
CHEMISTRY

5070/11

Paper 1 Multiple Choice

October/November 2015

1 hour

Additional Materials: Multiple Choice Answer Sheet
 Soft clean eraser
 Soft pencil (type B or HB recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This document consists of **14** printed pages and **2** blank pages.

- 1 Which process is used in the preparation of soluble salts?
- A electrolysis
 - B evaporation
 - C melting
 - D precipitation
- 2 Which positive ions are present in aqueous copper(II) sulfate?
- A copper ions only
 - B copper ions and hydrogen ions
 - C sulfate ions only
 - D sulfate ions and hydroxide ions
- 3 In a titration between an acid (in the burette) and an alkali, you may need to re-use the same titration flask.

Which is the best procedure for rinsing the flask?

- A Rinse with distilled water and then with the alkali.
 - B Rinse with tap water and then with distilled water.
 - C Rinse with tap water and then with the acid.
 - D Rinse with the alkali.
- 4 Two containers, one of methane and one of butane, are placed at the same distance from a naked flame.
- Both gases are released at the same time. The methane gas reaches the flame and catches fire before the butane gas reaches the flame.
- Which statement explains this?
- A Each methane molecule has a higher proportion of hydrogen than each butane molecule.
 - B Methane does not have isomers, butane does have isomers.
 - C Methane has a higher boiling point than butane.
 - D Methane molecules have a smaller mass than butane molecules.

- 5 Metal X oxidises in air. The formula of the oxide is XO.

X displaces zinc from aqueous zinc nitrate.

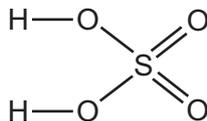
Which could be X?

- A aluminium
 - B lead
 - C magnesium
 - D sodium
- 6 Which is a compound?
- A air
 - B carbon
 - C oxygen
 - D steam
- 7 How is a calcium ion, Ca^{2+} , formed from a calcium atom?
- A by gaining two electrons
 - B by gaining two protons
 - C by losing two electrons
 - D by losing two protons
- 8 An oxygen atom contains 8 electrons, 8 protons and 10 neutrons.

What is the nucleon number of this atom?

- A 8 B 10 C 16 D 18

- 9 A molecule of sulfuric acid has the structural formula shown.



How many electrons are involved in forming all the covalent bonds in one molecule?

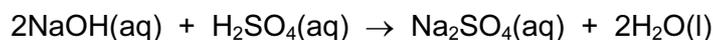
- A 6 B 8 C 12 D 16

10 A metal consists of a lattice of positive ions in a 'sea of electrons'.

What happens to the electrons and positive ions in a metal wire when an electric current is passed through it?

	electrons	positive ions
A	replaced by new electrons	replaced by new ions
B	replaced by new electrons	unchanged
C	unchanged	replaced by new ions
D	unchanged	unchanged

11 The equation shown represents the neutralisation of aqueous sodium hydroxide with dilute sulfuric acid.



How much sulfuric acid is required to neutralise 100 cm³ of 1.0 mol/dm³ NaOH?

- A** 50 cm³ of 2.0 mol/dm³ sulfuric acid
- B** 100 cm³ of 1.0 mol/dm³ sulfuric acid
- C** 25 cm³ of 0.5 mol/dm³ sulfuric acid
- D** 50 cm³ of 1.0 mol/dm³ sulfuric acid

12 Which change in conditions increases the energy of particles in a reaction?

- A** increase in concentration
- B** increase in pressure
- C** increase in temperature
- D** presence of a catalyst

13 Which change is endothermic?

- A** $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
- B** $\text{H}(\text{g}) + \text{Cl}(\text{g}) \rightarrow \text{HCl}(\text{g})$
- C** $\text{H}_2\text{O}(\text{g}) \rightarrow 2\text{H}(\text{g}) + \text{O}(\text{g})$
- D** $\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}_2\text{O}(\text{s})$

- 14 The enthalpy changes when methane, butane and octane are burned completely in oxygen are shown below.

	enthalpy change (kJ/mol)
methane, CH ₄	-890
butane, C ₄ H ₁₀	-2877
octane, C ₈ H ₁₈	-5512

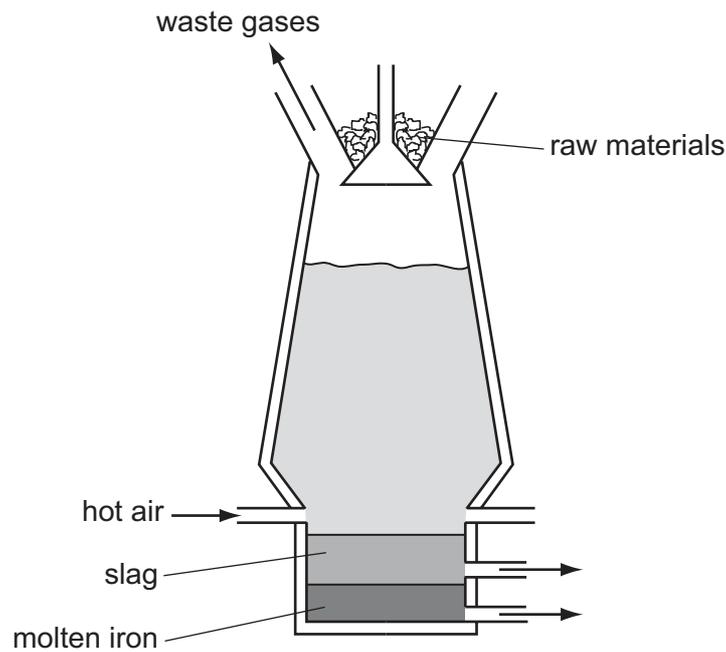
Which are the enthalpy changes when propane and pentane are burned completely in oxygen?

	propane, C ₃ H ₈ (kJ/mol)	pentane, C ₅ H ₁₂ (kJ/mol)
A	-2220	-4210
B	-2220	-3530
C	-1560	-4210
D	-1560	-3530

- 15 In the ionic solid zinc phosphide, Zn₃P₂, what is the formula of the phosphide ion?

A P³⁻ **B** P³⁺ **C** P⁴⁻ **D** P²⁺

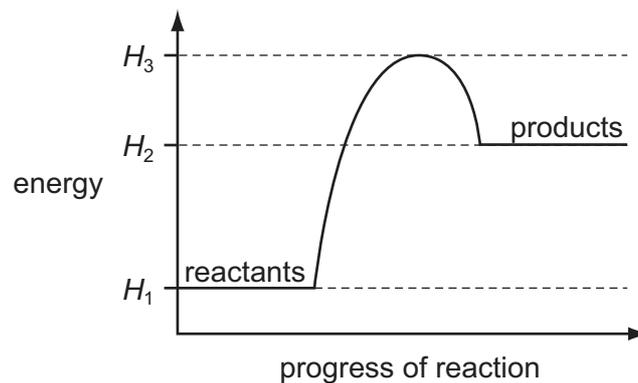
16 Iron is produced in the blast furnace.



Which statement about this process is correct?

- A Carbon is oxidised to carbon dioxide.
- B Carbon monoxide is produced by the thermal decomposition of calcium carbonate.
- C Haematite is reduced by calcium carbonate.
- D Impurities are removed by the hot air blast.

17 The energy profile diagram for a reaction is shown.



Which statement is correct?

- A The activation energy of the reaction is $(H_3 - H_1)$.
- B The activation energy of the reaction is $(H_3 - H_2)$.
- C ΔH is $(H_1 - H_2)$.
- D ΔH is $(H_1 - H_3)$.

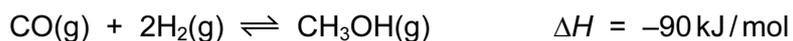
18 In which reaction is nitric acid acting as an oxidising agent?

- A $\text{Cu} + 4\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$
 B $\text{CuO} + 2\text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{H}_2\text{O}$
 C $\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$
 D $\text{NaOH} + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$

19 Which occurs during the electrolysis of dilute sulfuric acid?

- A Hydrogen and oxygen are formed in the ratio two volumes of oxygen to one volume of hydrogen.
 B Hydrogen is formed at the positive electrode.
 C Oxide ions are oxidised to oxygen.
 D The dilute sulfuric acid becomes more concentrated.

20 Methanol is made in industry by a reaction between carbon monoxide and hydrogen.



The process is usually carried out at a temperature of 400 °C.

Which row correctly shows the effect on both the position of the equilibrium and on the rate of the reaction of increasing the temperature to above 400 °C?

	position of equilibrium	rate of reaction
A	moves to left	decreases
B	moves to left	increases
C	moves to right	decreases
D	moves to right	increases

21 Which statement about graphite is **not** correct?

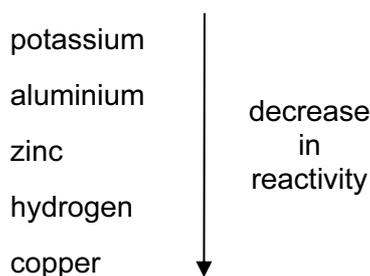
- A It burns to form carbon dioxide.
 B It is a carbon compound.
 C It is a giant molecular substance.
 D It is used as a lubricant.

22 Ammonium nitrate, NH_4NO_3 , is an artificial fertiliser produced from ammonia.

What is an advantage of using ammonium nitrate as a fertiliser?

- A It contains a large percentage by mass of nitrogen.
- B It gives off ammonia gas.
- C Nitrates are insoluble.
- D Nitrates can cause eutrophication.

23 Four metals and hydrogen are arranged in order of decreasing reactivity.



Which statement about these elements is correct?

- A Aluminium is formed when aluminium oxide is heated with hydrogen.
- B Copper displaces zinc from zinc sulfate solution.
- C Copper is formed when copper(II) oxide is heated with hydrogen.
- D When added to water, aluminium forms positive ions more readily than potassium.

24 Which pair of substances reacts to form a salt and water only?

- A aqueous sodium chloride and aqueous silver nitrate
- B aqueous sodium hydroxide and dilute ethanoic acid
- C aqueous sodium carbonate and dilute sulfuric acid
- D zinc and dilute hydrochloric acid

25 An element is burned in an excess of oxygen.

Which statement about the oxide formed is always correct?

- A The mass of oxide formed is greater than the mass of element burned.
- B The oxide formed is a crystalline solid.
- C The oxide formed is soluble in water.
- D The oxide formed is white in colour.

26 Which reaction does **not** involve neutralisation?

- A $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{NH}_3(\text{aq}) \rightarrow (\text{NH}_4)_2\text{SO}_4(\text{aq})$
 B $\text{H}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{HCl}(\text{aq})$
 C $\text{H}_2\text{SO}_4(\text{aq}) + \text{CuO}(\text{s}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 D $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

27 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

28 Three different elements react by losing electrons. The ions formed all have the electronic configuration 2,8.

Which statement about these elements is correct?

- A They are in the same group.
 B They are in the same period.
 C They are noble gases.
 D They are transition elements.

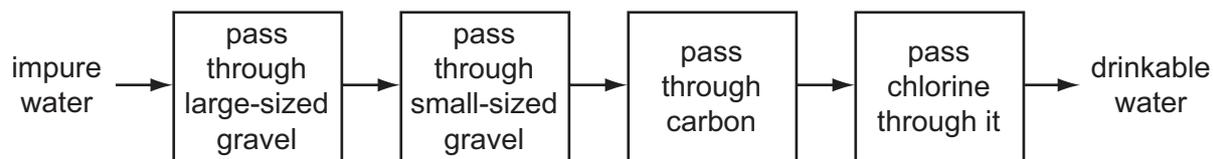
29 An alloy of aluminium is used in the construction of aircraft.

Why is pure aluminium never used?

- A Pure aluminium cannot be manufactured.
 B Pure aluminium conducts electricity.
 C Pure aluminium is less dense than its alloys.
 D Pure aluminium is too malleable.

- 30 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.

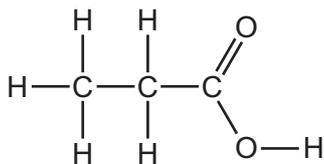
- 31 The flow chart shows how impure water can be treated to produce drinkable water.



What is **not** removed from the water by this process?

- A clay particles
 - B microbes
 - C nitrates
 - D odours
- 32 Which property of a liquid ester can be used to check its purity before use as a food flavouring?
- A boiling point
 - B colour
 - C smell
 - D solubility in water
- 33 Which alcohol will, on oxidation, produce $\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$?
- A CH_3OH
 - B $\text{CH}_3\text{CH}_2\text{OH}$
 - C $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 - D $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{OH}$

34 The diagram shows the structure of an organic acid.



Which row is correct?

	name of acid	reacts with aqueous sodium carbonate to produce carbon dioxide
A	butanoic acid	no
B	butanoic acid	yes
C	propanoic acid	no
D	propanoic acid	yes

35 A carbohydrate such as starch can be represented as shown.



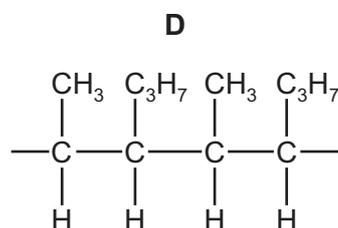
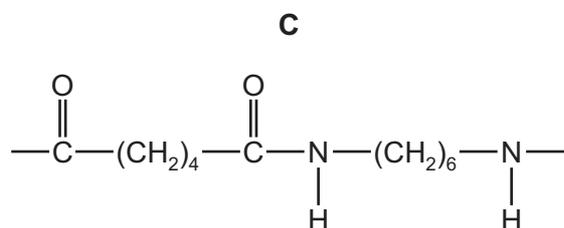
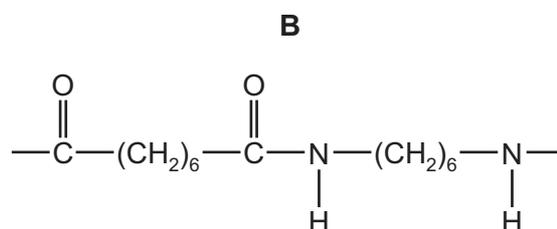
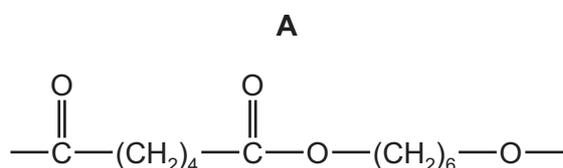
What is X?

- A** carbon
- B** hydrogen
- C** nitrogen
- D** oxygen

36 **P** is a polymer that

- has six carbon atoms in each of the monomers from which it was formed,
- is **not** a polyester,
- was formed using condensation polymerisation.

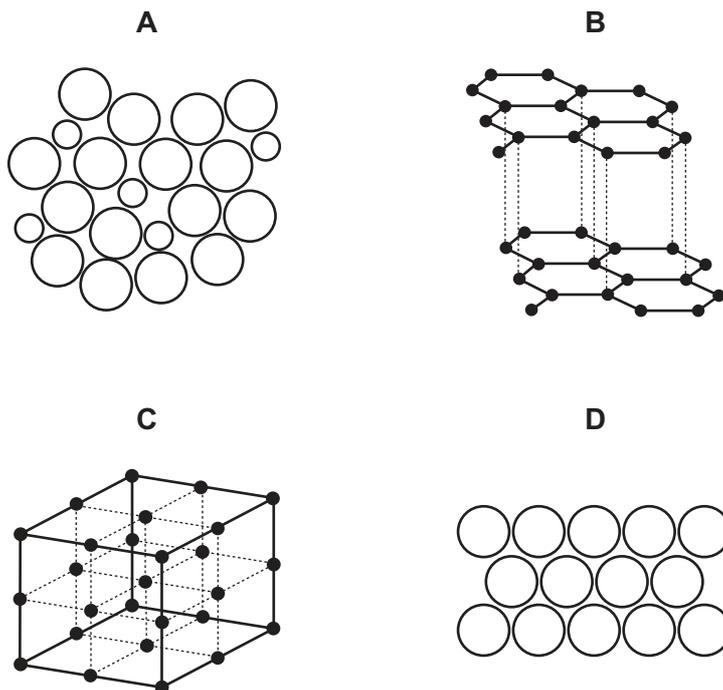
What is the partial structure of **P**?



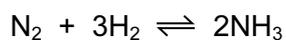
37 What are the products of photosynthesis?

- A** carbon dioxide and oxygen
- B** carbon dioxide and water
- C** glucose and water
- D** glucose and oxygen

38 Which diagram shows the structure of an alloy?



39 Hydrogen and nitrogen react to form ammonia.



Which statement is correct?

- A Ammonia is made in industry by the Contact process.
- B Ammonia is used in industry to make hydrogen and nitrogen.
- C Hydrogen, for the forward reaction, is obtained from cracking oil.
- D Weed killers are manufactured from ammonia.

40 Which statement about the hydrocarbon C_2H_4 is **not** correct?

- A It contains a double bond.
- B It decolourises bromine water.
- C It forms a condensation polymer.
- D It forms an alcohol when reacted with steam.

DATA SHEET
The Periodic Table of the Elements

		Group													
I	II	III	IV	V	VI	VII	0						0		
		1 H Hydrogen 1										4 He Helium 2			
7 Li Lithium 3	9 Be Beryllium 4											20 Ne Neon 10			
23 Na Sodium 11	24 Mg Magnesium 12											35.5 Cl Chlorine 17	40 Ar Argon 18		
39 K Potassium 19	40 Ca Calcium 20											79 Se Selenium 34	84 Kr Krypton 36		
85 Rb Rubidium 37	88 Sr Strontium 38											128 Te Tellurium 52	131 Xe Xenon 54		
133 Cs Caesium 55	137 Ba Barium 56											209 Bi Bismuth 83	210 Po Polonium 84		
226 Fr Francium 87	227 Ra Radium 88											207 Pb Lead 82	210 Rn Radon 86		
													169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
													167 Er Erbium 68	168 Fm Fermium 100	102 No Nobelium 102
													162 Dy Dysprosium 66	165 Ho Holmium 67	169 Md Mendelevium 101
													159 Tb Terbium 65	162 Es Einsteinium 99	101 Cf Californium 98
													157 Gd Gadolinium 64	162 Cf Californium 98	101 Cf Californium 98
													152 Eu Europium 63	162 Cf Californium 98	101 Cf Californium 98
													150 Sm Samarium 62	162 Cf Californium 98	101 Cf Californium 98
													144 Nd Neodymium 60	162 Cf Californium 98	101 Cf Californium 98
													141 Pr Praseodymium 59	162 Cf Californium 98	101 Cf Californium 98
													140 Ce Cerium 58	162 Cf Californium 98	101 Cf Californium 98
													232 Th Thorium 90	162 Cf Californium 98	101 Cf Californium 98
													238 U Uranium 92	162 Cf Californium 98	101 Cf Californium 98
													93 Np Neptunium 93	162 Cf Californium 98	101 Cf Californium 98
													94 Pu Plutonium 94	162 Cf Californium 98	101 Cf Californium 98
													95 Am Americium 95	162 Cf Californium 98	101 Cf Californium 98
													96 Cm Curium 96	162 Cf Californium 98	101 Cf Californium 98
													97 Bk Berkelium 97	162 Cf Californium 98	101 Cf Californium 98
													99 Es Einsteinium 99	162 Cf Californium 98	101 Cf Californium 98
													100 Fm Fermium 100	162 Cf Californium 98	101 Cf Californium 98
													101 Md Mendelevium 101	162 Cf Californium 98	101 Cf Californium 98
													102 No Nobelium 102	162 Cf Californium 98	101 Cf Californium 98
													103 Lr Lawrencium 103	162 Cf Californium 98	101 Cf Californium 98

*58-71 Lanthanoid series
†90-103 Actinoid series

	a	X	a = relative atomic mass X = atomic symbol
Key	b	X	b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).