



# Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/02

Paper 2 Multiple Choice (Extended)

For examination from 2025

SPECIMEN PAPER

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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall =  $9.8 \text{ m/s}^2$ ).

## 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.

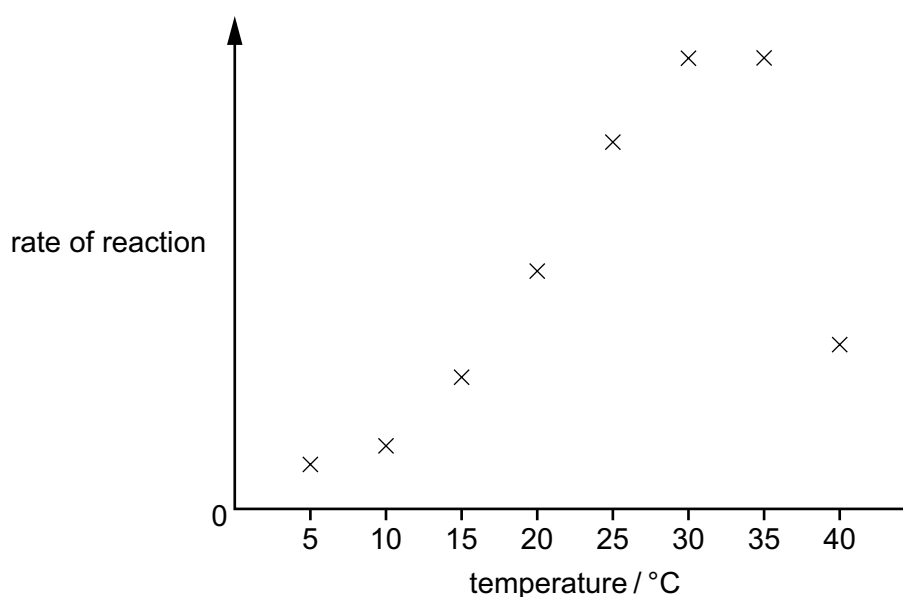
This document has **16** pages.



1 Which row shows active transport?

	particles move from high concentration to low concentration	particles move from low concentration to high concentration	requires energy
<b>A</b>	x	✓	x
<b>B</b>	✓	x	x
<b>C</b>	x	✓	✓
<b>D</b>	✓	x	✓

2 An experiment is carried out to determine the rate of an enzyme-catalysed reaction at eight different temperatures.



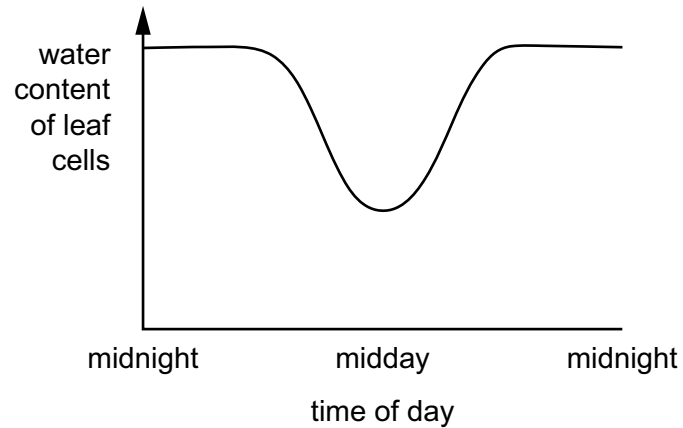
What conclusion can be drawn from the data?

- A** The enzyme is **not** active at 5°C.
- B** The enzyme has many effective collisions with the substrate at 25°C.
- C** The enzyme has an optimum temperature of 30°C.
- D** The enzyme is completely denatured at 40°C.

3 Which disease can be caused by a lack of vitamin C?

- A AIDS
- B coronary heart disease
- C rickets
- D scurvy

4 The graph shows the water content of leaf cells in a plant.

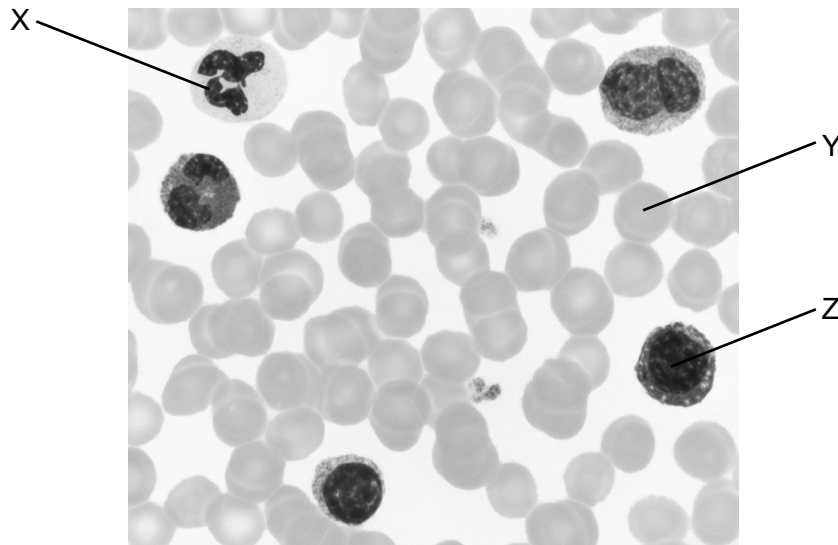


Which row describes the most likely conditions that exists at midday?

	transpiration rate	temperature	humidity
<b>A</b>	low	low	high
<b>B</b>	low	high	low
<b>C</b>	high	high	low
<b>D</b>	high	low	high

5 The photomicrograph shows a blood sample.

Three components are labelled.



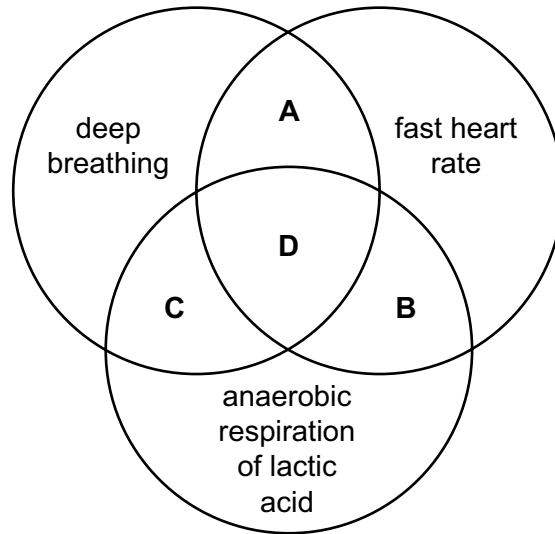
Which row shows the correct name and function for each component?

	X		Y		Z	
	component	function	component	function	component	function
<b>A</b>	lymphocyte	antibody production	red blood cell	oxygen transport	phagocyte	engulfing pathogens
<b>B</b>	lymphocyte	antibody production	platelet	blood clotting	red blood cell	oxygen transport
<b>C</b>	phagocyte	engulfing pathogens	red blood cell	oxygen transport	lymphocyte	antibody production
<b>D</b>	phagocyte	engulfing pathogens	platelet	oxygen transport	red blood cell	blood clotting

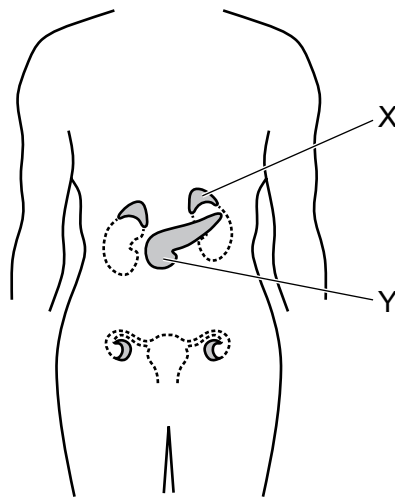
6 Which statement is correct?

- A** Each pathogen has its own antigens, which have specific shapes.
- B** Immunity against pathogens is provided by antibiotics.
- C** Memory cells give short-term immunity.
- D** Vaccines contain antibodies to stimulate an active immune response.

7 Which processes are used to remove an oxygen debt after exercise?



8 The diagram shows the position of different endocrine glands in the human body.



Which row shows the correct label for each endocrine gland and the hormone that the gland secretes?

	X		Y	
	gland	hormone	gland	hormone
<b>A</b>	adrenal	adrenaline	ovary	insulin
<b>B</b>	adrenal	adrenaline	pancreas	insulin
<b>C</b>	pancreas	insulin	adrenal	adrenaline
<b>D</b>	ovary	insulin	pancreas	adrenaline

9 Why should antibiotics only be used when essential?

- A because they encourage the development of resistant viruses
- B because they modify the chemical reactions taking place in the body
- C to limit the development of human resistance
- D to limit the development of resistant bacteria

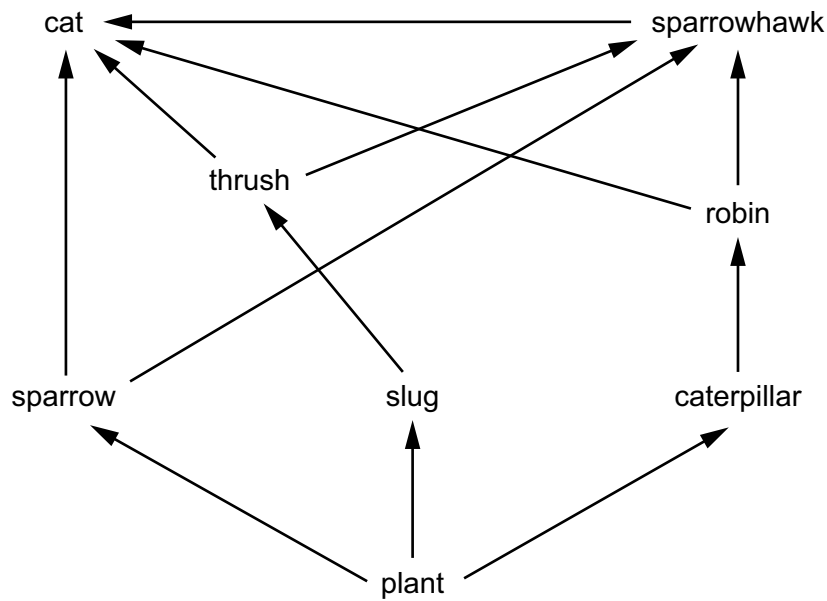
10 Which row correctly shows the chromosomes present and the type of nucleus in some human sperm cells?

	chromosomes	nucleus
<b>A</b>	22 + X	haploid
<b>B</b>	22 + Y	diploid
<b>C</b>	44 + XX	haploid
<b>D</b>	44 + XY	diploid

11 What is the definition of a gene?

- A all the DNA in a cell that controls metabolic reactions
- B a length of DNA that codes for a protein
- C the nucleus and its chromosomes
- D all the DNA in a cell that determines the inheritance of sex

12 The diagram shows a food web.



Which statement is correct?

- A The cat is a primary, secondary and tertiary consumer.
- B The cat is a secondary, tertiary and quaternary consumer.
- C The sparrowhawk is a primary, secondary and tertiary consumer.
- D The sparrowhawk is a secondary, tertiary and quaternary consumer.

13 What is meant by the term biodiversity?

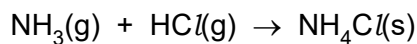
- A an increase in the number of different species that live in an area
- B how organisms and their environment interact
- C the number of different animals that live in an area
- D the number of different species that live in an area

14 Which two elements react together to form an ionic compound?

element	electronic structure
R	2,4
T	2,8
X	2,8,1
Z	2,8,7

- A R and T
- B T and X
- C X and Z
- D Z and R

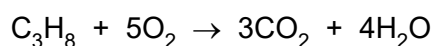
- 15 The equation for the reaction of ammonia,  $\text{NH}_3$ , and hydrogen chloride,  $\text{HCl}$ , is shown.



When 1.7 g of ammonia is used, 5.35 g of ammonium chloride,  $\text{NH}_4\text{Cl}$ , is produced.

What is the mass of hydrogen chloride that reacts with 5.1 g of ammonia?

- A 3.65 g  
 B 10.95 g  
 C 7.05 g  
 D 21.15 g
- 16 The equation for the complete combustion of propane,  $\text{C}_3\text{H}_8$ , is shown.



4.4 g of propane is burned completely in oxygen.

Assume the molar gas volume to be  $24 \text{ dm}^3$ .

Which row shows the volume of oxygen used and the volume of carbon dioxide produced in the reaction?

	volume of oxygen/ $\text{dm}^3$	volume of carbon dioxide/ $\text{dm}^3$
<b>A</b>	2.4	2.4
<b>B</b>	2.4	7.2
<b>C</b>	12	2.4
<b>D</b>	12	7.2

- 17 Which statements describe advantages of using hydrogen–oxygen fuel cells in vehicles instead of using gasoline (petrol) engines?

- 1 Fewer particulates are produced.
- 2 More greenhouse gases are formed.
- 3 More acid rain is formed.
- 4 Fewer respiratory problems occur.

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



18 During a reaction, the temperature of the reaction mixture decreases.

Which statement about the reaction is correct?

- A It is endothermic and thermal energy is absorbed from the surroundings.
- B It is endothermic and thermal energy is transferred to the surroundings.
- C It is exothermic and thermal energy is absorbed from the surroundings.
- D It is exothermic and thermal energy is transferred to the surroundings.

19 Which row describes and explains what happens to the rate of a reaction when a change in the reaction conditions is made?

	change in the reaction conditions	rate of reaction	explanation
<b>A</b>	increase temperature	increases	particles are closer together
<b>B</b>	decrease aqueous reactant concentration	decreases	particles collide more frequently
<b>C</b>	add a catalyst	increases	more particles have the activation energy
<b>D</b>	use powdered reactant instead of lumps	decreases	there is a greater surface area of the solid

20 Which statement defines reduction?

- A It is the gain of electrons and a decrease in oxidation number.
- B It is the gain of electrons and an increase in oxidation number.
- C It is the loss of electrons and a decrease in oxidation number.
- D It is the loss of electrons and an increase in oxidation number.

21 Which statement explains why elements in the same group of the Periodic Table have similar chemical properties?

- A They have different numbers of protons.
- B They have the same number of neutrons.
- C They have the same number of electron shells.
- D They have the same number of outer-shell electrons.

22 Aqueous chlorine is added to aqueous sodium bromide.

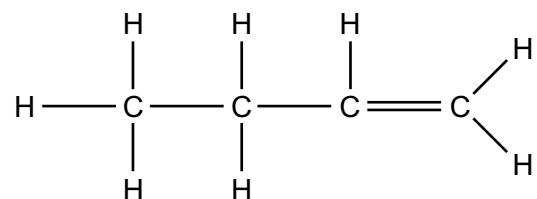
Which statement describes and explains the final colour of the reaction mixture?

- A It is pale yellow-green because chlorine is less reactive than bromine.
- B It is pale yellow-green because chlorine is more reactive than bromine.
- C It is red-brown because chlorine is less reactive than bromine.
- D It is red-brown because chlorine is more reactive than bromine.

23 Which statement describes and explains the sacrificial protection of iron?

- A Copper is used because it has a lower tendency to lose electrons than iron.
- B Copper is used because it has a greater tendency to lose electrons than iron.
- C Zinc is used because it has a lower tendency to lose electrons than iron.
- D Zinc is used because it has a greater tendency to lose electrons than iron.

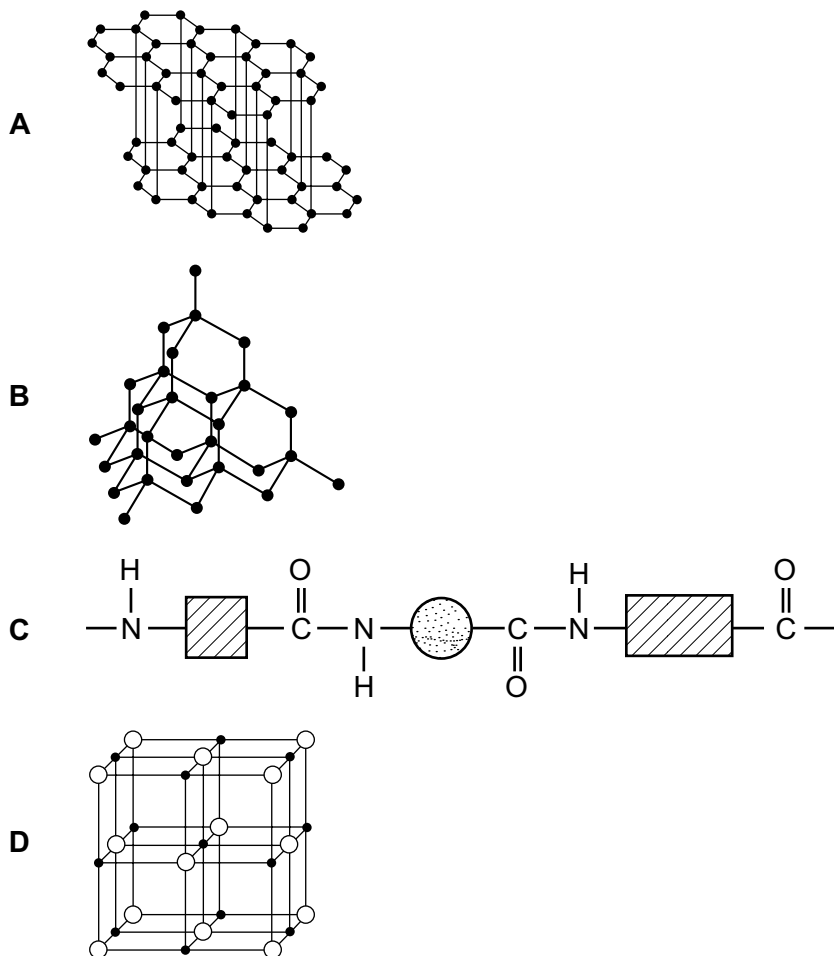
24 The structure of a molecule is shown.



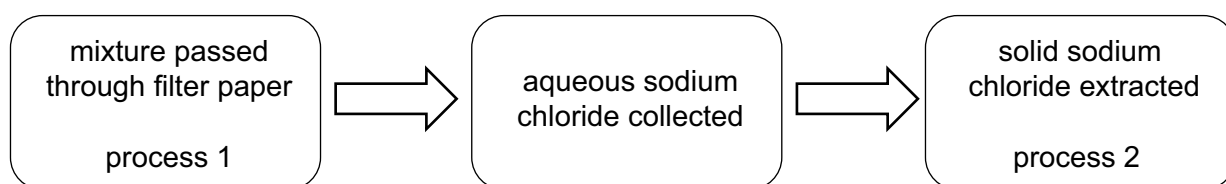
What is the name of this molecule?

- A but-1-ene
- B but-2-ene
- C prop-1-ene
- D prop-2-ene

25 Which structure represents a polymer?



26 A mixture contains aqueous sodium chloride and an insoluble salt. Two processes are used to extract solid sodium chloride from the mixture. The diagram shows the processes used.



Which row describes aqueous sodium chloride in process 1 and the name of process 2?

	aqueous sodium chloride	process 2
<b>A</b>	residue	evaporation
<b>B</b>	residue	filtration
<b>C</b>	filtrate	evaporation
<b>D</b>	filtrate	filtration

27 Aqueous potassium iodide is acidified with dilute nitric acid.

What is observed when aqueous silver nitrate is added to this mixture?

- A white precipitate
- B white solution
- C yellow precipitate
- D yellow solution

28 Which list contains only vector quantities?

- A acceleration, energy, time
- B force, mass, temperature
- C gravitational field strength, velocity, weight
- D speed, temperature, time

29 A stone is released from rest and falls. It hits the floor 0.50 s later.

What is the speed of the stone just before it reaches the floor?

- A 2.5 m/s
- B 4.9 m/s
- C 9.8 m/s
- D 19.6 m/s

30 A solid block has a mass of 10 g and a volume of  $5.0 \text{ cm}^3$ .

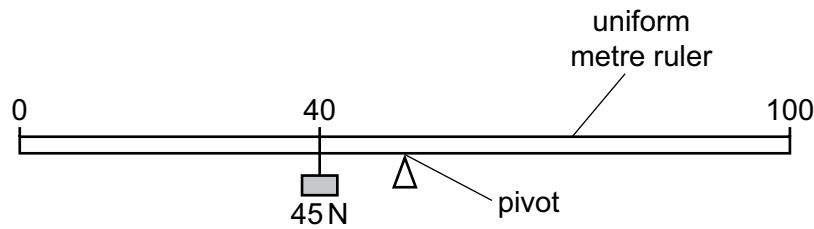
The block is lowered into a liquid of density  $1.5 \text{ g/cm}^3$ .

What is the density of the block and does it float or sink in the liquid?

	<u>density of block</u> $\text{g/cm}^3$	floats or sinks
<b>A</b>	0.50	floats
<b>B</b>	0.50	sinks
<b>C</b>	2.0	floats
<b>D</b>	2.0	sinks

31 A uniform metre ruler has a pivot at its centre.

A 45 N load is suspended at the 40 cm mark. A 90 N load is suspended so that the ruler is in equilibrium.



Where is the 90 N load suspended?

- A at the 55 cm mark
- B at the 60 cm mark
- C at the 70 cm mark
- D at the 80 cm mark

32 A cylinder contains a gas.

The volume of the cylinder is slowly decreased. The temperature of the gas does **not** change.

What happens to the pressure of the gas and what happens to the average speed of the gas particles?

	pressure of gas	average speed of gas particles
A	increases	decreases
B	increases	no change
C	no change	decreases
D	no change	no change

33 A seismic S-wave (secondary) passes through the ground.

What is the nature of this wave and what is the direction of vibration of the ground as the S-wave passes through it?

	nature of S-wave	direction of vibration
A	longitudinal	at right angles to the direction of propagation
B	longitudinal	parallel to the direction of propagation
C	transverse	at right angles to the direction of propagation
D	transverse	parallel to the direction of propagation

34 White light is dispersed and produces a visible spectrum of seven colours.

Which pair contains two of these colours in order of increasing frequency (lower frequency first)?

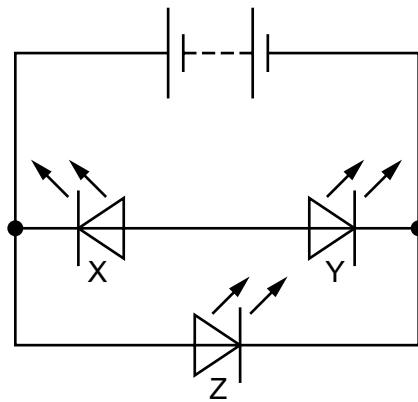
- A green, red
- B green, violet
- C violet, yellow
- D yellow, red

35 A 2.0 kW heater is connected to a mains power supply.  
The cost of electricity is \$0.30 per kWh.

What is the total cost of using the heater for 15 minutes?

- A \$0.04
- B \$0.15
- C \$2.40
- D \$9.00

36 The diagram shows a circuit containing three light-emitting diodes (LEDs), X, Y and Z.



Which of the LEDs are lit?

- A X and Y
- B Y and Z
- C X only
- D Z only

- 37 The outer casing of a mains electrical appliance is **not** earthed. The appliance is working and is safe to use.

Which statement about the appliance must be correct?

- A It does **not** have a live connection.
- B It has two fuses.
- C It has two switches.
- D It is double-insulated.

- 38 Fission and fusion are two types of nuclear reaction.

Which row describes each reaction and states which reaction is used in nuclear power stations?

	fission	fusion	reaction in nuclear power stations
<b>A</b>	joining of nuclei	splitting of nuclei	fission
<b>B</b>	joining of nuclei	splitting of nuclei	fusion
<b>C</b>	splitting of nuclei	joining of nuclei	fission
<b>D</b>	splitting of nuclei	joining of nuclei	fusion

- 39 A satellite orbits the Earth with an orbital speed of 3.0 km/s and an orbital period of  $8.8 \times 10^4$  s.

What is the radius of the orbit of the satellite?

- A  $4.2 \times 10^4$  km
- B  $8.4 \times 10^4$  km
- C  $8.3 \times 10^5$  km
- D  $1.7 \times 10^6$  km

- 40 Which sequence is part of the life cycle of a very large mass star?

- A red giant  $\rightarrow$  planetary nebula + neutron star
- B red giant  $\rightarrow$  planetary nebula + black hole
- C red supergiant  $\rightarrow$  supernova  $\rightarrow$  neutron star
- D red supergiant  $\rightarrow$  supernova  $\rightarrow$  black hole

## The Periodic Table of Elements

		Group																																	
I	II	III						IV	V	VI	VII	VIII																							
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>Key</b>            atomic number            atomic symbol            name            relative atomic mass         </div>										2 <b>He</b> helium 4																							
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24	13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40	19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84										
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131	55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	113 <b>Nh</b> nihonium —	114 <b>Fl</b> flerovium —	115 <b>Mc</b> moscovium —	116 <b>Lv</b> livermorium —	117 <b>Ts</b> tennessine —	118 <b>Og</b> oganesson —																		

57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium —	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
89 <b>Ac</b> actinium —	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium —	94 <b>Pu</b> plutonium —	95 <b>Am</b> americium —	96 <b>Cm</b> curium —	97 <b>Bk</b> berkelium —	98 <b>Cf</b> californium —	99 <b>Es</b> einsteinium —	100 <b>Fm</b> fermium —	101 <b>Md</b> mendelevium —	102 <b>No</b> nobelium —	103 <b>Lr</b> lawrencium —

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

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