

A LEVEL CHEMISTRY EXAM

Q919

Which sample, measured at room temperature and pressure, contains the greatest number of the stated particles?

[1 mark]

A 1 g of hydrogen molecules

☐

B 1 g of helium atoms

☐

C 1 dm³ of hydrogen molecules

☐

D 1 dm³ of helium atoms

☐

Q1019

5.0 g of an oxide of molybdenum contain 4.0 g of molybdenum.

What is the empirical formula of this oxide?

[1 mark]

A MoO_2

☐

B Mo_4O_5

☐

C Mo_2O_3

☐

D Mo_3O_2

☐

Q1119

Which substance has delocalised electrons?

[1 mark]

A graphite

☐

B iodine

☐

C sodium chloride

☐

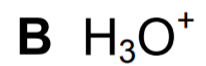
D tetrachloromethane

☐

Q1219

Which species is **not** pyramidal in shape?

[1 mark]

☐☐☐☐

Q1319

1 3

Which change occurs when water is vaporised?

[1 mark]

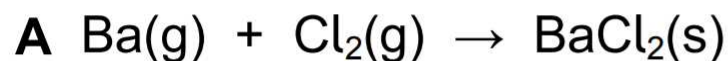
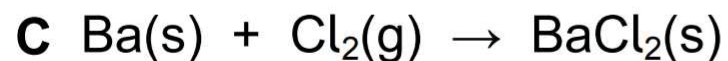
- A** An exothermic change occurs.
- B** Covalent bonds are broken.
- C** Intermolecular forces are overcome.
- D** The total energy of the molecules decreases.

☐☐☐☐

Q1419

Which equation represents the reaction that has a standard enthalpy change equal to the standard enthalpy of formation for barium chloride?

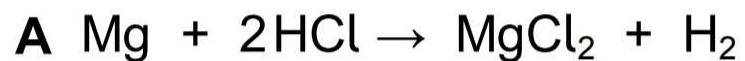
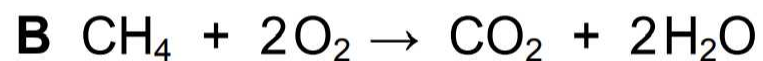
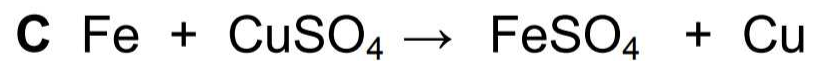
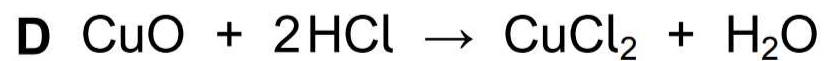
[1 mark]

☐☐☐☐

Q1519

Which equation does **not** represent a redox reaction?

[1 mark]

☐☐☐☐

Q1619

1 6

Which property would you expect the element radium, Ra, to possess?

[1 mark]

A It forms a soluble sulfate.

☐

B It does not react with water.

☐

C It is a good conductor of electricity.

☐

D It forms a covalent fluoride.

☐

Q1719

Which statement is **not** correct?

[1 mark]

- A Strontium has a lower first ionisation energy than calcium.
- B Strontium has a larger ionic radius than calcium.
- C Strontium reacts less vigorously with water than calcium.
- D Strontium hydroxide is more soluble in water than calcium hydroxide.

☐☐☐☐

Q1819

Which property of the Group 2 elements, Ca to Ba, increases with increasing atomic number?

[1 mark]

A Atomic Radius

☐

B Electronegativity

☐

C First ionisation energy

☐

D Melting Point

☐

Q1919

What is the best oxidising agent?

[1 mark]

A F_2

☐

B F^-

☐

C I_2

☐

D I^-

☐

Q2019

Some fuel in a spirit burner is burned, and the heat produced is used to heat a container of water.

In this experiment:

The mass of water heated = m g

The temperature rise = y °C

The specific heat capacity of water = c J K⁻¹ g⁻¹

What is the amount of heat energy absorbed by the water?

[1 mark]

A mcy

☐

B $mc(y + 273)$

☐

C y / mc

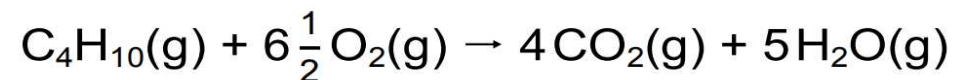
☐

D $(y + 273) / mc$

☐

Q2119

The equation below represents the complete combustion of butane.



20 cm³ of butane are completely burned in 0.20 dm³ of oxygen.
Which statement is correct?

All volumes are measured at the same temperature and pressure.

[1 mark]

A 40 cm³ of carbon dioxide are formed

☐

B 0.065 dm³ of oxygen react

☐

C 70 cm³ of oxygen remain

☐

D 0.50 dm³ of steam are formed

☐

Q2219

Which statement is correct about reactions involving halide ions?

[1 mark]

A Sodium chloride forms chlorine when added to concentrated sulfuric acid.

☐

B Sodium chloride forms chlorine when added to bromine.

☐

C Sodium bromide forms bromine when added to concentrated sulfuric acid.

☐

D Sodium bromide forms bromine when added to iodine.

☐

Q2319

What is the percentage yield when 20 g of aluminium are produced from 50 g of aluminium oxide?



[1 mark]

A 76%

☐

B 40%

☐

C 33%

☐

D 19%

☐

Q920

Which atom has the smallest number of neutrons?

[1 mark]

A ^3H

☐

B ^4He

☐

C ^5He

☐

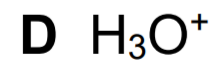
D ^4Li

☐

Q1020

Which species contains bonds that have different polarities?

[1 mark]

☐☐☐☐

Q1120

Which compound has hydrogen bonding?

[1 mark]

A NaH

☐

B NH₃

☐

C HI

☐

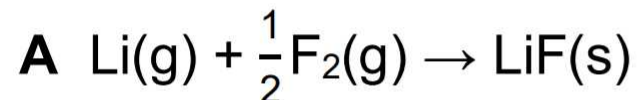
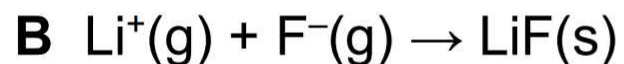
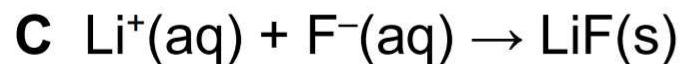
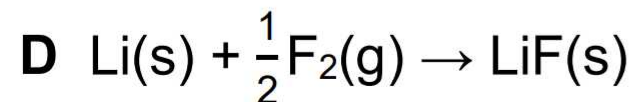
D SiH₄

☐

Q I 220

Which reaction has an enthalpy change equal to the standard enthalpy of formation of lithium fluoride?

[1 mark]

☐☐☐☐

Q1320

NO_2^- ions can be reduced in acidic solution to NO

How many electrons are gained when each NO_2^- ion is reduced?

[1 mark]

A 1

☐

B 2

☐

C 3

☐

D 4

☐

Q I 420

Which is the electron configuration of an atom with **only two** unpaired electrons?

[1 mark]

A $1s^2 2s^2 2p^3$

☐

B $1s^2 2s^2 2p^4$

☐

C $1s^2 2s^2 2p^6 3s^2 3p^5$

☐

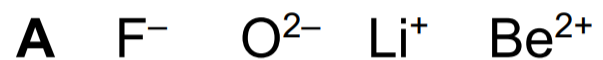
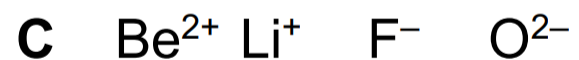
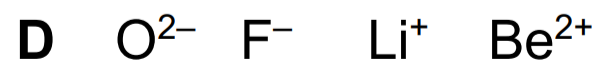
D $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^5$

☐

Q1520

Which represents the correct order of increasing radius of the ions?

[1 mark]

☐☐☐☐

Q1620

Which compound contains a co-ordinate bond?

[1 mark]

A HF

☐

B NH₃

☐

C CHCl₃

☐

D NH₄Cl

☐

Q1720

Which property increases down Group 7?

[1 mark]

A ability to oxidise a given reducing agent

☐

B boiling point

☐

C electronegativity

☐

D first ionisation energy

☐

Q I 820

Which of these elements has the highest melting point?

[1 mark]

A Argon

☐

B Chlorine

☐

C Silicon

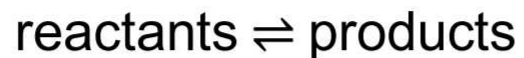
☐

D Sulfur

☐

Q1920

Which statement is **not** always correct for a reaction at equilibrium?



[1 mark]

A The concentrations of the reactants and products are equal.

☐

B The equilibrium can be achieved starting from the reactants.

☐

C The equilibrium can be achieved starting from the products.

☐

D The rate of the forward reaction is equal to the rate of the reverse reaction.

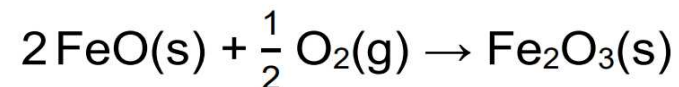
☐

Q2020

Two reactions of iron with oxygen are shown.



What is the enthalpy change, in kJ mol^{-1} , for this reaction?



[1 mark]

A +550

☐

B -278

☐

C -1094

☐

D -1372

☐

Q2120

Which compound contains chlorine in an oxidation state of +1?

[1 mark]

A Cl_2O

☐

B KClO_3

☐

C ClF_3

☐

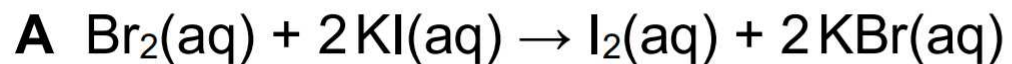
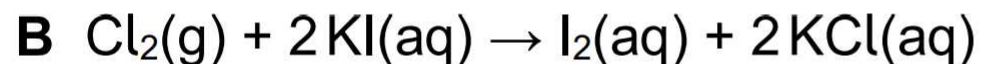
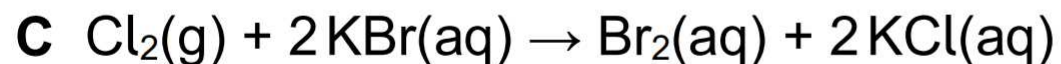
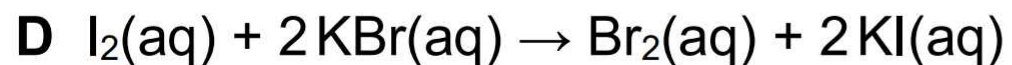
D CCl_4

☐

Q2220

Which equation shows a redox reaction that does **not** occur?

[1 mark]

☐☐☐☐

Q2320

Which molecule has a permanent dipole?

[1 mark]

A CF_4

☐

B PCl_5

☐

C CO_2

☐

D Cl_2O

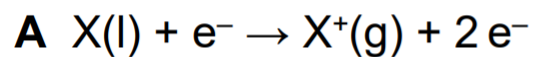
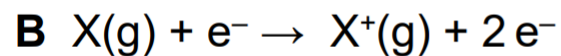
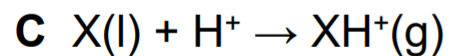
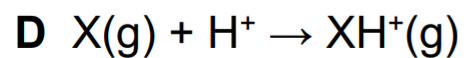
☐

Q1121

In a time of flight mass spectrometer, molecule X is ionised using electrospray ionisation.

What is the equation for this ionisation?

[1 mark]

☐☐☐☐

Q1221

What is the electron configuration of V^{2+} in the ground state?

[1 mark]

A $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$

☐

B $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1 4s^2$

☐

C $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$

☐

D $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$

☐

Q1321

Which molecule is **not** able to form a co-ordinate bond with another species?

[1 mark]

A BH_3

☐

B CH_4

☐

C NH_3

☐

D H_2O

☐

Q1421

Which species has a square planar shape?

[1 mark]

A NH_4^+

☐

B SF_4

☐

C XeF_4

☐

D PCl_4^+

☐

Q1521

Which bond has the most unsymmetrical electron distribution?

[1 mark]

A H–O

☐

B H–S

☐

C H–N

☐

D H–P

☐

Q1621

Which compound contains a chlorine atom with an oxidation state of +4?

[1 mark]

A KClO_4

☐

B CCl_4

☐

C ClO_2

☐

D ClO_2F

☐

Q1721

Which element is classified as a d block element?

[1 mark]

A Antimony

☐

B Molybdenum

☐

C Strontium

☐

D Uranium

☐

Q1821

Which element in Period 3 has the highest melting point?

[1 mark]

A Aluminium

☐

B Silicon

☐

C Sodium

☐

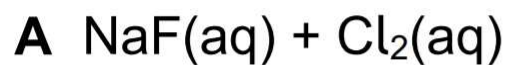
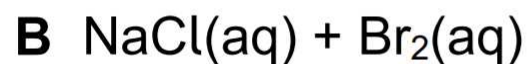
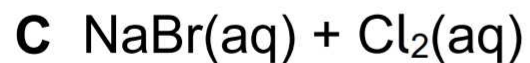
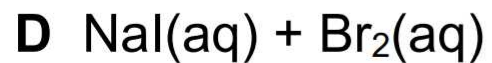
D Sulfur

☐

Q1921

Which pair of solutions, when mixed, reacts to form a dark brown solution?

[1 mark]

☐☐☐☐

Q202 I

Some solid sodium halides are reacted with concentrated sulfuric acid.

Which solid sodium halide does **not** produce a sulfur-containing gas as one of the products?

[1 mark]

A NaCl

☐

B NaBr

☐

C NaI

☐

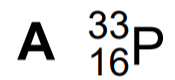
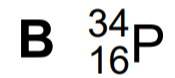
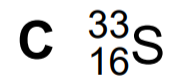
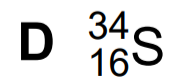
D NaAt

☐

Q2121

Which atom has one more proton and two more neutrons than $^{31}_{15}\text{P}$?

[1 mark]

☐☐☐☐

Q2221

What is a use for barium sulfate?

[1 mark]

- A** In agriculture to act as a fertiliser
- B** In agriculture to neutralise acidic soil
- C** In medicine to produce an X-ray image
- D** In medicine as an antacid to treat indigestion

☐☐☐☐

Q232 I

Which ion has the largest radius?

[1 mark]

A F^-

☐

B Mg^{2+}

☐

C Na^+

☐

D O^{2-}

☐

Q2421

Which element has a first ionisation energy lower than that of sulfur?

[1 mark]

A Chlorine

☐

B Oxygen

☐

C Phosphorus

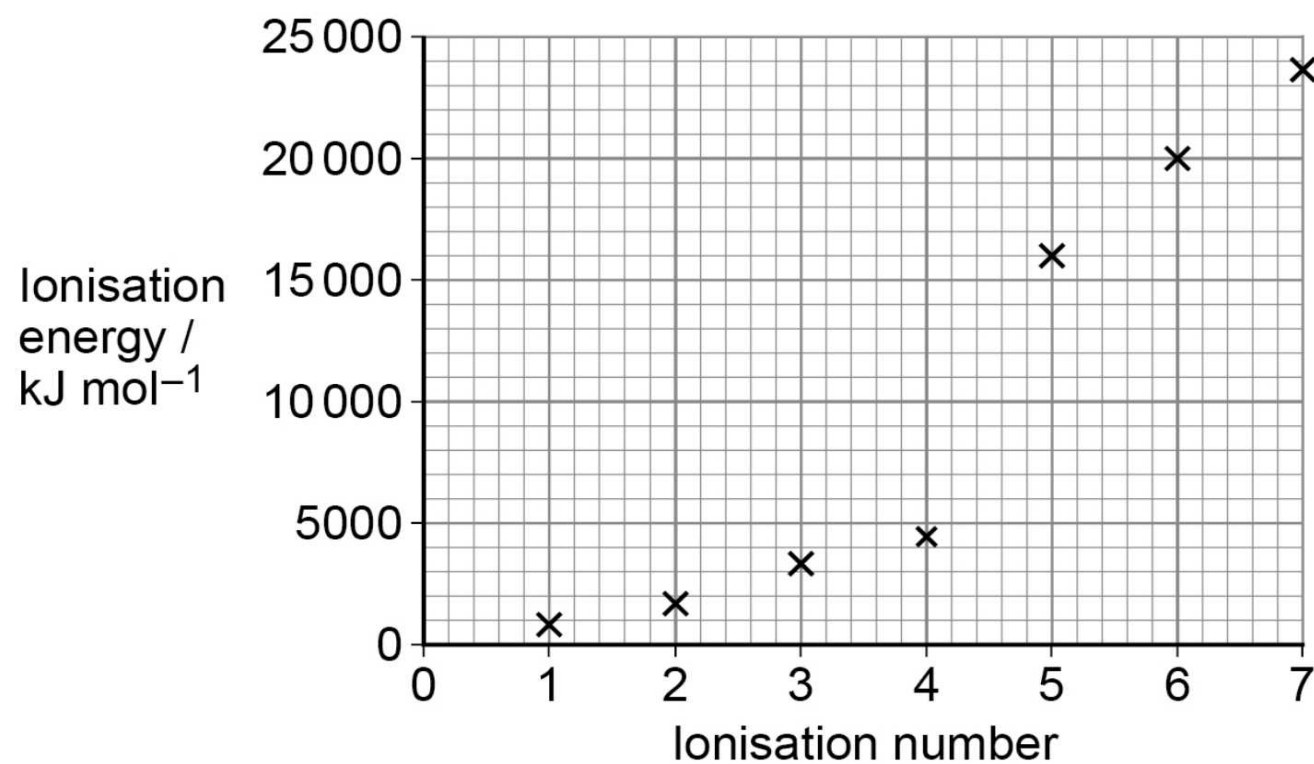
☐

D Selenium

☐

Q252 I

The first seven successive ionisation energies for element Z are shown.



What is element Z?

[1 mark]

Q922

Which atom has two more protons and two more neutrons than $^{52}_{24}\text{Cr}$?

[1 mark]

A $^{54}_{26}\text{Cr}$

☐

B $^{56}_{26}\text{Cr}$

☐

C $^{54}_{26}\text{Fe}$

☐

D $^{56}_{26}\text{Fe}$

☐

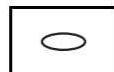
Q1022

An atom has all its electrons in their lowest energy levels.

Which atom contains only two unpaired electrons?

[1 mark]

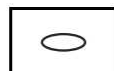
A Helium



B Beryllium



C Oxygen



D Iron



Q1122

The first six ionisation energies, in kJ mol^{-1} , of an element are:

1090, 2350, 4610, 6220, 37 800, 47 000

What is the element?

[1 mark]

A Boron

☐

B Carbon

☐

C Nitrogen

☐

D Oxygen

☐

Q1222

In which pair is the first ionisation energy of atom **Y** greater than that of atom **X**?
[1 mark]

	Electron configuration of atom X	Electron configuration of atom Y
A	$1s^2 2s^2$	$1s^2 2s^2 2p^1$
B	$1s^2 2s^2 2p^3$	$1s^2 2s^2 2p^4$
C	$1s^2 2s^2 2p^5$	$1s^2 2s^2 2p^6$
D	$1s^2 2s^2 2p^6$	$1s^2 2s^2 2p^6 3s^1$

☐
☐
☐
☐

Q I 322

Which statement about isotopes of an element is **not** correct?

[1 mark]

- A** They have the same chemical properties.
- B** They have the same number of electrons in ions of the same charge.
- C** They have the same number of neutrons.
- D** They have the same number of protons.

☐☐☐☐

Q I 422

5.0 g of an oxide contains 4.0 g of molybdenum.

What is the empirical formula of this oxide?

[1 mark]

A MoO_2

☐

B MoO_5

☐

C Mo_2O_3

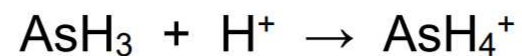
☐

D Mo_3O_2

☐

Q I 522

The equation for a reaction is



What type of interaction forms in this reaction?

[1 mark]

A Co-ordinate bond

☐

B Dipole–dipole force

☐

C Hydrogen bond

☐

D Ionic bond

☐

Q1622

Which is a correct trend down Group 7 from fluorine to iodine?

[1 mark]

A The boiling point of the element decreases.

☐

B The oxidising ability of the element decreases.

☐

C The electronegativity of the atom increases.

☐

D The first ionisation energy of the atom increases.

☐

Q1722

Which of these ions has the largest ionic radius?

[1 mark]

A S^{2-}

☐

B Cl^{-}

☐

C K^{+}

☐

D Ca^{2+}

☐

Q1822

Which statement is correct?

[1 mark]

- A** Chloride ions reduce concentrated sulfuric acid to form sulfur dioxide.
- B** Bromide ions reduce concentrated sulfuric acid to form sulfur.
- C** Bromide ions reduce iodine to form iodide ions.
- D** Iodide ions reduce chlorine to form chloride ions.

☐☐☐☐

Q1922

In which of these substances is oxygen in the highest oxidation state?

[1 mark]

A OF_2

☐

B H_2O

☐

C O_2

☐

D H_2O_2

☐

Q2022

Which block in the Periodic Table contains the element samarium (Sm)?

[1 mark]

A d block

☐

B f block

☐

C p block

☐

D s block

☐

Q2122

Which species is **not** a possible product of the reactions between chlorine and water?
[1 mark]

A Cl^-

☐

B ClO^-

☐

C O_2

☐

D OH^-

☐

Q2222

Which statement is correct?

[1 mark]

- A** Magnesium reacts with steam to give magnesium oxide as one of the products. ☐
- B** Magnesium acts as an oxidising agent in the extraction of titanium. ☐
- C** Magnesium has a lower melting point than sodium. ☐
- D** Magnesium hydroxide is very soluble in water. ☐

Q2322

Which is **not** responsible for conducting electricity?

[1 mark]

- A The sodium ions in molten sodium chloride
- B The electrons between layers of carbon atoms in graphite
- C The bonding electrons in a metal
- D The lone pair electrons in liquid water molecules

☐☐☐☐

Q2422

Which statement is **not** correct for both primary and secondary alcohols?

[1 mark]

A They are easily oxidised to carboxylic acids by acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

☐

B They can be formed from bromoalkanes by hydrolysis.

☐

C They form esters with carboxylic acids.

☐

D They show hydrogen bonding in the liquid state.

☐

Q2522

Which compound is an isomer of ethyl ethanoate?

[1 mark]

- A** butyl methanoate
- B** methyl propanoate
- C** methyl butanoate
- D** propanoic acid

☐☐☐☐

Q2622

Which compound is an amide?

[1 mark]

☐☐☐☐

Q2722

Suberoyl chloride, $\text{ClOC}(\text{CH}_2)_6\text{COCl}$, is commonly used in the manufacture of polymers.

Which compound can form a polymer with suberoyl chloride?

[1 mark]

A $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$

☐

B $\text{ClOCCH}_2\text{COCl}$

☐

C $\text{CH}_3\text{CH}_2\text{CONH}_2$

☐

D $\text{HOOCCH}_2\text{COOH}$

☐

Q2822

Which polymer is **not** hydrolysed when heated with aqueous alkali?

[1 mark]

A Kevlar

☐

B Nylon 6,6

☐

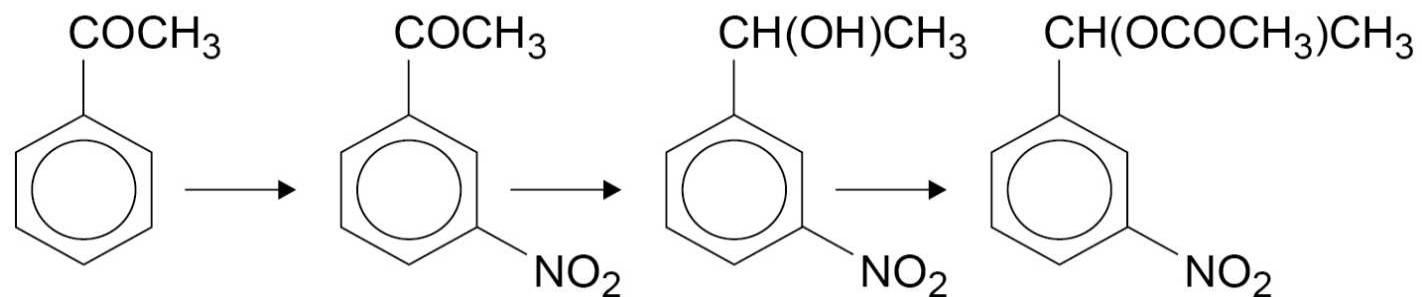
C Poly(propene)

☐

D Terylene

☐

Q3022



Which type of reaction is **not** involved in this reaction sequence?

[1 mark]

A esterification

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B hydrolysis

☐

C nitration

☐

D reduction

☐

Q3 | 22

Which pair of reagents does **not** produce ethanol?

[1 mark]

A $\text{CH}_3\text{CH}_2\text{Br}$ and NaOH(aq)

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B $\text{CH}_3\text{COOCH}_3$ and NaOH(aq)

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C $\text{HCOOCH}_2\text{CH}_3$ and NaOH(aq)

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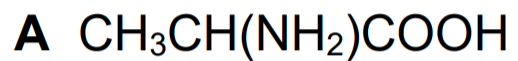
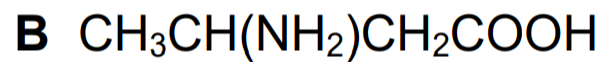
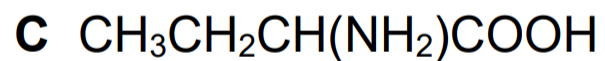
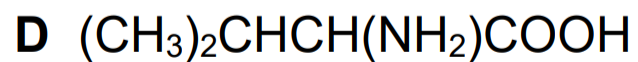
D CH_3CHO and $\text{NaBH}_4\text{(aq)}$

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Q3522

Which compound is **not** a 2-aminocarboxylic acid?

[1 mark]

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