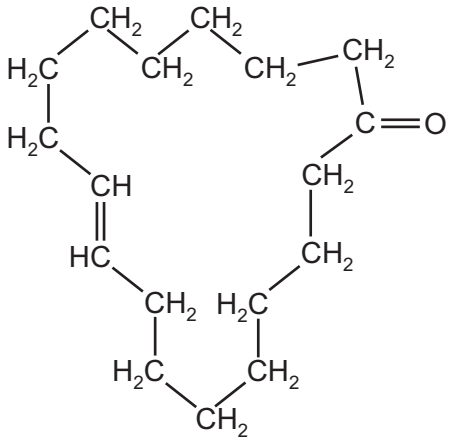
26 The naturally-occurring molecule civetone is found in a gland of the African civet cat and has been used in perfumery.



civetone

With which reagent will civetone **not** react?

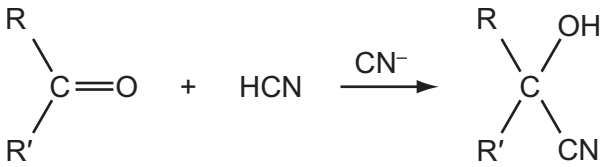
A 2,4-dinitrophenylhydrazine reagent

B Fehling's reagent

C hydrogen bromide

D sodium tetrahydridoborate(III) (sodium borohydride)

27 Cyanohydrins can be made from carbonyl compounds by generating CN^- ions from HCN in the presence of a weak base.



In a similar reaction, $^-CH_2CO_2CH_3$ ions are generated from $CH_3CO_2CH_3$ by strong bases.

Which compound can be made from an aldehyde and $CH_3CO_2CH_3$ in the presence of a strong base?

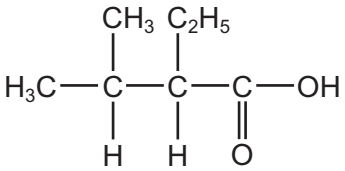
A $CH_3CH(OH)CO_2CH_3$

B $CH_3CO_2CH_2CH(OH)CH_3$

C $CH_3CH_2CH(OH)CH_2CO_2CH_3$

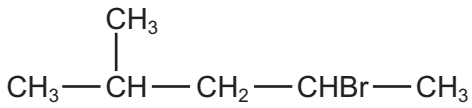
D $(CH_3)_2C(OH)CH_2CO_2CH_3$

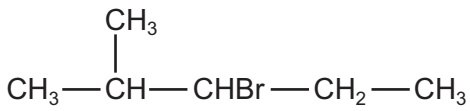
28 The characteristic odour of rum is attributed to the compound 2-ethyl-3-methylbutanoic acid.

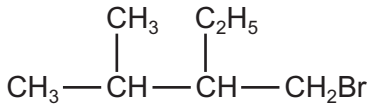


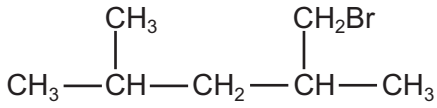
2-ethyl-3-methylbutanoic acid

Which compound will produce 2-ethyl-3-methylbutanoic acid by heating under reflux with alcoholic sodium cyanide and subsequent acid hydrolysis of the reaction product?

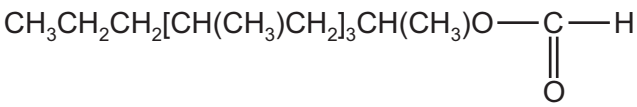
A 

B 

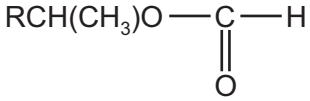
C 

D 

29 The acarid mite releases *lardolure* to attract other mites to a host. This chemical can be destroyed by hydrolysis with acid.



A simplified formula for *lardolure* may be written as follows.



What are the products of its hydrolysis?

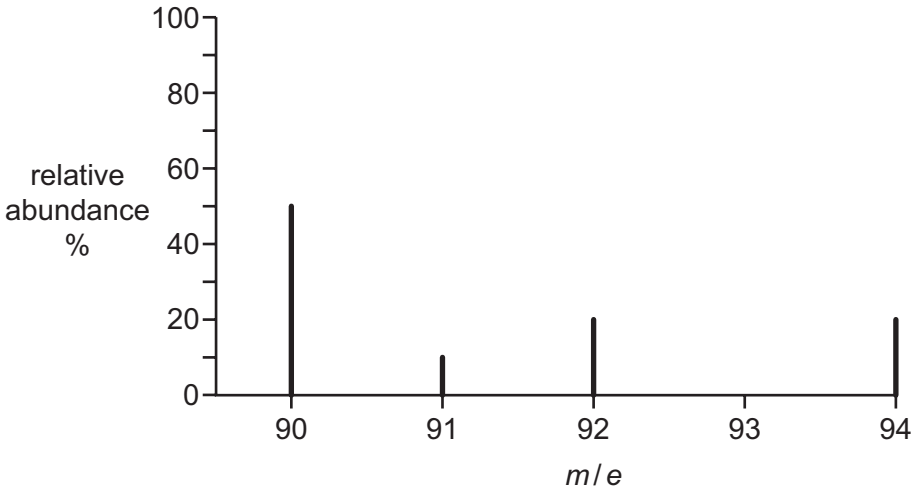
A $RCH(CH_3)CO_2H + CH_3OH$

B $RCH(CH_3)CO_2H + HCO_2H$

C $RCH(CH_3)OH + CO_2$

D $RCH(CH_3)OH + HCO_2H$

30 An element **X** consists of four isotopes. The mass spectrum of **X** is shown in the diagram.



What is the relative atomic mass of **X**?

A 91.00 **B** 91.30 **C** 91.75 **D** 92.00

Section B

For each of the questions in this section, 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.

31 Which physical properties are due to hydrogen bonding between water molecules?

1 Water has a higher boiling point than H_2S.

2 Ice floats on water.

3 The H–O–H bond angle in water is approximately 104°.

32 Which equilibria, in which all species are gaseous, would have equilibrium constants, K_p, with no units?

1 sulfur dioxide and oxygen in equilibrium with sulfur trioxide

2 hydrogen and iodine in equilibrium with hydrogen iodide

3 carbon monoxide and steam in equilibrium with carbon dioxide and hydrogen

33 Why does a mixture of hydrogen gas and bromine gas react together faster at a temperature of 500 K than it does at a temperature of 400 K?

1 A higher proportion of effective collisions occurs at 500 K.

2 Hydrogen molecules and bromine molecules collide more frequently at 500 K.

3 The activation energy of the reaction is lower at 500 K.

34 A farmer added lime to damp soil, followed by the nitrogenous fertiliser ammonium sulfate. A chemical reaction occurred in the soil.

Which substances were formed in this reaction?

1 sulfuric acid

2 calcium sulfate

3 ammonia

35 Which statements about the reaction of solid sodium bromide with concentrated sulfuric acid are correct?

1 Hydrogen bromide is a product of the reaction.

2 Sulfuric acid is oxidised to sulfur dioxide.

3 Bromide ions are reduced to bromine.

36 Which statements are true for an S_N2 reaction?

1 One bond is broken as another bond is formed.

2 The formation of a transition state involves the collision of two molecules or ions.

3 A carbon atom in the transition state is bonded, either fully or partially, to five other atoms.

37 The chlorine free radical takes part in the destruction of the ozone layer.

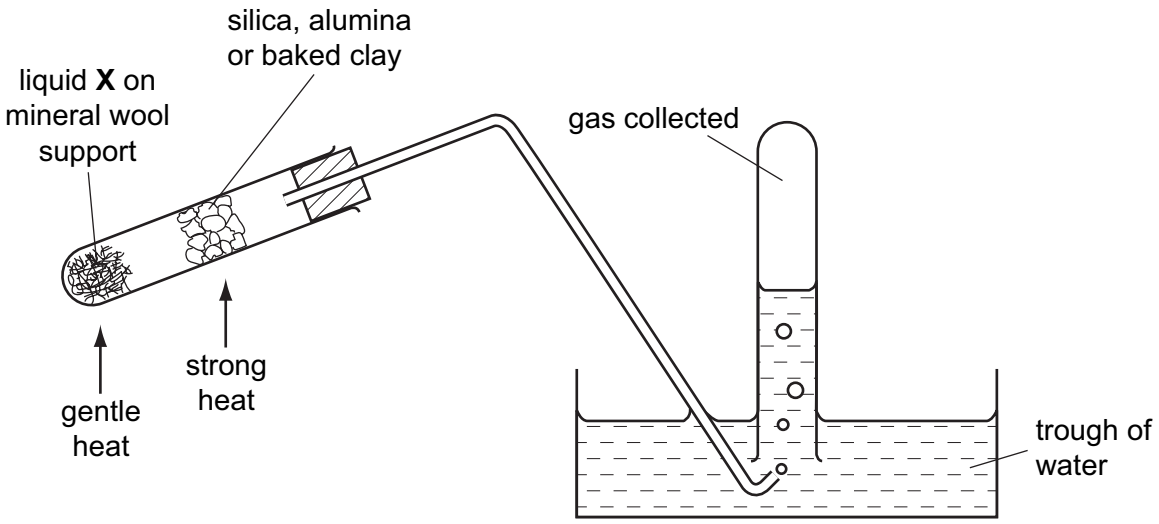
Which statements about this free radical are correct?

1 It is formed by the heterolytic fission of the covalent bond in a chlorine-containing molecule.

2 It has a single unpaired electron.

3 It has the same electron arrangement as a chlorine atom.

38 The diagram shows an experiment.



Which processes could be demonstrated by using the above apparatus?

1 the oxidation of ethanol (the liquid **X)**

2 the dehydration of ethanol (the liquid **X**)

3 the cracking of paraffin (the liquid **X**)

39 A compound has a relative molecular mass of 88 and its molecule contains only four carbon atoms.

What could this compound be?

1 a saturated non-cyclic diol

2 a secondary alcohol containing an aldehyde group

3 a primary alcohol containing a ketone group

40 A monomer undergoes addition polymerisation. A 1 mol sample of the monomer is completely polymerised.

How many moles of polymer might, theoretically, be formed?

1 1

2 10^{-6}

3 $\frac{1}{6.02 \times 10^{23}}$