Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

CO-ORDINATED SCIENCES **0973/21**

Paper 2 Multiple Choice (Extended) **May/June 2019**

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 16.
Electronic calculators may be used.

1 Which characteristic of living organisms is correctly matched to the description?

	characteristic	description
A	excretion	the removal from organisms of the waste products of metabolism
B	nutrition	the chemical reactions in cells that break down nutrient molecules and release energy for metabolism
C	respiration	the taking in of materials for energy, growth and development
D	sensitivity	the action by an organism or part of an organism causing a change of position or place

2 Which row correctly describes the diffusion of molecules from P to Q?

	P	Q	movement
A	higher concentration	lower concentration	down a concentration gradient
B	higher concentration	lower concentration	up a concentration gradient
C	lower concentration	higher concentration	down a concentration gradient
D	lower concentration	higher concentration	up a concentration gradient

3 Which chemical element is found in proteins, but **not** in carbohydrates or fats?

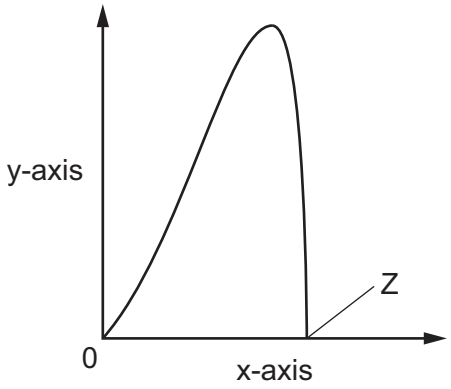
A carbon

B hydrogen

C oxygen

D nitrogen

4 An investigation was carried out to see the effect of temperature on how quickly the enzyme amylase breaks down starch to sugar.



Which labels should be used for the axes and what has happened at point Z?

	x-axis	y-axis	what has happened at Z
A	rate of breakdown of starch	temperature	enzyme is denatured
B	temperature	time taken to break down starch	enzyme is used up
C	temperature	rate of break down of starch	enzyme is denatured
D	time taken to break down starch	temperature	enzyme is used up

5 A farmer noticed that the older leaves of his maize plant were becoming yellow between the veins.

What is the plant lacking?

A carbon dioxide

B magnesium ions

C sunlight

D water

6 Which disease is caused by a diet that is low in protein?

A coronary heart disease

B kwashiorkor

C rickets

D scurvy

7 Which component is needed for blood to clot?

A hormones

B platelets

C red blood cells

D white blood cells

8 During vigorous exercise there is an increase in the rate of breathing.

What causes the increase in the rate of breathing?

A a decrease in the adrenaline concentration in the blood

B a decrease in the lactic acid concentration in the blood

C an increase in the alcohol concentration in the blood

D an increase in the carbon dioxide concentration in the blood

9 What occurs when our eyes look from a near object in dim light to a distant object in bright light?

A Pupils constrict and lenses become thinner.

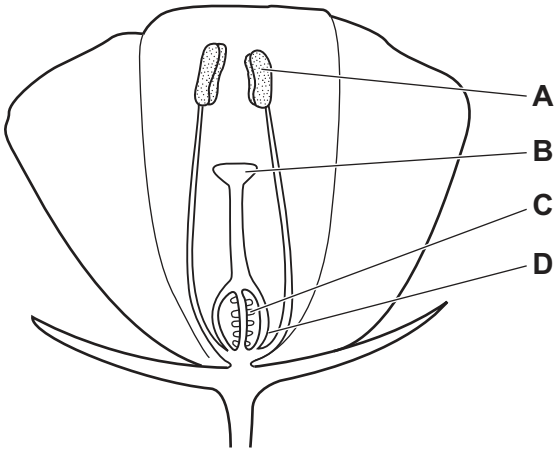
B Pupils constrict and lenses become fatter.

C Pupils dilate and lenses become thinner.

D Pupils dilate and lenses become fatter.

10 The diagram shows a section through an insect-pollinated flower.

When pollination occurs, where must the pollen grains reach?



11 Which row about human cells is correct?

	name of cell	type of nucleus	number of chromosomes
A	body cell	diploid	23
B	body cell	haploid	46
C	gamete	diploid	46
D	gamete	haploid	23

12 In a food chain, what do all living organisms get from their food?

A a supply of water

B oxygen for respiration

C protection from disease

D the energy they need

13 What decreases as a result of eutrophication?

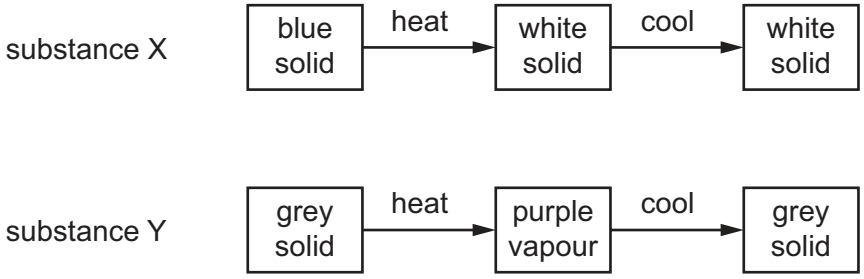
A aerobic respiration by decomposers

B decomposition of dead producers

C dissolved oxygen in the water

D growth of producers

14 Two substances, X and Y, are heated and then cooled. The observations are shown.



Which type of change occurs when X and Y are heated?

	X	Y
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

15 Why do isotopes of the same element have the same chemical properties?

A They have a different number of protons and a different number of outer shell electrons.

B They have a different number of protons and the same number of outer shell electrons.

C They have the same number of protons and a different number of outer shell electrons.

D They have the same number of protons and the same number of outer shell electrons.

16 Diamond and graphite are different forms of the element carbon.

Graphite conducts electricity.

Which statement explains why diamond does **not** conduct electricity?

A All of the atoms in diamond are arranged tetrahedrally.

B All of the bond lengths in diamond are the same.

C All of the bonds in diamond are single bonds.

D All of the outer shell electrons in diamond are held in covalent bonds.

17 What is the electrolyte that is used when a nickel spoon is electroplated with copper?

A copper

B copper sulfate solution

C nickel sulfate solution

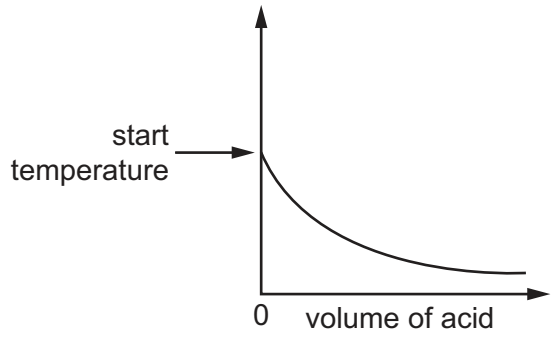
D nickel

18 An acid is added to an alkali until the final solution is **just** neutral.

The reaction is exothermic.

Which graph shows how the temperature changes as the acid is being added to the alkali?

A



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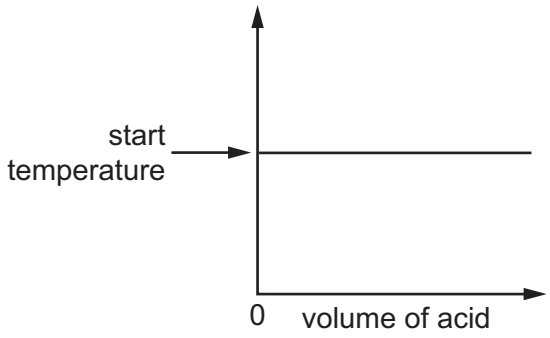

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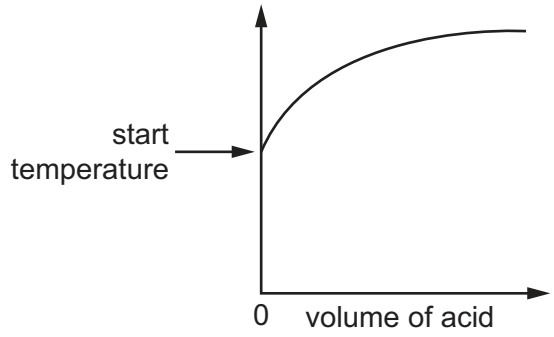

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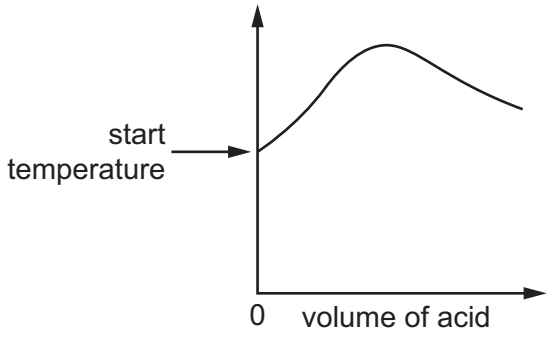


19 Some properties of four oxides, W, X, Y and Z, are shown.

property	W	X	Y	Z
reaction with acids	yes	no	no	yes
reaction with alkalis	no	yes	no	yes

Which row classifies these oxides?

	W	X	Y	Z
A	acidic	basic	neutral	amphoteric
B	acidic	basic	amphoteric	neutral
C	basic	acidic	amphoteric	neutral
D	basic	acidic	neutral	amphoteric

[Turn over

20 Hydrochloric acid and sodium hydroxide neutralise each other to form water and sodium chloride.

Which method is used to make the solution crystallise?

A chromatography

B evaporation

C filtration

D fractional distillation

21 Which statement about elements in the Periodic Table is correct?

A Elements are arranged in mass number order.

B The group number of an element is the same as the number of outer shell electrons.

C The reactivity of elements in both Group I and Group VII increases down the group.

D There is a change from non-metallic to metallic character from left to right across each period.

22 Samples of four different metals, L, M, N and O, are added to solutions of the metal chlorides.

The table shows which metals react with the metal chlorides.

	L chloride	M chloride	N chloride	O chloride
L		✗	✗	✗
M	✓		✗	✓
N	✓	✓		✓
O	✓	✗	✗	

key

✓ = reaction

✗ = no reaction

What is the order of reactivity?

	most reactive → least reactive			
A	L	M	O	N
B	L	O	M	N
C	N	M	O	L
D	N	O	M	L

23 Some properties of aluminium are listed.

1 conducts electricity

2 malleable

3 resistant to corrosion

Which properties make aluminium suitable for use as food containers?

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

24 Which processes lead to the formation of a greenhouse gas?

1 reaction of sodium with water

2 respiration

3 combustion of fossil fuels

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

25 Sulfuric acid is manufactured by the Contact process.

Four reactions occur in this process.

Which reaction requires a catalyst?

A $S + O_2 \rightarrow SO_2$

B $2SO_2 + O_2 \rightarrow 2SO_3$

C $H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$

D $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

26 Three reactions are listed.

1 the addition of hydrogen to ethene

2 the addition of steam to ethene

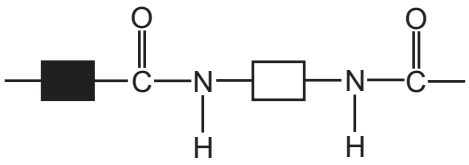
3 the cracking of long chain alkanes

Which reactions produce molecules of a different homologous series from the reactant molecules?

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

27 Which diagram represents part of the structure of nylon?

A



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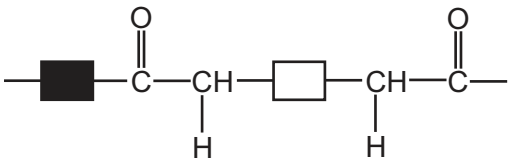

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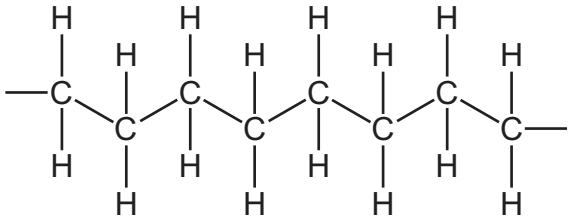

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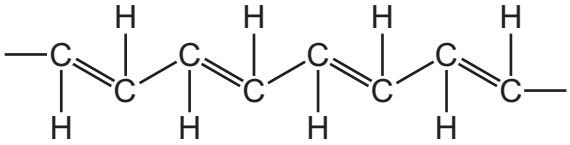


28 A spring that obeys Hooke's law has an unstretched length of 5.0 cm. A load of weight 0.50 N is hung from the spring and the length of the spring becomes 10.0 cm.

The load is replaced with a new load and the length of the spring becomes 15.0 cm.

The spring has not passed its limit of proportionality.

What is the weight of the new load?

A 0.50 N **B** 0.75 N **C** 1.0 N **D** 1.5 N

29 An object X with mass 2.0 kg is moving with a speed of 4.0 m / s.

Which object has kinetic energy equal to that of object X?

	mass of object / kg	speed of object / m / s
A	0.50	16
B	1.0	8.0
C	8.0	2.0
D	16	1.0

30 What are the units of work and power?

	work	power
A	joule	joule
B	joule	watt
C	watt	joule
D	watt	watt

31 When evaporation occurs, molecules escape from the surface of a liquid.

Which molecules escape, and what happens to the average speed of the molecules remaining in the liquid?

	escaping molecules	average speed of remaining molecules
A	less energetic	decreases
B	less energetic	increases
C	more energetic	decreases
D	more energetic	increases

32 Two identical metal containers are painted. One is painted dull black and the other is painted shiny silver. They contain equal volumes of water and are placed outside on a sunny day.

The temperature of the water in the black container increases more quickly than the temperature of the water in the silver container.

Why does this happen?

A The black container is the better absorber of radiation from the Sun.

B The black container is the better conductor of heat.

C The black container is the better emitter of radiation.

D The black container is the better reflector of radiation from the Sun.

[Turn over

33 Diagram 1 represents a wave.

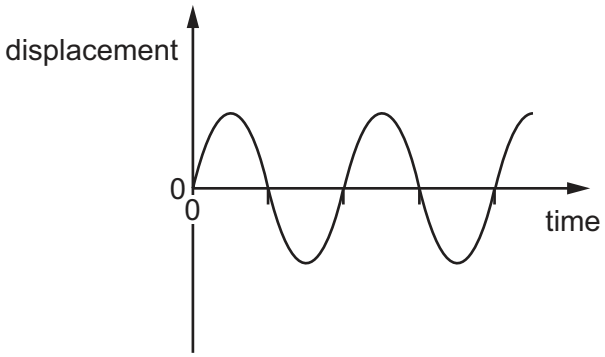
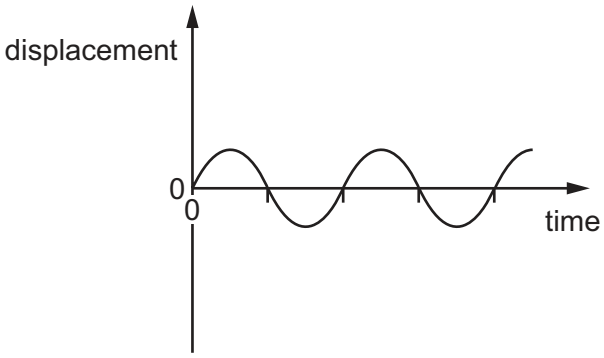


diagram 1

Which diagram represents a wave with twice the frequency and half the amplitude of the wave in diagram 1?

The scales are the same in all the diagrams.

A



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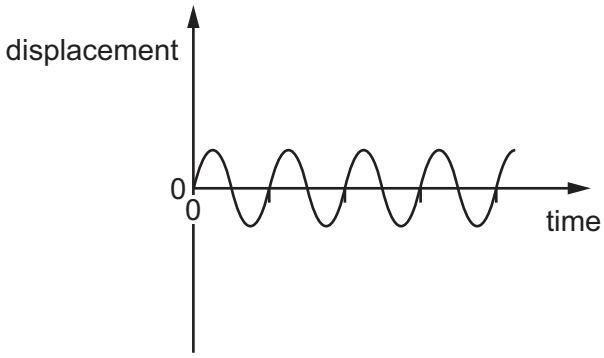

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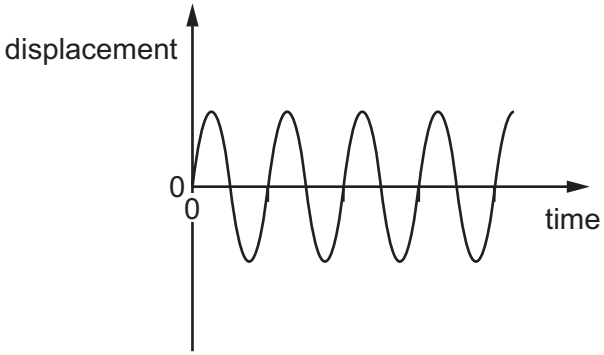

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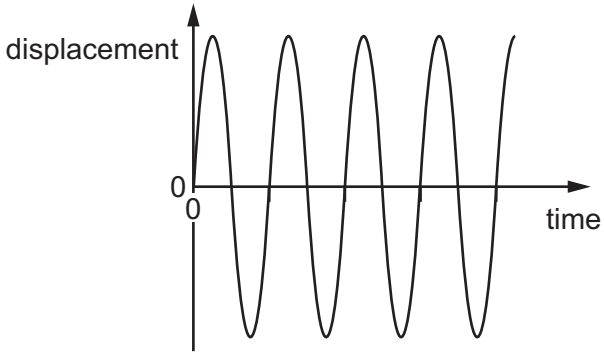
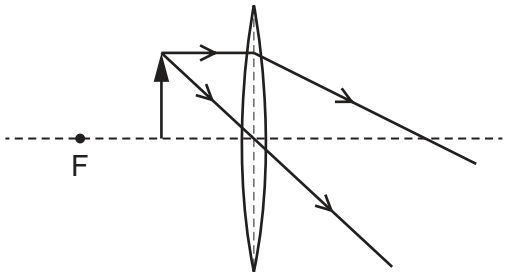


34 In the diagrams, F is one principal focus of the converging lens.

Which diagram shows the lens being used as a magnifying glass?

A



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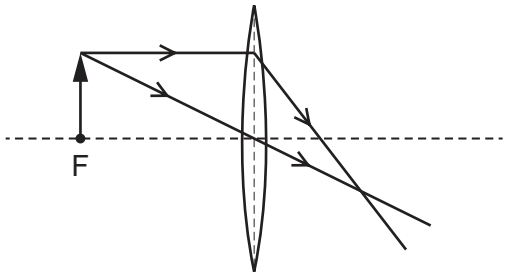

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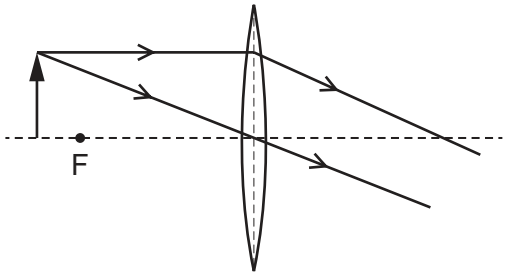

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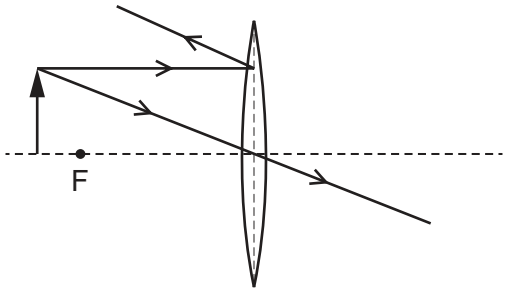
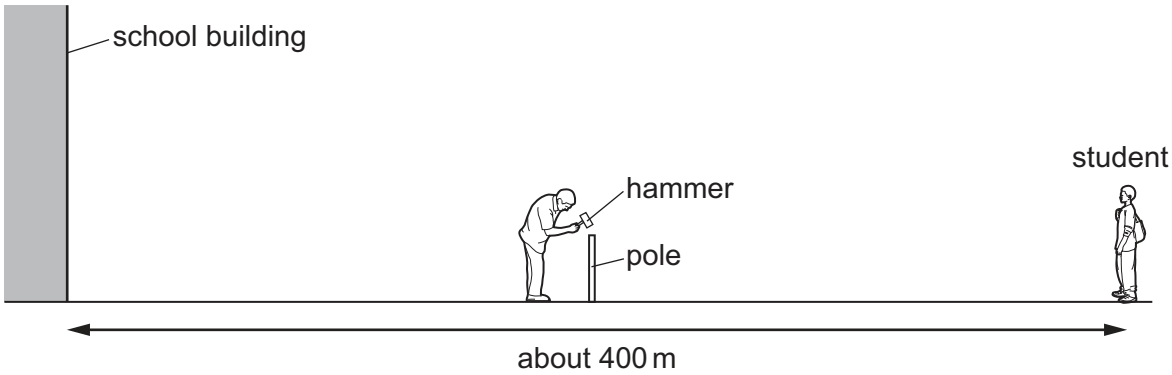


35 A sports field is next to a large school building. A student at the far side of the sports field sees a groundsman hit a pole with a hammer.

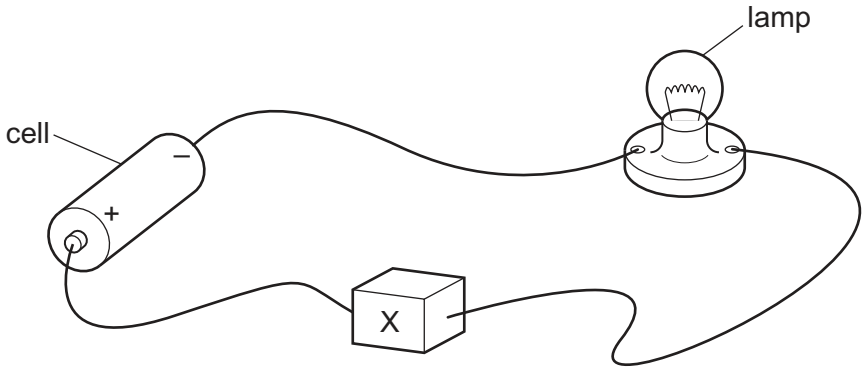


After the hammer hits the pole, the student hears two bangs.

Why does the student hear two bangs?

	first bang caused by	second bang caused by
A	sound of hammer hitting pole	sound of pole hitting hammer
B	sound reaching the student's left ear	sound reaching the student's right ear
C	sound reaching student directly	sound reflected back from school building
D	sound reflected back from school building	sound reaching student directly

36 In the circuit, component X is used to control the brightness of the lamp.



What is component X?

A an ammeter

B a fixed resistor

C a fuse

D a variable resistor

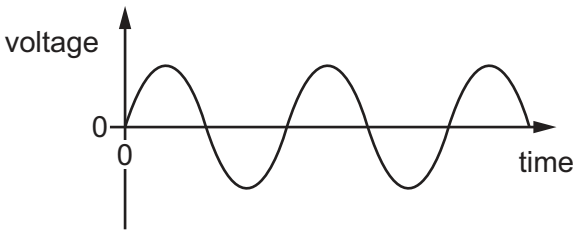
37 There is a current of 3.0 A in a resistor. The potential difference across the resistor is 3.0 V.

How much electrical energy is transferred to other forms in 3.0 minutes?

A 3.0 J **B** 9.0 J **C** 540 J **D** 1620 J

38 Which graph shows how the output voltage of an a.c. generator varies with time?

A



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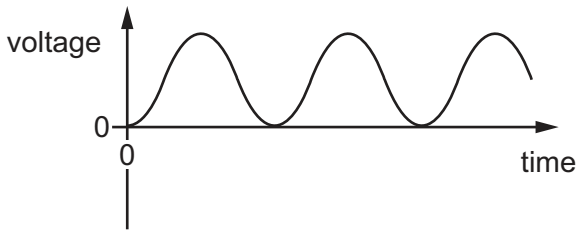

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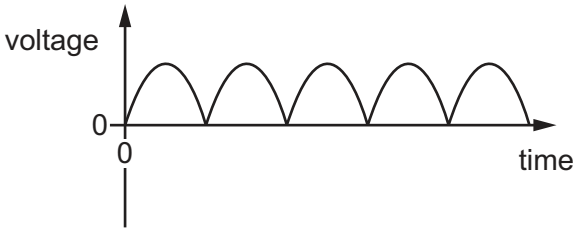

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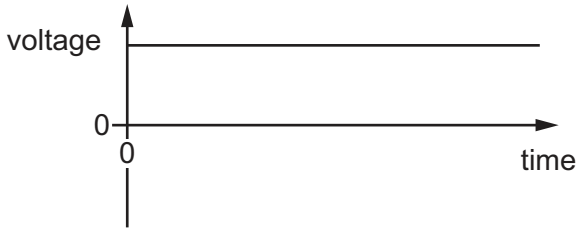

39 A transformer increases the voltage from a power station in order to transfer electricity along the transmission cables.

How does increasing the voltage affect the current in the cables and how does it affect the efficiency of energy transfer?

	current	efficiency
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

40 There are three different isotopes of hydrogen.

$$^{1}_{1}H \qquad ^{2}_{1}H \qquad ^{3}_{1}H$$

Which statement about the nuclei of these three isotopes is correct?

A They have different numbers of electrons.

B They have the same number of nucleons.

C They have the same number of neutrons.

D They have the same number of protons.

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.).