Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/02**

Paper 2 Multiple Choice (Extended) **For Examination from 2017**

SPECIMEN PAPER

45 minutes

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, 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 18.
Electronic calculators may be used.

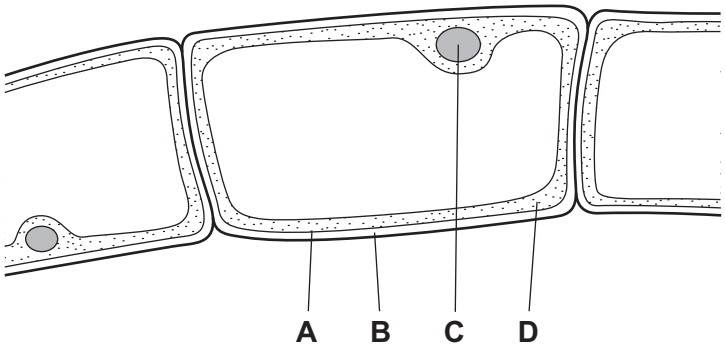
This document consists of **18** printed pages.

CAMBRIDGE International Examinations

[Turn over

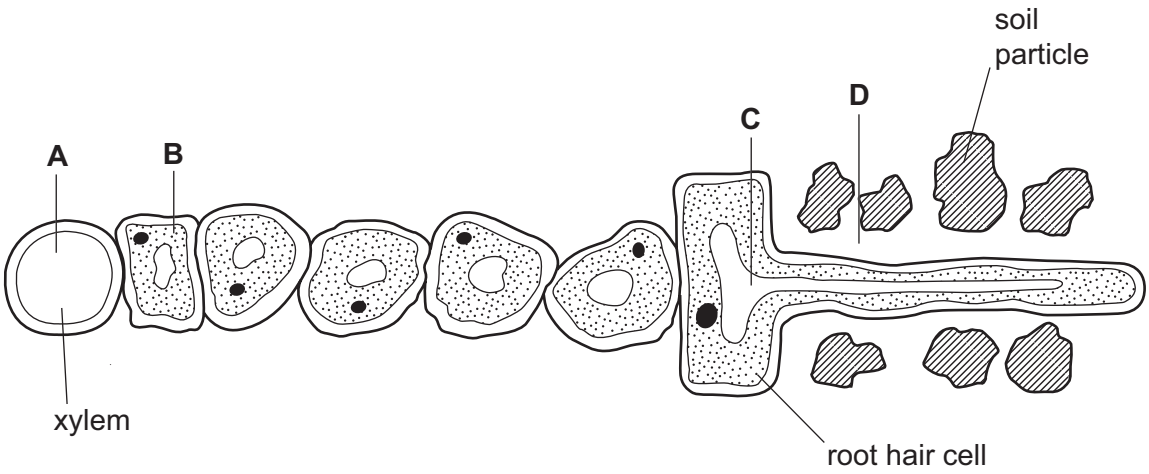
1 The diagram shows part of an organism that lives in water, magnified by a microscope.

Which part shows that the organism **must** be a plant?



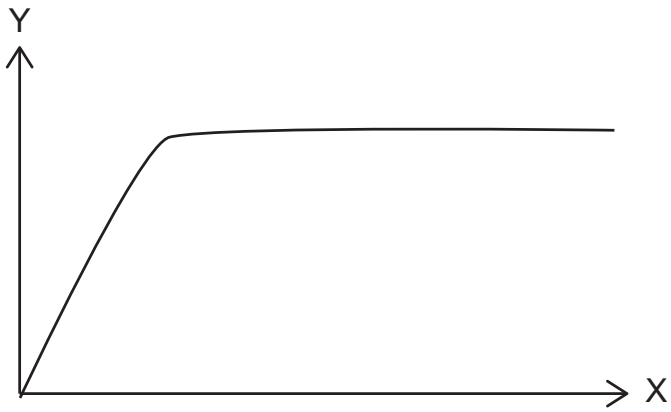
2 The diagram shows part of a plant root in the soil. The root is absorbing water.

At which labelled point is the water potential highest?



3 A student investigates the effect of light intensity on the rate of photosynthesis in an aquatic plant which is underwater.

She draws a graph of her results.

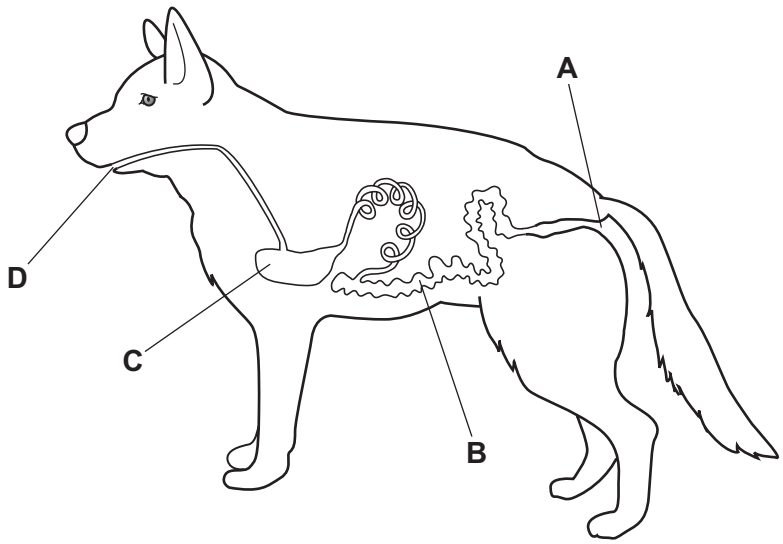


Which labels are correct for axes Y and X?

	Y	X
A	volume of carbon dioxide produced	distance of light from plant
B	volume of carbon dioxide produced	light intensity
C	volume of oxygen produced	distance of light from plant
D	volume of oxygen produced	light intensity

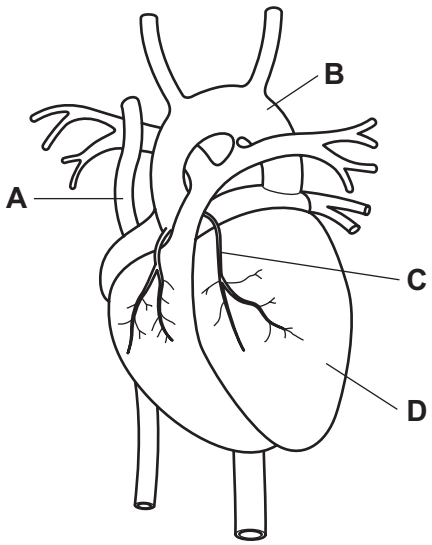
4 The diagram shows the alimentary canal of a dog.

Where does egestion occur?



5 Coronary heart disease may lead to a person having a heart attack. The diagram shows a human heart and some of its major blood vessels.

Which labelled part can cause a heart attack if it becomes blocked?



6 Which statement about blood components is correct?

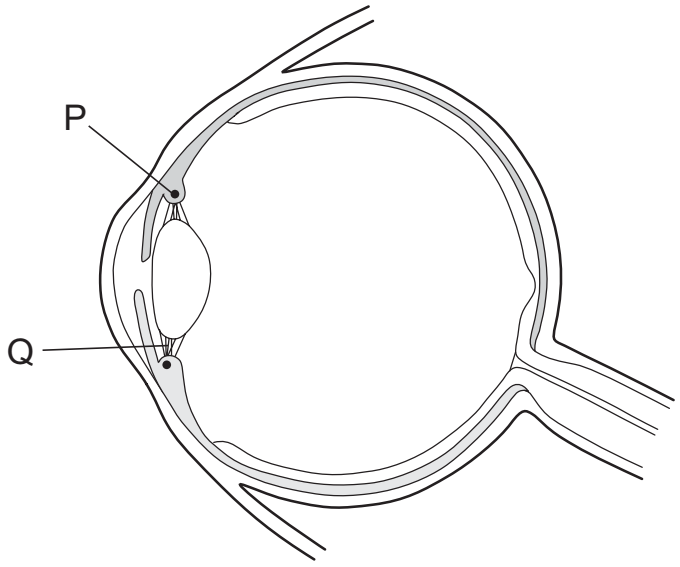
A Platelets make antibodies.

B Platelets transport oxygen.

C White blood cells can carry out phagocytosis.

D White blood cells transport carbon dioxide.

7 The diagram shows a section through a human eye.



When focusing on a close object at night, what is the state of structures P and Q?

	P	Q
A	contracted	tight
B	contracted	slack
C	relaxed	tight
D	relaxed	slack

8 What is the meaning of homeostasis?

A breathing faster after exercise

B getting rid of carbon dioxide from the lungs

C keeping internal conditions in the body constant

D preventing the body from getting too hot

9 Which feature of sexual reproduction helps a species to evolve?

A Fewer offspring are produced than in asexual reproduction.

B Offspring always inherit advantageous characteristics.

C Offspring are the result of the fusion of genetically different gametes.

D Offspring produced will always be in a suitable environment.

10 Pollination is the transfer of pollen

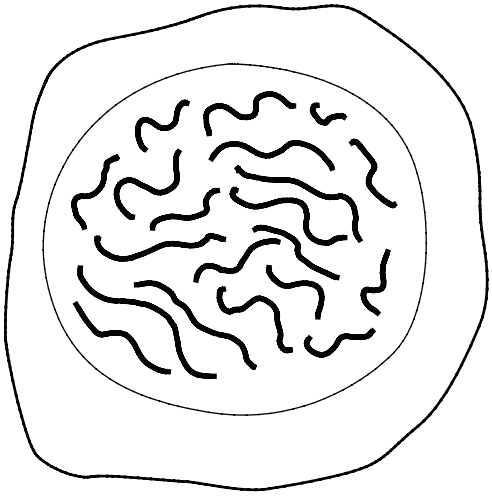
A from anther to sepal.

B from anther to stigma.

C from sepal to anther.

D from stigma to anther.

11 The diagram shows a cell of an organism formed by meiosis. The nucleus contains 20 chromosomes.



What is the diploid number for the organism in which this cell was formed?

A 10 **B** 20 **C** 40 **D** 46

12 In mice, the allele for black fur is dominant to the allele for white fur. Two heterozygous mice mate.

What colour are the offspring likely to be?

A all black

B all grey

C all white

D some black and some white

13 Some stages of the process of eutrophication are described below. They are not in the correct order.

1 Fish and other aquatic organisms die.

2 Excess fertiliser is washed into rivers.

3 Less oxygen is available in the water.

4 Water plants grow rapidly.

Which is the correct order of the stages above?

A 2, 3, 4, 1

B 2, 4, 3, 1

C 3, 1, 4, 2

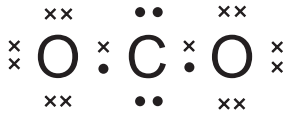
D 3, 2, 1, 4

14 What is the dot-and-cross diagram for carbon dioxide?

A

B

C



D

15 Hydrogen can occur as an atom, an ion and a molecule.

Which row in the table represents these particles?

	atom	ion	molecule
A	H	H^+	H_2
B	H	H_2	H^+
C	H^+	H	H_2
D	H_2	H^+	H

16 Which substances are produced during the electrolysis of concentrated aqueous sodium chloride?

A chlorine, hydrogen and sodium

B chlorine, hydrogen and sodium hydroxide

C hydrogen and oxygen

D oxygen and sodium hydroxide

17 Which statement describes an exothermic reaction?

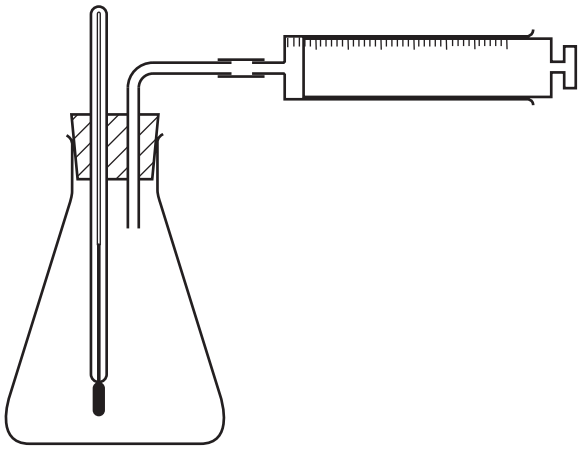
A Chemical energy is transformed to heat energy and the temperature decreases.

B Chemical energy is transformed to heat energy and the temperature increases.

C Heat energy is transformed to chemical energy and the temperature decreases.

D Heat energy is transformed to chemical energy and the temperature increases.

18 The apparatus below is used to investigate the speed of a chemical reaction.



For which reaction is the apparatus suitable?

A gas E + gas F → liquid G only

B solid H + solution I → solution J only

C solid K + solution L → solution M + gas N

D solution P + solution Q → solid R + solution Q

19 Which equation shows a redox reaction?

A $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

B $BaCl_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2HCl(aq)$

C $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$

D $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O$

20 The elements from sodium to sulfur are in the same period of the Periodic Table.

Na	Mg	A*l*	Si	P	S

Which trend does **not** occur across the Periodic Table from sodium to sulfur?

A The chlorides of the elements change from covalent to ionic.

B The elements change from good to poor electrical conductors.

C The oxides of the elements change from basic to acidic.

D The solid elements change from malleable to brittle.

21 Astatine, At, is below iodine in Group VII of the Periodic Table.

Which statement about astatine is **not** correct?

A It displaces bromine from potassium bromide.

B It exists as At_2 molecules.

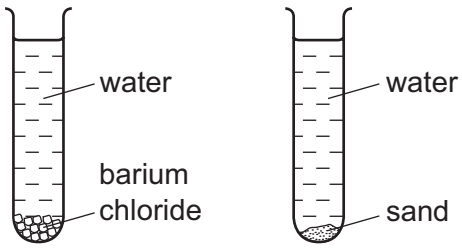
C It has a dark grey or black colour.

D It is solid at room temperature.

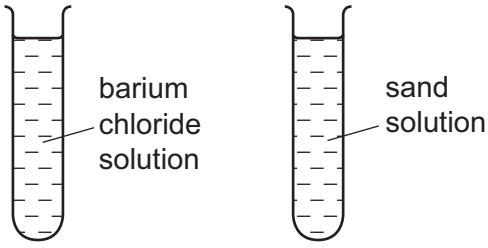
22 Small amounts of barium chloride and sand are shaken with separate samples of water in two test-tubes. The test-tubes are left to stand for 24 hours.

Which diagram shows how the test-tubes appear after leaving to stand?

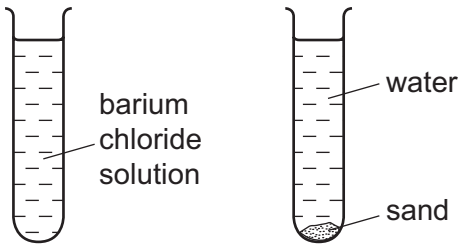
A



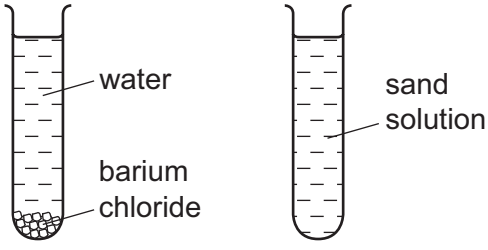
B



C



D



23 Which compounds are formed in the Contact process?

A H_2SO_4 only

B SO_2 and SO_3 only

C SO_2 and H_2SO_4 only

D SO_2, SO_3 and H_2SO_4

24 A cup is made of copper.

Why is the cup **not** used for hot drinks?

A Copper is a good conductor of heat.

B Copper is a good electrical conductor.

C Copper is brightly coloured.

D Copper reacts with saliva.

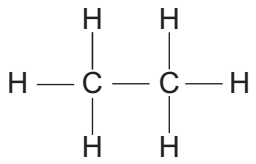
25 Petroleum is separated by fractional distillation.

Which row in the table describes the properties of the compounds collected at the bottom of the fractionating column?

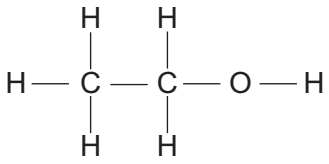
	boiling point	molecular size	intermolecular forces
A	high	large	strong
B	high	small	weak
C	low	large	strong
D	low	small	weak

26 Which compound **cannot** be formed by reacting ethene, C_2H_4, with one other substance?

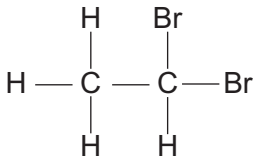
A



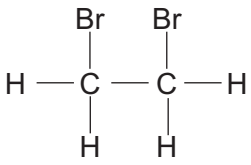
B



C



D



27 Which statement about proteins is **not** correct?

A They are formed by addition polymerisation.

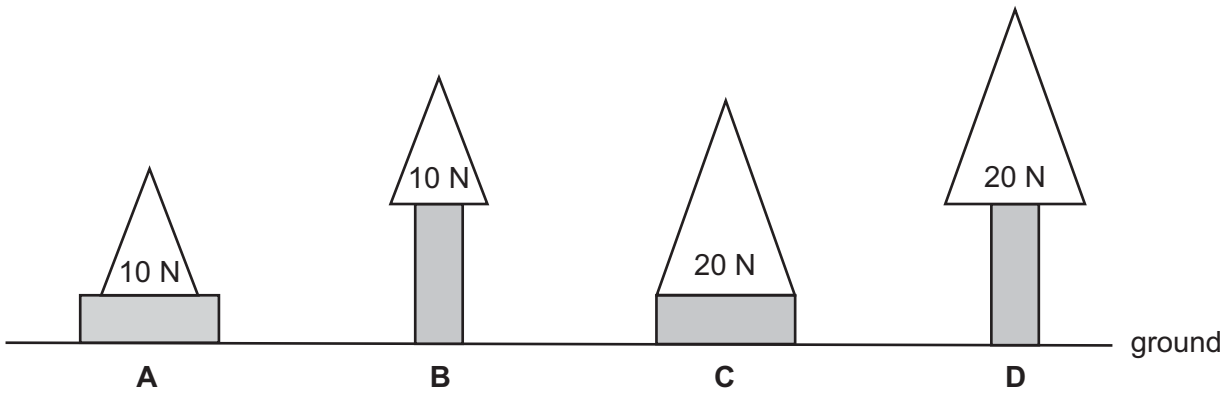
B They can be hydrolysed by acids.

C They can be hydrolysed by alkalis.

D They contain amide linkages.

28 The diagrams show different weights resting on wooden blocks. All the wooden blocks have the same dimensions and weight.

In which diagram is the greatest pressure exerted on the ground?



29 A stone of mass 0.10 kg is thrown vertically upwards at a speed of 4.0 m/s.

What maximum height does it reach?

Air resistance can be ignored. The acceleration of free fall g is 10 m/s^2.

A 0.40 m **B** 0.80 m **C** 10 m **D** 40 m

30 Molecules escape from a liquid as it evaporates.

Which row in the table describes the molecules that escape and the effect on the temperature of the remaining liquid?

	molecules that escape	effect on temperature of remaining liquid
A	high energy	decreases
B	high energy	increases
C	low energy	decreases
D	low energy	increases

31 A student wishes to calculate the specific heat capacity of copper.

He has a block of copper and an electrical heater. He knows the power of the heater.

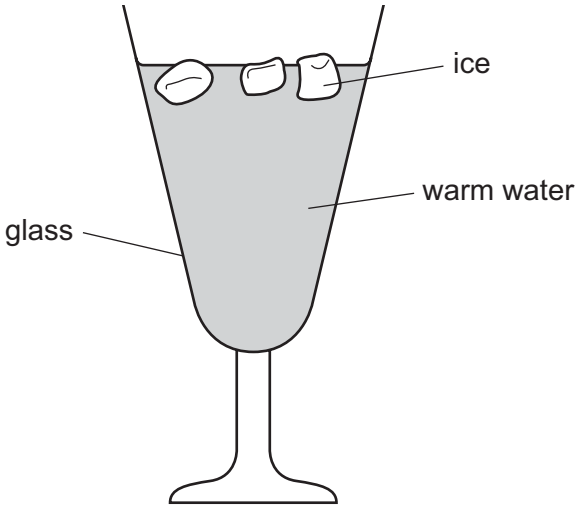
Which other apparatus does he need?

	balance	stop watch	thermometer
A	✓	✓	✓
B	✓	✓	×
C	✓	×	✓
D	×	✓	✓

key

✓ = needed
× = not needed

32 The diagram shows some ice being used to lower the temperature of some warm water.



What is the main process by which the water at the bottom of the glass becomes cool?

A condensation

B conduction

C convection

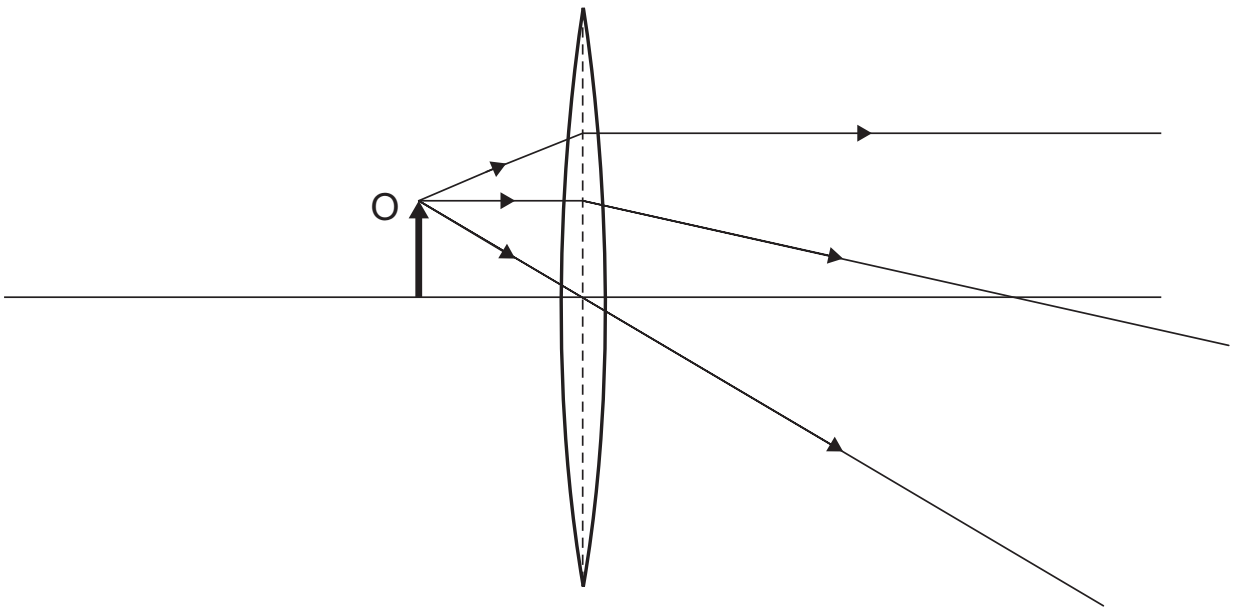
D radiation

33 Which row in the table states a colour of surface that is a poor absorber of infra-red radiation, and a colour that is a poor emitter of infra-red radiation?

	poor absorber	poor emitter of infra-red
A	dull black	dull black
B	dull black	white
C	white	dull black
D	white	white

34 An object O is placed close to a thin converging lens.

The diagram represents three rays from the top of O passing through the lens.



Which type of image is produced by the lens when the object O is in this position?

A real and diminished

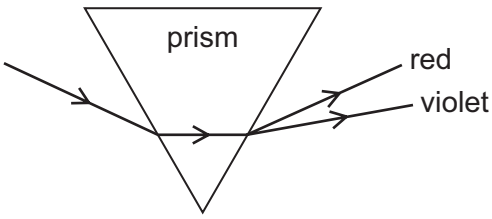
B real and enlarged

C virtual and diminished

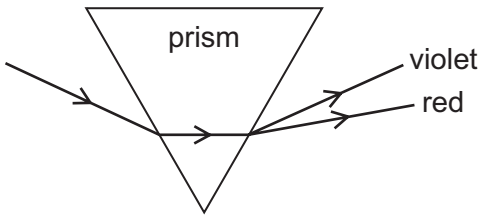
D virtual and enlarged

35 Which diagram shows the dispersion of white light as it passes through a glass prism?

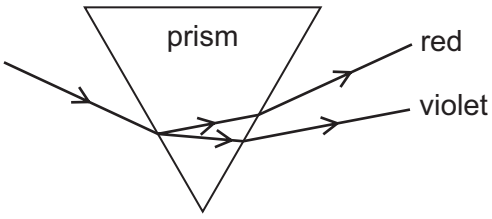
A



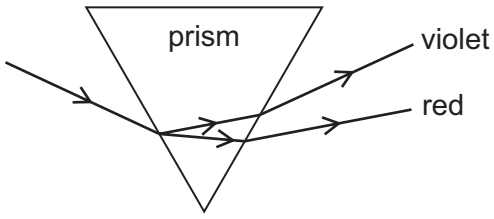
B



C



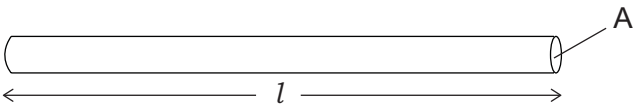
D



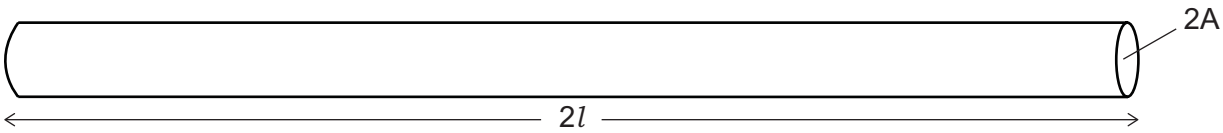
36 Which row in the table shows how the speed and the wavelength of microwaves compare with the speed and the wavelength of γ (gamma)-rays?

	speed of microwaves	wavelength of microwaves
A	less than γ-rays	greater than γ-rays
B	less than γ-rays	less than γ-rays
C	the same as γ-rays	greater than γ-rays
D	the same as γ-rays	less than γ-rays

37 A copper wire has resistance *R*.



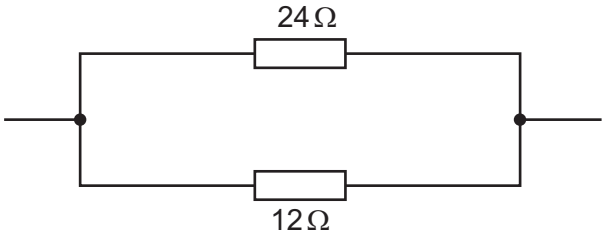
A second copper wire is twice as long as the first wire, and has twice the cross-sectional area.



What is the resistance of the second copper wire?

A 0.5*R** **B** *R** **C** 2*R** **D** 4*R*

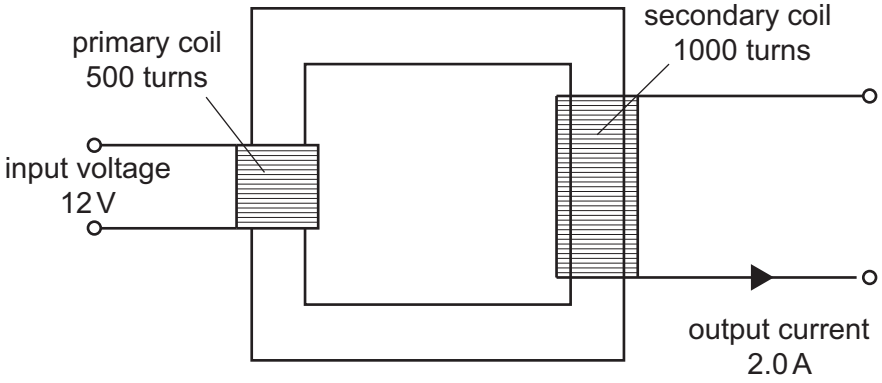
38 A 24 Ω resistor and a 12 Ω resistor are connected in parallel.



What is their effective resistance?

A 2.0 Ω **B** 8.0 Ω **C** 18 Ω **D** 36 Ω

39 A transformer has 500 turns on its primary coil and 1000 turns on its secondary coil. The transformer is 100% efficient. The input voltage is 12 V and the output current is 2.0 A.



What is the output power of the transformer?

A 12 W **B** 24 W **C** 48 W **D** 96 W

40 A radioactive substance is placed near a detector. The reading on the detector is 600 counts per minute (corrected for background radiation). The half-life of the substance is one week.

What was the reading on the detector three weeks earlier?

A 75 counts per minute

B 1800 counts per minute

C 4800 counts per minute

D 12 600 counts per minute

Group	I	II												III	IV	V	VI	VII	VIII
																			2 He helium 4
								1 H hydrogen 1						5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
														13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
	3 Li lithium 7	4 Be beryllium 9												31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
	11 Na sodium 23	12 Mg magnesium 24												49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
	19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65		81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
	37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112		113	114 Fl flerovium –		116 Lv livermorium –		
	55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204						
	87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113						

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

Key

atomic number
atomic symbol
name
relative atomic mass

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)