Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/21**

Paper 2 Multiple Choice (Extended) **May/June 2018**

45 minutes

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

* 5 9 7 7 5 3 0 5 9 8 *

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.

1 Which rows correctly match characteristics of living things with their descriptions?

	characteristic	description
1	excretion	removing the waste products of metabolism
2	growth	making more living things of the same type
3	nutrition	taking in or producing food
4	respiration	releasing energy from food

A 1, 2 and 4 **B** 1, 3 and 4 **C** 1 and 3 only **D** 2 and 4 only

2 Which statement about cells is correct?

A Cell membranes are found only in animal cells.

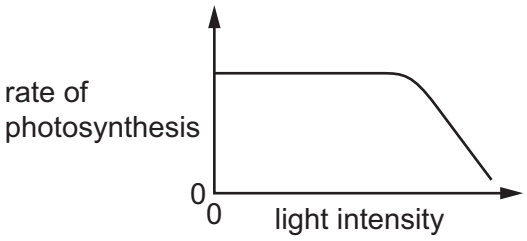
B Cell membranes are found only in plant cells.

C Cell walls are found only in animal cells.

D Cell walls are found only in plant cells.

3 Which graph shows the effect of light intensity on the rate of photosynthesis, if all other factors are kept constant?

A



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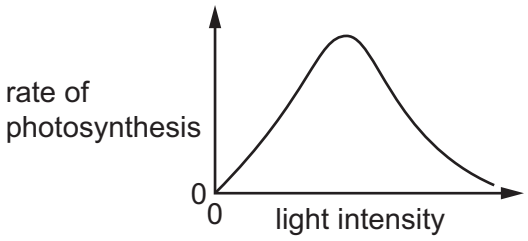

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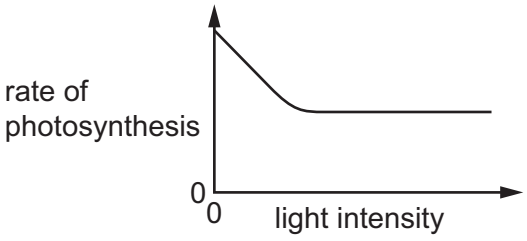
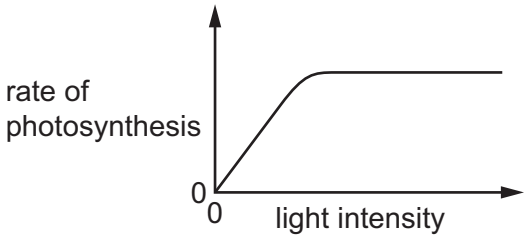


D



4 What leads to coronary heart disease?

A Coronary arteries become blocked.

B Coronary arteries become enlarged.

C Heart muscles become enlarged.

D Heart muscles do not contract.

5 In which tissue does translocation occur and what is a substance that is translocated?

	tissue	substance translocated
A	phloem	amino acid
B	phloem	glycogen
C	xylem	sucrose
D	xylem	water

6 The word equation for aerobic respiration is shown.

oxygen + ... → carbon dioxide + water

Which molecule is missing from the equation?

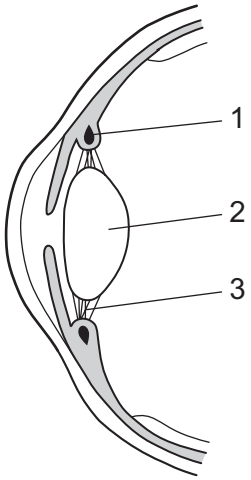
A glucose

B glycogen

C starch

D sucrose

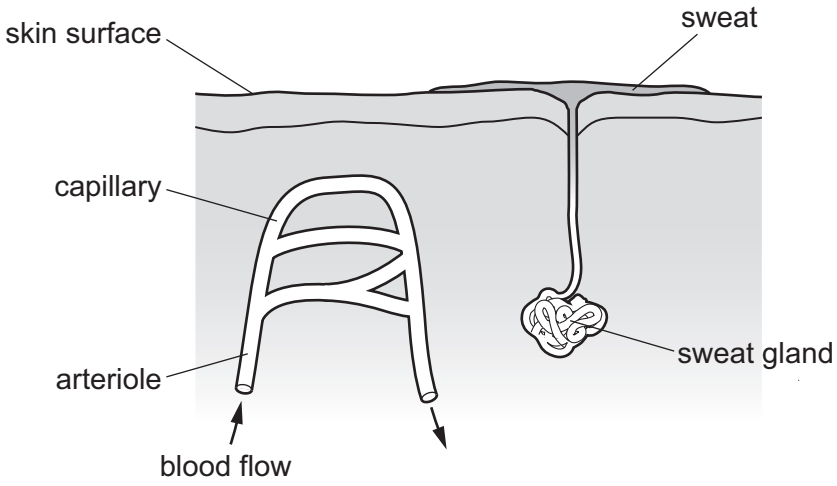
7 The diagram shows structures in a section through the front of the eye.



When reading a book, how are the labelled structures involved in focusing the eye?

	1	2	3
A	contracts	thicker	slackens
B	contracts	thinner	tightens
C	relaxes	thicker	tightens
D	relaxes	thinner	slackens

8 The diagram shows a section through the skin of a person who is sweating.



What happens to the arteriole and what will be the effect on heat loss when a person is sweating?

	arteriole	heat loss
A	vasoconstricts	decreases
B	vasoconstricts	increases
C	vasodilates	decreases
D	vasodilates	increases

9 Which statement about flowers is correct?

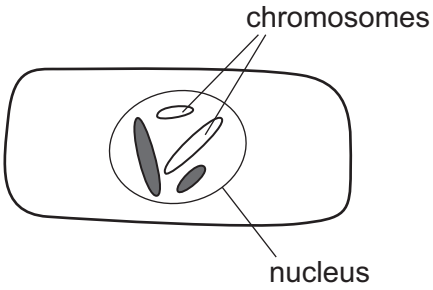
A The anther and stigma are parts of the carpel.

B The anther and stigma are parts of the stamen.

C The ovary and stigma are parts of the carpel.

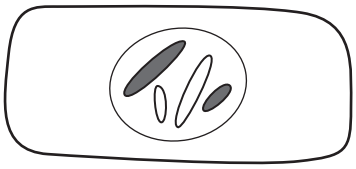
D The ovary and stigma are parts of the stamen.

10 The diagram shows a cell that is about to divide by meiosis.



Which cell could be the result of this division?

A



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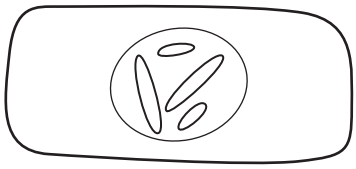

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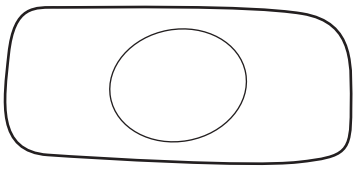

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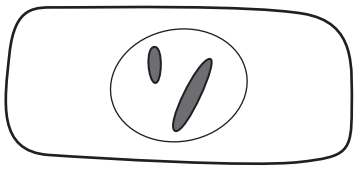


11 What is the function of mitosis?

A to produce cells with double the number of chromosomes

B to produce cells with varying numbers of chromosomes

C to produce gametes

D to produce genetically identical cells

12 Which processes change the amount of carbon dioxide in the air?

	process causing increase in carbon dioxide	process causing decrease in carbon dioxide
A	burning fossil fuels	photosynthesis in plants
B	photosynthesis in plants	respiration in animals
C	respiration in animals	respiration in plants
D	respiration in plants	burning fossil fuels

13 What is the overuse of nitrogen-containing fertilisers most likely to cause?

A acid rain

B deforestation

C eutrophication

D global warming

14 Which statement about liquids is correct?

A They have a fixed shape and a fixed volume.

B They have a fixed shape but not a fixed volume.

C They have no fixed shape but they do have a fixed volume.

D They have no fixed shape and no fixed volume.

15 Pure copper chloride can be obtained from a mixture of powdered copper and solid copper chloride.

Three stages in the method are listed.

P add water and stir

Q crystallise

R filter

In which order are these stages carried out in order to obtain pure copper chloride from the mixture?

A P $\rightarrow$ Q $\rightarrow$ R

B P $\rightarrow$ R $\rightarrow$ Q

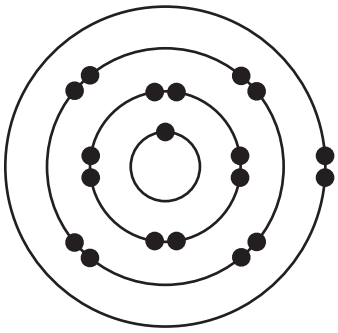
C R $\rightarrow$ P $\rightarrow$ Q

D R $\rightarrow$ Q $\rightarrow$ P

16 The atomic number of potassium is 19.

What is the electronic structure of a potassium atom?

A



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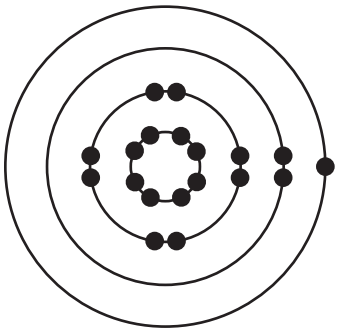

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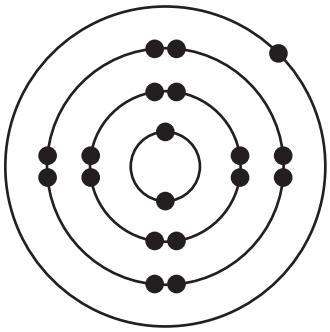

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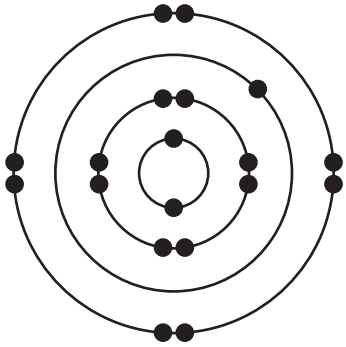


17 A rock contains three ores, galena (PbS), copper pyrites ($CuFeS_2$) and cinnabar (HgS).

How many metals are present in this rock?

A 3 **B** 4 **C** 5 **D** 8

18 What is the equation for the complete combustion of ethane?

A $C_2H_6 + 2O_2 \rightarrow 2CO_2 + 3H_2O$

B $2C_2H_6 + 3O_2 \rightarrow 4C + 6H_2O$

C $2C_2H_6 + 5O_2 \rightarrow 4CO + 6H_2O$

D $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

19 What are the products of the electrolysis of concentrated aqueous sodium chloride?

A chlorine, hydrogen and sodium

B chlorine, hydrogen and sodium hydroxide

C chlorine and hydrogen only

D chlorine and sodium only

20 Which statement describes an exothermic reaction?

A Heat energy is transferred from the surroundings and the temperature decreases.

B Heat energy is transferred from the surroundings and the temperature increases.

C Heat energy is transferred to the surroundings and the temperature decreases.

D Heat energy is transferred to the surroundings and the temperature increases.

21 Dilute hydrochloric acid is added to lumps of calcium carbonate.

Which change decreases the rate of the reaction?

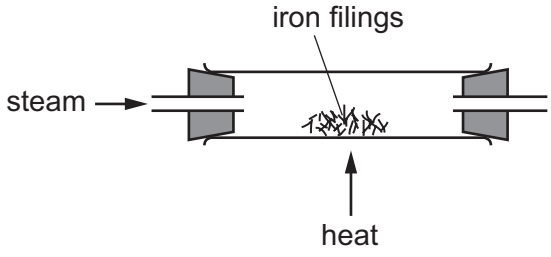
A Decrease the temperature of the acid.

B Increase the concentration of the acid.

C Use a larger volume of the acid.

D Use powdered calcium carbonate.

22 When iron is heated with steam, a black solid is formed.



The equation for the reaction is shown.

$$\text{iron} + \text{water} \rightarrow \text{iron oxide} + \text{hydrogen}$$

Which statement about this reaction is correct?

A Iron has been oxidised because it has gained oxygen.

B Iron has been reduced because it removed oxygen from water.

C Iron oxide has been reduced because it contains oxygen.

D Water has been oxidised because it contains oxygen.

23 Zinc sulfate is made by adding zinc oxide to dilute sulfuric acid.

The steps used to obtain zinc sulfate crystals are listed.

1 filter the solution to remove excess zinc oxide

2 warm the zinc sulfate solution

3 add excess zinc oxide and stir

4 filter and dry the crystals

What is the correct order of the steps?

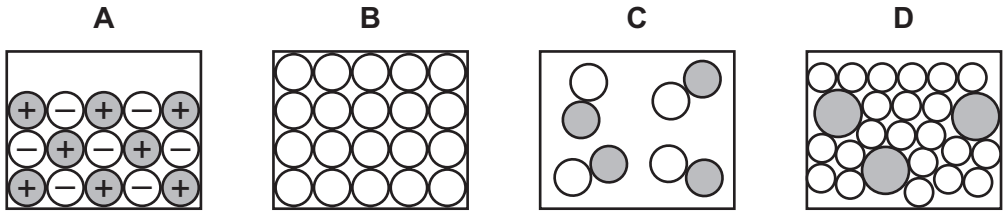
A $1 \rightarrow 3 \rightarrow 4 \rightarrow 2$

B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 1 \rightarrow 2 \rightarrow 4$

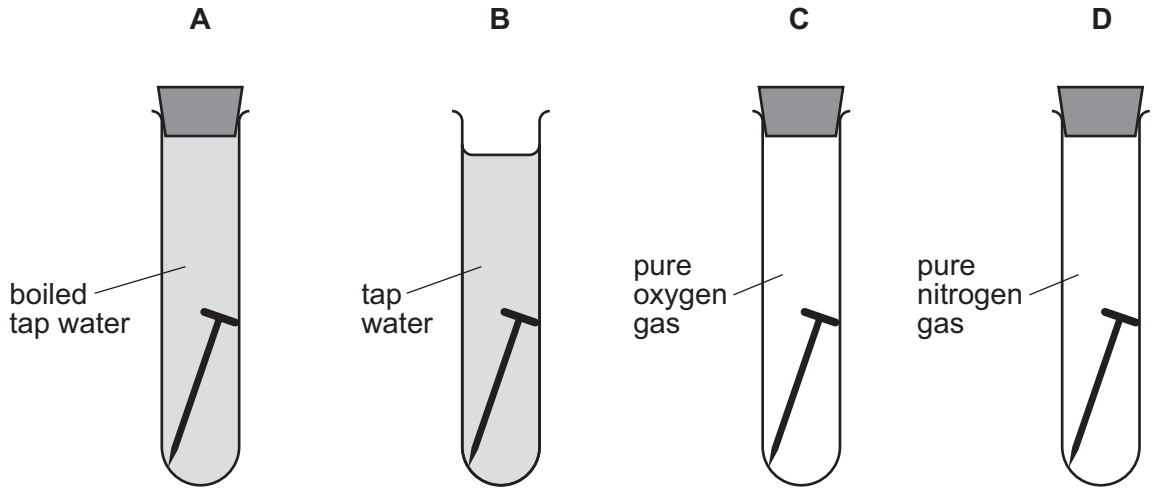
D $3 \rightarrow 2 \rightarrow 1 \rightarrow 4$

24 Which diagram represents the structure of an alloy?



25 Four iron nails are placed in four test-tubes as shown.

In which test-tube does the iron nail rust most quickly?



26 During the manufacture of sulfuric acid by the Contact process, sulfur trioxide is produced.

The sulfur trioxide is dissolved in concentrated sulfuric acid.

Which statement explains why sulfur trioxide is **not** dissolved in water?

A The reaction is too endothermic.

B The reaction is too exothermic.

C The reaction is too slow.

D The reaction needs a high pressure.

27 Ethanol is manufactured by reacting ethene with steam in the presence of a catalyst.

Which type of reaction occurs?

A addition

B oxidation

C polymerisation

D reduction

28 A body has a mass of 12 kg and weighs 120 N on Earth. It is taken from Earth to the Moon.

The strength of the gravitational field on the Moon is one sixth of that on Earth.

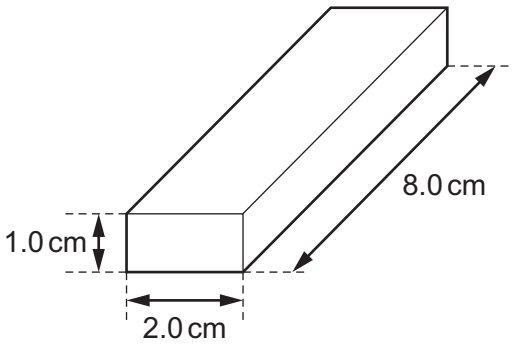
What is the mass and what is the weight of the body on the Moon?

	mass / kg	weight / N
A	2.0	20
B	2.0	120
C	12	20
D	12	120

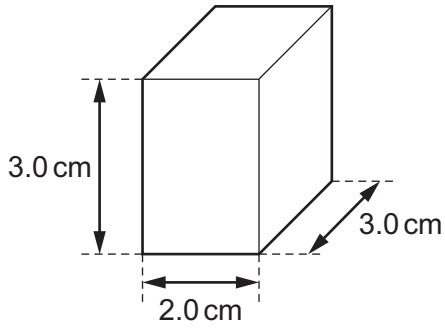
29 The diagrams show four solid blocks with the same mass.

Which block is made from the **least** dense material?

A



B



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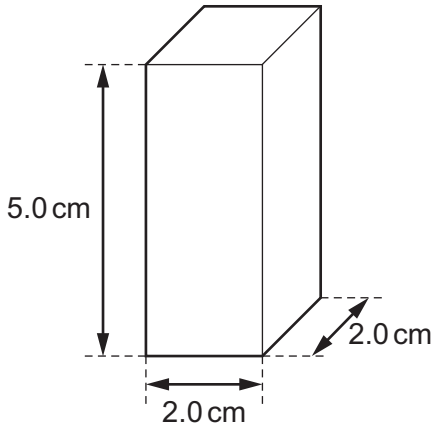

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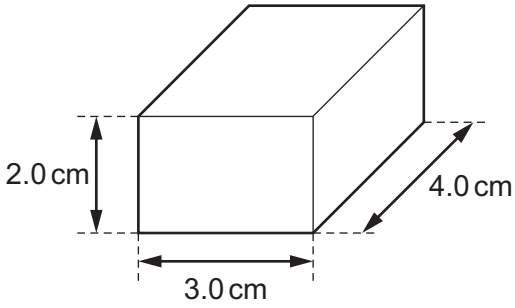


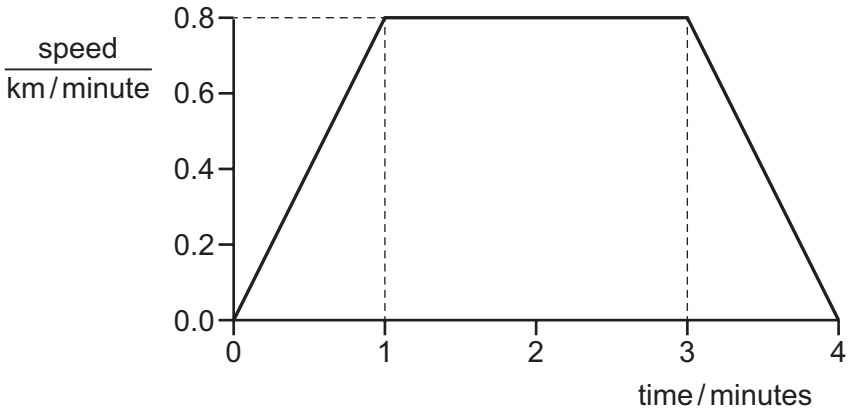
30 A rocket has a mass of 300 kg. Its motors produce a force of 12 000 N vertically upwards.

The acceleration of free fall g is 10 m / s^2.

What is the resultant force on the rocket and what is the acceleration of the rocket?

	resultant force / N	acceleration / m / s^2
A	9 000	30
B	9 000	2.7×10^6
C	15 000	50
D	15 000	4.5×10^6

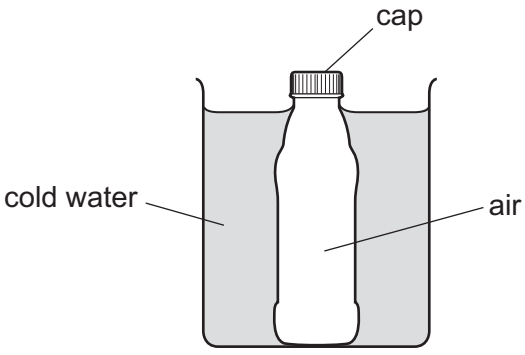
31 The speed-time graph represents the journey of a bicycle.



What is the total distance travelled by the bicycle?

A 1.6 km **B** 2.0 km **C** 2.4 km **D** 3.2 km

32 A glass bottle containing warm air is sealed with a screw cap and then cooled in cold water.



The contraction of the glass bottle can be ignored.

What remains the same during the cooling?

A the air pressure inside the bottle

B the energy of the air molecules in the bottle

C the force on the cap made by the air molecules in the bottle

D the volume of air in the bottle

33 When a substance changes state, it releases latent heat of fusion.

What is the change of state?

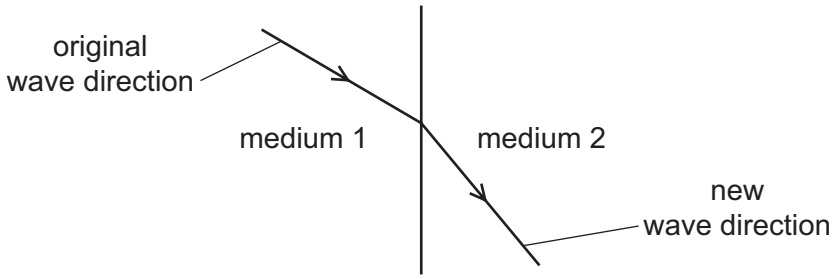
A gas to liquid

B liquid to gas

C liquid to solid

D solid to liquid

34 A wave passes from medium 1 into medium 2. The diagram shows the change in direction of the wave.



How do the frequency and the wavelength of the wave change, if at all, as it passes from medium 1 into medium 2?

	frequency	wavelength
A	decreases	decreases
B	decreases	increases
C	no change	decreases
D	no change	increases

35 Light travelling in a glass block strikes the inside surface of the block at the critical angle.

What is the size of the angle of refraction?

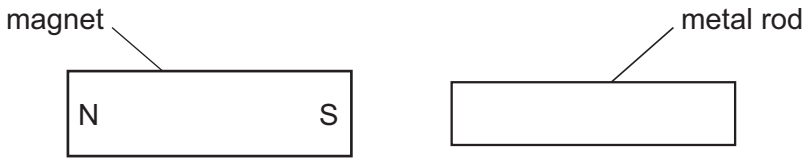
A equal to the critical angle

B between the critical angle and 90°

C exactly 90°

D greater than 90°

36 A bar magnet is brought near to a metal rod.



The magnet is now turned around so that the N-pole is on the right. The magnet is again brought near to the metal rod.

In both cases the metal rod is attracted to the magnet.

What could the metal rod be?

A another bar magnet

B a piece of aluminium

C a piece of copper

D a piece of iron

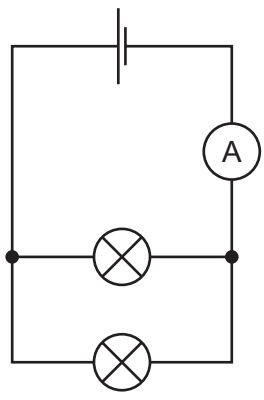
37 Which quantity is defined in terms of the energy supplied by a source in driving charge round a complete circuit, and what is its unit?

	quantity	unit
A	e.m.f.	joule
B	e.m.f.	volt
C	p.d.	joule
D	p.d.	volt

38 The diagrams show four circuits.

Which circuit contains two lamps connected in parallel with each other, and contains an ammeter that measures the total current in the two lamps?

A



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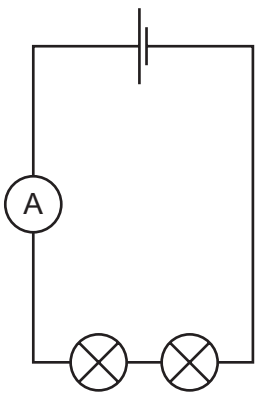

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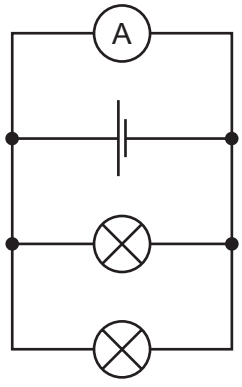

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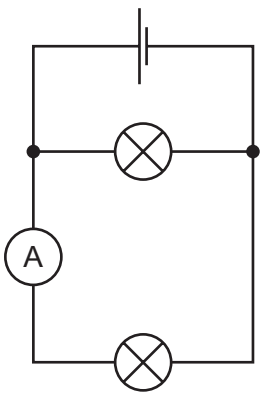
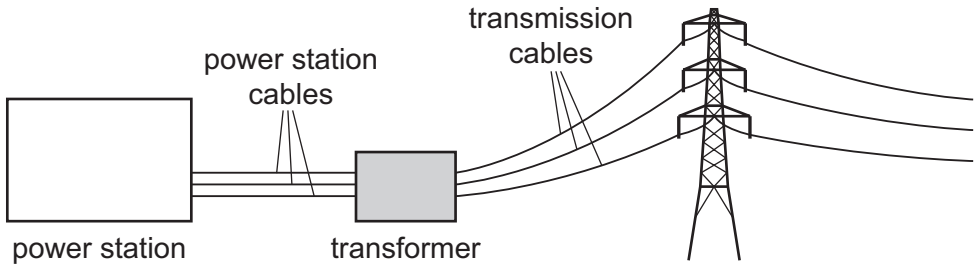


39 Transmission cables are used to carry electricity between a power station and a town.

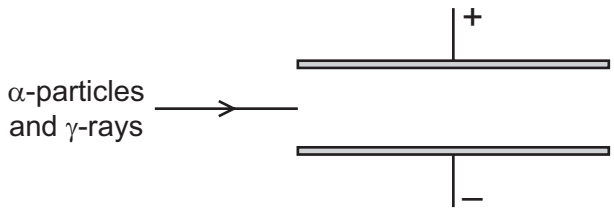
Near the power station a transformer is used to reduce energy losses in the transmission cables.



How do the voltage of the transmission cables and the current in them compare with their values for the power station cables?

	transmission cable voltage	transmission cable current
A	larger	larger
B	larger	smaller
C	smaller	larger
D	smaller	smaller

40 The diagram shows a beam of α-particles and γ-rays entering an electric field between two metal plates.



What is the effect, if any, of the electric field on the α-particles and on the γ-rays?

	α-particles	γ-rays
A	deflected downwards	deflected downwards
B	deflected downwards	not deflected
C	deflected upwards	deflected downwards
D	deflected upwards	not deflected

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											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
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	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
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	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
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	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
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 –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

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 –

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