Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/21**

Paper 2 Multiple Choice (Extended) **May/June 2022**

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.

IB22 06_0654_21/2RP

1 Which statement about one of the characteristics of living organisms is correct?

A Excretion is the removal of excess substances and toxic materials.

B Movement is the ability to detect and respond to changes in the environment.

C Nutrition is the maintenance of a constant internal environment.

D Respiration is the manufacture of nutrients from raw materials.

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 small molecules are joined together to make a starch molecule?

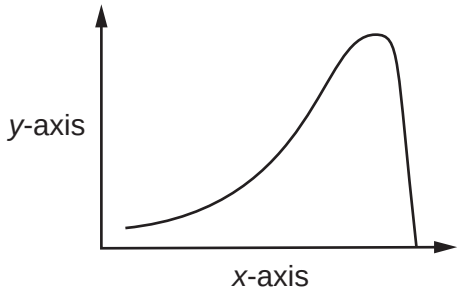
A amino acids

B fatty acids

C glucose

D glycerol

4 The graph shows the effect of increasing temperature on an enzyme-controlled reaction.

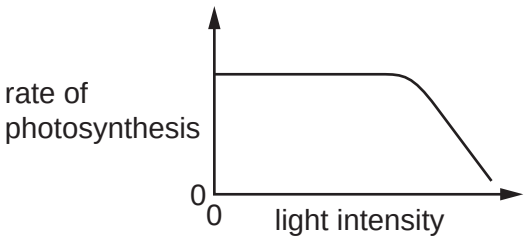


What are the correct labels for the *y*-axis and the *x*-axis?

	y-axis	*x*-axis
A	rate of reaction	temperature
B	rate of reaction	time
C	time	rate of reaction
D	time	temperature

5 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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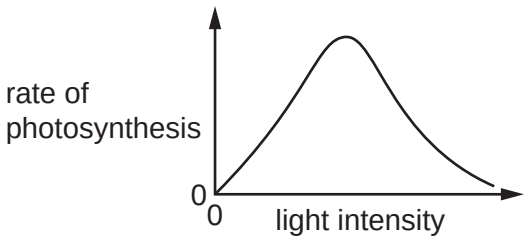

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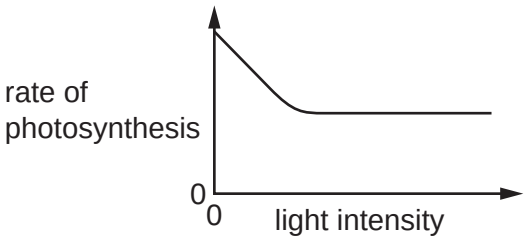
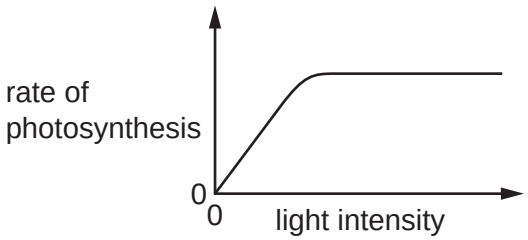
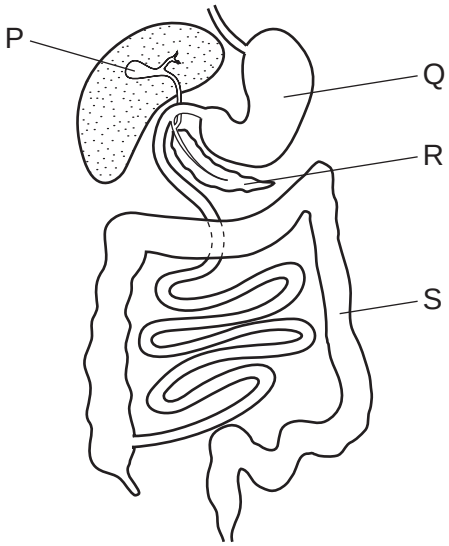


D



6 The diagram shows part of the digestive system.



Which labelled parts produce digestive enzymes, absorb water and store bile?

	produce digestive enzymes	absorb water	store bile
A	P	Q	R
B	Q	R	P
C	R	S	P
D	S	P	R

7 Where does evaporation of water occur during transpiration?

A from the air spaces through the stomata

B from the phloem

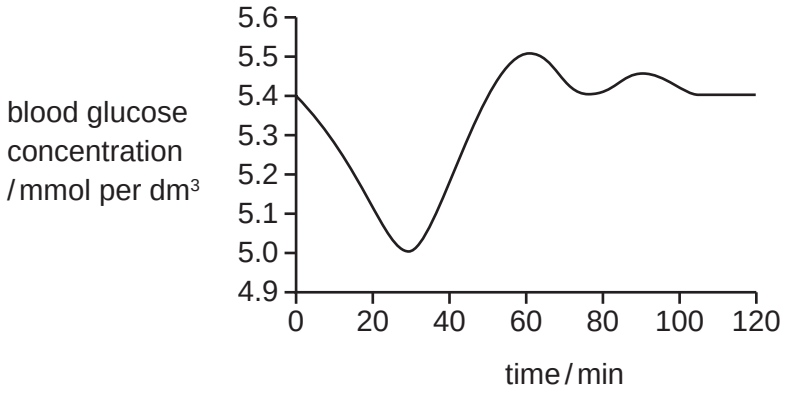
C from the surfaces of mesophyll cells

D from the xylem

8 Which row is correct about the components of tobacco smoke and their effects?

	component	effect
A	carbon monoxide	addictive
B	nicotine	carcinogen
C	smoke particle	addictive
D	tar	carcinogen

9 The graph shows the changes in blood glucose concentration during two hours of exercise.



What causes the change in blood glucose concentration between 30 and 60 min?

1 increased adrenaline release

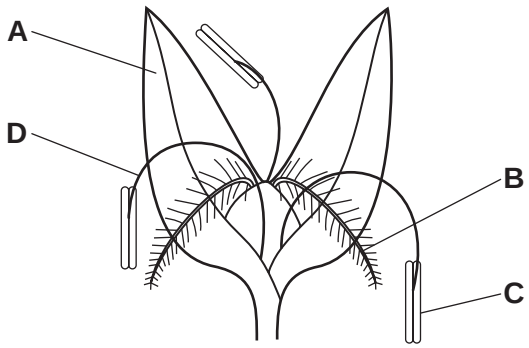
2 increased glucagon release

3 increased insulin release

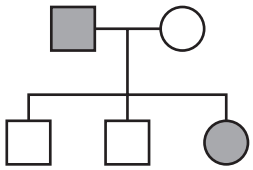
A 1 only **B** 1 and 2 **C** 1 and 3 **D** 2 only

10 The diagram shows a wind-pollinated flower.

Which structure is adapted to receive pollen?



11 Cystic fibrosis is a genetic disease caused by a recessive allele.



key

affected male

unaffected male

affected female

unaffected female

What is the genetic composition of the parents?

	male parent	female parent
A	heterozygous	heterozygous
B	heterozygous	homozygous
C	homozygous	heterozygous
D	homozygous	homozygous

12 Which organisms obtain energy directly from every trophic level?

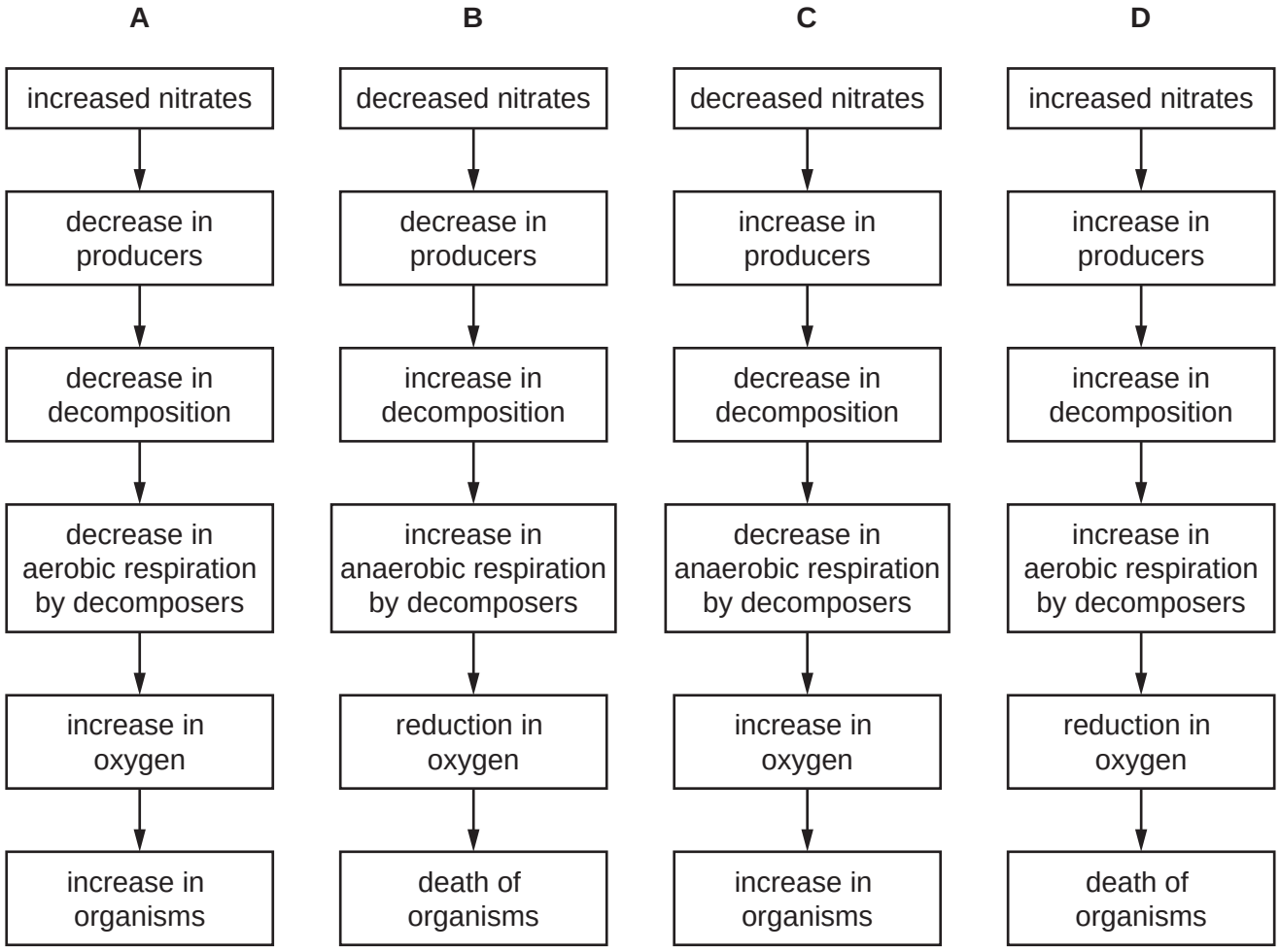
A carnivores

B decomposers

C herbivores

D producers

13 Which flowchart correctly shows the stages of eutrophication?



14 A mixture contains solid P dissolved in liquid Q.

Which process is used to obtain a pure sample of liquid Q from this mixture?

A crystallisation

B distillation

C evaporation

D paper chromatography

15 Three different processes are listed.

1 heating ice to form water

2 lighting a match

3 removing zinc from sodium chloride solution by filtration

Which processes are physical changes?

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

16 Sodium phosphate, Na_3PO_4, contains sodium ions, Na^+.

Aluminium sulfate, $Al_2(SO_4)_3$, contains sulfate ions, SO_4^{2-}.

What is the formula of aluminium phosphate?

A $AlPO_4$ **B** $Al(PO_4)_2$ **C** $Al_2(PO_4)_3$ **D** $Al_3(PO_4)_2$

17 Aqueous copper(II) sulfate is electrolysed using inert electrodes.

Which statement about this electrolysis is correct?

A Copper ions are attracted to the cathode.

B Electrons move from the cathode to the anode.

C Electrolyte ions are oxidised at the cathode.

D Sulfate ions are reduced to sulfur dioxide.

18 Sodium reacts with chlorine to form sodium chloride.

The equation is shown.

$$2Na + Cl_2 \rightarrow 2NaCl$$

During the reaction, sodium atoms .....1..... electrons and chlorine molecules act as .....2..... .

Which row completes gaps 1 and 2?

	1	2
A	gain	an oxidising agent
B	gain	a reducing agent
C	lose	an oxidising agent
D	lose	a reducing agent

19 Which row shows the flame test colours for lithium and sodium?

	lithium	sodium
A	lilac	blue-green
B	lilac	yellow
C	red	blue-green
D	red	yellow

20 A gas is used in welding metals together at high temperatures.

The gas is used to provide an inert atmosphere.

What is the gas?

A argon

B carbon dioxide

C fluorine

D oxygen

21 Which row does **not** link a general physical property to the type of element?

	type of element	general physical property
A	metal	malleable
B	metal	thermal conductor
C	non-metal	electrical conductor
D	non-metal	low melting point

22 Iron is extracted from hematite in the blast furnace.

Why is limestone added to the furnace?

A It decreases the melting point of the mixture.

B It increases the temperature inside the furnace.

C It produces calcium oxide which removes acidic impurities.

D It produces carbon dioxide which reduces the hematite.

23 A piece of iron is coated with a layer of zinc.

Which statement explains why zinc prevents iron from rusting, even when the layer of zinc is damaged?

A Iron is less reactive than zinc and zinc atoms lose electrons less easily than iron atoms.

B Iron is less reactive than zinc and zinc atoms lose electrons more easily than iron atoms.

C Iron is more reactive than zinc and zinc atoms lose electrons less easily than iron atoms.

D Iron is more reactive than zinc and zinc atoms lose electrons more easily than iron atoms.

24 Sulfuric acid is produced in the Contact process.

Which substances react together in a reversible reaction in the Contact process?

A S and O_2

B SO_2 and O_2

C H_2SO_4 and SO_3

D $H_2S_2O_7$ and H_2O

25 Why do farmers add limestone to soil?

A It acts as a fertiliser.

B It adds nitrogen to the soil.

C It decreases the pH of the soil.

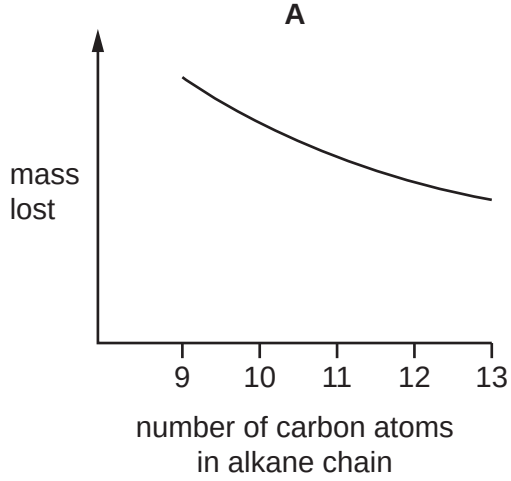
D It increases the pH of the soil.

26 The same mass of five different alkanes are left to evaporate under identical conditions.

The mass lost by each alkane in one day is measured.

Which graph shows the mass lost against the number of carbon atoms in each alkane chain?

A



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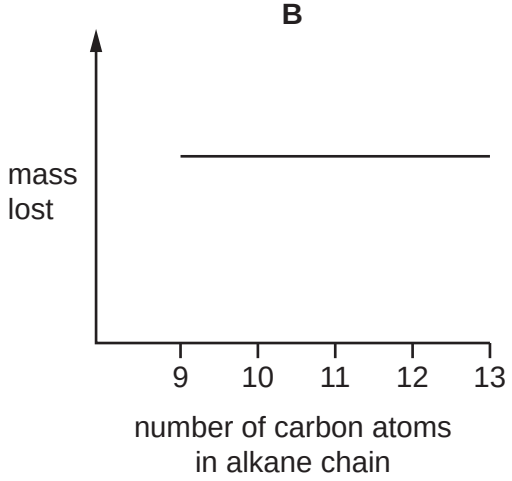

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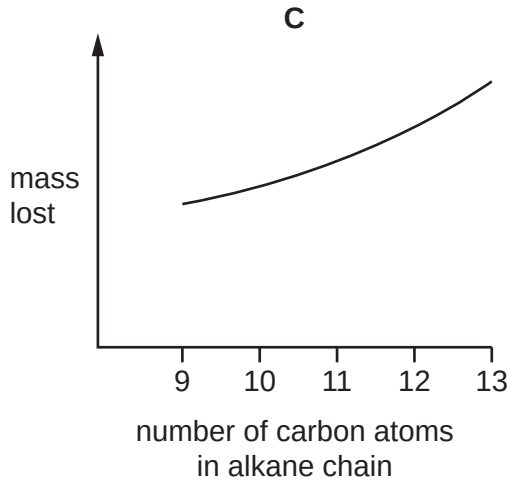

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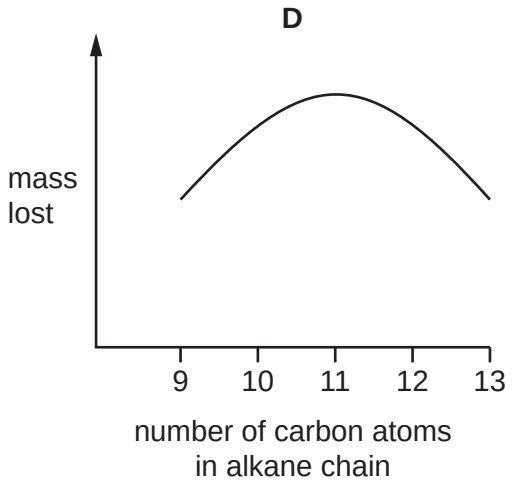
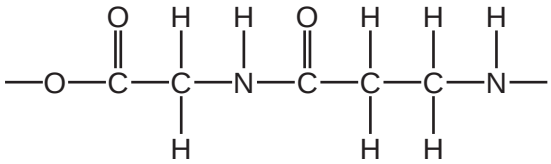


27 A section of a polymer made from two different monomers is shown.



Which monomers are used to make this polymer?

A $HO_2CCH_2CO_2H$ and $H_2NCH_2NH_2$

B $HO_2CCH_2CO_2H$ and $H_2NCH_2CH_2NH_2$

C $HO_2CCH_2CH_2CO_2H$ and $H_2NCH_2NH_2$

D $HO_2CCH_2NH_2$ and $HO_2CCH_2CH_2NH_2$

28 What is the difference between speed and velocity?

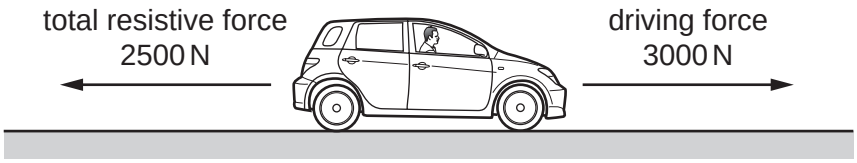
A Speed has magnitude and direction; velocity has magnitude only.

B Speed has magnitude and direction; velocity has direction only.

C Speed has magnitude only; velocity has magnitude and direction.

D Speed has magnitude only; velocity has direction only.

29 The diagram shows a car of mass 1000 kg travelling along a straight, horizontal road. The driving force from the car's engine is 3000 N. The total resistive force acting on the car is 2500 N.



What is the acceleration of the car along the road?

A $0.50\,m/s^2$ **B** $2.0\,m/s^2$ **C** $3.0\,m/s^2$ **D** $5.5\,m/s^2$

30 An object moving at speed v has kinetic energy E.

What is the speed of the object when its kinetic energy is $4.0E$?

A $0.25v$ **B** $2.0v$ **C** $4.0v$ **D** $16v$

31 A passenger lift (elevator) has a total weight of 4000 N, including the people inside it. The power output of the lift motor is 800 W.

How much time does it take for the lift to rise 12 m vertically?

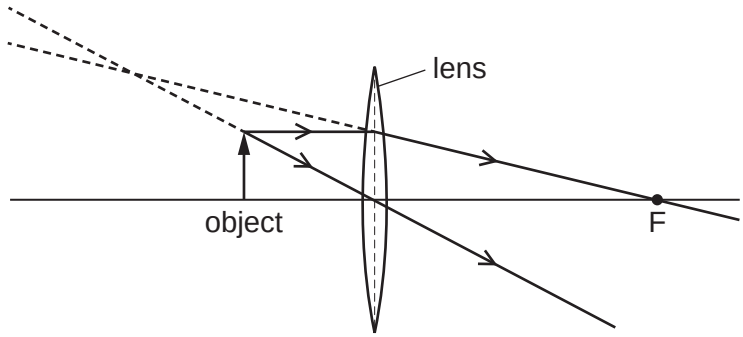
A 2.4 s **B** 6.0 s **C** 24 s **D** 60 s

32 What happens to the temperature of a substance as it is melting and as it is boiling?

	melting	boiling
A	decreases	increases
B	decreases	no change
C	increases	increases
D	no change	no change

33 The diagram shows how a thin, converging lens forms an image of an object.

One principal focus of the lens is labelled F.



How is the image described?

A enlarged, upright and real

B enlarged, upright and virtual

C diminished, inverted and real

D diminished, inverted and virtual

34 Which statement about sound is correct?

A An echo is produced by refraction of sound waves.

B The amplitude of a sound wave affects the pitch of a sound.

C The approximate range of audible frequencies for a human is 20 Hz–20 kHz.

D Sound waves travel more quickly in a vacuum than in air.

35 A plastic rod is rubbed with a cloth and the rod becomes positively charged.

Why does this happen?

A Electrons move from the cloth to the rod.

B Electrons move from the rod to the cloth.

C Protons move from the cloth to the rod.

D Protons move from the rod to the cloth.

36 The resistance of a wire is 20 Ω. A second wire is made of the same material. The second wire is four times as long and has half the cross-sectional area of the first wire.

What is the resistance of the second wire?

A 10 Ω **B** 40 Ω **C** 80 Ω **D** 160 Ω

37 Which row shows how lamps are connected in a lighting circuit in a house and gives an advantage of connecting them in this way?

	how lamps are connected	advantage of connecting them in this way
A	in parallel	they can be switched separately
B	in parallel	they share the voltage
C	in series	they can be switched separately
D	in series	they share the voltage

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

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

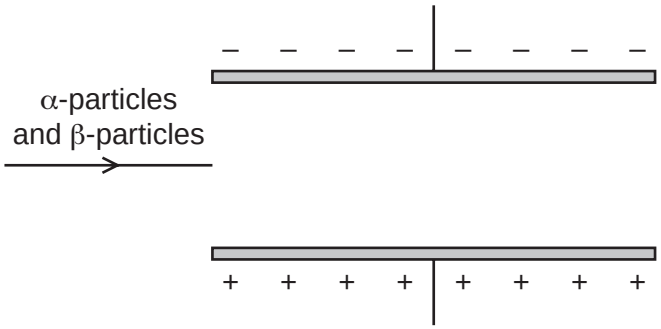
	current	efficiency
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

39 An atom of beryllium is represented by $^{9}_{4}\text{Be}$.

How many neutrons are in the nucleus of this type of beryllium atom?

A 4 **B** 5 **C** 9 **D** 13

40 A beam of α-particles and β-particles passes into an electric field between two horizontal parallel plates in a vacuum.



Which row shows what happens to the beam?

	α-particles	β-particles
A	deflected downwards	deflected upwards
B	deflected downwards	not deflected
C	deflected upwards	deflected downwards
D	deflected upwards	not deflected

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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.).