

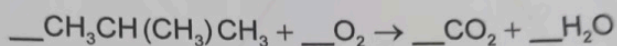
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19. Which classification is correct for this reaction?



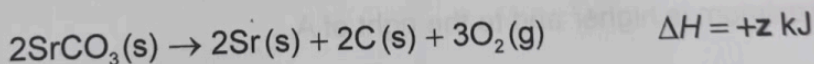
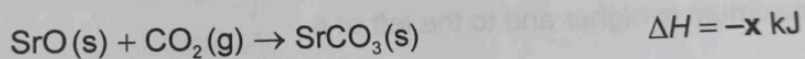
	Exothermic or endothermic?	Temperature	Products or reactants more stable?
A.	endothermic	decreases	reactants
B.	exothermic	decreases	products
C.	exothermic ✓	increases ✓	products ✓
D.	endothermic	increases	reactants

20. What is the sum of the coefficients when this equation is balanced with the smallest whole numbers?

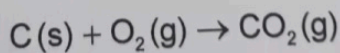


- A. 10
- B. 16
- C. 26
- D. 33

21. Given the following data:



What is the ΔH of the following reaction?

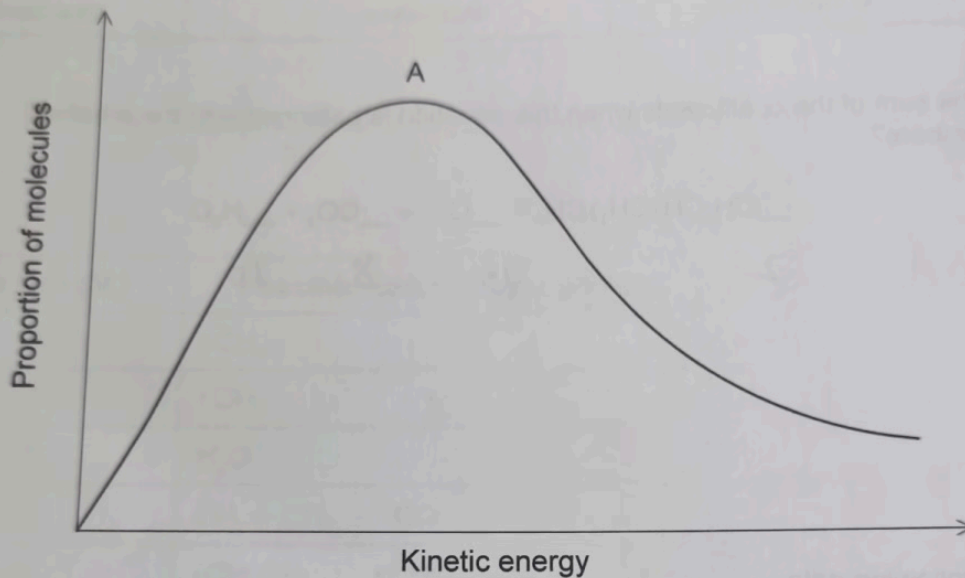


- A. $+x + 0.5y - 0.5z$
- B. $+x + 0.5y + 0.5z$
- C. $+2x + y - z$
- D. $+x - y - 2z$

22. In which reaction will there be a decrease in entropy?

- A. $\text{LiCl(s)} \rightarrow \text{LiCl(aq)}$
- B. $\text{Mg(s)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{MgSO}_4\text{(aq)} + \text{H}_2\text{(g)}$
- C. $2\text{NaHCO}_3\text{(s)} \rightarrow \text{Na}_2\text{CO}_3\text{(s)} + \text{CO}_2\text{(g)} + \text{H}_2\text{O(g)}$
- D. $\text{NH}_3\text{(g)} + \text{HCl(g)} \rightarrow \text{NH}_4\text{Cl(s)}$

23. What is the effect of increasing temperature on this Maxwell-Boltzmann energy distribution curve?



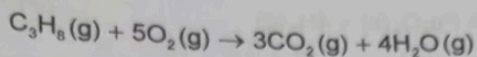
- A. The curve maximum is higher and to the left of A.
- B. The curve maximum is lower and to the right of A.
- C. The curve maximum is higher and to the right of A.
- D. The curve maximum is lower and to the left of A.

24.

B

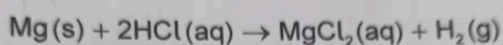
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24. Which volume of oxygen is required to react fully with 50.0 cm³ of propane to ensure complete combustion?



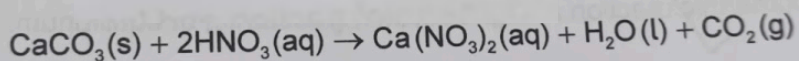
- A. 500 cm³
- B. 250 cm³
- C. 150 cm³
- D. 50.0 cm³

25. Which substances will be present in the reaction vessel at the end of the reaction between 1.2 g of magnesium and 200 cm³ of 1.0 mol dm⁻³ hydrochloric acid?



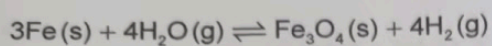
- A. HCl(aq), MgCl₂(aq)
- B. Mg(s), HCl(aq)
- C. Mg(s), MgCl₂(aq)
- D. Mg(s), HCl(aq), MgCl₂(aq)

26. Which of these changes will increase the time taken for this reaction to go to completion?



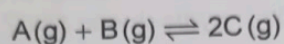
- A. Increase concentration of HNO₃
- B. Increase particle size of CaCO₃
- C. Decrease pressure in container
- D. Decrease volume of container

27. Which change would shift the position of this equilibrium towards the products?



$$\Delta H = +320 \text{ kJ mol}^{-1}$$

28. What can be deduced about this equilibrium reaction from these data?

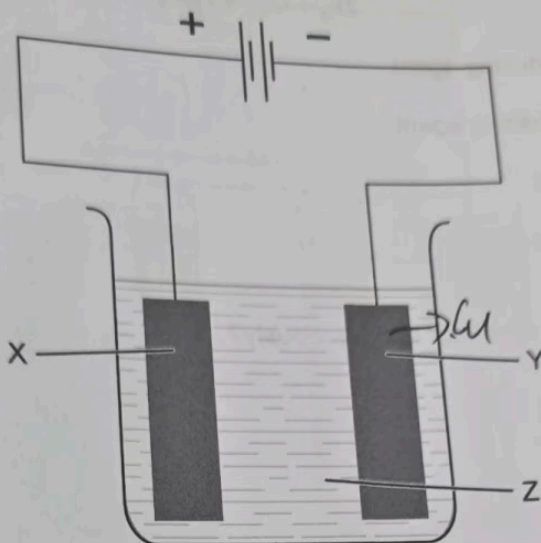


Temperature	Value of equilibrium constant, K
290 K	100
350 K	300

29. What does the Arrhenius factor, A, take into account in a reaction?

- A. The collision orientation
 B. The rate constant
 C. The activation energy
 D. The collision temperature

30. Which combination of substances is correct for electroplating a copper electrode with silver using an electrolytic cell?

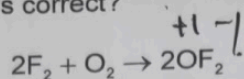


	X	Y	Z
A.	silver	copper	silver nitrate solution ✓
B.	copper	silver	silver nitrate solution
C.	silver	copper	copper(II) nitrate solution
D.	copper	silver	copper(II) nitrate solution

31. Which of these salts, when dissolved in water to make solutions of equal concentration, has the highest pH?

- A. KCl $pH \approx 7$
- B. $KHCO_3$
- C. NH_4NO_3
- D. NH_4HCO_3

32. Which statement about this reaction is correct?



- A. Fluorine is the reducing agent.
- B. Fluorine is the oxidizing agent.
- C. Oxygen is reduced.
- D. Fluorine is oxidized.

33. Which of these reactions will occur spontaneously?

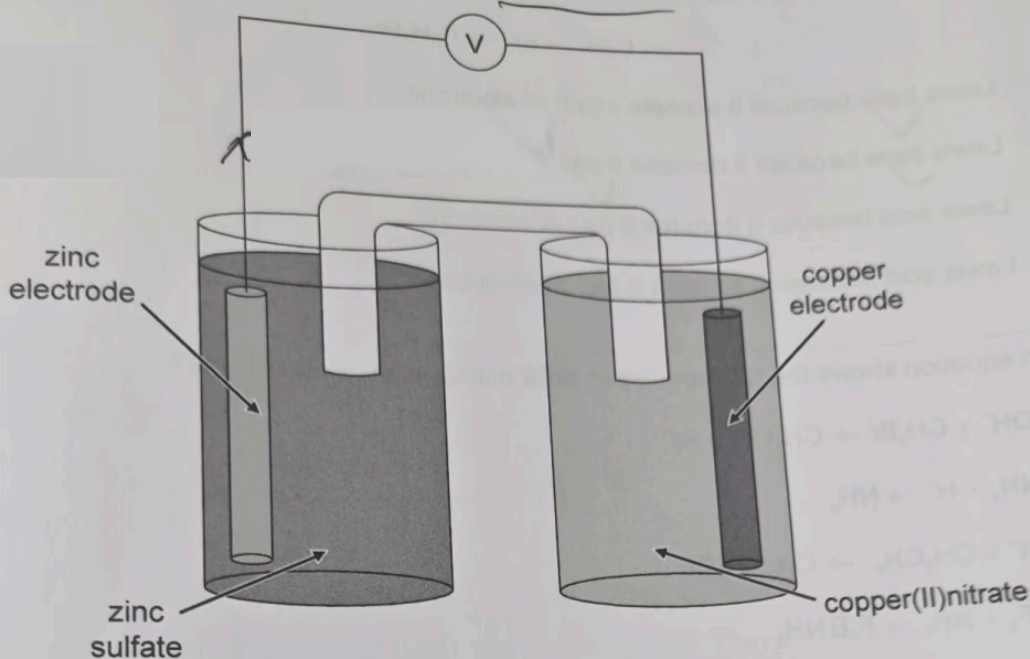
- I. $\text{NaCl} + \text{Br}_2$
- II. $\text{NaI} + \text{Br}_2$ ✓
- III. $\text{NaBr} + \text{Cl}_2$ ✓

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

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A. KCl ✓
 B. KHCO_3
 C. NH_4NO_3
 D. NH_4HCO_3

34. Which combination is correct for this cell, when zinc is more reactive than copper?

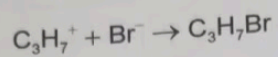


	Cathode	Anode	Sign on cathode	Sign on anode
A.	copper	zinc	-	+
B.	zinc	copper	-	+
C.	zinc	copper	+	-
D.	copper	zinc	+	-

35. Which products are produced at the electrodes by the electrolysis of aqueous calcium bromide?

	Product at cathode	Product at anode
A.	calcium	bromine
B.	hydrogen	bromine
C.	bromine	calcium
D.	bromine	hydrogen

36. Which statement explains the Lewis acid-base nature of the bromide ion in this reaction?



- A. Lewis base because it accepts a pair of electrons
 B. Lewis base because it donates a pair of electrons
 C. Lewis acid because it donates a pair of electrons
 D. Lewis acid because it accepts a pair of electrons

37. Which equation shows the first species in **bold** acting as an **electrophile**?

- A. **OH**⁻ + CH₃Br → CH₃OH + Br⁻
 B. **NH**₃ + H⁺ → NH₄⁺
 C. **Cl**⁻ + CH₃CH₂⁺ → CH₃CH₂Cl
 D. **BF**₃ + NH₃ → F₃BNH₃

38. What can react with benzene to produce nitrobenzene?

- A. NO⁺
 B. NO₂⁻
 C. NO⁻
 D. NO₂⁺

39. Which reaction will be fastest when a halogen is substituted by aqueous hydroxide ions?

- A. (CH₃)₃C-I
 B. (CH₃)₃C-Br
 C. (CH₃)₃C-Cl
 D. (CH₃)₃C-F

40. What is the charge on this complex ion of iron (II), $[\text{Fe}(\text{H}_2\text{O})_4(\text{OH})_2]^{x?}$?

- A. 2+
 - B. 1+
 - C. 0
 - D. 2-
-