



Cambridge IGCSE™ (9–1)

CO-ORDINATED SCIENCES

0973/22

Paper 2 Multiple Choice (Extended)

May/June 2023

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.

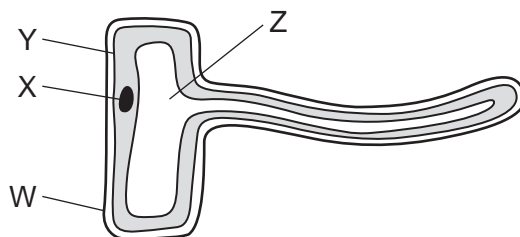


2

1 Which is **not** a characteristic of all living organisms?

- A excretion
- B growth
- C photosynthesis
- D sensitivity

2 The diagram shows a specialised cell from a plant.



Which structures **not** found in animal cells are shown in the diagram and which structure often found in other plant cells is missing?

| | structures not found in animal cells | structure found in other plant cells |
|----------|--------------------------------------|--------------------------------------|
| A | W and X | chloroplast |
| B | X and Y | nucleus |
| C | Y and Z | nucleus |
| D | Z and W | chloroplast |

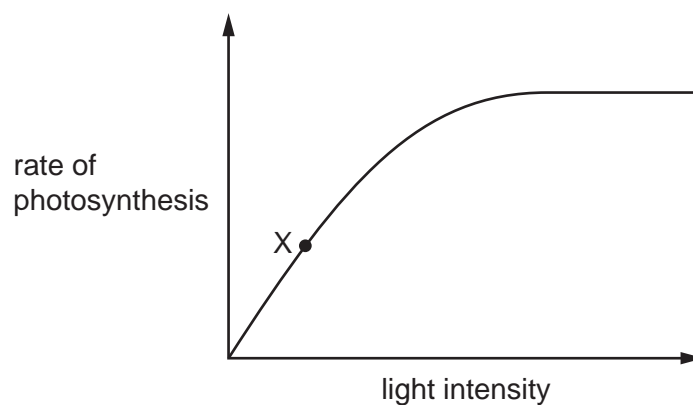
3 Which row shows the elements and the small molecules that are used to make the larger molecules?

| | elements | small molecule | larger molecule |
|----------|---------------------------------------|----------------|-----------------|
| A | carbon, hydrogen and oxygen | glucose | fats |
| B | carbon, hydrogen, oxygen and nitrogen | amino acids | fats |
| C | carbon, hydrogen and oxygen | glucose | proteins |
| D | carbon, hydrogen, oxygen and nitrogen | amino acids | proteins |

4 Which type of molecules speed up chemical digestion?

- A carbohydrates
- B enzymes
- C hormones
- D fatty acids

5 The graph shows the effect of increasing light intensity on the rate of photosynthesis of a submerged aquatic plant.

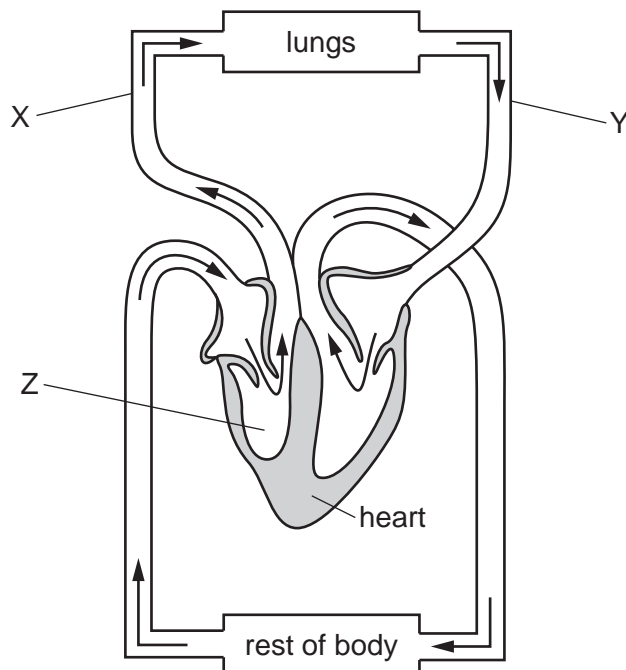


Which factor is limiting the rate of photosynthesis at X?

- A carbon dioxide concentration
 - B humidity
 - C light intensity
 - D temperature
- 6 What is one of the functions of bile?
- A denaturing lipase
 - B digesting fats
 - C emulsifying fats
 - D increasing acidity

4

7 The diagram shows the circulatory system of a mammal.



Which row shows the correct names for blood vessels X and Y and for chamber Z?

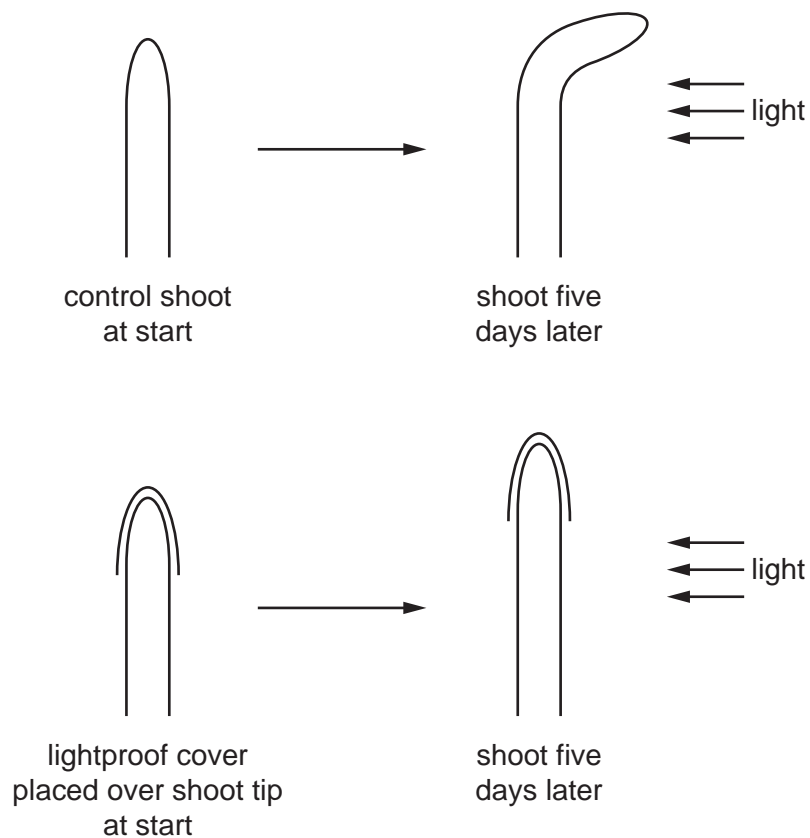
| | X | Y | Z |
|----------|------------------|----------------|-----------------|
| A | pulmonary artery | aorta | left ventricle |
| B | vena cava | pulmonary vein | left ventricle |
| C | vena cava | aorta | right ventricle |
| D | pulmonary artery | pulmonary vein | right ventricle |

8 During cold weather, warm blooded animals, such as mammals and birds, require more food.

Which statement explains the reason for this?

| | energy required to maintain constant body temperature | rate of respiration |
|----------|---|---------------------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

9 The diagram shows an experiment using the shoots of seedlings.

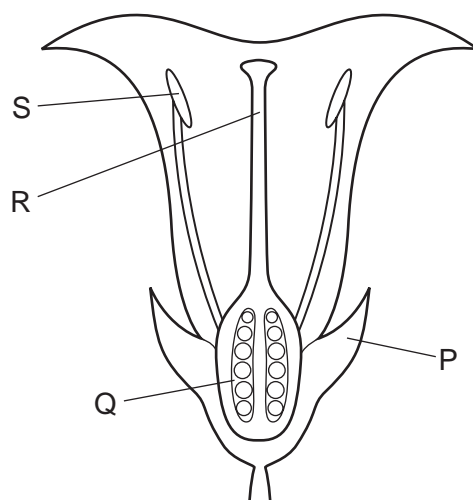


Which statement explains why the covered shoot tip does **not** grow towards the light?

- A The lightproof cover decreases auxin production by the shoot tip.
- B The lightproof cover keeps auxin distribution even on all sides of the shoot.
- C The lightproof cover prevents auxin from diffusing from the shoot tip.
- D The lightproof cover stimulates cell elongation without requiring auxin.

6

10 The diagram shows a section through a flower.



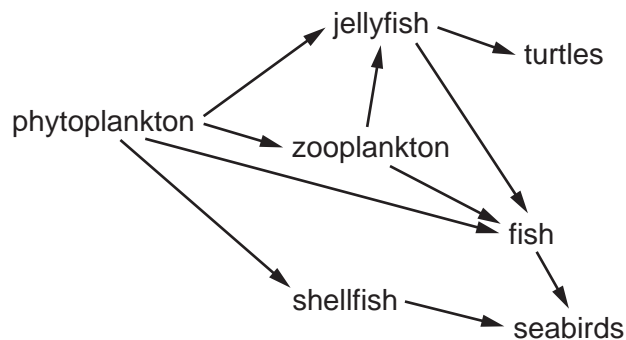
Which labelled structures are the anther and the ovary?

| | anther | ovary |
|----------|--------|-------|
| A | R | P |
| B | R | Q |
| C | S | P |
| D | S | Q |

11 Which process results in the development of strains of antibiotic-resistant bacteria?

- A** artificial selection
- B** discontinuous variation
- C** natural selection
- D** selective breeding

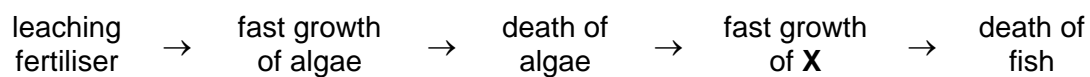
12 The diagram shows a food web.



Which groups of organisms are both primary **and** secondary consumers?

- A fish and jellyfish
- B fish and shellfish
- C seabirds and turtles
- D shellfish and zooplankton

13 The flow diagram shows the consequence of the overuse of fertilisers on farm land.

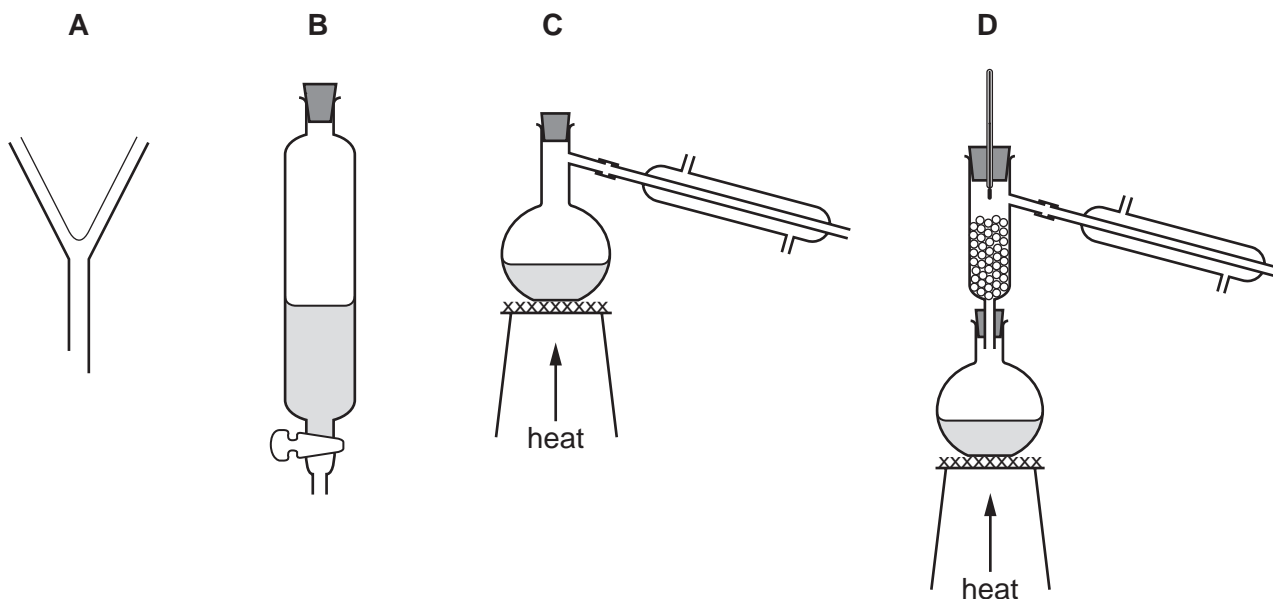


Which group of organisms is represented by **X**?

- A decomposers
- B fish
- C invertebrates
- D plants

14 Hexane and octane are liquid hydrocarbons that mix together.

Which apparatus is used to separate a mixture of these two liquids?



15 When solid zinc carbonate is heated, a different solid and a gas are formed.

Which type of change occurs?

- A chemical
- B exothermic
- C physical
- D separation

16 An atom of osmium is represented by ${}_{76}^{190}\text{Os}$.

How many neutrons are in this atom?

- A 76
- B 114
- C 190
- D 266

17 Aqueous potassium bromide reacts with aqueous silver nitrate to produce a cream precipitate.

What is the ionic equation for this reaction?

- A $\text{Ag}^+(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{AgBr}(\text{s})$
- B $\text{Ag}^{2+}(\text{aq}) + 2\text{Br}^-(\text{aq}) \rightarrow \text{AgBr}_2(\text{s})$
- C $\text{K}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{KNO}_3(\text{s})$
- D $2\text{K}^+(\text{aq}) + \text{NO}_3^{2-}(\text{aq}) \rightarrow \text{K}_2\text{NO}_3(\text{s})$

- 18 Which statement about the extraction of aluminium from its ore by electrolysis is correct?
- A Aluminium gains electrons from the anode.
 - B Aluminium ions are oxidised at the cathode.
 - C Aluminium ore is called cryolite.
 - D Aluminium oxide is in the electrolyte.
- 19 Which statement explains why increasing the concentration of reactants increases the rate of a reaction?
- A The proportion of particles that possess the activation energy is greater.
 - B The particles collide more frequently.
 - C The particles collide more slowly.
 - D The particles collide with greater energy.
- 20 Copper(II) sulfate is produced by reacting copper(II) oxide with dilute sulfuric acid.

The stages in the process to produce pure dry crystals are listed.

- 1 Leave to crystallise in a cool place.
- 2 Filter the reaction mixture.
- 3 Press the crystals between dry filter papers.
- 4 Add copper(II) oxide until it is in excess.
- 5 Heat the filtrate to concentrate it.
- 6 Heat the dilute sulfuric acid.

What is the correct order for these stages?

- A 6 → 4 → 2 → 5 → 3 → 1
 - B 6 → 4 → 1 → 2 → 5 → 3
 - C 6 → 4 → 2 → 5 → 1 → 3
 - D 4 → 6 → 2 → 1 → 5 → 3
- 21 The box lists four substances.

| | | | |
|-----------------|----|----|----|
| Br ₂ | CO | Cu | Na |
|-----------------|----|----|----|

Which substance is an element that forms a basic oxide and coloured compounds?

- A Br₂
- B CO
- C Cu
- D Na

22 Car engines produce pollutant gases.

Which gases are removed by catalytic converters?

- A carbon monoxide, nitrogen monoxide and sulfur dioxide
- B carbon monoxide and nitrogen monoxide only
- C nitrogen monoxide and sulfur dioxide only
- D carbon dioxide and sulfur dioxide

23 In the blast furnace, which substance is added to make slag?

- A calcium carbonate
- B carbon dioxide
- C carbon monoxide
- D coke

24 Which catalyst is used in the Contact process?

- A iron
- B phosphoric(V) acid
- C nickel
- D vanadium(V) oxide

25 Which statements about limestone are correct?

- 1 It contains calcium oxide.
- 2 It is used to manufacture lime.
- 3 It neutralises acidic industrial waste products.
- 4 It neutralises alkaline soil.

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

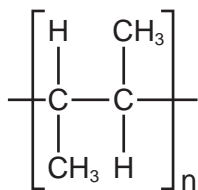
26 Naphtha is obtained by the fractional distillation of petroleum.

Which statements about naphtha are correct?

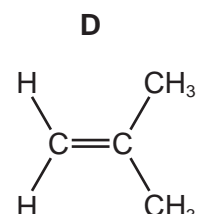
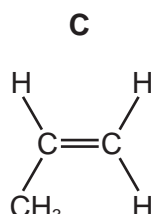
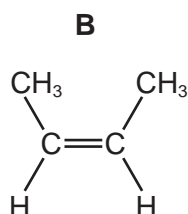
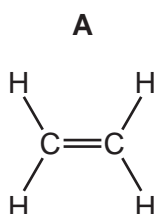
- 1 It burns to form carbon dioxide and water.
- 2 It is a mixture of hydrocarbons.
- 3 It is present in bottled gas.
- 4 The main component of naphtha is methane.

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

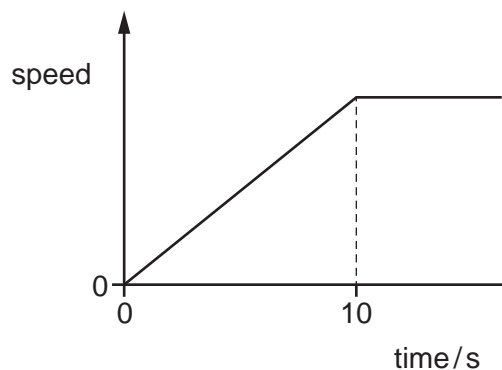
27 The structure of an addition polymer is shown.



Which monomer is used to make this polymer?



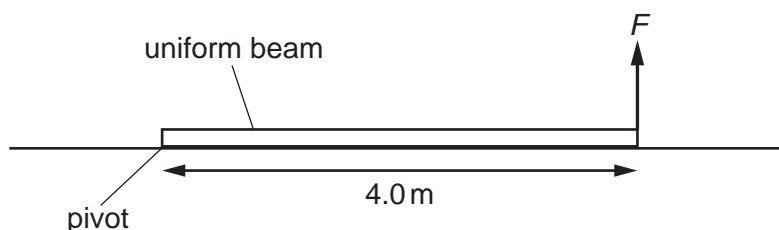
28 The diagram shows the speed–time graph for an object moving in a straight line.



Which statement about the motion of the object is **not** correct?

- A** The acceleration is constant during the first 10 s.
- B** The acceleration steadily increases and then becomes constant.
- C** The rate of change of speed is constant during the first 10 s.
- D** The speed steadily increases and then becomes constant.

- 29 A uniform beam has a mass of 12 kg and a length of 4.0 m. The beam rests on horizontal ground. One end of the beam is now raised from the ground by a vertical force F . The other end of the beam remains in contact with the ground and acts as a pivot.

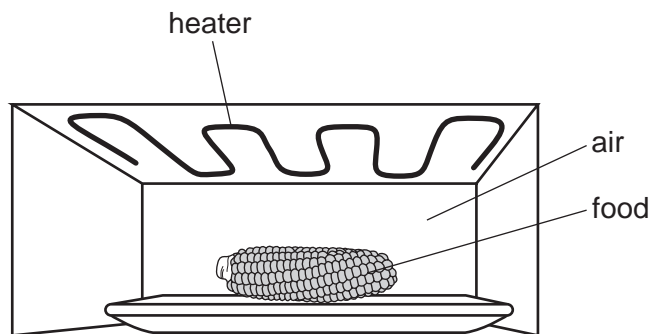


The gravitational field strength g is 10 N/kg.

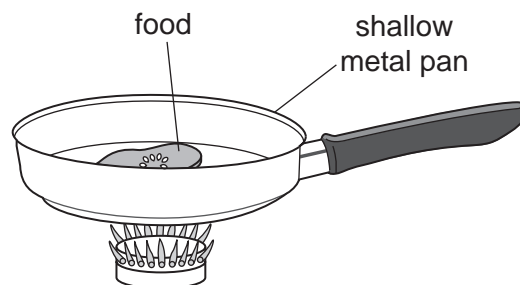
What is the value of F ?

- A 6.0 N B 24 N C 60 N D 240 N
- 30 A solid block of weight 14 N rests on a horizontal table. The pressure on the table due to the block is 70 Pa. What is the area of the surface of the block in contact with the table?
- A 0.20 m² B 5.0 m² C 98 m² D 980 m²
- 31 Which object is mainly responsible for the energy stored in tides in the sea?
- A Mars
B the Earth
C the Moon
D the Sun
- 32 Which statement about gas particles is **not** correct?
- A Increasing the temperature of a gas makes the gas particles move more slowly.
B The gas particles are in constant random motion.
C The pressure of a gas is caused by the collision of gas particles with the container.
D Very small particles suspended in a gas are in constant random motion.

33 Two methods of cooking are grilling under a red-hot heater and frying in a shallow metal pan.



method 1: grilling



method 2: frying

How does thermal energy pass through the air to reach the food in method 1 and how does thermal energy pass through the bottom of the metal pan in method 2?

| | method 1 | method 2 |
|----------|------------|------------|
| A | convection | conduction |
| B | convection | radiation |
| C | radiation | conduction |
| D | radiation | radiation |

34 An object is placed in front of a plane mirror on a wall.

What are the characteristics of the image formed?

- A** same size as object and inverted top to bottom
- B** same size as object and laterally inverted (left to right)
- C** smaller than object and inverted top to bottom
- D** smaller than object and laterally inverted (left to right)

35 A ray of light in air enters glass at an angle of incidence of 34° .

The refractive index of glass is 1.5.

What is the angle of refraction of the ray of light in the glass?

- A** 22°
- B** 24°
- C** 56°
- D** 57°

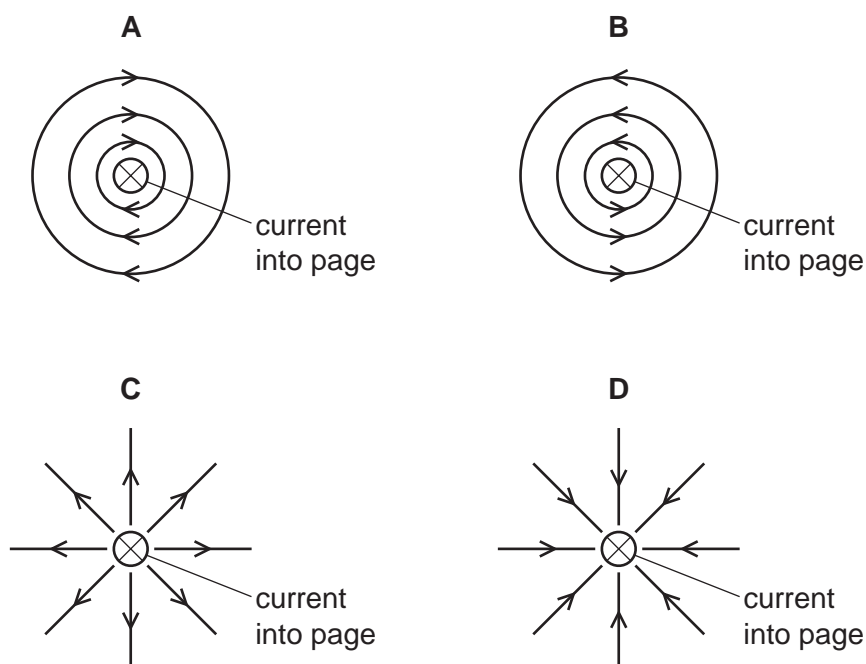
36 Which material is used for the core of an electromagnet?

- A aluminium
- B copper
- C iron
- D steel

37 There is a current-carrying wire perpendicular to the page.

The direction of the current is into the page.

Which diagram shows the pattern and direction of the magnetic field around the wire?



38 When a straight conductor moves through a magnetic field, an electromotive force (e.m.f.) is induced between the ends of the conductor.

Which factor does **not** affect the magnitude of the induced e.m.f.?

- A the length of conductor in the field
- B the resistance of the conductor
- C the speed at which the conductor moves
- D the strength of the magnetic field

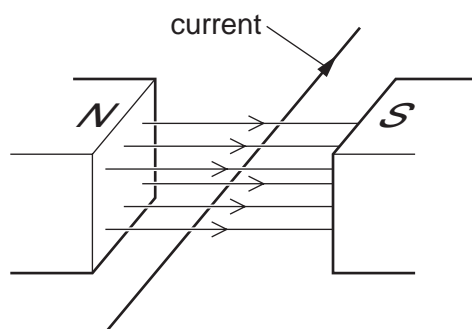
39 Cables transmit electrical power.

The power input to the cables is constant, but the voltage input is increased.

What happens to the power loss from the cables, and what happens to the current in the cables?

| | power loss from cables | current in cables |
|----------|------------------------|-------------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

40 The diagram shows a current-carrying conductor in a magnetic field. The direction of the current is shown.



In which direction is the force on the wire due to the magnetic field?

- A** downwards
- B** to the left
- C** to the right
- D** upwards

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The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|----------------------------|-----------------------------|--|---------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|------------------------------|----------------------------|
| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | 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 | | | | | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | Key atomic number atomic symbol name relative atomic mass | | 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 — | 113 Nh nihonium — | 114 Fl flerovium — | 115 Mc moscovium — | 116 Lv livermorium — | 117 Ts tennessine — | 118 Og oganeson — |

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 |
| 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 — |

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).