



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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CO-ORDINATED SCIENCES

0654/13

Paper 1 Multiple Choice

October/November 2012

45 minutes

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

* 8 6 2 1 7 0 9 9 0 1 *

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 printed on page 20.

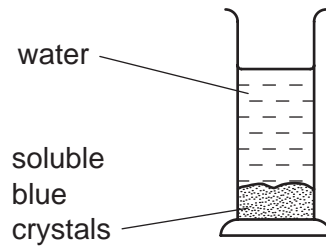
This document consists of **17** printed pages and **3** blank pages.



1 Which part of a cell contains the most water?

- A cell wall
- B membrane
- C nucleus
- D vacuole

2 Apparatus is set up as shown.



After several hours, all the water has turned blue.

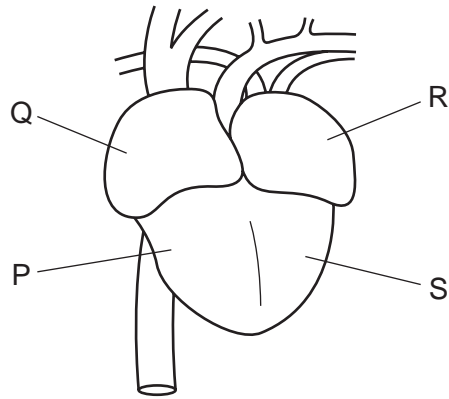
Which process causes this colour change to take place?

- A assimilation
- B diffusion
- C digestion
- D evaporation

3 What are the effects of adrenaline?

	blood glucose concentration	pulse rate
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

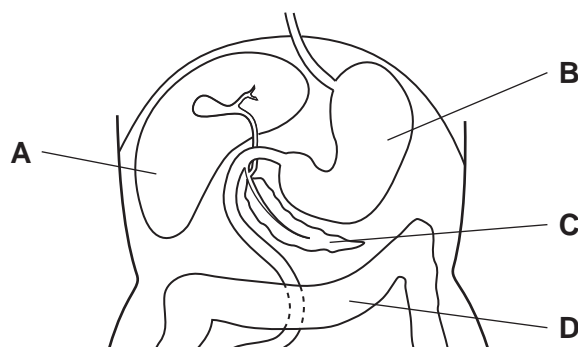
- 4 The diagram shows a human heart, seen from the front.



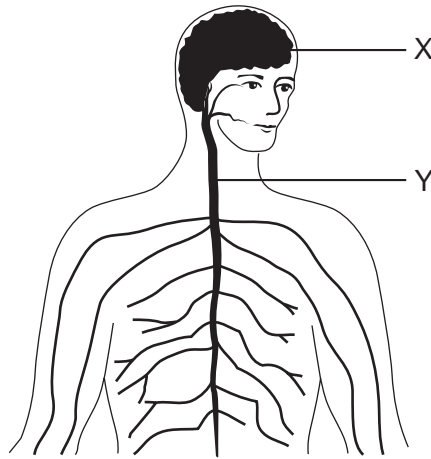
What is the sequence in which a blood cell passes through the four chambers of the heart?

- A** P → S → R → Q
B Q → P → R → S
C R → Q → P → S
D S → R → Q → P
- 5 How should the diet of a weight-lifter differ from the diet of an office worker?
- A** She should eat less fat.
B She should eat more protein.
C She should eat less carbohydrate.
D She should eat more fibre.
- 6 The diagram shows some organs in the abdomen.

Which labelled organ is the pancreas?



7 The diagram shows part of the human nervous system.



What name is given to X and Y together?

- A brain
 - B central nervous system
 - C nerve
 - D spinal cord
- 8 Which action is part of a homeostatic mechanism?
- A blinking after moving into strong sunlight
 - B making digestive enzymes in the pancreas
 - C swallowing food after chewing it
 - D sweating in a hot room
- 9 A woman's menstrual cycle lasts 32 days. She usually ovulates 18 days after the first day of her period (day 1 of the cycle). Her period lasts five days.
- On which days would sexual intercourse be most likely to lead to fertilisation?
- A days 6-9
 - B days 12-15
 - C days 16-19
 - D days 29-32

10 From largest to smallest, what is the correct order of size for these structures?

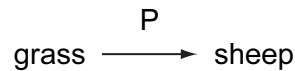
- A chromosome → gamete → gene → nucleus
- B chromosome → gene → gamete → nucleus
- C gamete → chromosome → gene → nucleus
- D gamete → nucleus → chromosome → gene

11 In the following sentence, which words should replace P, Q and R to make a correct statement about the genetics of an organism?

When compared with a heterozygous organism, a homozygous organism with two matchingP..... alleles will have the sameQ..... but differentR..... .

	P	Q	R
A	dominant	genotype	phenotype
B	dominant	phenotype	genotype
C	recessive	genotype	phenotype
D	recessive	phenotype	genotype

12 The diagram shows the first link in a food chain.



What is process P?

- A excretion
- B feeding
- C photosynthesis
- D respiration

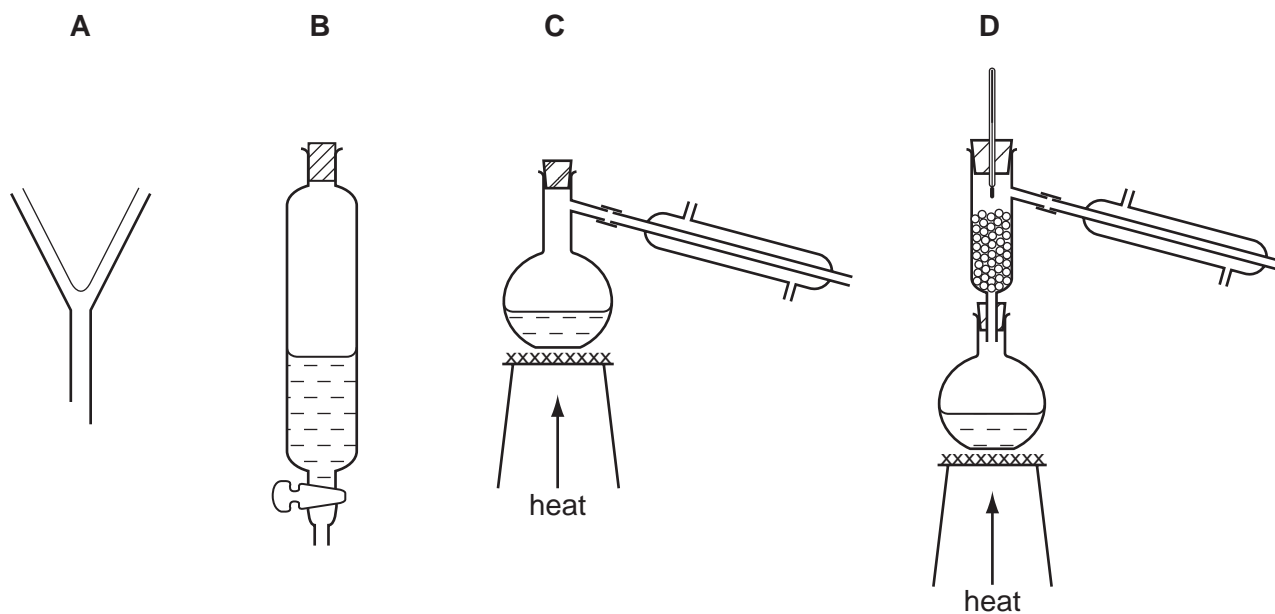
13 In the carbon cycle, several different processes may release carbon dioxide from dead organisms.

Which process does **not** do so?

- A combustion
- B decomposition
- C photosynthesis
- D respiration

14 Hexane and octane are liquid hydrocarbons that mix together.

Which is the best method of separating a mixture of these two liquids?

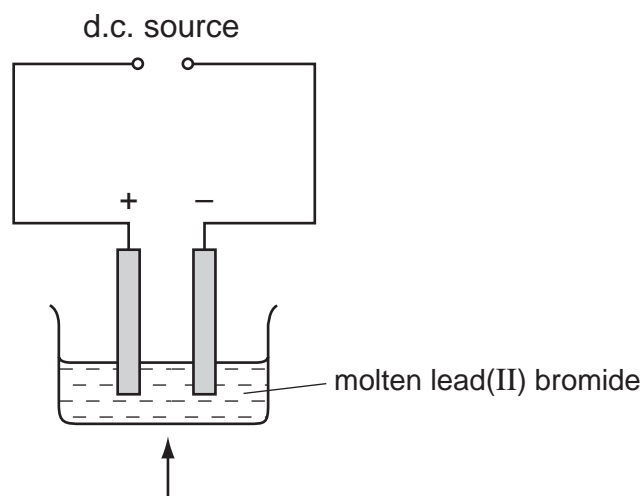


15 What is formed when an atom loses an electron?

- A** an atom of a non-metal
- B** a positive ion
- C** a molecule
- D** a negative ion

16 Molten lead(II) bromide is electrolysed as shown.

An element is produced at the negative electrode.



What is the name of the element and of the electrode?

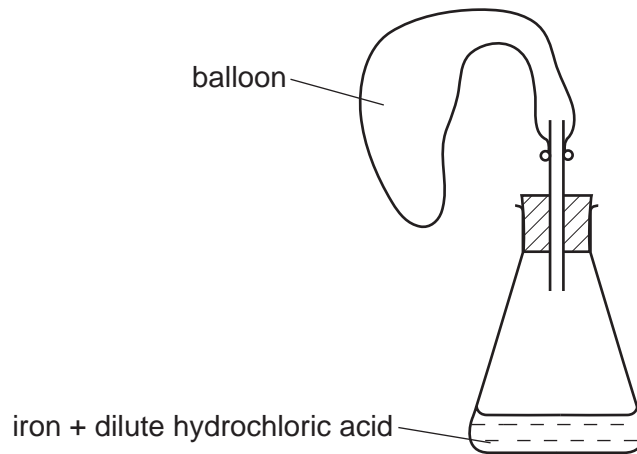
	element	electrode
A	bromine	anode
B	bromine	cathode
C	lead	anode
D	lead	cathode

17 Lime is manufactured by heating limestone. It is used to control the acidity of soil.

Which types of chemical change occur in these two reactions?

	heating limestone	controlling acidity
A	endothermic	oxidation
B	endothermic	neutralisation
C	exothermic	oxidation
D	exothermic	neutralisation

18 The diagram shows a balloon being filled with hydrogen.



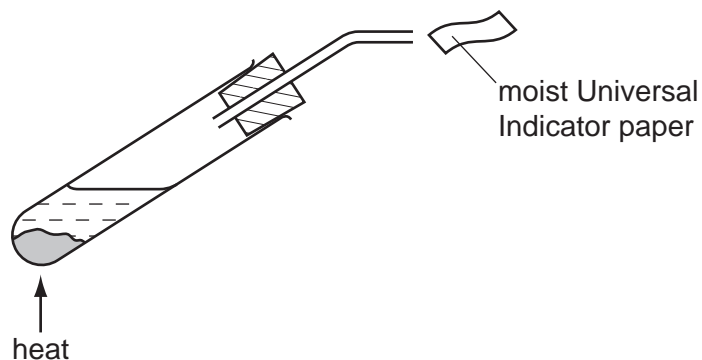
Which form of iron makes the balloon fill most quickly?

- A a lump
- B pieces of wire
- C powder
- D thin sheets

19 Which substances react with dilute sulfuric acid to form a salt?

	magnesium	magnesium oxide	magnesium carbonate	magnesium chloride
A	✓	✓	✓	x
B	✓	✓	x	✓
C	✓	x	✓	✓
D	x	✓	✓	✓

20 A solid, S, is heated with aqueous sodium hydroxide.



The moist Universal Indicator paper turns blue.

What is S?

- A ammonium sulfate
- B copper(II) sulfate
- C iron(II) sulfate
- D zinc sulfate

21 An element X has a high melting point and its oxide is coloured.

Which row is correct?

	element	oxide
A	transition metal	acidic
B	transition metal	basic
C	non-metal	acidic
D	non-metal	basic

22 An element is a solid at room temperature and does **not** conduct electricity.

What could the proton number of this element be?

- A 11
- B 19
- C 35
- D 53

23 Three of the properties of aluminium alloys are shown.

- 1 high strength
- 2 good electrical conductivity
- 3 low density

Which properties are required for making aircraft bodies?

- A** 1 and 3 only
B 2 and 3 only
C 1 only
D 2 only

24 The table gives information about three metals, G, H and J.

metal	reacts with	
	water	steam
G	x	x
H	✓	✓
J	x	✓

What is the order of reactivity of these metals?

	most reactive	→	least reactive
A	G		J
B	H		J
C	H		G
D	J		G

25 Which three elements do most fertilisers contain?

- A** Na, C, P **B** Na, P, K **C** K, C, N **D** K, P, N

26 Which process produces molecules with long chains?

- A combustion of hydrocarbons
- B cracking
- C fractional distillation of petroleum
- D polymerisation

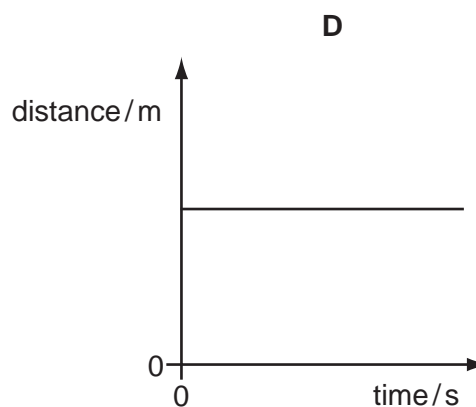
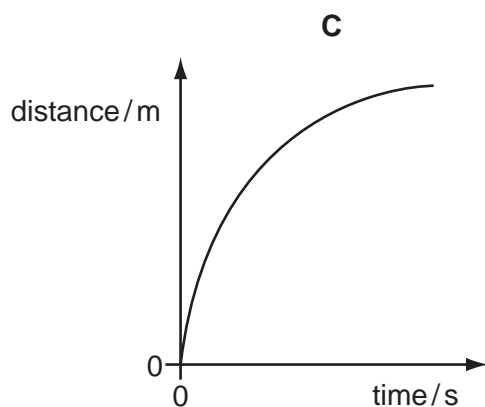
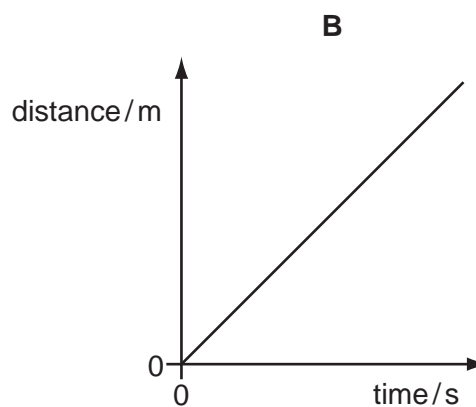
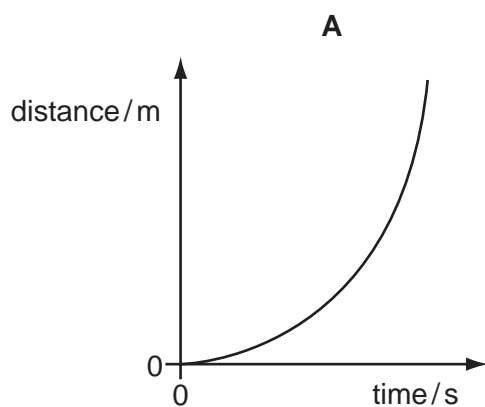
27 The table gives information about four fractions obtained by distilling petroleum.

Which fraction is most likely to contain a compound of formula $C_{11}H_{24}$ and boiling point 196°C ?

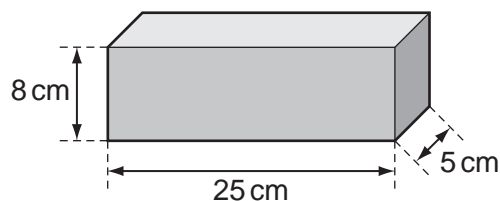
	range of boiling point/ $^\circ\text{C}$	number of carbon atoms per molecule
A	20 to 70	5 to 10
B	70 to 120	8 to 12
C	120 to 240	10 to 16
D	240 to 300	15 to 24

28 The following are distance/time graphs.

Which graph shows an object travelling at constant speed?



- 29 A solid, rectangular metal block has the dimensions shown.



The mass of the block is 2700 g.

What is the density of the metal?

- A $\frac{2700}{25 \times 5} \text{ g/cm}^3$
- B $\frac{25 \times 5}{2700} \text{ g/cm}^3$
- C $\frac{2700}{25 \times 5 \times 8} \text{ g/cm}^3$
- D $\frac{25 \times 5 \times 8}{2700} \text{ g/cm}^3$
- 30 A certain machine is very efficient, but not completely efficient.

What does this mean?

- A It uses no energy.
- B It uses only a small fraction of its energy input.
- C It wastes no energy.
- D It wastes only a small fraction of its energy input.

- 31 A gas cylinder has a constant volume.

The gas molecules collide with the walls of the cylinder at a certain rate.

The gas is heated and its pressure increases.

What happens to the average speed of the gas molecules and to their rate of collision with the cylinder walls?

	average speed of gas molecules	rate of collision
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

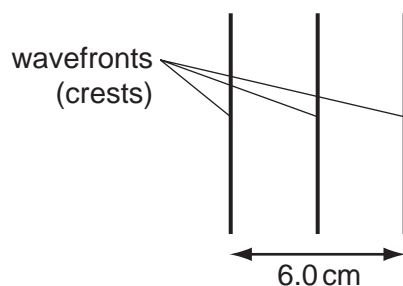
32 Four students make statements about the change of state of solids, liquids and gases.

Which statement is correct?

- A The boiling point of a liquid is the temperature at which it starts to evaporate.
- B The temperature of a liquid does not change while it is boiling.
- C The temperature of a liquid falls while it is solidifying.
- D Heat energy must be put into a gas to make it condense.

33 The diagram shows water waves seen from above.

One wave is made every 0.5 s.

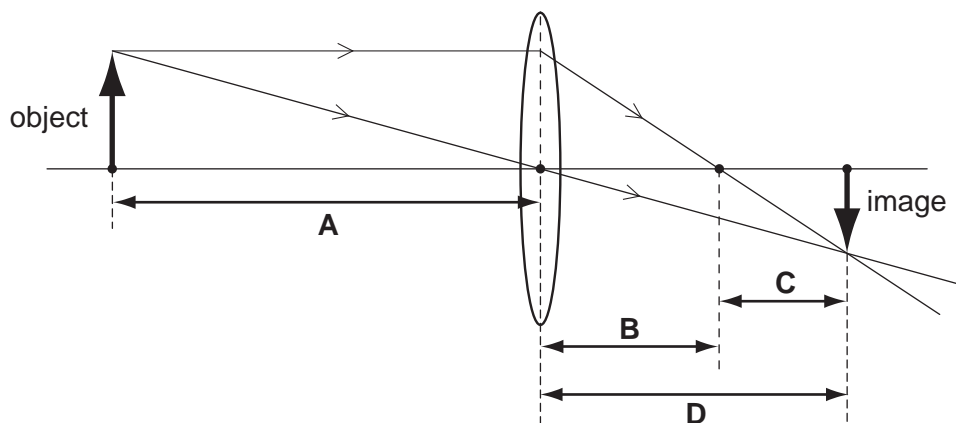


What is the frequency of the waves and what is their wavelength?

	frequency / Hz	wavelength / cm
A	0.5	3.0
B	0.5	6.0
C	2.0	3.0
D	2.0	6.0

34 The diagram shows how a real image is formed by a converging lens.

Which distance is the focal length of the lens?

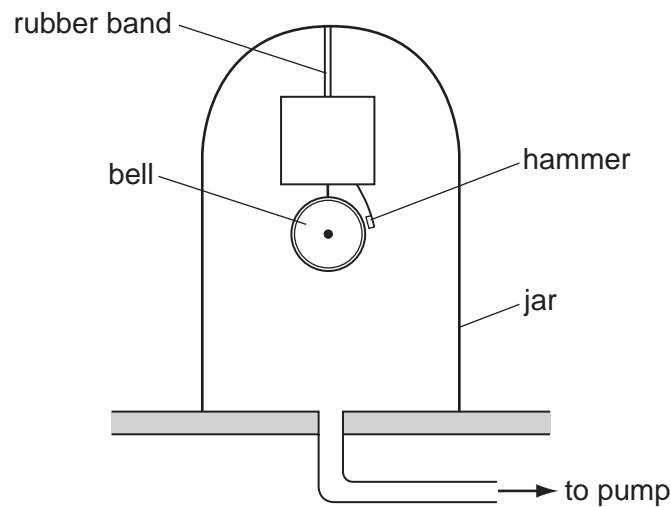


35 Radio waves, infra-red radiation and visible light are different types of electromagnetic waves.

What is true for these electromagnetic waves?

- A Infra-red radiation travels more quickly than visible light.
- B Radio waves travel more quickly than infra-red radiation.
- C Radio waves travel at the same speed as visible light.
- D Visible light travels more slowly than radio waves.

36 An electric bell with its own battery is suspended by a rubber band inside a sealed glass jar. The hammer hits the bell and makes it ring. A pump can remove air from the jar.



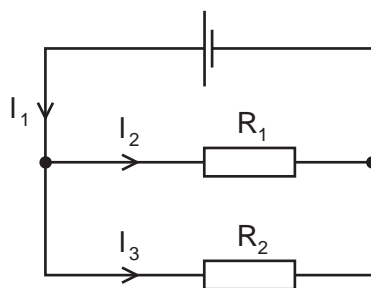
The pump is switched on and the air is removed from the jar. The hammer still hits the bell but the sound becomes quieter until it cannot be heard.

Why does this happen?

- A An electric current cannot flow in a vacuum.
- B A medium is required to transmit sound waves.
- C The bell cannot be made to vibrate in a vacuum.
- D The pitch of the note is now outside the range of human hearing.

37 Two resistors, R_1 and R_2 , are connected in parallel as shown.

The combined resistance of R_1 and R_2 is R_T .

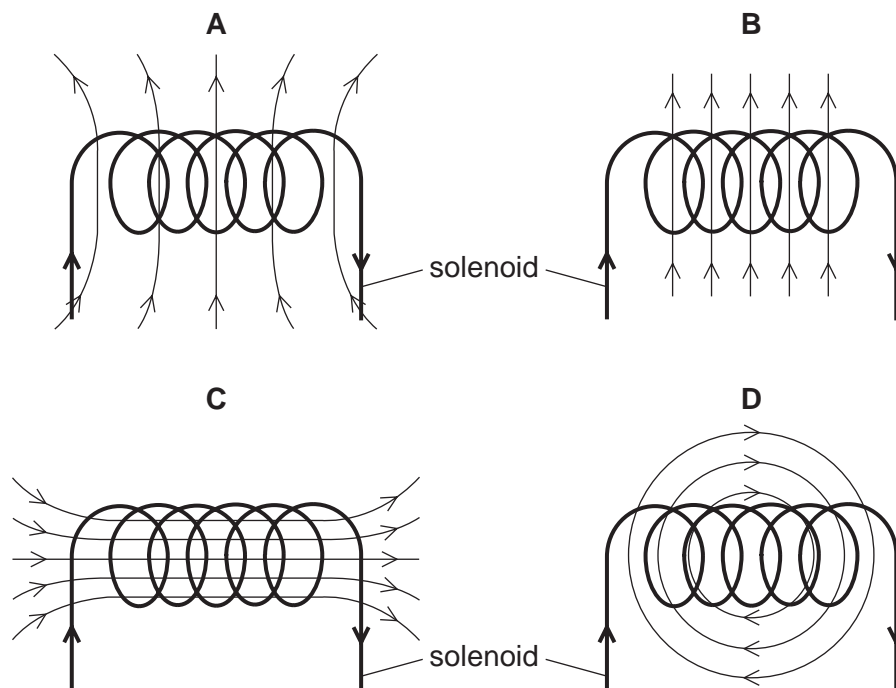


Which row is correct?

	current I_1	resistance R_T
A	larger than I_3	smaller than R_2
B	larger than I_3	larger than R_1
C	smaller than I_2	smaller than R_2
D	smaller than I_2	larger than R_1

38 A solenoid carrying a current produces a magnetic field.

Which diagram shows the magnetic field pattern?



39 Which type of radiation has the greatest ionising effect?

- A α -particles
- B β -particles
- C γ -rays
- D infra red rays

40 Carbon-13 and Nitrogen-14 are two different elements.

A neutral atom of $^{13}_6\text{C}$ and a neutral atom of $^{14}_7\text{N}$ have the same number of

- A electrons
- B neutrons
- C nucleons
- D protons

DATA SHEET
The Periodic Table of the Elements

		Group																																					
		I	II	III	IV	V	VI	VII	0																														
		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">1</td> <td style="width: 10%; text-align: center;">H Hydrogen 1</td> <td colspan="8"></td> <td style="width: 10%; text-align: center;">2</td> <td style="width: 10%; text-align: center;">He Helium 2</td> </tr> </table>										1	H Hydrogen 1									2	He Helium 2																
1	H Hydrogen 1									2	He Helium 2																												
7	Li Lithium 3	9	Be Beryllium 4											19	F Fluorine 9	20	Ne Neon 10																						
23	Na Sodium 11	24	Mg Magnesium 12											32	S Sulfur 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	51	V Vanadium 23	56	Fe Iron 26	59	Co Cobalt 27	64	Cu Copper 29	65	Zn Zinc 30	70	Ga Gallium 31	73	Ge Germanium 32	75	As Arsenic 33	79	Se Selenium 34	80	Br Bromine 35	84	Kr Krypton 36										
85	Rb Rubidium 37	88	Sr Strontium 38	89	Y Yttrium 39	91	Zr Zirconium 40	93	Nb Niobium 41	101	Ru Ruthenium 44	106	Pd Palladium 46	108	Ag Silver 47	112	Cd Cadmium 48	115	In Indium 49	119	Sn Tin 50	122	Sb Antimony 51	128	Te Tellurium 52	127	I Iodine 53	131	Xe Xenon 54										
133	Cs Caesium 55	137	Ba Barium 56	139	La Lanthanum 57	178	Hf Hafnium 72	181	Ta Tantalum 73	186	Re Rhenium 75	195	Pt Platinum 78	197	Au Gold 79	201	Hg Mercury 80	204	Tl Thallium 81	207	Pb Lead 82	209	Bi Bismuth 83	210	Po Polonium 84	210	At Astatine 85	210	Rn Radon 86										
226	Ra Radium 88	227	Ac Actinium 89											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
87	Fr Francium 87	232	Th Thorium 90	238	U Uranium 92	238	U Uranium 92	91	Pa Protactinium 91	93	Np Neptunium 93	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

	a		a = relative atomic mass
Key	X	b	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.).

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