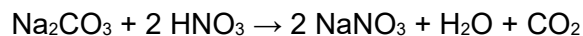


Q1.

What is the percentage atom economy for the formation of sodium nitrate in the reaction between sodium carbonate and nitric acid?



- A** 36.6% ☐
- B** 50.3% ☐
- C** 57.8% ☐
- D** 73.3% ☐

(Total 1 mark)

Q2.

The table shows some results from a titration.

Titration	Rough	Titre 1	Titre 2	Titre 3
Initial reading / cm ³	0.00	11.30	0.00	8.55
Final reading / cm ³	26.85	37.20	26.20	34.55
Titre volume / cm ³	26.85	25.90	26.20	26.00

What is the correct mean titre?

- A** 25.95 cm³ ☐
- B** 26.03 cm³ ☐
- C** 26.10 cm³ ☐
- D** 26.24 cm³ ☐

(Total 1 mark)

Q3.

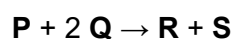
What is the empirical formula of an oxide of chlorine that contains 42.5% by mass of chlorine?

A ClO_2 ☐**B** ClO_3 ☐**C** Cl_2O_3 ☐**D** Cl_2O_5 ☐**(Total 1 mark)****Q4.**

Which of these practical steps will improve the accuracy of a titration?

A Using a 10.0 cm³ pipette instead of a 25.0 cm³ pipette.☐**B** Rinsing the sides of the conical flask with water.☐**C** Rinsing the burette with water before filling.☐**D** Using 6 drops of indicator instead of 3 drops of indicator.☐**(Total 1 mark)****Q5.**

The equation shows how **P** reacts with **Q** to make **R** and **S**.



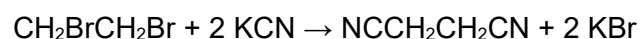
When a mixture of 0.25 mol of **P** and 0.40 mol of **Q** react, 0.15 mol of **R** is obtained.

What is the percentage yield of **R** in this reaction?

A $\frac{0.15}{0.20} \times 100$ ☐**B** $\frac{0.15}{0.25} \times 100$ ☐**C** $\frac{0.15}{0.40} \times 100$ ☐**D** $\frac{0.15}{0.65} \times 100$ ☐**(Total 1 marks)**

Q6.What is the M_r of this compound?**A** 94.0☐**B** 96.0☐**C** 98.0☐**D** 100.0☐**(Total 1 marks)****Q7.**

This is the equation for the conversion of 1,2-dibromoethane to butanedinitrile.



What is the percentage atom economy for the production of butanedinitrile in this reaction?

Relative formula masses, M_r

$$\text{CH}_2\text{BrCH}_2\text{Br} = 187.8$$

$$\text{KCN} = 65.1$$

$$\text{NCCH}_2\text{CH}_2\text{CN} = 80.0$$

$$\text{KBr} = 119.0$$

A 100%☐**B** 40.2%☐**C** 31.6%☐**D** 25.2%☐**(Total 1 marks)**

Q8.

A sample of cyclohexane contains 3.011×10^{24} atoms of carbon.

What is the mass of this sample?

The Avogadro constant, $L = 6.022 \times 10^{23} \text{ mol}^{-1}$

A 70.0 g

☐

B 71.7 g

☐

C 420 g

☐

D 430 g

☐

(Total 1 marks)

Q9.

Compound **P** is converted into compound **R** by a two-stage synthesis via compound **Q**.

The yields for the individual steps are:

P → **Q** 50%

Q → **R** 30%

What is the overall yield of **R** in this synthesis?

A 15%

☐

B 30%

☐

C 40%

☐

D 80%

☐

(Total 1 mark)

Q10.

A student completes a titration to determine the concentration of ethanoic acid in vinegar.

25.0 cm³ of vinegar are transferred to a conical flask using a pipette.
A few drops of phenolphthalein are added to the conical flask.
Sodium hydroxide solution is added from a burette to the conical flask.
The titration is repeated until concordant results are obtained.

Which suggestion improves the accuracy of the titres?

- A** Rinsing the conical flask with vinegar between each titration.
- B** Rinsing the conical flask with sodium hydroxide solution between each titration.
- C** Rinsing the conical flask with water between each titration.
- D** Not rinsing the conical flask between each titration.

☐☐☐☐

(Total 1 mark)

Q11.

A student completes a titration to determine the concentration of ethanoic acid in vinegar.

25.0 cm³ of vinegar are transferred to a conical flask using a pipette.
A few drops of phenolphthalein are added to the conical flask.
Sodium hydroxide solution is added from a burette to the conical flask.
The titration is repeated until concordant results are obtained.

Which suggestion decreases the percentage uncertainty in the mean titre?

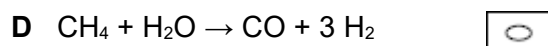
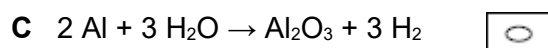
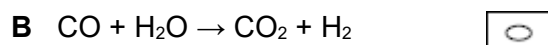
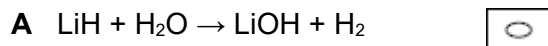
- A** Use a more dilute solution of sodium hydroxide in the burette.
- B** Use a more dilute solution of vinegar.
- C** Rinse the inside of the conical flask with distilled water during each titration.
- D** Rinse the tip of the burette with distilled water near the end point in each titration.

☐☐☐☐

(Total 1 mark)

Q12.

Which reaction has the highest percentage atom economy for the production of hydrogen?



(Total 1 mark)

Q13.

What is the minimum volume, in dm^3 , of air needed for the complete combustion of 1 dm^3 of methane?

Assume that air contains 20% of oxygen by volume.

Assume that all volumes are measured at the same temperature and pressure.

A 1 ☐

B 2 ☐

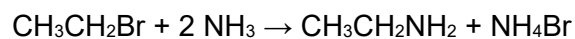
C 5 ☐

D 10 ☐

(Total 1 mark)

Q14.

What is the atom economy for the formation of ethylamine in this reaction?



A 31.5% ☐

B 35.7% ☐

C 36.1% ☐

D 41.3% ☐

(Total 1 mark)

Q15.

What is the relative molecular mass (M_r) of benzene-1,4-dicarboxylic acid?

A 164.0

☐

B 166.0

☐

C 168.0

☐

D 170.0

☐

(Total 1 mark)

Q16.

5.0 g of an oxide contains 4.0 g of molybdenum.

What is the empirical formula of this oxide?

A MoO_2

☐

B MoO_5

☐

C Mo_2O_3

☐

D Mo_3O_2

☐

(Total 1 mark)

Q17.

Which compound has the same empirical formula and molecular formula?

A butane

☐

B but-1-ene

☐

C propane

☐

D propene

☐

(Total 1 mark)