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ST ANDREW'S JUNIOR COLLEGE



JC2 Preliminary Examination

Chemistry

8872/1

Higher 1

Paper 1

01 SEPTEMBER 2015

0800 – 0850

50 minutes

Candidates answer on separate paper.

Additional Materials: Writing paper, Data Booklet, OAS

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, civics group and index number on the OAS provided unless this has been done for you.

There are **thirty** questions on this paper. Answer all questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the one you consider correct and record your choice in **soft pencil** on the separate OAS.

Read the instructions on the OAS very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

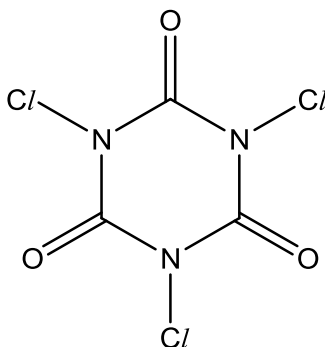
This document consists of **15** pages including one blank page.

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Section A

For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the one you consider to be correct.

- 1** **Trichloroisocyanuric acid** is used commonly in swimming pools as a disinfectant. The recommended concentration level of the acid is 1.50 mg per litre.



Trichloroisocyanuric acid

How many moles of chlorine atoms are present in a 2.50×10^6 litre Olympic-sized pool?

- A** 16.1
B 48.4
C 161
D 484
- 2** Carbon sulfide, CS_2 is a volatile flammable liquid used in the manufacture of cellophane. It combusts to form CO_2 and SO_2 .

What is the volume of gases produced after the complete combustion of 30 cm^3 of CS_2 ?

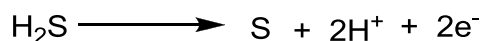
- A** 30 cm^3
B 60 cm^3
C 90 cm^3
D 120 cm^3

[Turn over]

- 3 The active ingredient in antacids is calcium carbonate. To assess the percentage content of calcium carbonate in a tablet, a 0.50 g tablet was dissolved in 30 cm³ of 0.150 mol dm⁻³ hydrochloric acid. The resultant solution required 21.30 cm³ of 0.100 mol dm⁻³ sodium hydroxide for complete reaction.

What is the percentage mass of calcium carbonate in the antacid tablet?

- A 23.7%
B 45.0%
C 46.4%
D 90.0%
- 4 720 cm³ of H₂S gas is passed through 40 cm³ of 0.500 mol dm⁻³ HNO₃. Yellow precipitate of S was produced after the complete reaction as shown in the following half equation.



Which of the following could be the nitrogen-containing product?

(Assume that all volumes are measured at room temperature and pressure conditions)

- A N₂
B NO
C NO₂
D NH₃
- 5 Barium carbonate is an insoluble salt composed of barium and carbonate ions. When the two ions are passed through an electric field, it was observed that the barium ions are deflected by an angle of -5.8°.

What would be the angle of defection for the carbonate ions?

- A -15.2°
B -13.2°
C +13.2°
D +15.2°

- 6 The following data shows the successive ionisation energies of two elements.

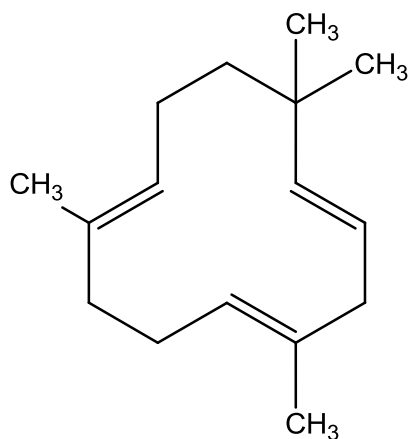
Elements	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
X	1060	1900	2920	4960	6280	21200	25430	29872
Y	1251	2298	3822	5159	6542	9362	11018	33604

Which of the following could be the compounds formed between X and Y?

- A XY
 - B XY₂
 - C XY₃
 - D XY₄
- 7 Which of the two species when mixed together will give the most exothermic interactions?
- A dichloromethane and propane
 - B tetrachloromethane and ethanol
 - C propanal and propane
 - D propanal and dichloromethane
- 8 Which of the following pairs contain one simple covalent and one giant covalent compound?
- A aluminium fluoride and silicon dioxide
 - B sulfur dioxide and silicon
 - C boron fluoride and silicon tetrachloride
 - D sodium oxide and graphite

[Turn over]

- 9 **Humulene** can be extracted from carnation flowers.

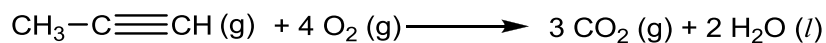


Humulene

How many $sp^2 - sp^3$ hybrid orbital overlap are present in humulene?

- A 3
B 6
C 8
D 12
- 10 Which of the following sequence gives the lattice energies in order of increasing magnitude?
A $BaS < MgO < NaBr < KI$
B $NaBr < MgO < KI < BaS$
C $KI < NaBr < BaS < MgO$
D $MgO < BaS < KI < NaBr$
- 11 *The use of the Data Booklet is required for the following question.*

The combustion of propyne is shown below.



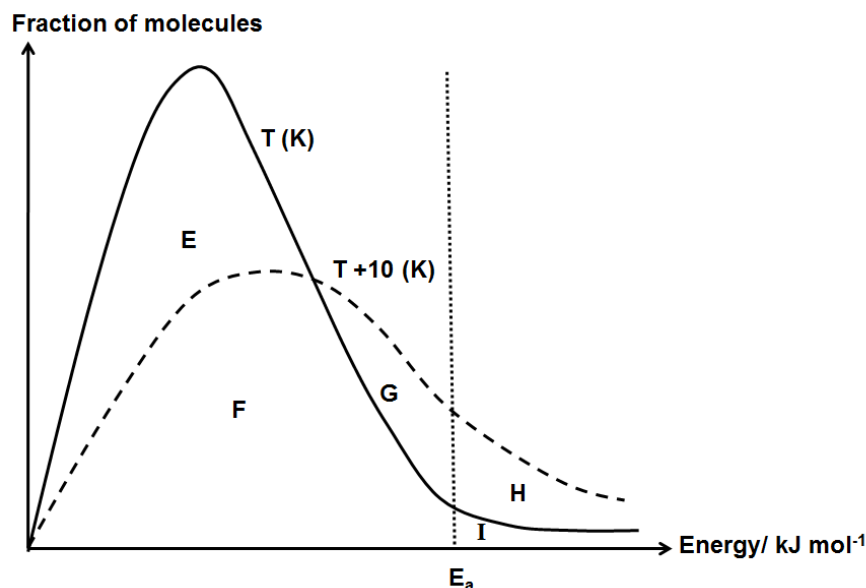
What is the standard enthalpy change of combustion of propyne?

- A $-1466 \text{ kJ mol}^{-1}$
B -754 kJ mol^{-1}
C $+754 \text{ kJ mol}^{-1}$
D $+1466 \text{ kJ mol}^{-1}$

12 Which of the following is always an endothermic process?

- A Enthalpy change of combustion
- B Enthalpy change of formation
- C Enthalpy change of neutralisation
- D Lattice dissociation energy

13



Which of the following shows the correct fraction of molecules with energy greater than activation energy, E_a , at the respective temperatures?

	T (K)	(T+10) K
A	I	H
B	I	H + I
C	E + F	F + G
D	E + F + I	F + G + H + I

14 The rate of the reaction between **M** and **L** is shown below.

$$\text{Rate} = k [\text{M}][\text{L}]^2$$

When the concentration of **M** is doubled, the reaction proceeded at half of its original rate.

What was the corresponding change made to the concentration of **L**?

- A keep the concentration of **L** constant
- B increase the concentration of **L** to double of its original concentration
- C decrease the concentration of **L** to half of its original concentration
- D decrease the concentration of **L** to one quarter of its original concentration

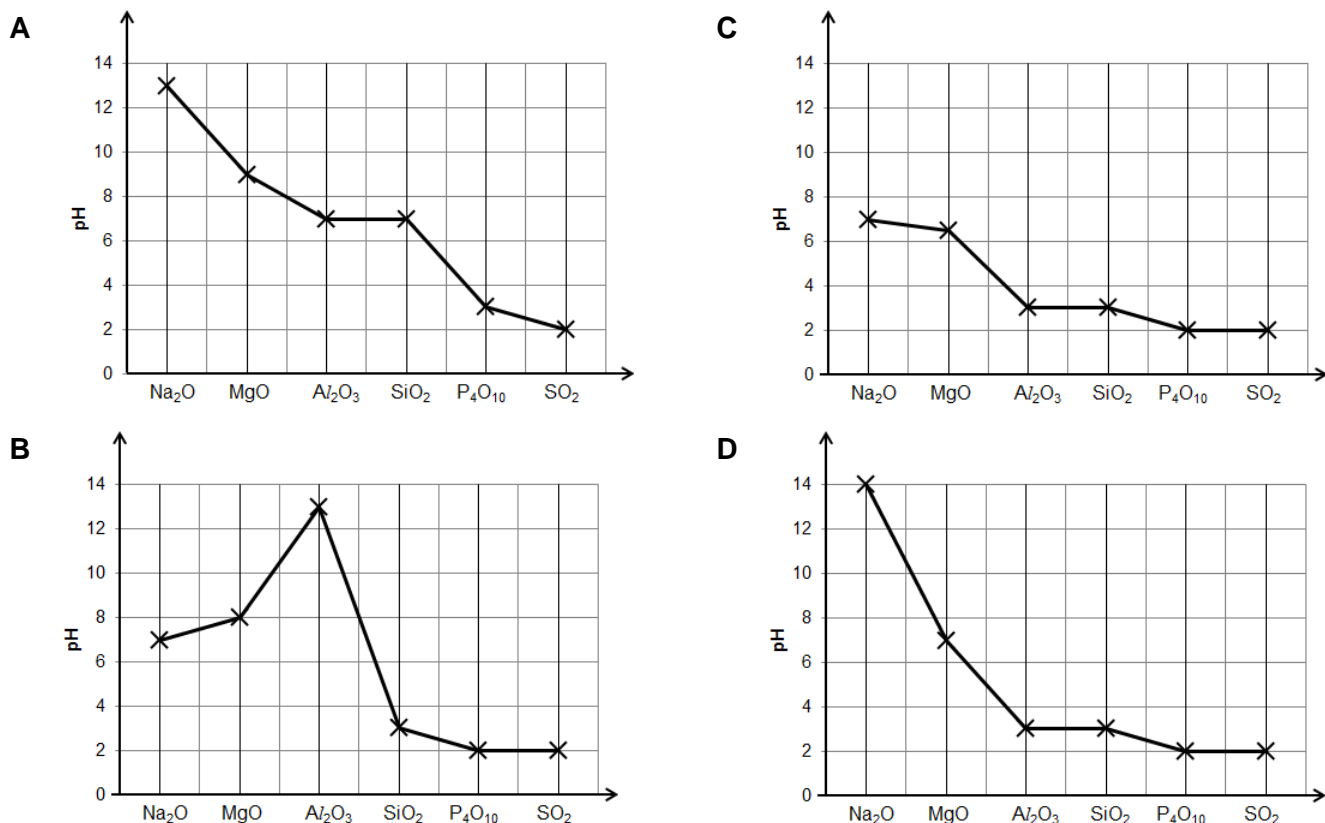
[Turn over]

- 15** There are 39 known isotopes of radon (Rn) from ^{193}Rn to ^{231}Rn . The most stable isotope is ^{222}Rn with a half-life of 3.8 days.

How long will it take for ^{222}Rn to decrease to one-eighth of its original amount?

- A** 7.6 days
 - B** 11.4 days
 - C** 15.2 days
 - D** 19.0 days
- 16** A mixture of nitrogen, hydrogen and ammonia were reacting at dynamic equilibrium via the Haber Process. When 0.5 mole of hydrogen chloride was passed through the system, which of the following will occur?
- A** Amount of hydrogen will increase initially then decrease after some time.
 - B** Amount of nitrogen will increase initially then decrease after some time.
 - C** Amount of ammonia will decrease initially then increase after some time.
 - D** All the gases will decrease initially then increase after some time.
- 17** Which of the following solutions when mixed together will form a buffer solution?
- A** 0.5 mol of ethanoic acid and 0.5 mol of sodium hydroxide
 - B** 0.5 mol of sulfuric acid and 1.0 mol of ammonia
 - C** 1.0 mol of ethanoic acid and 2.0 of sodium hydroxide
 - D** 1.0 mol of sulfuric acid and 3.0 mol of ammonia

18 Which of the following graph shows the correct pH trend of oxides of Period 3?



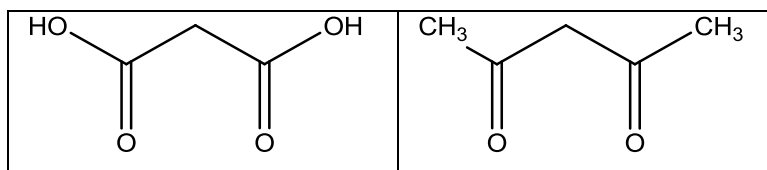
19 **M** is an element in Period 3. Its oxide does not dissolve readily in water but spontaneously in aqueous sodium hydroxide. The molten oxide of **M** has a high electrical conductivity.

Which of the following statement about **M** is **not** true?

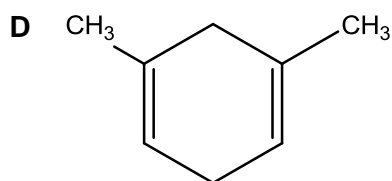
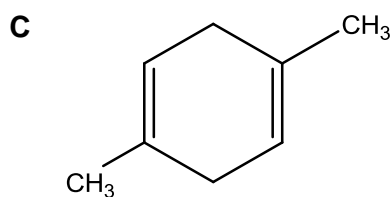
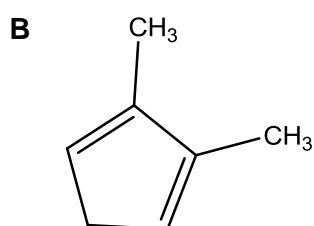
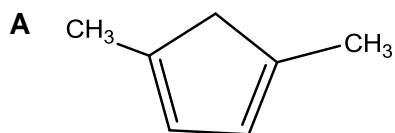
- A** **M** exist as a giant covalent structure.
- B** The oxide of **M** dissolves in aqueous hydrochloric acid.
- C** The aqueous solution of the chloride of **M** reacts has a pH of 3.
- D** The chloride of **M** is able to dimerise through dative bonds.

[Turn over]

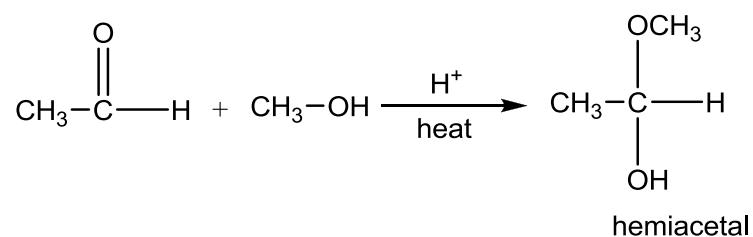
- 20 An organic compound when reacted with hot acidified potassium manganate (VII) forms only the following products.



Which of the following could be the organic compound?



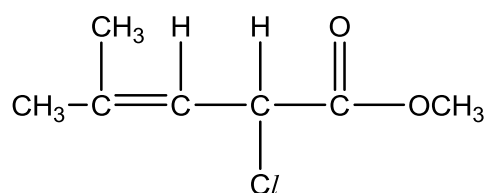
- 21 Ketones and aldehydes undergo the following reaction to form hemiacetal.



Which of the following describes the reaction above?

- A** Substitution
- B** Condensation
- C** Addition
- D** Elimination

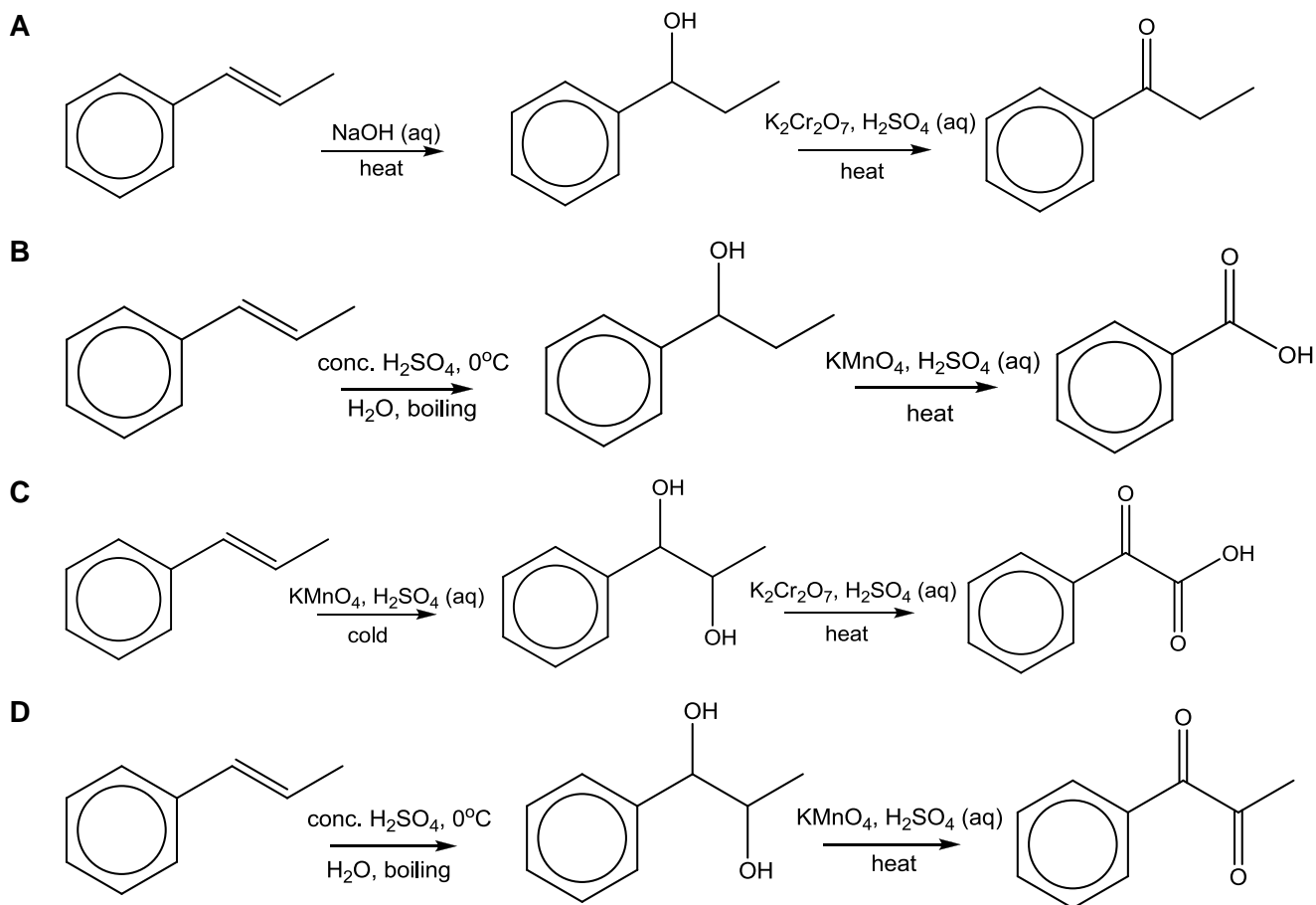
22 Which of the following reagents will give a positive colour change with compound **W**?



Compound **W**

- A hydrogen bromide gas
- B 2,4- dinitrophenylhydrazine
- C bromine in tetrachloromethane
- D aqueous alkaline iodine

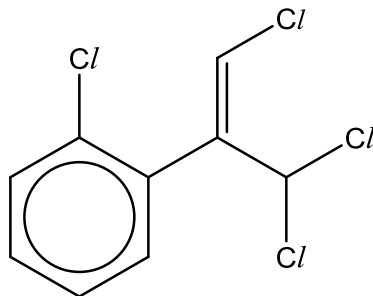
23 Which of the following shows the correct synthetic pathway?



[Turn over]

- 24** Compound **T** was reacted with hot sodium hydroxide. When the solution is cooled and acidified, dilute silver nitrate was added to the resultant mixture.

What is the mass of the precipitate formed given that 0.10 mol of compound **T** is used?



Compound **T**

- A** 14.35 g
B 28.70 g
C 43.05 g
D 57.40 g
- 25** Which of the following will react with sodium metal to produce 1 mol of hydrogen gas?
- A** $\text{CH}_3\text{CH}_2\text{OH}$
B $\text{HOCH}_2\text{CH}_2\text{OH}$
C $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$
D $\text{CH}_3\text{CH}_2\text{CHO}$

Section B

For each of the following questions, one or more of the three numbered statements **1** to **3** may be correct.

Decide whether each of the statements is or is not correct (you may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

No other combination of statements is used as a correct response.

26 Which of the following shows the correct trend in electronegativity?

- 1** $F > Cl > Br$
- 2** $S > Cl > K$
- 3** $Na > Mg > Al$

27 Which of the following particles would, on losing an electron, have a half-filled set of p orbitals?

- 1** N^+
- 2** C^{2-}
- 3** O

28 Poly(tetrafluoroethene) is a polymer used as a coating in non-stick kitchen utensils. One of the steps in the reaction is shown below.



Which of the following conditions will result in a shift of the equilibrium to the left?

- 1** decreasing temperature
- 2** increasing pressure
- 3** adding aqueous sodium hydroxide

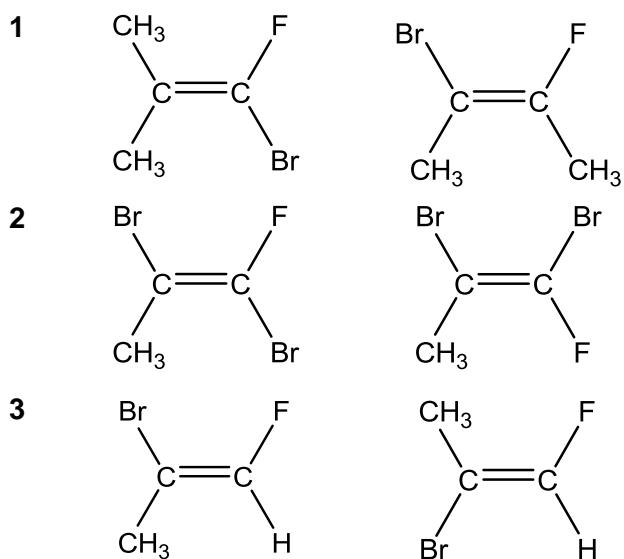
[Turn over]

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

No other combination of statements is used as a correct response.

29 Which of the following pairs illustrate cis-trans isomerism?

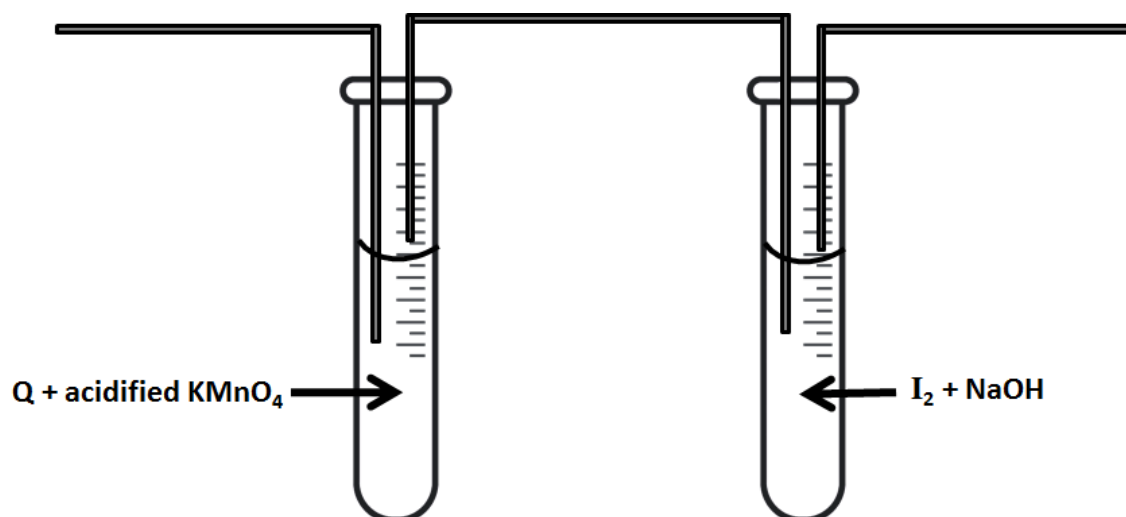


The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

No other combination of statements is used as a correct response.

- 30** When the apparatus below was used with compound **Q**, a yellow precipitate was formed at the right hand test tube.



Which of the following could be compound **Q**?

- 1 $(\text{CH}_3)_2\text{C}=\text{CH}_2$
- 2 $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$
- 3 $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$

END