National
Qualifications
2026

X813/76/12

Chemistry
Paper 1 — Multiple choice

TUESDAY, 12 MAY
9:00 AM – 9:40 AM

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.

You must leave your answer booklet on your desk; if you do not, you could lose all the marks for this paper.

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Total marks — 25

Attempt ALL questions

1. The bonding and structure in fullerenes is

A ionic lattice
B metallic lattice
C covalent network
D covalent molecular.

2. The two hydrogen atoms in a molecule of hydrogen are held together by a

A hydrogen bond
B polar covalent bond
C pure covalent bond
D van der Waals force.

3. Which of the following statements is true?

A The oxygen atom is larger than the oxide ion.
B The magnesium atom is larger than the magnesium ion.
C The sulfide ion is smaller than the sulfur atom.
D The calcium ion is larger than the calcium atom.

4. What is the enthalpy change, in $kJ\,mol^{-1}$, for the following reaction?

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

A 633
B 1235
C 1868
D 2470

5. Which of the following is a redox reaction?

A $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
B $NaOH + HCl \rightarrow NaCl + H_2O$
C $NiO + 2HCl \rightarrow NiCl_2 + H_2O$
D $CuCO_3 + 2HCl \rightarrow CuCl_2 + H_2O + CO_2$

6. Iodide ions can be oxidised to iodine.

$$2I^-(aq) \rightarrow I_2(s) + 2e^-$$

Which of the following ions could be used to oxidise iodide ions to iodine?

A $SO_3^{2-}(aq)$

B $SO_4^{2-}(aq)$

C $Cr^{3+}(aq)$

D $Cr_2O_7^{2-}(aq)$

7. Oil molecules are more likely to react with oxygen in the air than fat molecules.
During the reaction the oil molecules

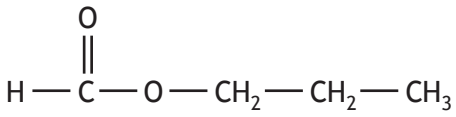
A are reduced

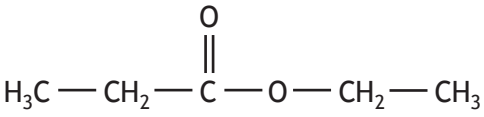
B form rancid products

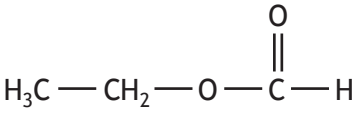
C are hydrolysed

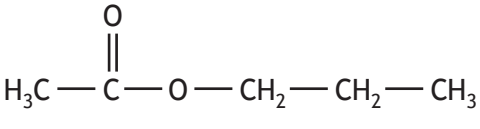
D become unsaturated.

8. A student was given samples of ethanol, propan-1-ol, methanoic acid and ethanoic acid.
Which of the following esters **could not** be made from these chemicals?

A 

B 

C 

D 

[Turn over

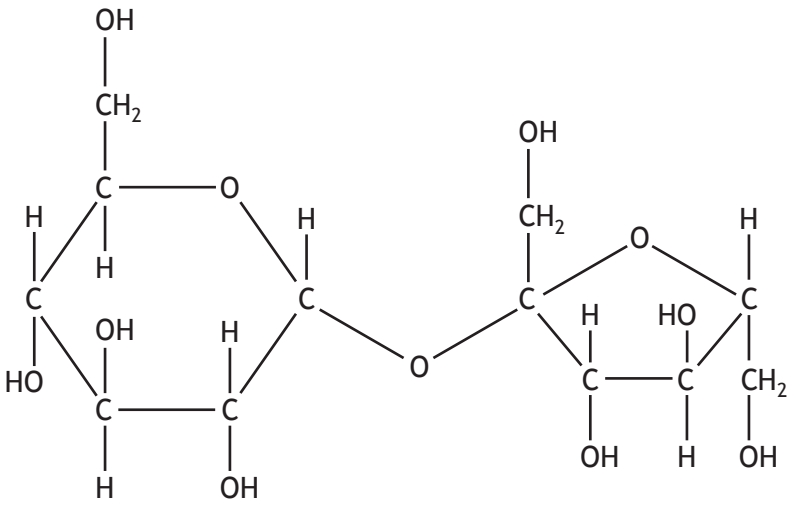
9. A compound with the formula CH_2O_2 must be

A an ester
B an alcohol
C an aldehyde
D a carboxylic acid.

10. Which process is used to convert ethanoic acid to ethanal?

A Addition
B Condensation
C Hydrolysis
D Reduction

11. Olestra is a calorie free fat made by reacting carboxylic acids with sucrose.
The structure of a sucrose molecule can be represented as shown.



How many carboxylic acid molecules can react with one molecule of sucrose?

A 3
B 5
C 8
D 11

12. Fats have higher melting points than oils because

A fats are more saturated
B oils are more saturated
C fats are less closely packed
D oils are more closely packed.

13. Propanal, C_3H_6O, can be converted to propanoic acid by heating with acidified dichromate solution.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$$

$$C_3H_6O + H_2O \rightarrow C_3H_6O_2 + 2H^+ + 2e^-$$

How many moles of $Cr_2O_7^{2-}$ would react with one mole of propanal?

A $\frac{1}{3}$

B $\frac{2}{3}$

C 1

D 3

14. Which of the following is an isomer of 2,2-dimethylpentan-1-ol?

A $CH_3CH_2CH_2C(CH_3)_2CH_2OH$

B $(CH_3)_3CCH(CH_3)CH_2OH$

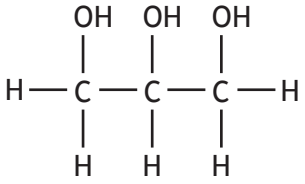
C $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2OH$

D $(CH_3)_2CHC(CH_3)_2CH_2CH_2OH$

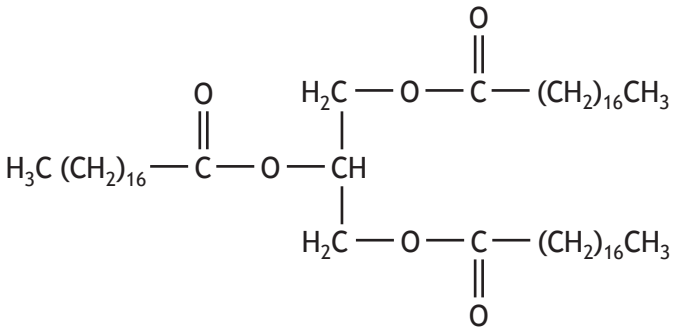
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15. Which of the following could be made by reacting edible oils with glycerol?

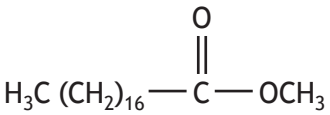
A



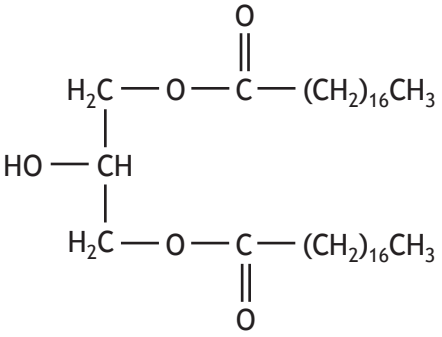
B



C



D



16. A two-step reaction is shown.

Step 1

$$S_2O_8^{2-}(aq) + 2I^-(aq) + 2Fe^{2+}(aq) \rightarrow 2SO_4^{2-}(aq) + 2I^-(aq) + 2Fe^{3+}(aq)$$

Step 2

$$2SO_4^{2-}(aq) + 2I^-(aq) + 2Fe^{3+}(aq) \rightarrow 2SO_4^{2-}(aq) + I_2(aq) + 2Fe^{2+}(aq)$$

The ion that is the catalyst in the overall reaction is

A $S_2O_8^{2-}(aq)$

B $I^-(aq)$

C $Fe^{2+}(aq)$

D $SO_4^{2-}(aq)$

17. A student added 0.1 mol of zinc to a solution containing 0.05 mol of silver(I) nitrate.

$$Zn(s) + 2AgNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2Ag(s)$$

Which of the following statements about the experiment is correct?

A 0.05 mol of zinc reacts.

B 0.05 mol of silver is produced.

C Silver nitrate is in excess.

D All of the zinc reacts.

[Turn over

18. The following equilibrium exists as an orange solution.

$$\underset{\text{(yellow)}}{Fe^{3+}(aq)} + CNS^{-}(aq) \rightleftharpoons \underset{\text{(red)}}{[FeCNS]^{2+}(aq)}$$

Addition of **X** causes the reaction mixture to become red.

X could be

A $FeCl_3$

B $[FeCNS]Cl_2$

C NaCl

D $FeCl_2$

19. Which of the following is **not** a factor that affects the rate of a reaction?

A Activation energy

B Kinetic energies of reactant molecules

C Concentration of reactants

D Enthalpy change of reaction

20. Chromatography separates substances by making use of their differences in size and

A boiling point

B polarity

C reactivity

D colour.

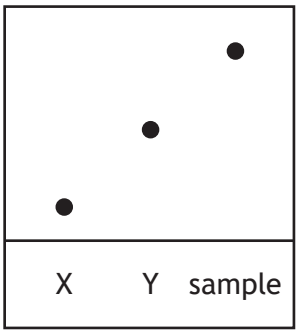
21. A chemist is attempting to make a fragrance compound by the following chemical reaction.

compound **X** + compound **Y** → fragrance compound

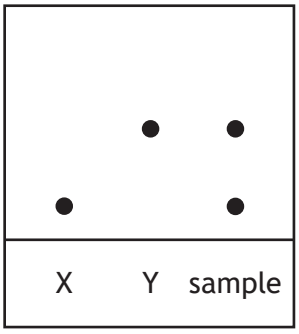
Compounds **X** and **Y** are mixed in a flask. After some time, a sample is removed from the flask and compared with pure samples of compounds **X** and **Y** using chromatography.

Which of the following chromatograms shows that a pure sample of the fragrance compound has been produced?

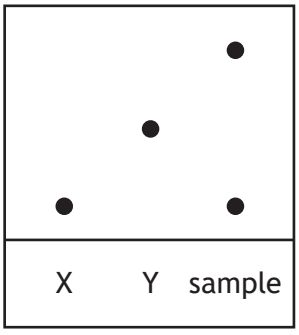
A



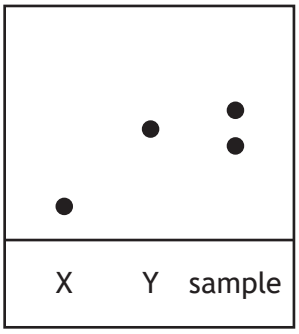
B



C



D



[Turn over

22. The vitamin C content of a carton of orange juice was determined by four students. Each student carried out the experiment three times.

	Concentration of vitamin C (mg/100 cm^3)		
	Experiment 1	**Experiment 2**	**Experiment 3**
Student A	28.0	24.0	23.0
Student B	21.4	21.6	21.8
Student C	21.9	22.0	21.9
Student D	22.0	21.5	21.9

The most reproducible results were obtained by

A student A

B student B

C student C

D student D.

23. Which of the following is the most appropriate apparatus to accurately prepare a 0.10 mol l^{-1} solution from a 1.0 mol l^{-1} solution?

A 1 cm^3 dropper and a 10 cm^3 measuring cylinder.

B 10 cm^3 volumetric flask and a 100 cm^3 conical flask.

C 25 cm^3 pipette and a 250 cm^3 volumetric flask.

D 50 cm^3 burette and a 500 cm^3 measuring cylinder.

24. The octane number is a measure of how easily hydrocarbons ignite.

	Hydrocarbon	Octane number
1	3-methylpentane	74.5
2	pentane	61.7
3	butane	93.6
4	2-methylpentane	73.4
5	hexane	24.8
6	methylcyclopentane	91.3

A student predicted that as the chain length of a hydrocarbon increases, the octane number decreases.

Which set of three hydrocarbons should have their octane numbers compared to provide the best test of this prediction?

A 1, 4, 6

B 1, 2, 4

C 3, 4, 5

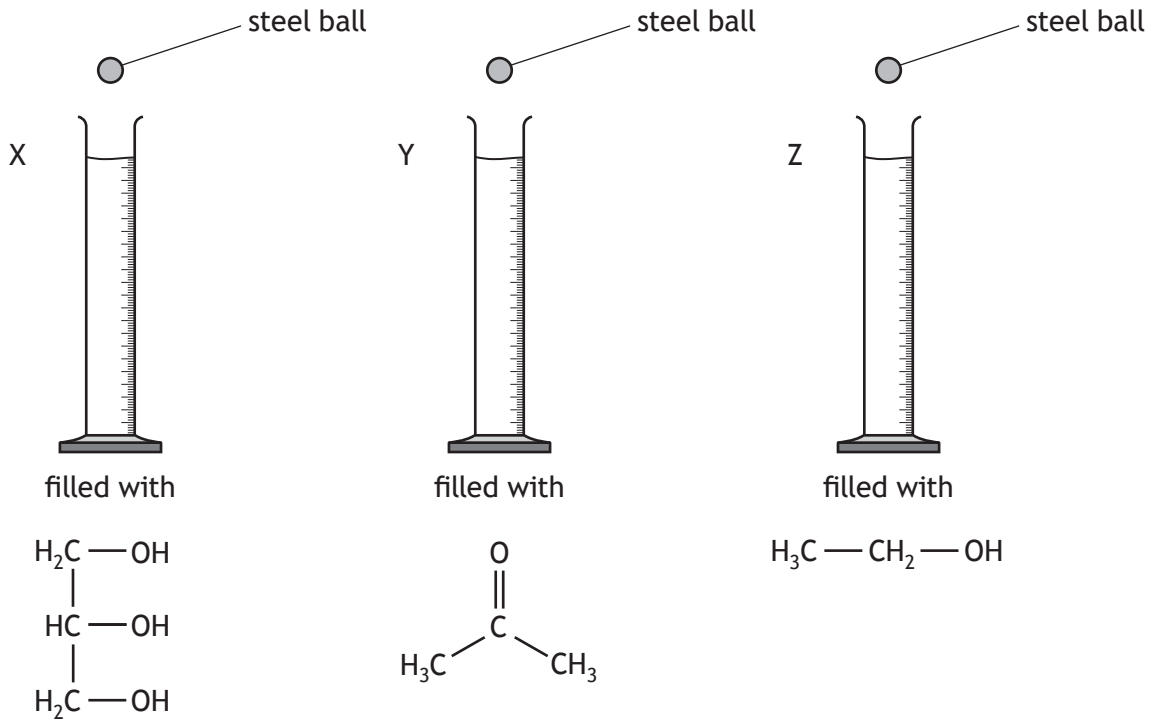
D 2, 3, 5

[Turn over

25. The type of forces between molecules can affect the viscosity of a liquid.

A steel ball will fall at different speeds through different liquids.

The more viscous a liquid the more slowly the ball falls through the liquid.



Which of the following shows the correct order for the speed of the steel balls falling through the liquids from the fastest to the slowest?

A Y, X then Z

B X, Z then Y

C Y, Z then X

D Z, Y then X

[END OF QUESTION PAPER]

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