Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **February/March 2021**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages.

1 Which statement defines excretion?

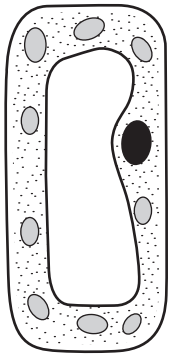
A the chemical reactions in cells that break down nutrient molecules and release energy for metabolism

B the removal from organisms of the waste products of metabolism

C the taking in of materials for energy, growth and development

D the ability to detect or sense stimuli in the internal or external environment and to make appropriate responses

2 The diagram shows an incomplete plant cell.



Which structure is **not** shown?

A cell membrane

B cell wall

C chloroplast

D vacuole

3 What are the molecules that make up fats and oils?

A amino acids and glycerol

B fatty acids and glycerol

C glucose and amino acids

D glucose and fatty acids

4 What are biological catalysts?

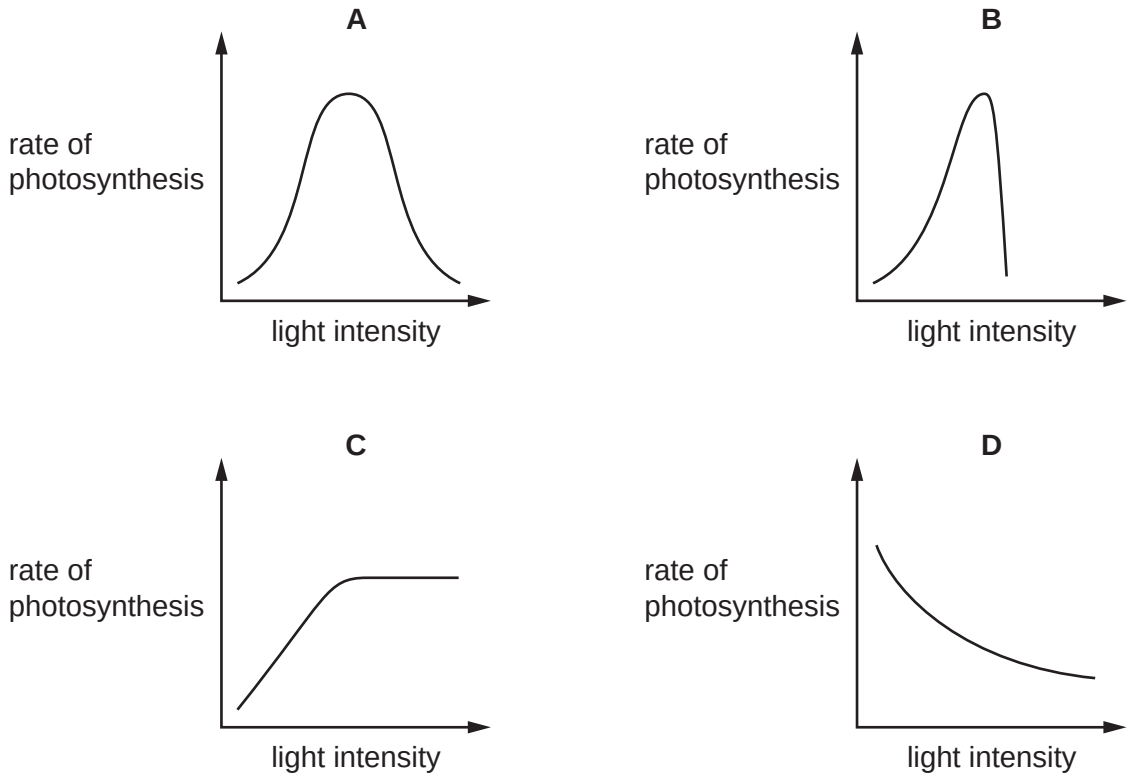
A antibodies

B enzymes

C hormones

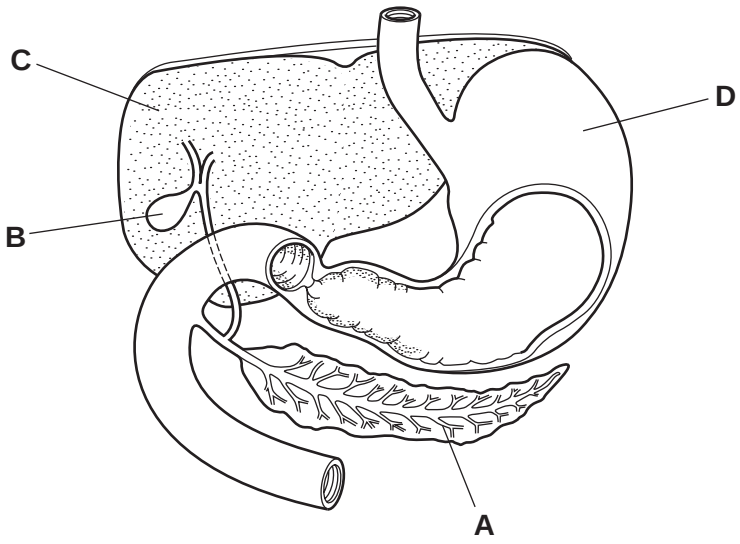
D platelets

5 Which graph shows the effect of increasing light intensity on the rate of photosynthesis?



6 The diagram shows part of the alimentary canal and associated organs.

Where is lipase produced?



7 In which weather conditions is the rate of transpiration fastest?

A cold and dry

B cold and wet

C warm and dry

D warm and wet

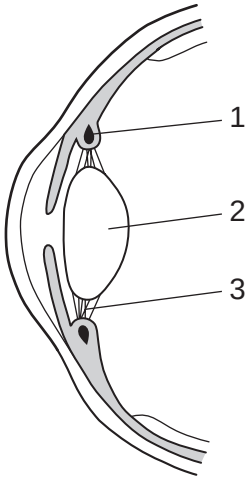
8 When a person was walking or running, the following measurements were taken.

speed / km per hour	number of breaths per minute	volume of each breath / dm^3
4	16	1
6	18	2
8	20	3

How many dm^3 of air did the person breathe per minute when running at 6 km per hour?

A 18 **B** 36 **C** 60 **D** 108

9 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

10 Which features are adaptations of wind-pollinated flowers?

1 anthers exposed to the wind

2 produce heavy sticky pollen

3 produce large quantities of pollen

4 brightly coloured petals

5 produce nectar

A 1, 2 and 3 **B** 3, 4 and 5 **C** 1 and 3 only **D** 4 and 5 only

11 Selective breeding is used to improve crop plants.

What does it involve?

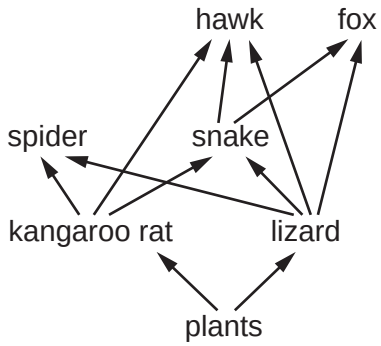
A artificial selection

B asexual reproduction

C ionising radiation

D natural selection

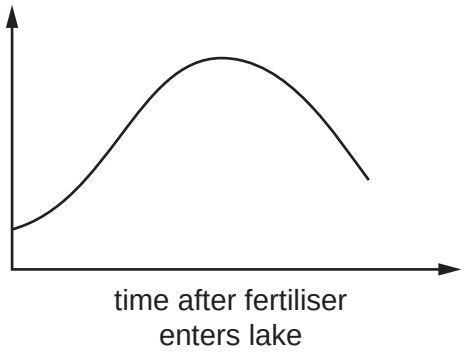
12 The diagram shows a food web.



How many organisms act as secondary consumers in this food web?

A 2 **B** 3 **C** 4 **D** 6

13 The graph shows changes during eutrophication.



What could be the label for the vertical (y) axis?

1 growth of producers

2 number of aerobic bacteria

3 rate of decomposition

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

14 Which process is used to separate a mixture of coloured compounds?

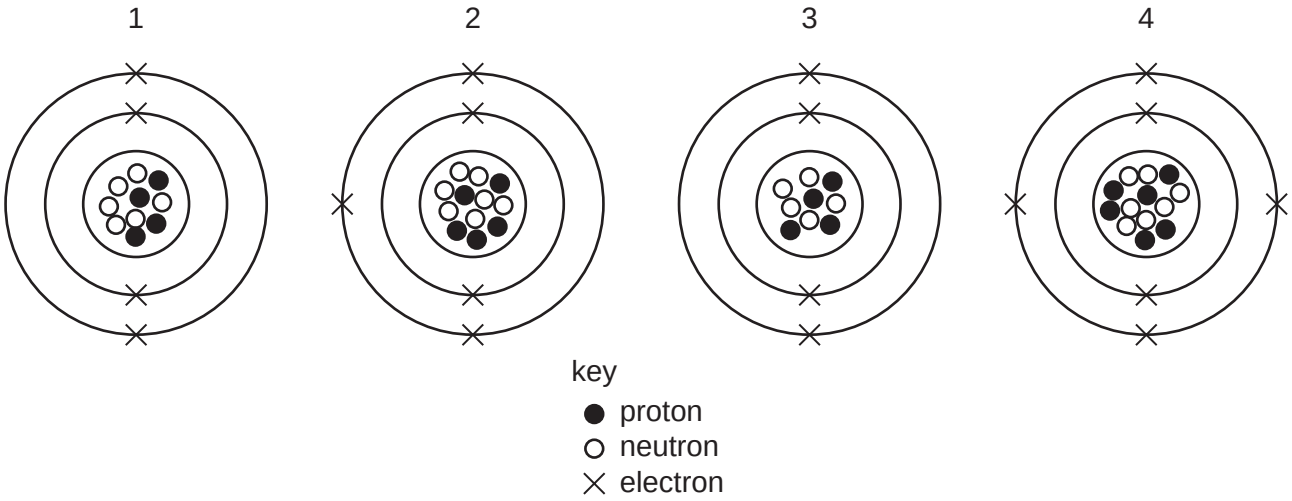
A chromatography

B distillation

C evaporation

D filtration

15 The electronic structures of four isotopes are shown.



Which isotopes have the same chemical properties?

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

16 What is the mass of hydrogen in 51 g of ammonia, NH_3?

A 3 g **B** 9 g **C** 14 g **D** 17 g

17 Molten lead(II) bromide is electrolysed.

Which equation represents the reaction at the cathode?

A $2Br^- \rightarrow Br_2 + 2e^-$

B $Br_2 + 2e^- \rightarrow 2Br^-$

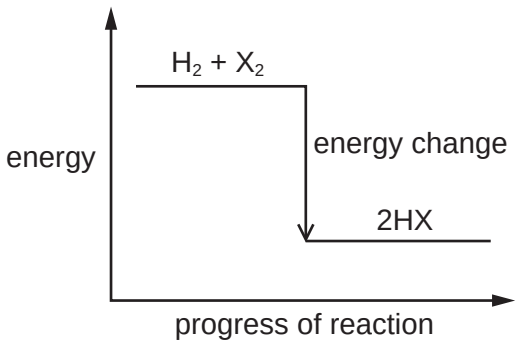
C $Pb^{2+} \rightarrow Pb + 2e^-$

D $Pb^{2+} + 2e^- \rightarrow Pb$

18 The diagram shows the energy change for the reactions between hydrogen and the halogens.

The reaction is $H_2 + X_2 \rightarrow 2HX$.

The size of the energy change is different for each halogen.



The diagram shows that the reactions are ……1…… .

The most reactive halogen is ……2…… and therefore the energy change for this element is ……3…… .

Which words complete gaps 1, 2 and 3?

	1	2	3
A	endothermic	fluorine	least
B	endothermic	iodine	least
C	exothermic	fluorine	greatest
D	exothermic	iodine	greatest

19 In which equation is the underlined substance acting as an oxidising agent?

A $CuO + \underline{H_2} \rightarrow Cu + H_2O$

B $CuSO_4 + \underline{Mg} \rightarrow MgSO_4 + Cu$

C $H_2 + \underline{Cl_2} \rightarrow 2HCl$

D $\underline{Zn} + 2HCl \rightarrow ZnCl_2 + H_2$

20 A label from a packet of indigestion tablets is shown.

Each tablet contains:	
magnesium carbonate	120 mg
magnesium hydroxide	15 mg
magnesium oxide	62 mg
magnesium sulfate	47 mg

Which substance does **not** neutralise stomach acid?

A magnesium carbonate

B magnesium hydroxide

C magnesium oxide

D magnesium sulfate

21 Substance X is insoluble in water.

It reacts with dilute nitric acid to produce solution Y and a gas which turns limewater milky.

A white precipitate is formed when aqueous sodium hydroxide is added to solution Y. This precipitate remains when excess sodium hydroxide is added.

What is substance X?

A calcium carbonate

B calcium chloride

C zinc carbonate

D zinc chloride

22 Astatine is below iodine in Group VII of the Periodic Table.

Which statements about astatine are correct?

1 It is monoatomic.

2 It is a solid at room temperature.

3 It is lighter in colour than iodine.

4 It does not react with aqueous potassium iodide.

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

23 Which elements in the Periodic Table form coloured compounds?

A Group I metals

B halogens

C noble gases

D transition metals

24 Part of the reactivity series is shown.

aluminium

(carbon)

iron

lead

copper

gold

Which statement is correct?

A Aluminium can be extracted by heating its oxide with carbon.

B Gold forms an oxide which cannot be reduced by heating with aluminium.

C Iron cannot be extracted by heating its oxide with carbon.

D Lead can be extracted by heating its oxide with carbon.

25 Which statement about the Haber process is correct?

A All of the raw materials are obtained from the air.

B It requires a catalyst.

C It uses a low pressure and a high temperature.

D Sulfuric acid is produced in the process.

26 Naphtha is obtained from petroleum.

What is a use for naphtha?

A cooking

B making chemicals

C heating

D making roads

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

Which type of reaction occurs?

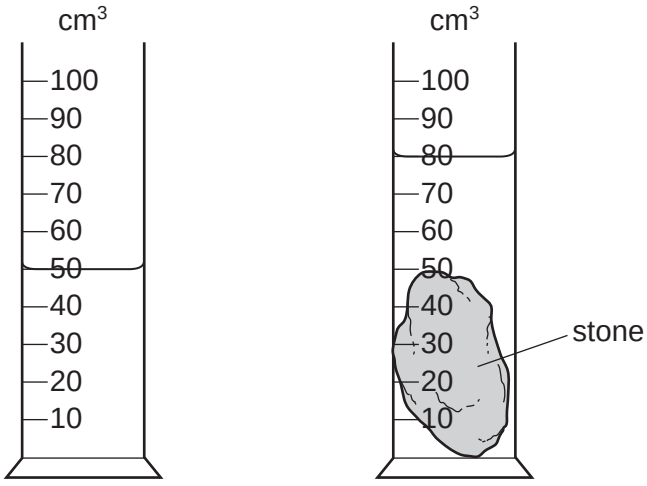
A addition

B oxidation

C polymerisation

D reduction

28 A stone of mass 60 g is placed in a measuring cylinder containing water. The water level in the measuring cylinder rises as shown.

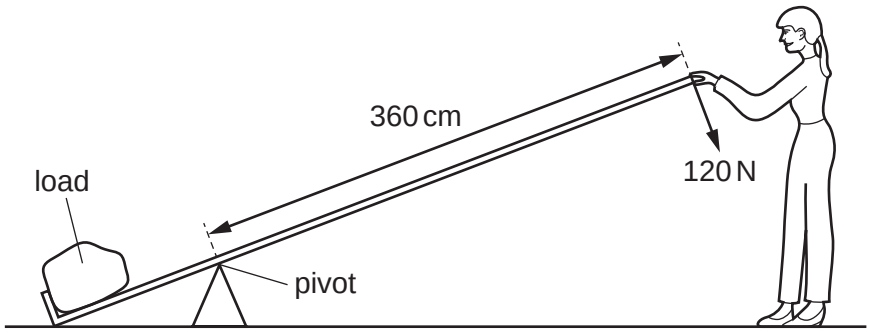


What is the density of the stone?

A 0.50 g / cm^3 **B** 0.75 g / cm^3 **C** 1.3 g / cm^3 **D** 2.0 g / cm^3

29 A scientist uses a lever to lift a heavy load.

She applies a force of 120 N at a distance of 360 cm from a pivot.



What is the moment about the pivot of the force applied by the scientist?

A 3.0 N m **B** 33.3 N m **C** 432 N m **D** 43 200 N m

30 A crane lifts a load of mass 300 kg through a height of 20 m in 1.0 minute. The gravitational field strength *g* is 10 N / kg.

What is the average power output of the crane during this task?

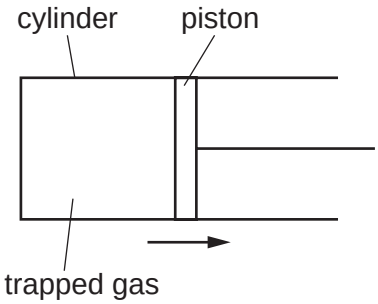
A 600 W **B** 1000 W **C** 36 000 W **D** 60 000 W

31 In a room, hot air above a heater rises and is replaced by cool air that falls.

What is the name of this process, and how does the density of the hot air compare with the density of the cool air?

	process	density of hot air
A	conduction	greater than cool air
B	conduction	less than cool air
C	convection	greater than cool air
D	convection	less than cool air

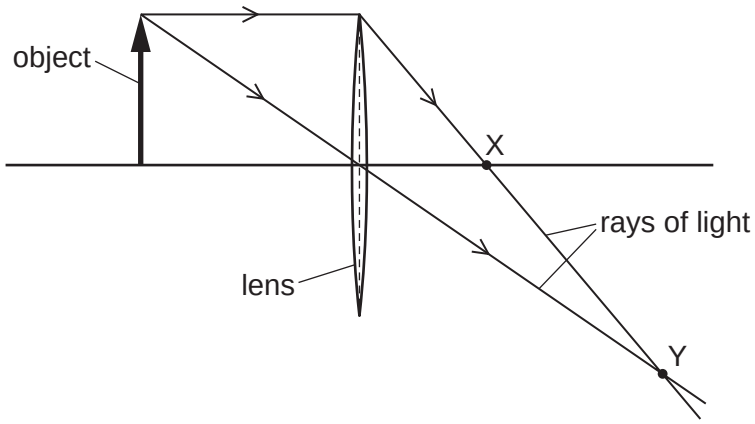
32 A fixed mass of gas is trapped in a cylinder by a piston, as shown. The volume of the gas is increased at constant temperature by moving the piston to the right, as shown.



What effect does this have on the average speed of the molecules and on how many collisions are made by the molecules with the piston each second?

	average speed of molecules	number of collisions each second
A	increases	decreases
B	increases	increases
C	unchanged	decreases
D	unchanged	increases

33 The diagram shows two rays of light that have passed from an object through a converging lens.



Which labelled point X or Y is a principal focus of the lens, and how does the size of the image compare with the size of the object?

	principal focus	size of image
A	X	larger than object
B	X	smaller than object
C	Y	larger than object
D	Y	smaller than object

34 Sound travels at different speeds in water, in steel and in air.

Each row in the table gives the three speeds at room temperature.

Which row gives the speeds in the correct columns?

	speed of sound in water m/s	speed of sound in steel m/s	speed of sound in air m/s
A	300	1500	4500
B	300	4500	1500
C	1500	4500	300
D	4500	1500	300

35 What is meant by an electric field?

A a region in which a charge experiences a force

B a region in which a current experiences a force

C a region in which a magnetic pole experiences a force

D a region in which a mass experiences a force

36 The electromotive force (e.m.f.) of a battery is 2.0 V.

Which statement is correct?

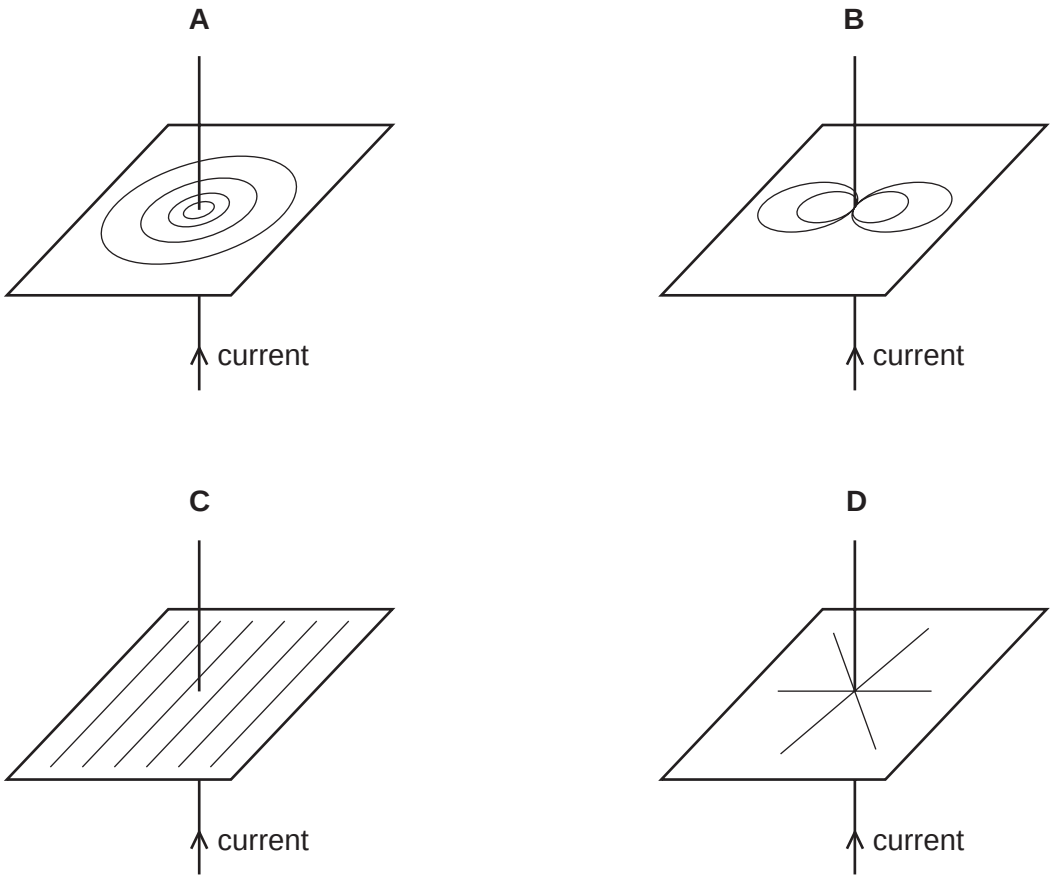
A The battery supplies 0.50 J of energy for every 1.0 C of charge driven around the circuit.

B The battery supplies 0.50 J of energy for every 2.0 C of charge driven around the circuit.

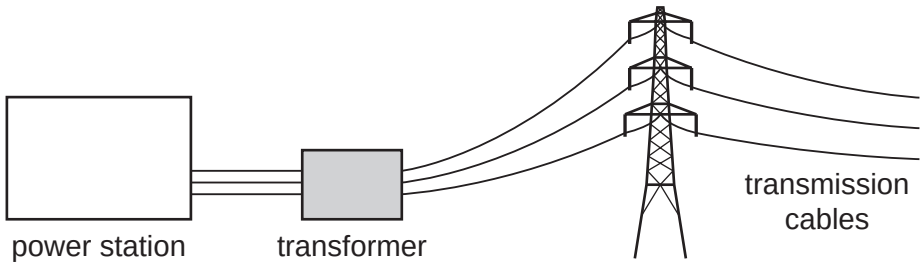
C The battery supplies 2.0 J of energy for every 1.0 C of charge driven around the circuit.

D The battery supplies 2.0 J of energy for every 2.0 C of charge driven around the circuit.

37 Which diagram shows the pattern of the magnetic field due to a current in a straight wire?



38 Electrical energy from a power station is transmitted over a large distance. A 100% efficient transformer is used near to the power station. This transformer reduces the amount of energy that is wasted thermally in the transmission cables.



How does the transformer reduce the amount of energy that is wasted?

A It decreases the power transmitted so the current and the voltage are both larger.

B It decreases the power transmitted so the current and the voltage are both smaller.

C It increases the current so the voltage is smaller.

D It increases the voltage so the current is smaller.

39 The table compares an atom of carbon-13 and an atom of nitrogen-14.

	carbon-13	nitrogen-14
nucleon number *A*	13	14
proton number *Z*	6	7

What do the neutral atom of carbon-13 and the neutral atom of nitrogen-14 have the same number of?

A electrons

B ions

C neutrons

D protons

40 α, β and γ radiation can all penetrate materials and ionise atoms.

Which row compares the different types of radiation?

	least penetrating	least ionising
A	α	β
B	α	γ
C	γ	α
D	γ	β

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.).