



**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.

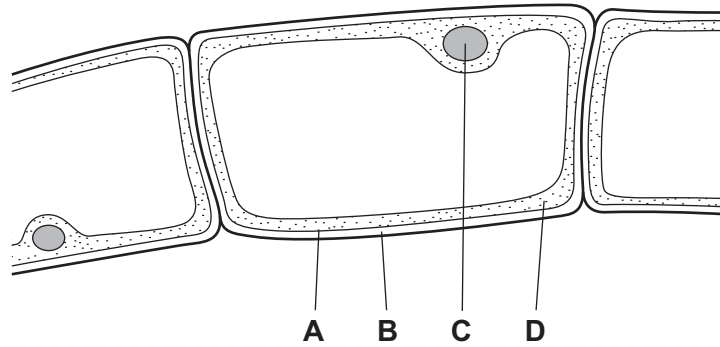
A copy of the Periodic Table is printed on page 18.

Electronic calculators may be used.

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

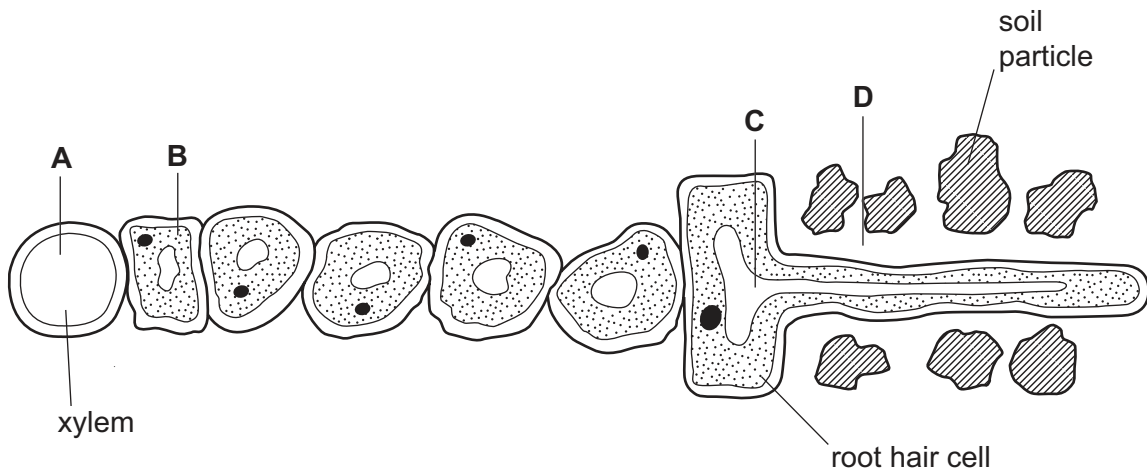
- 1 The diagram shows part of an organism that lives in water, magnified by a microscope.

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



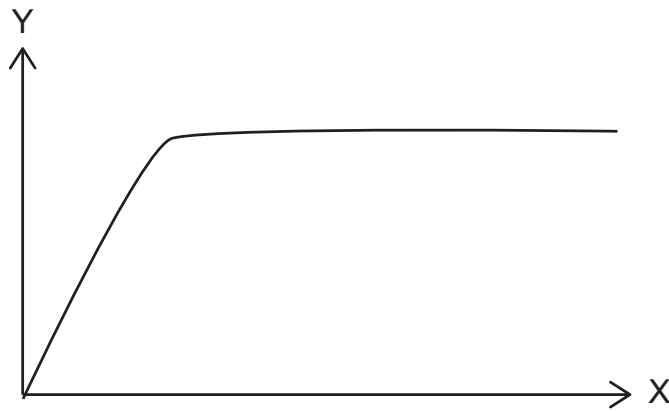
- 2 The diagram shows part of a plant root in the soil. The root is absorbing water.

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.

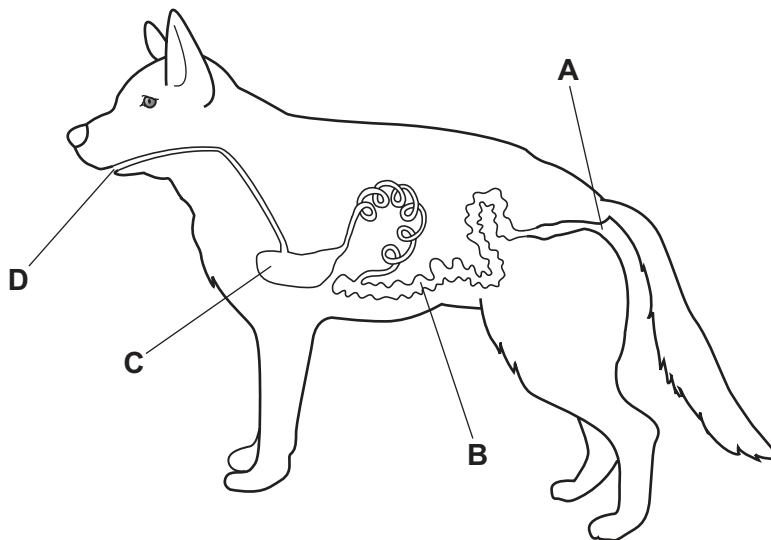


Which labels are correct for axes Y and X?

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

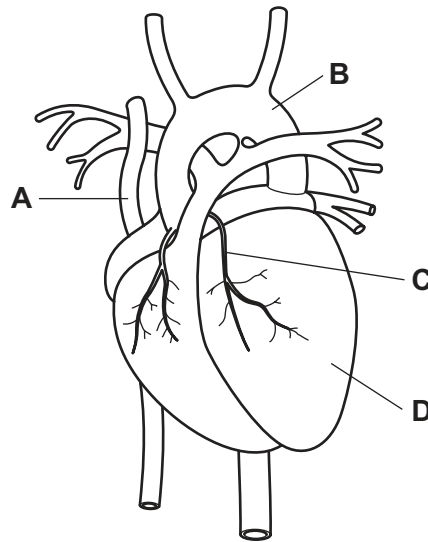
- 4 The diagram shows the alimentary canal of a dog.

Where does egestion occur?



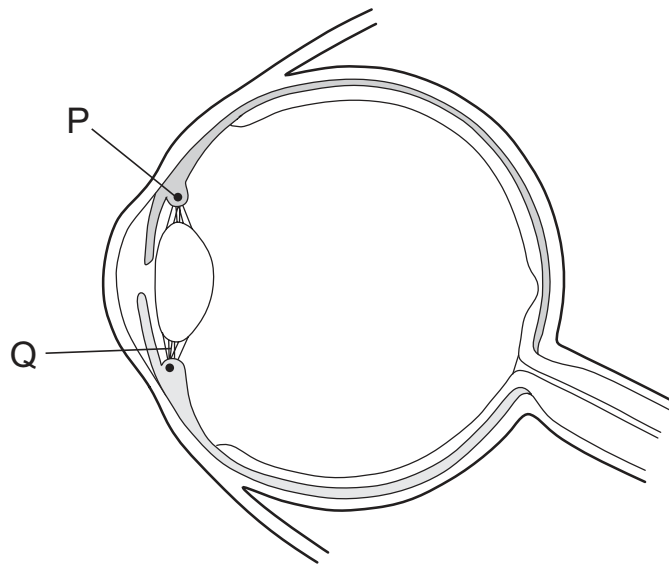
- 5 Coronary heart disease may lead to a person having a heart attack. The diagram shows a human heart and some of its major blood vessels.

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
<b>A</b>	contracted	tight
<b>B</b>	contracted	slack
<b>C</b>	relaxed	tight
<b>D</b>	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

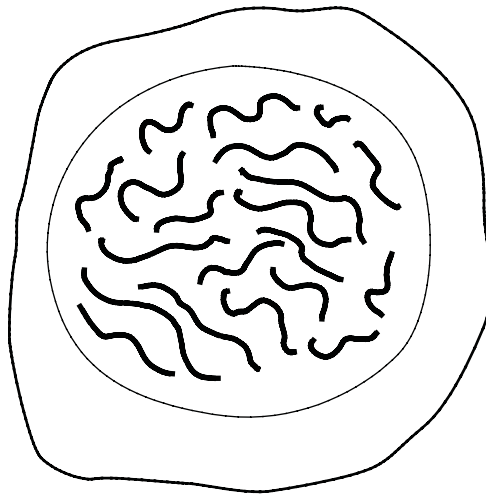
9 Which feature of sexual reproduction helps a species to evolve?

- 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?



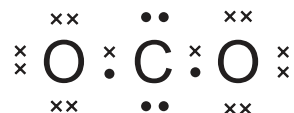
A



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
<b>A</b>	H	H <sup>+</sup>	H <sub>2</sub>
<b>B</b>	H	H <sub>2</sub>	H <sup>+</sup>
<b>C</b>	H <sup>+</sup>	H	H <sub>2</sub>
<b>D</b>	H <sub>2</sub>	H <sup>+</sup>	H

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

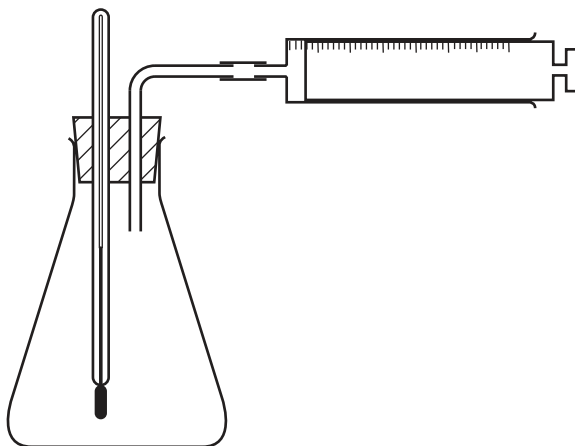
- A chlorine, hydrogen and sodium
- B chlorine, hydrogen and sodium hydroxide
- C hydrogen and oxygen
- D oxygen and sodium hydroxide

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  $\rightarrow$  liquid G only
- B solid H + solution I  $\rightarrow$  solution J only
- C solid K + solution L  $\rightarrow$  solution M + gas N
- D solution P + solution Q  $\rightarrow$  solid R + solution Q

19 Which equation shows a redox reaction?

- A  $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$
- B  $\text{BaCl}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{HCl}(\text{aq})$
- C  $2\text{Na}(\text{s}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{NaCl}(\text{s})$
- D  $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}$

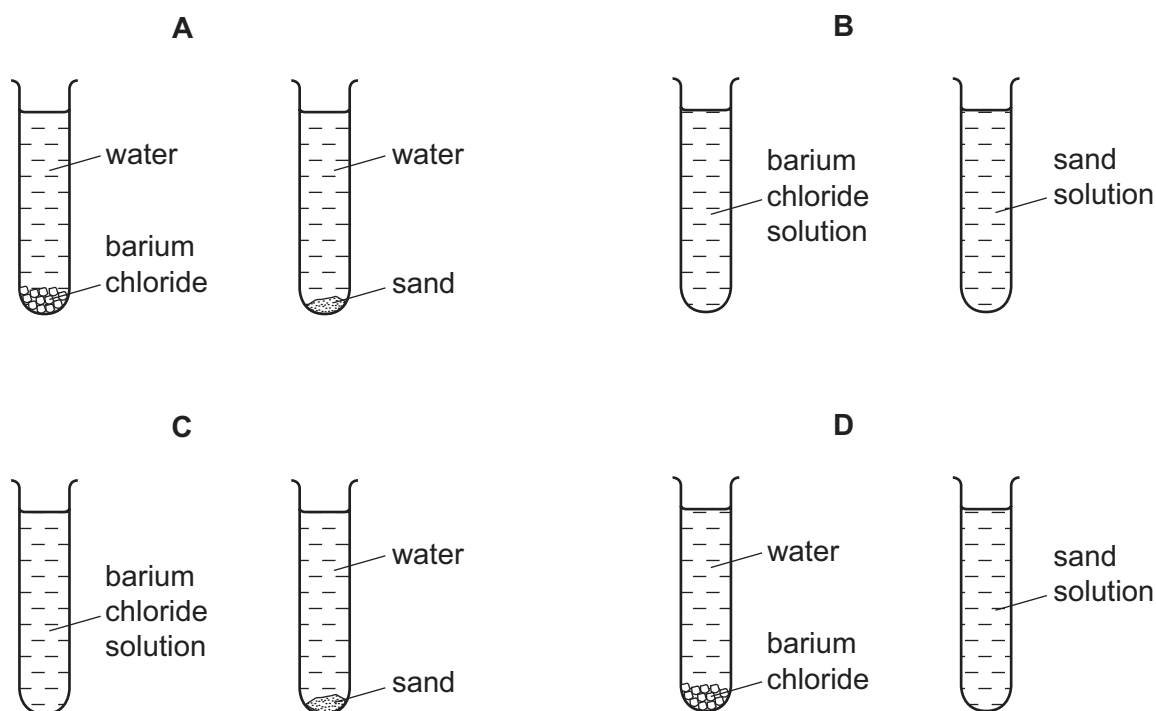
- 20 The elements from sodium to sulfur are in the same period of the Periodic Table.

Na	Mg	Al	Si	P	S
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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  $\text{At}_2$  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?



23 Which compounds are formed in the Contact process?

- A  $\text{H}_2\text{SO}_4$  only
- B  $\text{SO}_2$  and  $\text{SO}_3$  only
- C  $\text{SO}_2$  and  $\text{H}_2\text{SO}_4$  only
- D  $\text{SO}_2$ ,  $\text{SO}_3$  and  $\text{H}_2\text{SO}_4$

24 A cup is made of copper.

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

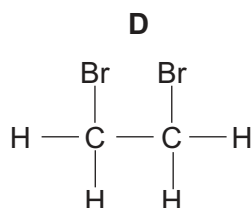
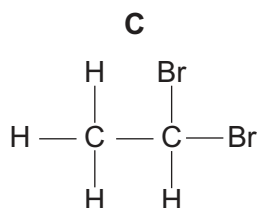
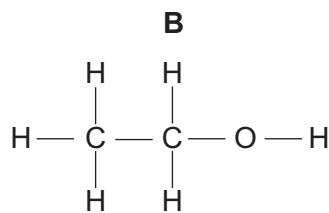
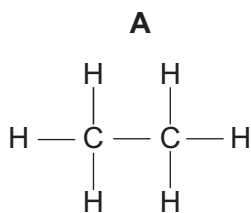
- A Copper is a good conductor of heat.
- B Copper is a good electrical conductor.
- C Copper is brightly coloured.
- D Copper reacts with saliva.

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?

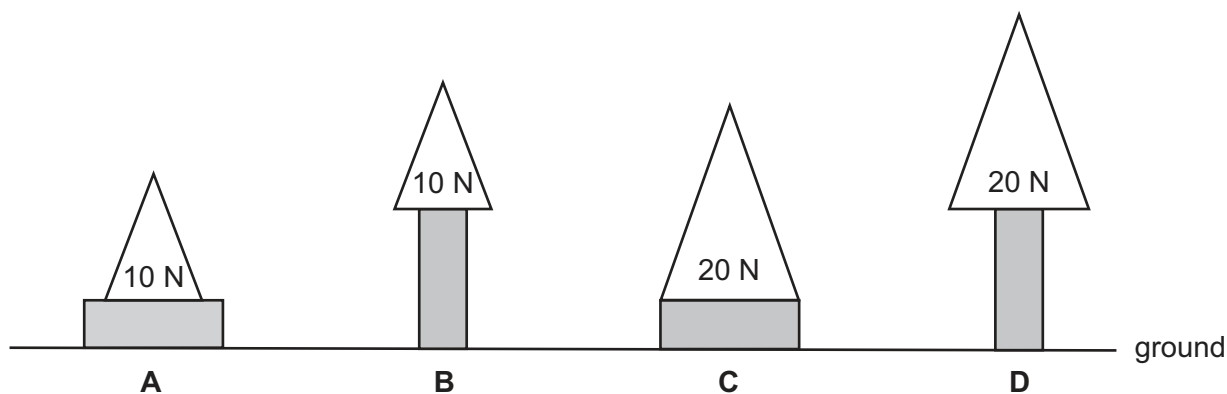


27 Which statement about proteins is **not** correct?

- 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<sup>2</sup>.

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

- 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
<b>A</b>	high energy	decreases
<b>B</b>	high energy	increases
<b>C</b>	low energy	decreases
<b>D</b>	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?

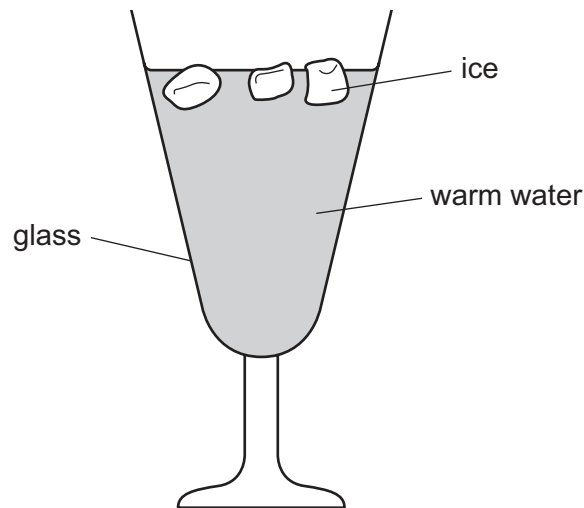
	balance	stop watch	thermometer
<b>A</b>	✓	✓	✓
<b>B</b>	✓	✓	✗
<b>C</b>	✓	✗	✓
<b>D</b>	✗	✓	✓

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?

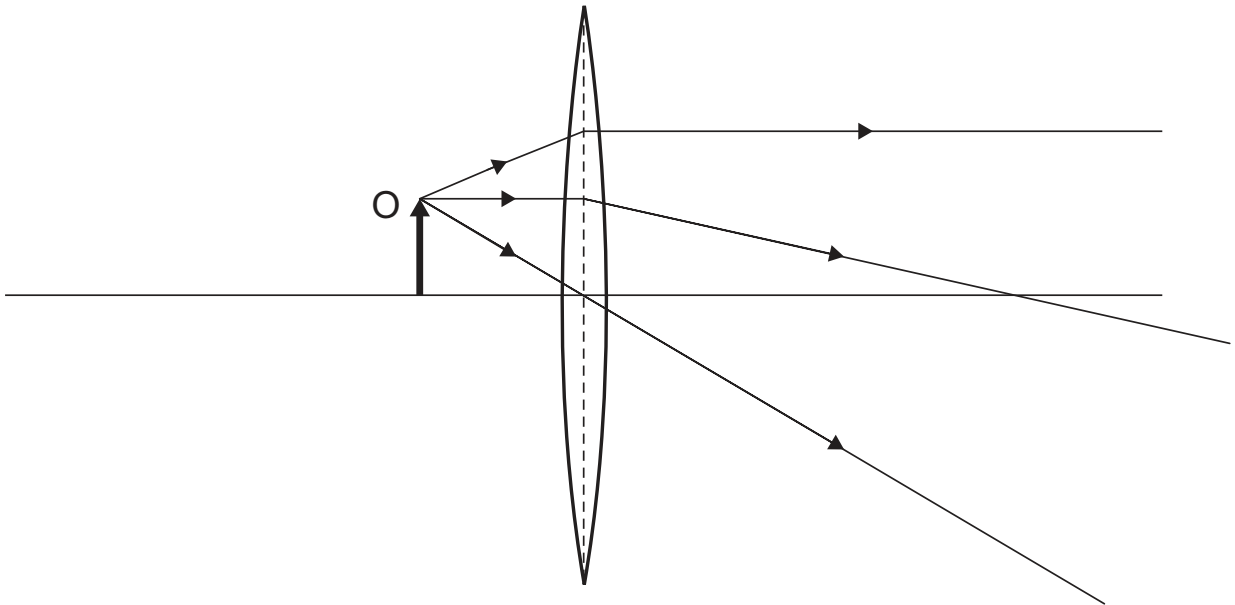
- A condensation
- B conduction
- C convection
- D radiation

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
<b>A</b>	dull black	dull black
<b>B</b>	dull black	white
<b>C</b>	white	dull black
<b>D</b>	white	white

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

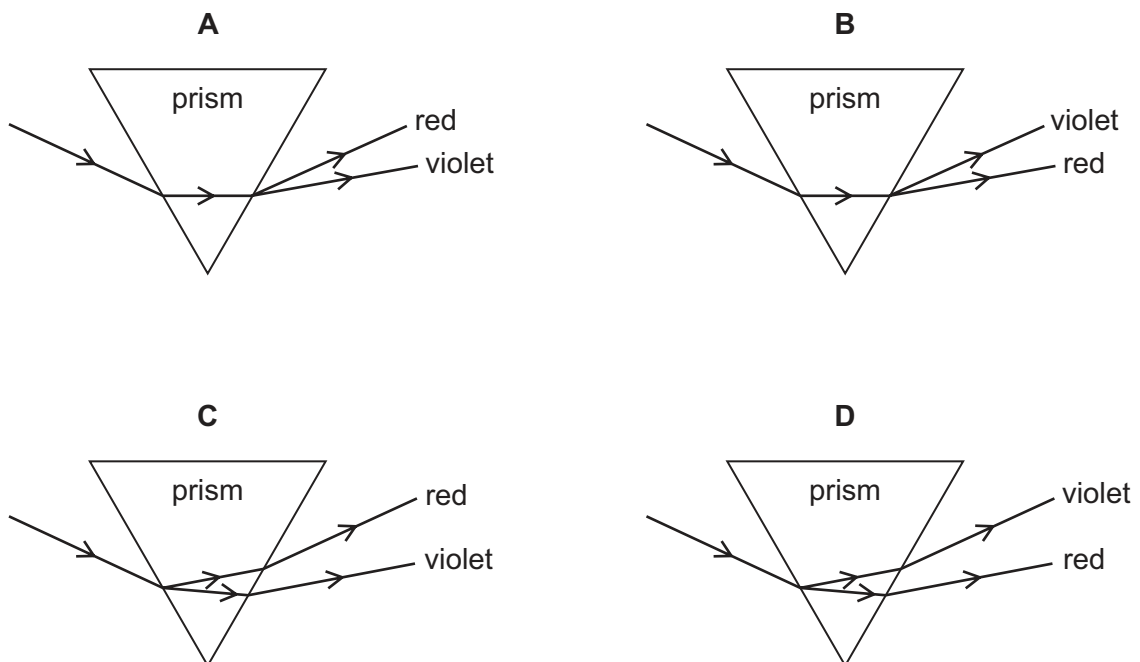
The diagram represents three rays from the top of O passing through the lens.



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

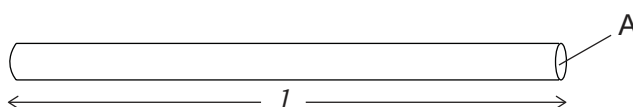
35 Which diagram shows the dispersion of white light as it passes through a glass prism?



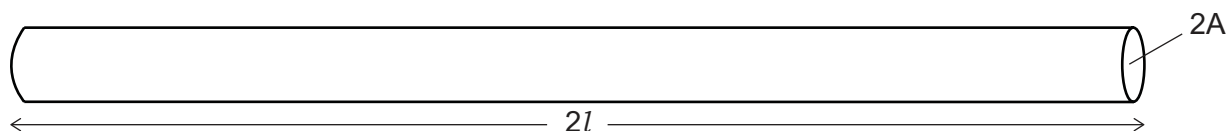
- 36 Which row in the table shows how the speed and the wavelength of microwaves compare with the speed and the wavelength of  $\gamma$  (gamma)-rays?

	speed of microwaves	wavelength of microwaves
<b>A</b>	less than $\gamma$ -rays	greater than $\gamma$ -rays
<b>B</b>	less than $\gamma$ -rays	less than $\gamma$ -rays
<b>C</b>	the same as $\gamma$ -rays	greater than $\gamma$ -rays
<b>D</b>	the same as $\gamma$ -rays	less than $\gamma$ -rays

- 37 A copper wire has resistance  $R$ .

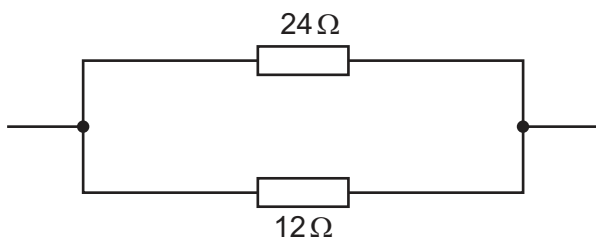


A second copper wire is twice as long as the first wire, and has twice the cross-sectional area.



What is the resistance of the second copper wire?

- A**  $0.5R$       **B**  $R$       **C**  $2R$       **D**  $4R$
- 38 A  $24\ \Omega$  resistor and a  $12\ \Omega$  resistor are connected in parallel.

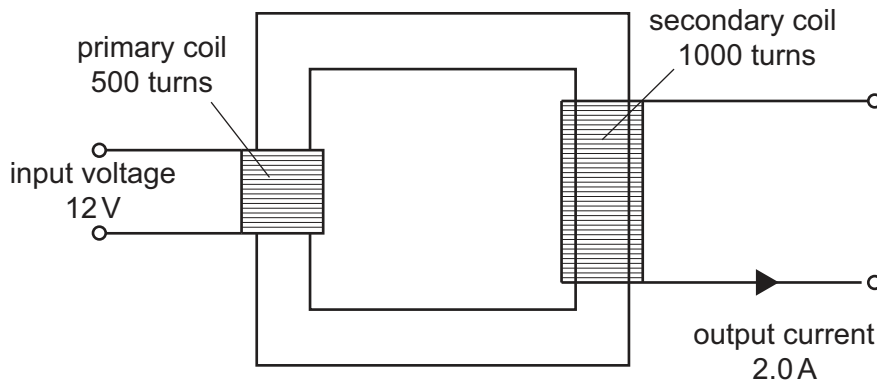


What is their effective resistance?

- A**  $2.0\ \Omega$       **B**  $8.0\ \Omega$       **C**  $18\ \Omega$       **D**  $36\ \Omega$



- 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								
3 Li lithium	4 Be beryllium	5 B boron	6 C carbon	7 N nitrogen	8 O oxygen	9 F fluorine	10 Ne neon								
7	9	11	12	14	16	19	20								
11 Na sodium	12 Mg magnesium	13 Al aluminium	14 Si silicon	15 P phosphorus	16 S sulphur	17 Cl chlorine	18 Ar argon								
23	24	27	28	31	32	35.5	40								
19 K potassium	20 Ca calcium	31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium	35 Br bromine	36 Kr krypton								
39	40	70	73	75	79	80	84								
37 Rb rubidium	38 Sr strontium	49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium	53 I iodine	54 Xe xenon								
85	88	115	119	122	128	127	131								
55 Cs caesium	56 Ba barium	81 Tl thallium	82 Pb lead	83 Bi bismuth	84 Po polonium	85 At astatine	86 Rn radon								
133	137	204	207	209	-	-	-								
87 Fr francium	88 Ra radium	114 Fl flerovium	-	-	116 Lv livermorium	-	-								
<table border="1"> <thead> <tr> <th colspan="2">Key</th> </tr> <tr> <th>atomic number</th> <th>atomic symbol name relative atomic mass</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>H hydrogen</td> </tr> </tbody> </table>										Key		atomic number	atomic symbol name relative atomic mass	1	H hydrogen
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1	H hydrogen														
29 Cu copper	26 Fe iron	28 Ni nickel	27 Co cobalt	25 Mn manganese	24 Cr chromium	23 V vanadium	22 Ti titanium	21 Sc scandium	1 H hydrogen						
29	56	59	59	55	52	51	48	45	1						
47 Ag silver	44 Ru ruthenium	46 Pd palladium	45 Rh rhodium	43 Tc technetium	42 Mo molybdenum	41 Nb niobium	40 Zr zirconium	39 Y yttrium	1						
65	101	106	103	-	96	93	91	89	1						
80 Hg mercury	78 Pt platinum	77 Ir iridium	77 Os osmium	75 Re rhenium	74 W tungsten	73 Ta tantalum	72 Hf hafnium	71 La lanthanoids	1						
201	197	192	190	186	184	181	178	171-103 actinoids	1						
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112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112	111	110	109	107	106	105	104	89-103 actinoids	1						
201	197	192	190	186	184	181	178	139 lanthanoids	1						
112															