

Transition Elements

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	The Periodic Table
Sub-Topic	Transition Elements
Booklet	Question Paper

Time Allowed: 25 minutes

Score: /21

Percentage: /100

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- 1 Which process does **not** involve the use of a catalyst?
- A the extraction of iron from haematite in a blast furnace
 - B the manufacture of sulfur trioxide
 - C the production of ammonia from nitrogen and hydrogen
 - D the redox reactions that remove combustion pollutants from car exhausts
- 2 The table gives the melting points, densities and electrical conductivities of four elements.

Which element is copper?

	melting point in °C	density in g/cm ³	electrical conductivity
A	-38.9	13.6	good
B	-7.2	3.12	poor
C	97.8	0.97	good
D	1083	8.96	good

- 3 The Contact process, the Haber process and the hydrogenation of fats all involve the use of a catalyst.

Which row correctly describes whether the catalyst used in each process is an element or a compound?

	Contact process	Haber process	hydrogenation of fats
A	compound	compound	compound
B	compound	element	element
C	element	element	compound
D	element	element	element

4 Which element described in the table is a transition metal?

	number of oxidation states	coloured compounds	melting point	density
A	one	no	high	low
B	two	no	low	high
C	two	yes	high	high
D	two	yes	low	low

5 What happens when a strip of silver is immersed in an aqueous solution of copper(II) sulfate?

- A** Bubbles of gas will appear.
- B** No reaction occurs.
- C** Pink copper will be deposited on the silver strip.
- D** The silver strip will start to dissolve.

6 Which element has a variable oxidation state, can act as a catalyst and forms coloured compounds?

- A** carbon
- B** iron
- C** lead
- D** nitrogen

7 Which pair of properties are **both** correct for a typical transition element?

	property 1	property 2
A	forms coloured compounds	soluble in water
B	high density	has variable oxidation states
C	low density	high melting point
D	low melting point	can act as a catalyst

- 8 The table gives the formulae of the catalysts used in some industrial processes.

process	catalyst
Haber process	Fe + Mo
Contact process	V_2O_5
cracking of alkanes	$Al_2O_3 + SiO_2$
polymerisation of ethene	$Al(C_2H_5)_3 + TiCl_4$
manufacture of silicones	CuCl

How many different transition metals are included, as elements or as compounds, in the list of catalysts?

- A** 3 **B** 4 **C** 5 **D** 6
- 9 What is the purpose of vanadium(V) oxide in the Contact Process?
- A** It oxidises sulfur to sulfur dioxide.
B It oxidises sulfur to sulfur trioxide.
C It speeds up the conversion of sulfur dioxide into sulfur trioxide.
D It speeds up the conversion of sulfur trioxide into sulfuric acid.
- 10 The oxide of an element X increases the rate of decomposition of hydrogen peroxide. At the end of the reaction the oxide of X is unchanged.

Which details are those of X?

	proton number	mass number
A	18	40
B	20	40
C	25	55
D	82	207

- 11 A coin is analysed by dissolving it in nitric acid. To the resulting solution an excess of aqueous ammonia is added and the mixture is filtered.

A brown precipitate remains in the filter paper and a deep blue solution is obtained as the filtrate.

Which metals does the coin contain?

- A aluminium and copper
 - B copper and iron
 - C iron and lead
 - D lead and zinc
- 12 Why is nickel used in the addition of hydrogen to alkenes?
- A It increases the yield of products.
 - B It lowers the activation energy of the reaction.
 - C It makes the reaction more exothermic.
 - D It prevents a reverse reaction from occurring.

- 13 The carbonate of metal X is a white solid.

It decomposes when heated to form carbon dioxide and a yellow solid oxide.

What is metal X?

- A copper
 - B iron
 - C lead
 - D sodium
- 14 In which oxide does X have the same oxidation state as in the chloride, XCl_3 ?
- A X_3O
 - B X_2O
 - C XO_2
 - D X_2O_3

15 The table shows some of the properties of four elements.

Which element is **most** likely to be a transition metal?

	melting point °C	density g / cm ³	electrical conductivity
A	3550	3.5	poor
B	1860	7.2	good
C	660	2.7	good
D	232	7.3	good

16 Which substance leaves a black solid when heated?

- A** calcium carbonate
- B** copper(II) carbonate
- C** potassium carbonate
- D** zinc carbonate

17 The carbonate of metal **X** is a white solid.

It decomposes when heated to form carbon dioxide and a yellow solid oxide.

What is metal **X**?

- A** copper
- B** iron
- C** lead
- D** sodium

18 Use the Periodic Table to decide which element has all four of the properties shown.

- high melting point
- variable oxidation states
- good electrical conductivity
- forms coloured compounds

- A** caesium, Cs
- B** cobalt, Co
- C** iodine, I
- D** strontium, Sr

19 Element **Z** has the following properties.

- It has a high melting point.
- Its presence can lower the activation energy for a reaction.

What type of element is **Z**?

- A** a halogen
- B** an alkali metal
- C** a noble gas
- D** a transition metal

20 In which process is a catalyst **not** used?

- A** The Blast furnace for the manufacture of iron.
- B** The Contact process for the manufacture of sulphuric acid.
- C** The Haber process for the manufacture of ammonia.
- D** The manufacture of margarine from unsaturated vegetable oils.

21 Which shows the correct catalyst for each industrial process?

	manufacture of sulphuric acid	manufacture of ammonia	manufacture of margarine
A	nickel	iron	vanadium(V) oxide
B	nickel	vanadium(V) oxide	iron
C	vanadium(V) oxide	iron	nickel
D	vanadium(V) oxide	nickel	iron