

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

SCIENCE (PHYSICS, CHEMISTRY)

5124/01

Paper 1 Multiple Choice

October/November 2003

1 hour

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

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

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.

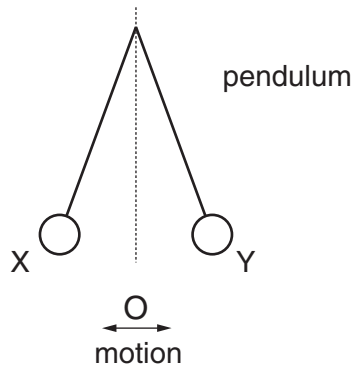
Any rough working should be done in this booklet.

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

This document consists of **16** printed pages.



- 1 The diagram shows a simple pendulum. It swings between X and Y.



Which sequence should be timed to measure the period of the pendulum?

- A $X \rightarrow O$
 - B $X \rightarrow Y$
 - C $X \rightarrow Y \rightarrow O$
 - D $X \rightarrow Y \rightarrow X$
- 2 An object falls through a vacuum where there is no air resistance.

Which line in the table describes the acceleration and velocity of the object?

| | acceleration | velocity |
|----------|--------------|------------|
| A | constant | constant |
| B | constant | increasing |
| C | increasing | constant |
| D | increasing | increasing |

- 3 An astronaut has a mass of 80 kg on Earth. He can jump 10 cm high off the surface of the Earth. When he is on the Moon he can jump higher than this.

This is because, on the Moon,

- A his mass is smaller than on Earth.
- B his weight is greater than on Earth.
- C his weight is smaller than on Earth.
- D his weight is the same as on Earth.

- 4 A stone of mass 400 g is lowered into a measuring cylinder containing water.

The water level rises from 300 cm³ to 500 cm³.

What is the density of the stone?

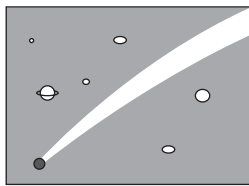
- A** 0.50 g/cm³ **B** 0.80 g/cm³ **C** 1.33 g/cm³ **D** 2.0 g/cm³

- 5 The diagrams show some effects which are all due to the same cause.

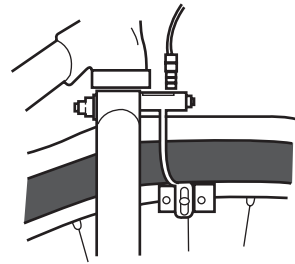
a parachutist
reaching terminal velocity



a meteor glowing as it
falls through the
atmosphere



brakes slowing down
a bicycle



What causes these effects?

- A** friction
B heat
C mass
D weight
- 6 A ball of mass 100 g is balanced on the edge of a ledge 10 m above the ground. It rolls off the ledge and falls.

How much gravitational potential energy is lost when the ball falls to the ground?
(gravitational field strength = 10 N/kg.)

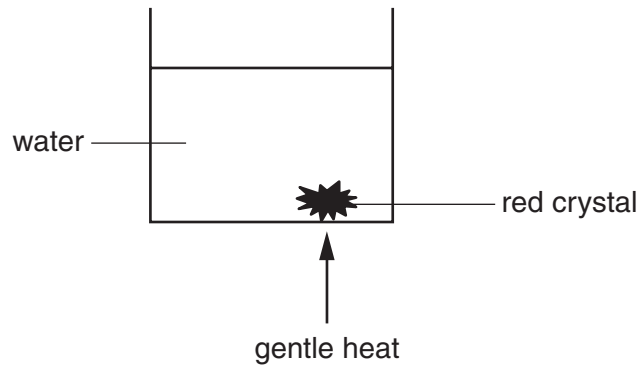
- A** 10 J **B** 100 J **C** 1000 J **D** 10 000 J

- 7 Which substance in the table is liquid at 20 °C?

| substance | melting point / °C | boiling point / °C |
|-----------|--------------------|--------------------|
| A | -218 | -183 |
| B | -39 | 357 |
| C | 44 | 280 |
| D | 119 | 444 |

- 8 A beaker of water contains a red crystal which slowly dissolves.

Gentle heat is applied below the crystal.



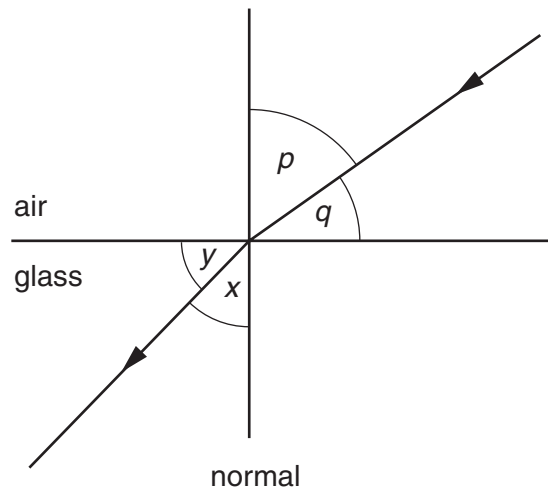
The red colour is seen to rise.

What is the name of this process?

- A evaporation
 - B conduction
 - C convection
 - D radiation
- 9 Which of the following correctly describes the natures of sound, light and radio waves?

| | sound | light | radio |
|----------|--------------|--------------|--------------|
| A | longitudinal | transverse | longitudinal |
| B | longitudinal | transverse | transverse |
| C | transverse | longitudinal | longitudinal |
| D | transverse | longitudinal | transverse |

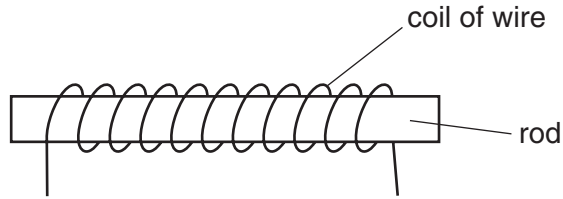
- 10 The diagram shows a ray of red light passing from air into glass.



Which ratio gives the refractive index for red light?

- A $\frac{\sin p}{\sin x}$
- B $\frac{\sin p}{\sin y}$
- C $\frac{\sin q}{\sin x}$
- D $\frac{\sin q}{\sin y}$
- 11 Which of the following, in the electromagnetic spectrum, has the shortest wavelength?
- A infrared
- B microwave
- C radio
- D ultra-violet
- 12 A loud sound is made in front of a tall building.
- An echo is heard 4 seconds after the sound is produced.
- If the speed of sound in air is 320 m/s, how far away is the building?
- A 80 m B 160 m C 640 m D 1280 m

- 13 An experiment was carried out using four rods made of different materials. These were placed, in turn, in a coil of wire.

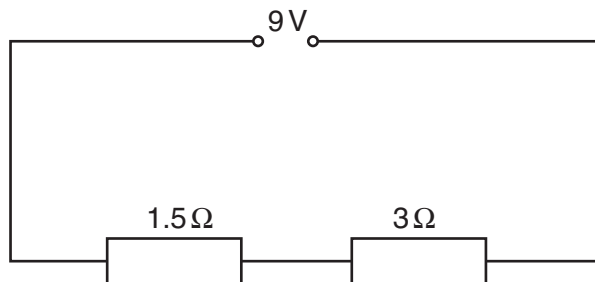


A large direct current was passed through the coil for a few seconds and was then switched off.

As a result one of the rods was **permanently** magnetised by this experiment.

Which material?

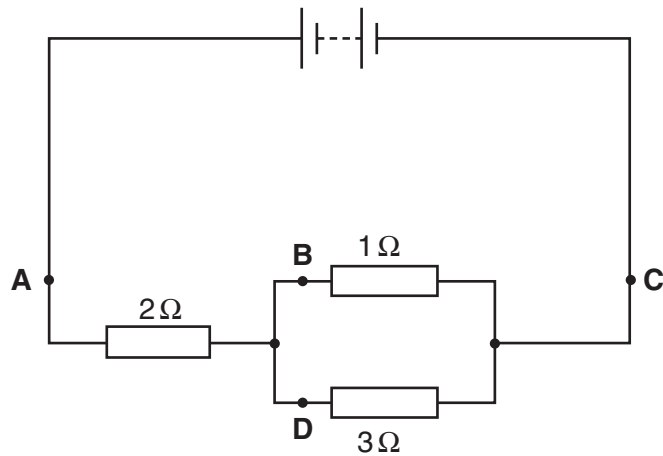
- A glass
 - B iron
 - C plastic
 - D steel
- 14 Two resistors are connected in series with a 9 volt supply.



What is the current flowing in the circuit?

- A 2.0 A
- B 3.0 A
- C 4.5 A
- D 6.0 A

15 At which point in this circuit is the current the smallest?



16 What should be the rating for a fuse used in the plug of an electric heater?

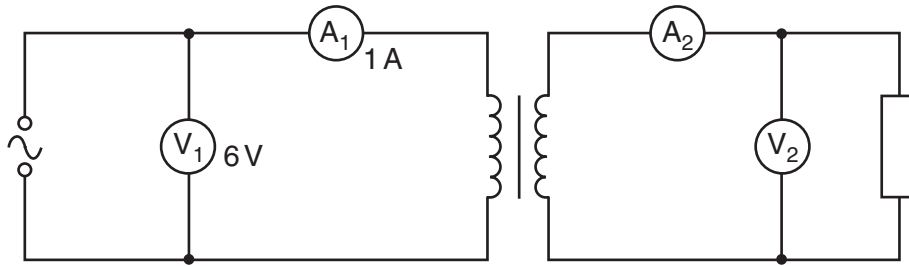
- A just less than the normal heater current
- B exactly equal to the normal heater current
- C just greater than the normal heater current
- D much greater than the normal heater current

17 Four electrical appliances are left switched on for different times.

In which appliance is the greatest amount of energy converted?

| | appliance | time / h |
|---|-------------------|----------|
| A | 100 W light bulb | 12.0 |
| B | 1 kW fan | 3.0 |
| C | 1.5 kW hot-plate | 1.5 |
| D | 3 kW water heater | 0.5 |

- 18 The diagram shows a 100% efficient **step-up** transformer.



Which pair of readings are possible on meters V_2 and A_2 ?

| | V_2 | A_2 |
|----------|-------|-------|
| A | 0.6 | 0.1 |
| B | 0.6 | 10.0 |
| C | 60.0 | 0.1 |
| D | 60.0 | 10.0 |

- 19 A sample contains 12 000 radioactive atoms of a particular nuclide.

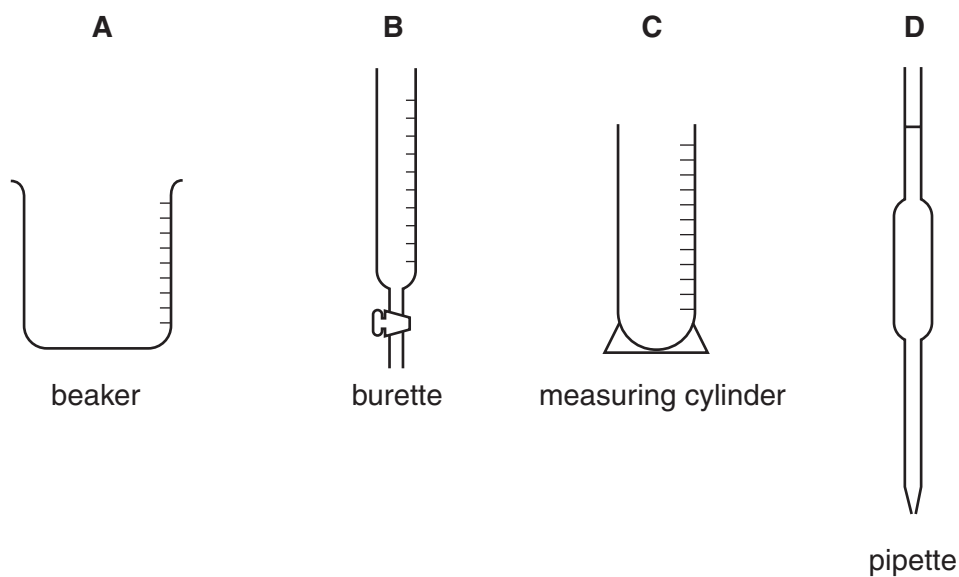
After an interval of two half-lives, how many atoms have disintegrated?

- A** 0 **B** 3000 **C** 6000 **D** 9000

- 20 How many neutrons and protons does one atom of substance A_ZX have in its nucleus?

| | number of neutrons | number of protons |
|----------|--------------------|-------------------|
| A | $Z - A$ | A |
| B | $A - Z$ | Z |
| C | Z | A |
| D | A | Z |

21 Which piece of apparatus is used to measure exactly 22.5 cm^3 of a liquid?



22 What can be deduced from the symbol ${}^4_2\text{He}$?

- A An atom of helium contains 2 electrons.
- B An atom of helium has 2 protons and 4 neutrons in its nucleus.
- C Helium has a proton (atomic) number of 4.
- D Helium occurs as a diatomic molecule.

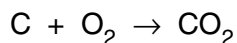
23 Substance X has the following properties

- 1 it conducts electricity when molten
- 2 it has a high melting point
- 3 it dissolves in an aqueous solution of hydrochloric acid

What is X?

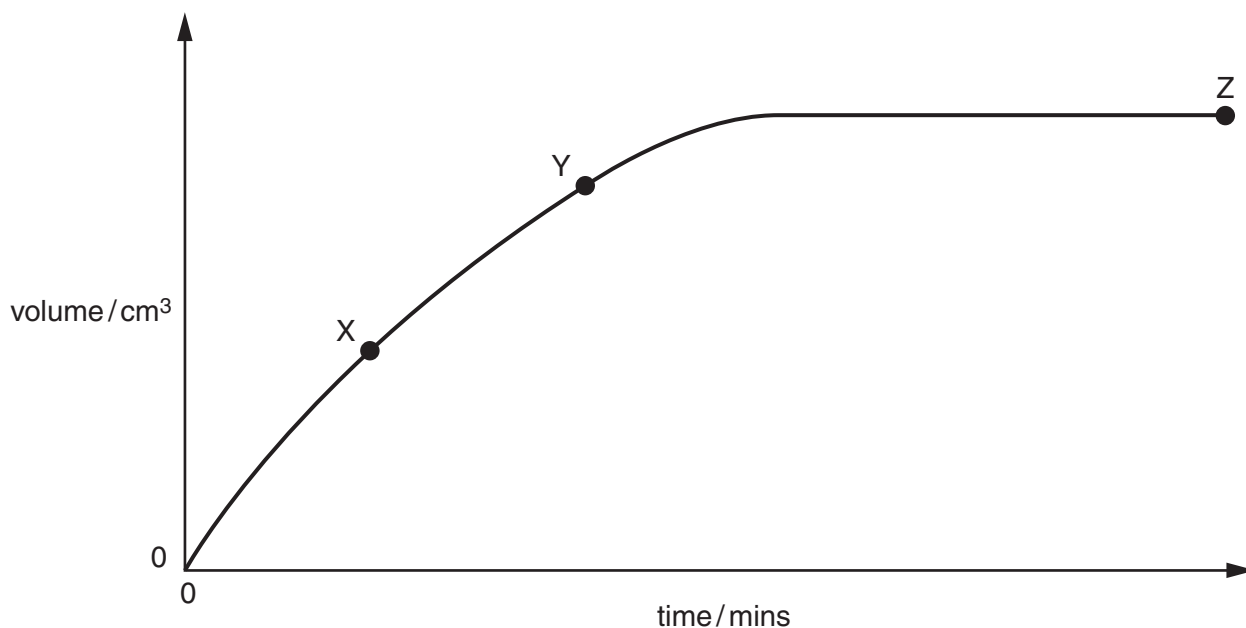
- A copper
- B ethanol
- C iodine
- D sodium chloride

- 24 A 6 g sample of pure carbon is completely burned in oxygen.



Which mass of carbon dioxide is produced?

- A 12 g
 B 22 g
 C 38 g
 D 44 g
- 25 The formula of copper(I) oxide is Cu_2O .
 How many grams of oxygen are combined with 64 g of copper in this compound?
 A 8 B 16 C 32 D 64
- 26 The graph shows the total volume of carbon dioxide evolved, plotted against time, when excess calcium carbonate reacts with 20 cm^3 of hydrochloric acid containing 2 mol/dm^3 .



Which statement is correct?

- A The reaction is faster at point Y than at point X.
 B The reaction first reaches completion at point Z.
 C The time taken to reach completion decreases if 20 cm^3 of hydrochloric acid containing 4 mol/dm^3 is used.
 D The total volume of carbon dioxide evolved is greater if a greater mass of calcium carbonate is used.

- 27 Which word describes the reaction between hydrochloric acid and sodium hydroxide?
- A electrolysis
 - B neutralisation
 - C precipitation
 - D thermal decomposition

- 28 Four aqueous solutions have the pH values shown in the table.

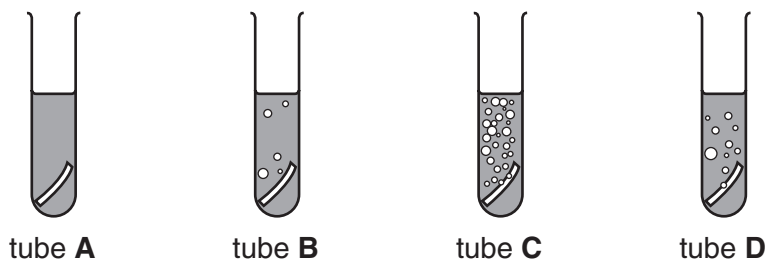
| | | | | |
|----------|---|---|---|----|
| solution | P | Q | R | S |
| pH | 2 | 6 | 8 | 10 |

If pairs of solutions are mixed, which pair **must** produce an acidic mixture?

- A P and Q B P and R C P and S D Q and R
- 29 Which two substances react to form a salt and water only?
- A dilute ethanoic acid and aqueous sodium hydroxide
 - B dilute hydrochloric acid and zinc
 - C dilute sulphuric acid and aqueous sodium carbonate
 - D aqueous silver nitrate and aqueous sodium chloride
- 30 Which arrangement of electrons is that of a gas normally used to fill light bulbs?
- A 2 B 2, 6 C 2, 8, 2 D 2, 8, 8
- 31 What is used to decide the order of the elements in the Periodic Table?
- A density
 - B number of neutrons
 - C number of protons
 - D relative atomic mass

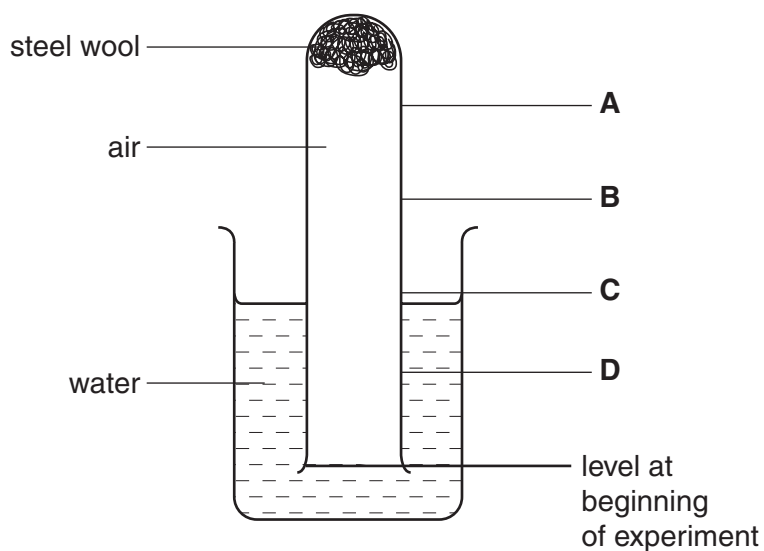
32 The metals iron, lead, magnesium and zinc are each added to dilute hydrochloric acid.

Which tube contains magnesium and dilute hydrochloric acid?



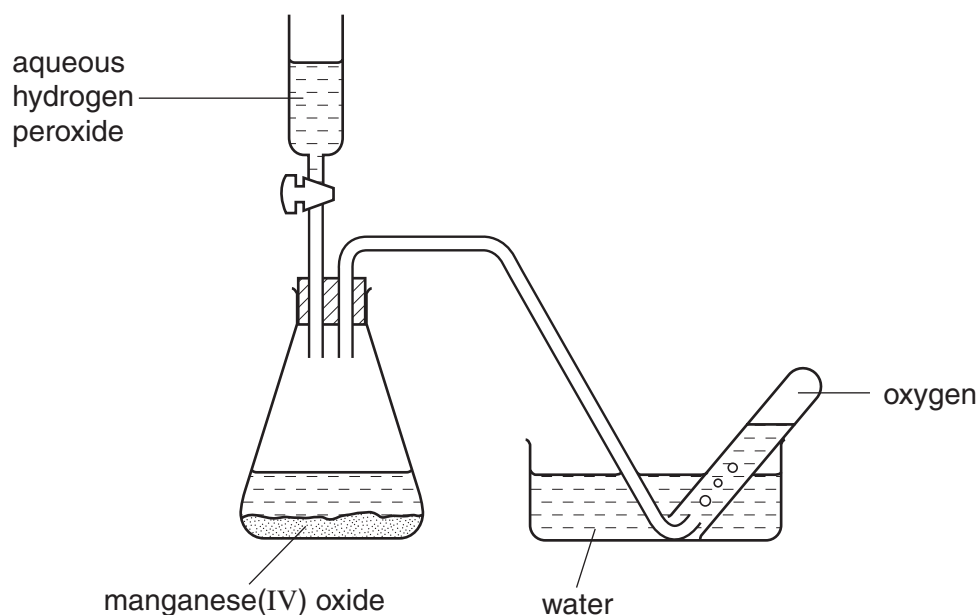
33 The diagram shows steel wool inside a test-tube. The test-tube is inverted in water, trapping air inside.

What will be the water level after several days?



- 34 Using manganese(IV) oxide as a catalyst, aqueous hydrogen peroxide decomposes to form oxygen.

This reaction was used to make and collect oxygen as shown in the diagram.



The first few test-tubes of collected gas should be rejected because the oxygen would be contaminated by

- A air.
 - B hydrogen.
 - C hydrogen peroxide.
 - D manganese(IV) oxide.
- 35 A sample of polluted air is bubbled through water.

The pH of the solution formed is less than 7.

Which gas causes this?

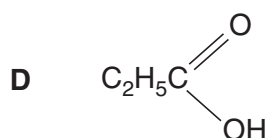
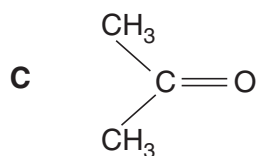
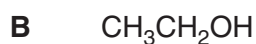
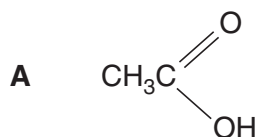
- A ammonia
- B carbon monoxide
- C nitrogen
- D sulphur dioxide

36 When crude oil is distilled, several products are obtained.

What is the correct order of their boiling points?

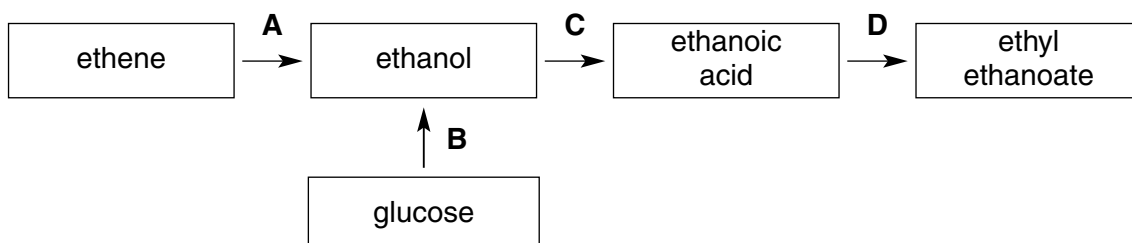
| | lowest boiling point → highest boiling point | | | |
|----------|---|----------|-----------------|-----------------|
| A | diesel | paraffin | petrol | lubricating oil |
| B | paraffin | petrol | lubricating oil | diesel |
| C | petrol | paraffin | diesel | lubricating oil |
| D | petrol | diesel | lubricating oil | paraffin |

37 Wine can deteriorate after a period of time, because of atmospheric oxidation. Which compound would be formed by the oxidation of the alcohol in the wine?

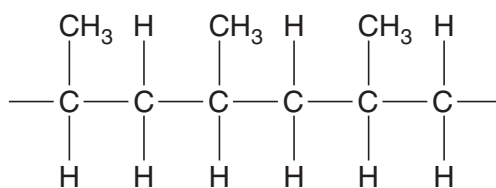


38 The diagram shows changes to some organic compounds.

In which change is an ester formed?

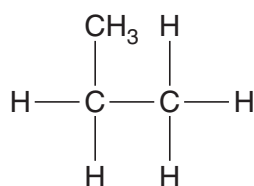


39 The structure of a polymer is shown

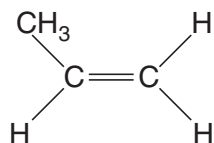


From which hydrocarbon is the polymer made?

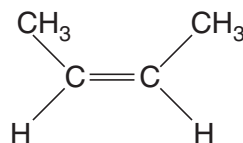
A



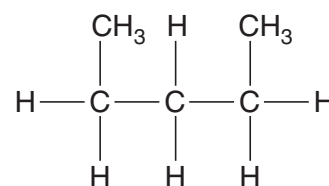
B



C



D



40 In which pair of polymers are the linkages the same?

- A** fats and proteins
- B** nylon and fats
- C** nylon and proteins
- D** proteins and *Terylene*

DATA SHEET
The Periodic Table of the Elements

| Group | | | | | | | | | | |
|-----------------------------------|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|-----------------------------------|
| I | II | III | IV | V | VI | VII | O | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | 1 H Hydrogen 1 | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 | 4 He Helium 2 | |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulphur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 | | | |
| 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 49 V Vanadium 23 | 51 Cr Chromium 24 | 52 Mn Manganese 25 | 55 Fe Iron 26 | 56 Ni Nickel 28 | 59 Co Cobalt 27 | 59 Cu Copper 29 |
| 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | 101 Tc Technetium 43 | 106 Ru Ruthenium 44 | 108 Pd Palladium 46 | 115 In Indium 49 | 112 Cd Cadmium 48 |
| 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 195 Pt Platinum 78 | 204 Tl Thallium 81 | 201 Hg Mercury 80 |
| 87 Fr Francium | 226 Ra Radium | 227 Ac Actinium | | | | | | | | |

| | | | | | | | | | | | | |
|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--|-------------------------------------|---------------------------------------|
| 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |
| 232 Th Thorium 90 | 238 Pa Protactinium 91 | 238 U Uranium 92 | 94 Pu Plutonium 94 | 95 Am Americium 95 | 96 Cm Curium 96 | 97 Bk Berkelium 97 | 98 Cf Californium 98 | 99 Es Einsteinium 99 | 100 Fm Fermium 100 | 101 Md Mendelevium 101 | 102 No Nobelium 102 | 103 Lr Lawrencium 103 |

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

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

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