



**Anglo-Chinese School
(Barker Road)**

END-OF-YEAR EXAMINATION 2023

SECONDARY TWO EXPRESS

SCIENCE

Total Duration for All Sections: 2 hours

SECTION A

INSTRUCTIONS TO CANDIDATES:

The use of an approved scientific calculator is expected, where appropriate.
Do not use glue or correction fluid.

INFORMATION FOR CANDIDATES:

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 OTAS answer sheet.

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 12 of this booklets.

*This question paper consists of **12** printed pages*

SECTION A (30 marks)

Select the best answer and shade it in the OTAS provided.

- A1** An experiment was carried out to find out if certain objects can float on water.

Which data collected is a qualitative data?

- A** the depth that the object sank in the water
- B** the mass of the objects
- C** the temperature of the water
- D** the texture of the objects

- A2** One tablespoon full of salt was placed into a glass of water. No stirring took place.

After five minutes, some salt was seen at the bottom of the glass.

Which factor **does not** affect the solubility of the salt?

- A** size of solute particles
- B** temperature of solvent
- C** type of the solute
- D** type of the solvent

- A3** An experiment is conducted to investigate the hardness of four different metals.

If metal M scratches metal N, a tick (✓) is placed in the corresponding box. Otherwise, a cross (×) is put in the box.

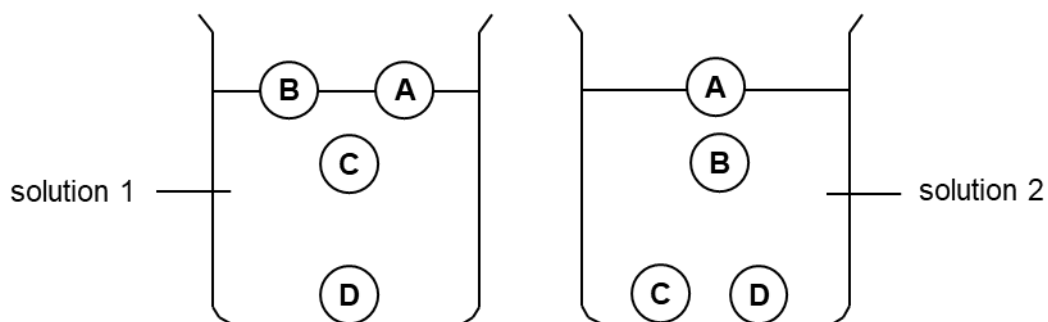
M \ N	brass	gold	steel	titanium
brass		✓	×	×
gold	×		×	×
steel	✓	✓		×
titanium	✓	✓	✓	

Which of the following correctly ranks the metals in **increasing** hardness?

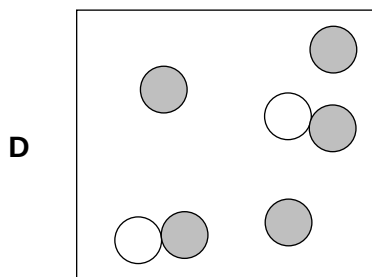
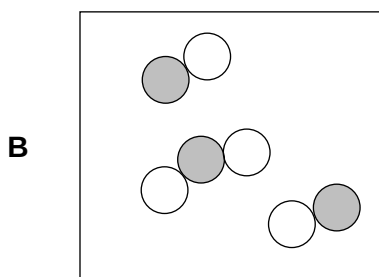
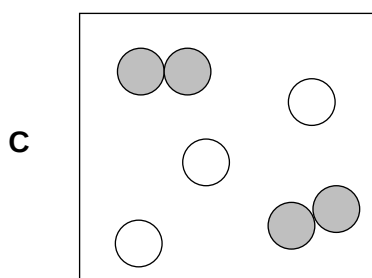
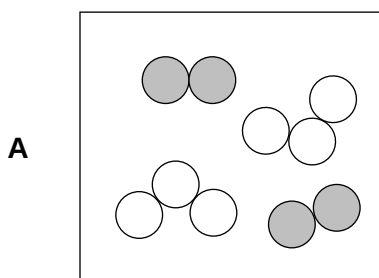
- A** gold, brass, steel, titanium
- B** gold, steel, brass, titanium
- C** titanium, brass, steel, gold
- D** titanium, steel, brass, gold

- A4** Four objects, **A**, **B**, **C** and **D**, of the same size, were placed in two beakers containing solutions of different densities.

Which object has the highest density?

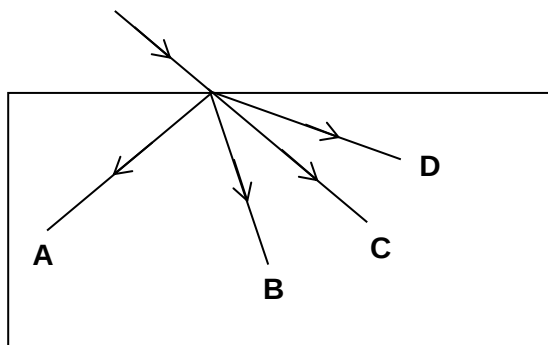


- A5** Which diagram represents a mixture of two compounds?

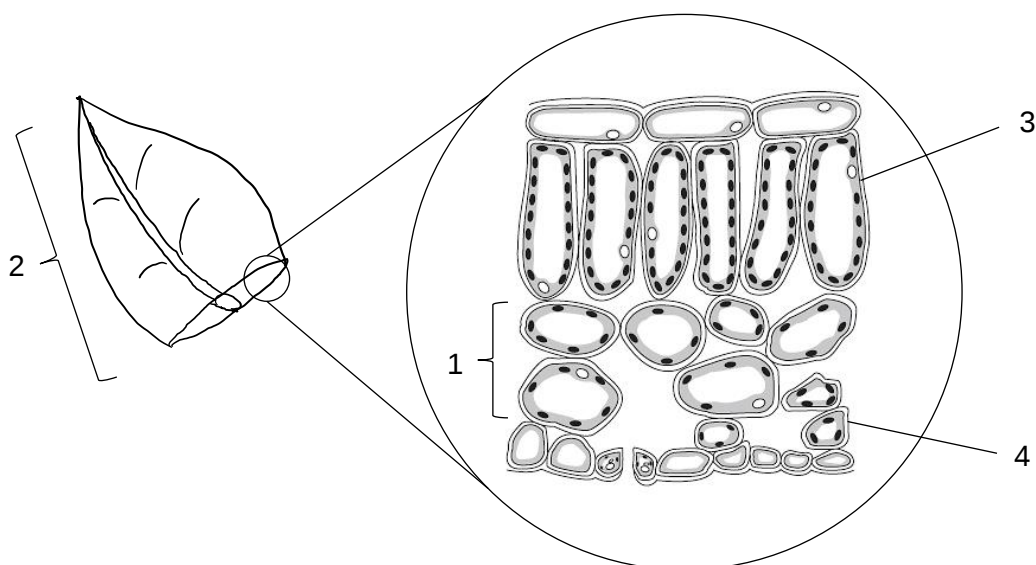


A6 A ray of light is shone from air, into one side of a rectangular glass block.

Which arrow illustrates the correct light ray that enters the glass block?



A7 The diagram shows the structure of a leaf.



Which part of the diagram identifies a cell, a tissue and an organ?

	cell	tissue	organ
A	1	4	3
B	2	3	1
C	3	2	4
D	4	1	2

- A8** When observed under the microscope, pollen grains suspended in a liquid are seen to be in continuous random motion.

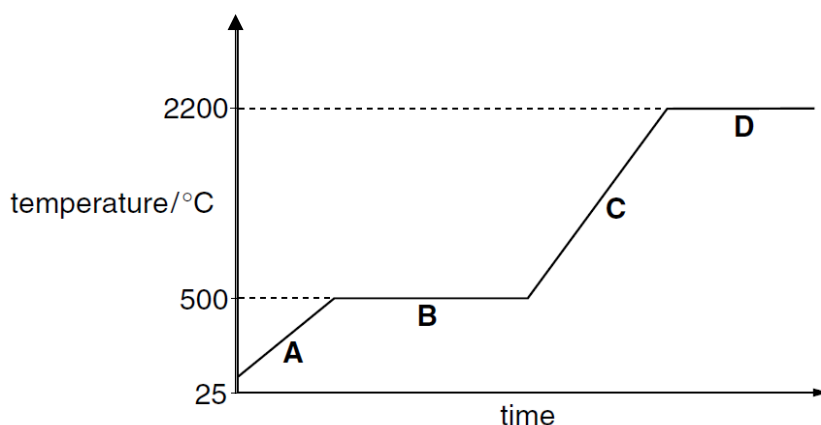
This is due to _____.

- A** the movement of the wind
- B** the particles of the liquid colliding with the pollen grains
- C** the pollen grains absorbing the liquid particles
- D** the pollen grains being bombarded by dust particles in the air

- A9** A substance is heated until it boils.

The graph shows how the temperature of the substance changes with time.

Which part of the graph shows the substance in the solid state?



- A10** Which is an example of a structural adaptation?

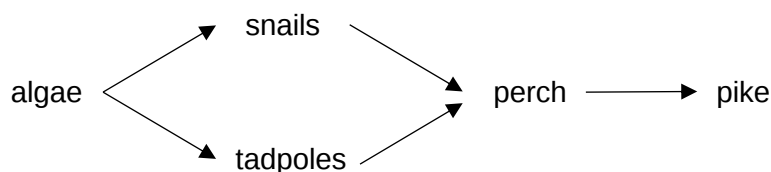
- A** Bears hibernating in winter.
- B** Eagles catching prey using sharp claws.
- C** Hamsters breeding only in the spring.
- D** Monkeys staying in groups for protection from predators.

- A11** When bees consume nectar produced by flowers, they help to pollinate the flower.

What relationship do bees and flowers have between them?

- A** mutualistic relationship
- B** no definite relationship
- C** parasitic relationship
- D** predator-prey relationship

A12 The diagram shows a food web in a lake.



All the perch are killed by water pollution.

How will this affect the food web immediately?

- A** The population of algae will increase.
- B** The population of pike will increase.
- C** The population of snails will increase.
- D** The population of tadpoles will decrease.

A13 To make gold medals, medals are coated with gold metal through the process of electrolysis.

Which effect of electricity is observed during electrolysis?

- A** chemical
- B** heating
- C** lighting
- D** magnetic

A14 Which statement correctly describes the need for digestion?

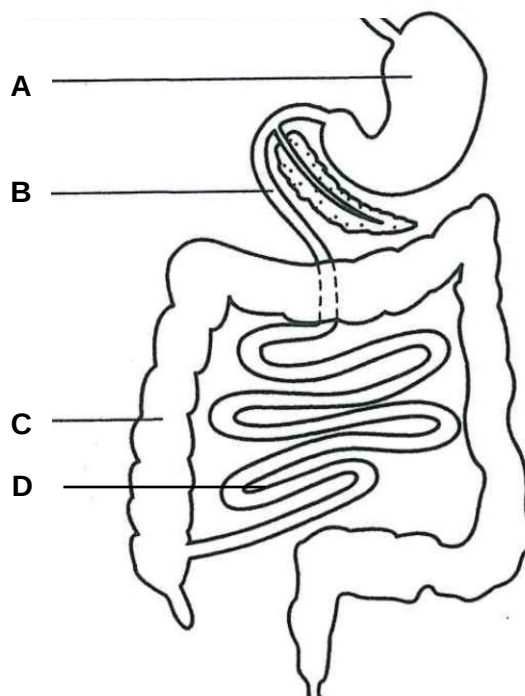
- A** It breaks down food into smaller particles which can be absorbed by the body.
- B** It makes new molecules to build up the body's different organ systems.
- C** It releases energy for the body to use in growth and repair.
- D** It transports food particles to all parts of the body via the alimentary canal.

A15 Which of the following is **not true** for digestion in the human body?

	nutrient	end-products of digestion
A	fats	fatty acids
B	fats	fatty acids and glycerol
C	proteins	amino acids
D	starch	glucose

A16 The diagram below shows part of the human alimentary canal.

In which region does digestion **not** take place?



A17 Which statement is **incorrect** about the use for the end products of digestion?

- A** Amino acids are used to repair damaged tissues.
- B** Carbon dioxide is used to form amino acids.
- C** Glucose is used to provide energy during respiration.
- D** Fats are used to keep our bodies warm.

A18 Which is **not** a good hygiene practice?

- A** Always wash your hands properly before and after handling raw food.
- B** Cook your meat thoroughly before consuming.
- C** Cover raw meat with plastic wrap before putting it into the refrigerator.
- D** Use the same knife when handling raw meat and vegetables.

A19 Which is **not** a benefit of bacteria in the human digestive system?

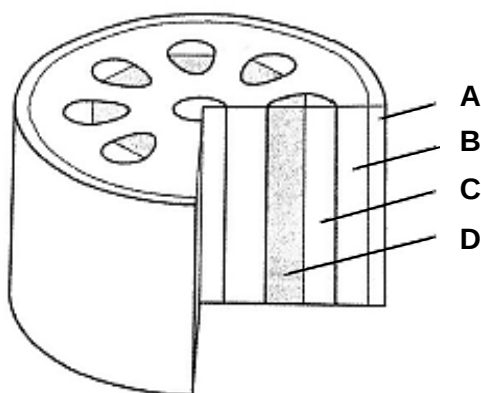
- A** Bacteria are responsible for producing digestive enzymes.
- B** Bacteria can cause infections and diseases.
- C** Bacteria helps absorb nutrients from the small intestine.
- D** Bacteria helps us to fight off certain diseases.

A20 Which component of the blood is responsible for fighting infections?

- A** plasma
- B** platelets
- C** red blood cells
- D** white blood cells

A21 The diagram shows a section of a stem.

Which tissue is responsible for the transport of sugars?



A22 Which is true about diffusion?

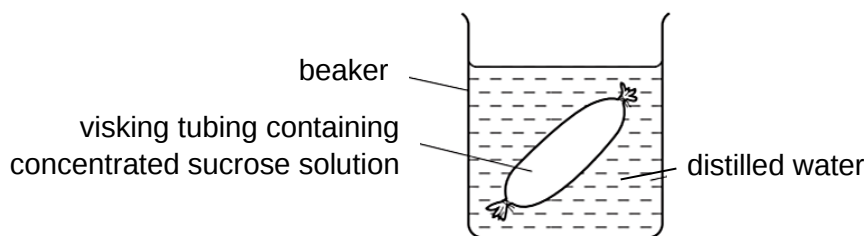
- A** Diffusion only happens in liquid and not in gas.
- B** Diffusion requires a partially permeable membrane.
- C** Movement of particles during diffusion is random.
- D** Particles move from a region of lower concentration to a region of higher concentration.

A23 Which process allows oxygen and carbon dioxide to move between cells in plants?

- A** breathing
- B** diffusion
- C** photosynthesis
- D** respiration

A24 Visking tubing is a type of partially permeable membrane.

A visking tubing containing a concentrated sucrose solution is weighed and placed in distilled water, as shown.



After 2 hours, the visking tubing is removed and re-weighed.

What happens to the mass of the visking tubing and why?

- A** The mass decreases because sucrose moves out of the visking tubing.
- B** The mass decreases because water moves out of the visking tubing.
- C** The mass increases because sucrose moves into the visking tubing.
- D** The mass increases because water moves into the visking tubing.

A25 In human sexual reproduction, genetic materials are passed down from parents to the baby.

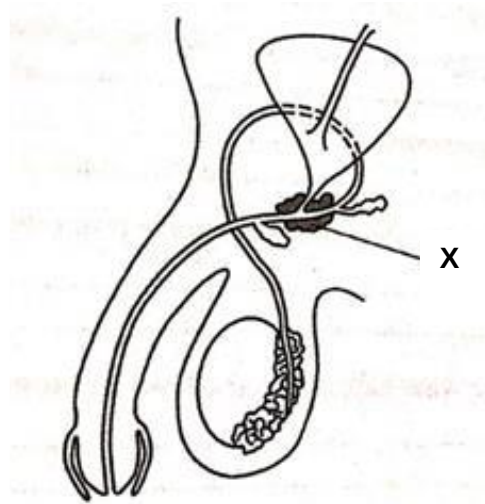
What determines how the baby would look like?

- A** The baby inherits half of each parent's traits.
- B** The baby randomly inherits traits from both parents.
- C** The baby usually inherits the father's traits.
- D** The baby usually inherits the mother's traits.

A26 Which change during puberty allows a girl to be able to get pregnant?

- A** enlargement of breast
- B** growth of pubic hair
- C** rounding of hips
- D** start of menstruation cycle

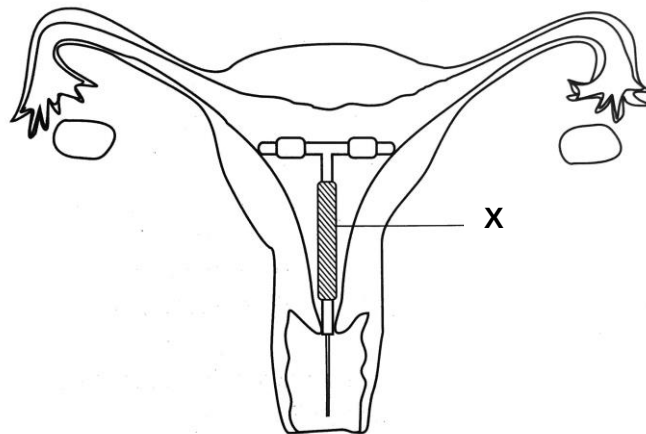
A27 The diagram shows a section through the male reproductive system.



What will be the effect if organ **X** is removed?

- A** The sperms released are less active.
- B** The sperms will not be able to be ejaculated during sexual intercourse.
- C** There will be less sperms produced.
- D** There will be less sperms stored.

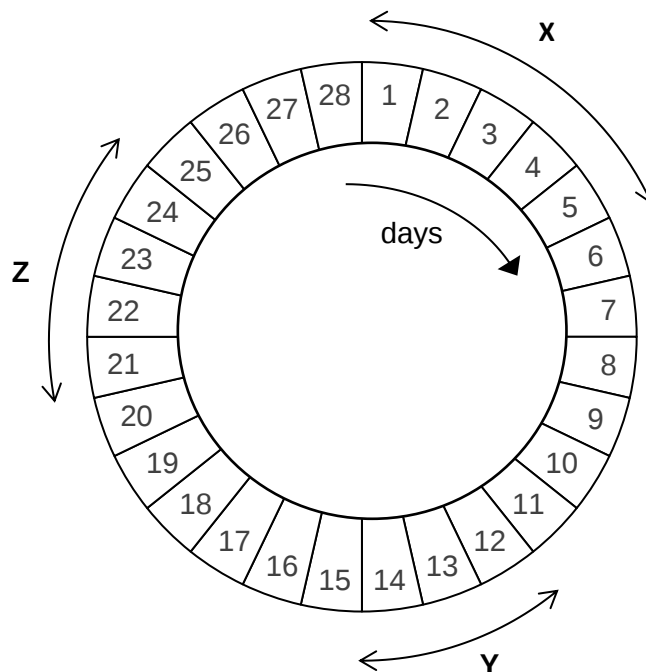
A28 A birth control method which involves structure **X** being inserted into the female reproductive system is shown.



How does structure **X** prevent pregnancy?

- A** Egg is not released.
- B** Egg is unable to travel along the oviduct.
- C** Fertilised egg is unable to implant.
- D** Sperms are unable to meet the egg.

A29 The diagram shows the menstrual cycle of a woman.



Which events will have occurred during the times marked **X**, **Y**, and **Z**?

	X	Y	Z
A	implantation	menstruation	ovulation
B	implantation	ovulation	menstruation
C	menstruation	ovulation	implantation
D	menstruation	implantation	ovulation

A30 Syphilis and gonorrhoea are both Sexually Transmitted Infections (STIs).

Which statement is true for the two STIs?

- A** Both are caused by bacteria.
- B** Both attack the immune system.
- C** Syphilis can be passed to the baby by the mother but not gonorrhoea.
- D** Syphilis can be treated with antibiotics but not gonorrhoea.

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
Key proton (atomic) number atomic symbol name relative atomic mass							1 H hydrogen 1										2 He helium 4
												5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
												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
3 Li lithium 7	4 Be beryllium 9																
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12						
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.).The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$

Full Name	Class	Class Index No.
Teacher's Name:	Mr Dalvin Ho / Ms Jasmine Zheng / Ms Lim Poh Fang (circle your teacher's name)	



Anglo-Chinese School (Parker Road)

END-OF-YEAR EXAMINATION 2023

SECONDARY TWO EXPRESS

SCIENCE

Total Duration for All Sections: 2 hours

SECTION B & C

INSTRUCTIONS TO CANDIDATES:

Write your name, class and index numbers in the space provided at the top of this page.

Write in dark blue or black pen.

You may use a pencil for any graphs.

The use of an approved scientific calculator is expected, where appropriate.

Do not use glue or correction fluid.

Section B and C

Answer all questions in the spaces provided.

INFORMATION FOR CANDIDATES:

The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use		
Section A		/30
Section B		/40
Section C		/30
Total		/100

This question paper consists of 20 printed pages.

SECTION B (40 marks)

Answer **all** the questions in the spaces provided.

- B1** Fig. 1.1 shows a setup to separate pure water from seawater.

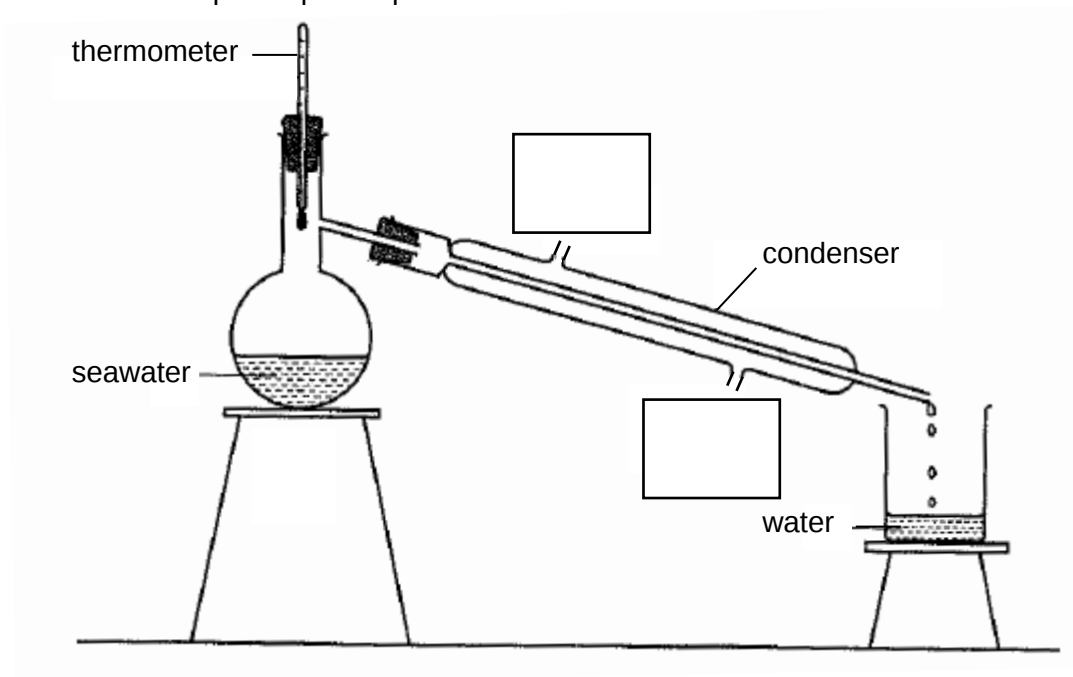


Fig. 1.1

- (a) State the name of this separation method.
..... [1]
- (b) Predict the reading on the thermometer when the pure water is collected.
..... [1]
- (c) In the boxes provided, draw arrows on Fig. 1.1 to show the direction of water flowing in and out of the condenser to cool down the distillate. [1]

- (d) A student tried to separate pure water from seawater using the setup in Fig. 1.2.

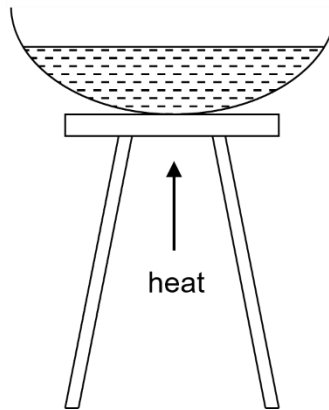


Fig. 1.2

- (i) Explain why he was unable to obtain pure water.

.....

..... [1]

- (ii) Describe the observation seen after the separation is completed.

..... [1]

[Total: 5]

- B2** Table 2.1 contains details of five different particles. The letters are not the chemical symbols.

Table 2.1

	K	L	M	N	O
mass number	3	10	11	19	23
proton number	2	5	5	9	11
total number of electrons	2	5	5	10	11

Use the letters in Table 2.1 to answer the questions.

- (a)** (i) Which particle has a single neutron?

..... [1]

- (ii) Which particle is **not** an atom?

..... [1]

- (iii) Which particles are the same element?

..... [1]

- (b)** State which element is particle **O**.

..... [1]

[Total: 4]

B3 Fig. 3.1 shows a ray diagram, not drawn to scale.

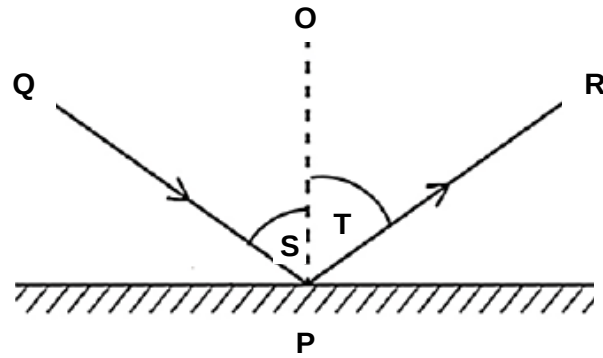


Fig. 3.1

(a) Using letters **O, P, Q, R, S** and **T** in Fig. 3.1, identify the following.

- | | | | |
|--------------|---------------------|-------|-----|
| (i) | normal | | [1] |
| (ii) | incident ray | | [1] |
| (iii) | angle of reflection | | [1] |

(b) State a characteristic of images formed on a plane mirror.

..... [1]

[Total: 4]

- B4** An experiment was conducted to investigate if the size of an object affects the pressure exerted when it is dropped from a fixed height onto sand.

Fig. 4.1 shows the setup of the experiment.

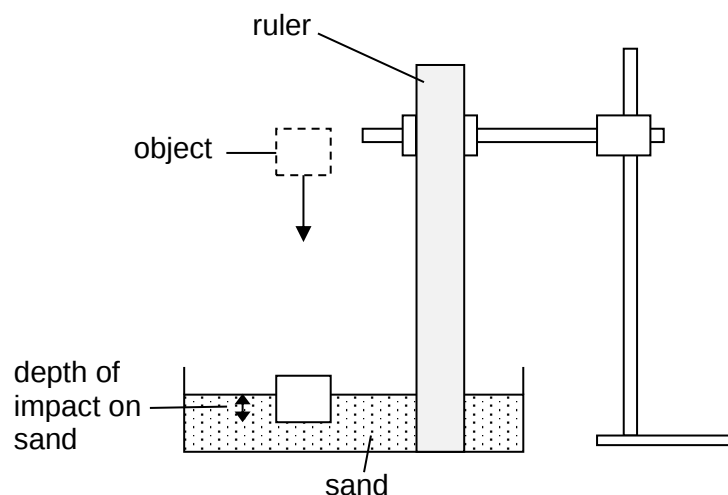


Fig. 4.1

When the object is dropped onto sand, it makes an impact in the sand. The depth where the object causes an impact in the sand is measured.

Fig. 4.2 shows the objects **X** and **Y**, which are of the same mass, that were used in the experiment.

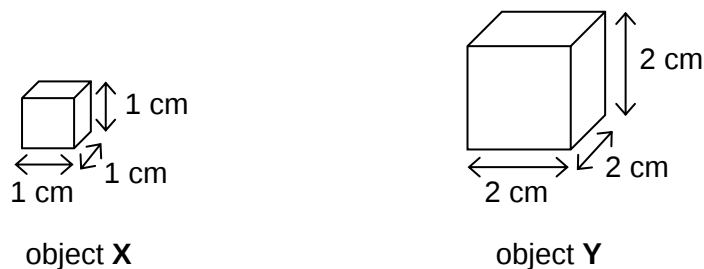


Fig. 4.2

- (a)** State the hypothesis for this investigation.

..... [1]

- (b) Fig. 4.2 shows the weight of the objects being measured to ensure that they are of the same weight.

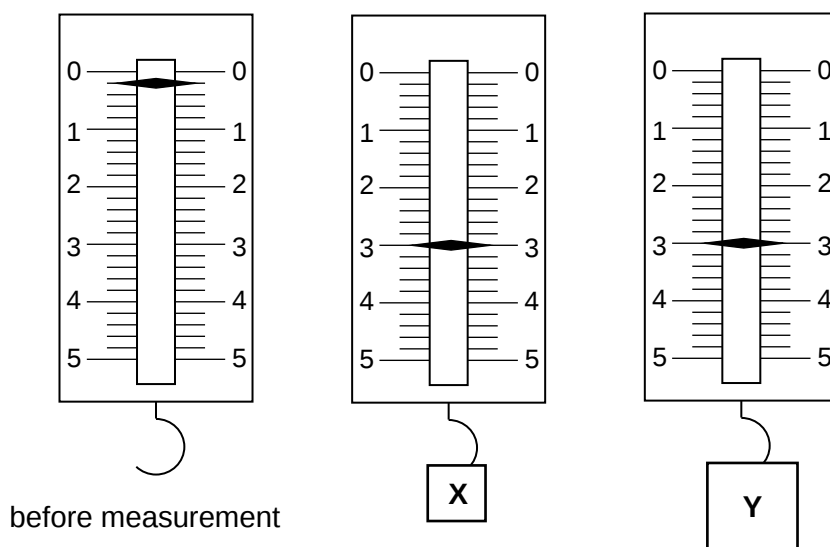


Fig. 4.3

- (i) State the type of error that took place in the measurement.

..... [1]

- (ii) Calculate the weight of the objects X and Y. State the unit of the measurement.

weight = [2]

- (c) Calculate the pressure exerted on the sand for object X.

pressure = [1]

- (d) The depth of the impact on the sand was measured and recorded in Table 4.4.

Table 4.4

object	depth of impact on sand / cm
X	2.8
Y	1.5

Do you agree with the results shown in Table 4.4? Explain your answer.

.....

.....

.....

..... [2]

[Total: 7]

- B5 (a)** Table 5.1 lists the different laboratory tests conducted on three different gases and the observations made.

Fill in the blanks to complete the table.

Table 5.1

gas	laboratory test	observation
ammonia	insert damp red litmus paper	turn damp red litmus paper blue
carbon dioxide	bubble into limewater	
hydrogen		extinguished with a “pop” sound

[2]

- (b)** Describe the property of ammonia gas shown in Table 5.1.

..... [1]

- (c)** Hydrochloric acid reacts with calcium carbonate to produce calcium chloride, carbon dioxide and product **C**.

Construct a word equation for the reaction and name product **C** in the equation.

..... [2]

[Total: 5]

B6 Table 6.1 shows the information from a food label on a bag of pasta.

Table 6.1

ingredient	g per 100 g
starch	54.7
sugar	0
fat	2.3
protein	11.3
fibre	0

A portion of pasta is eaten, and the digestion process begins.

(a) Describe **one** physical digestive process that occur in the digestive system.

.....

..... [1]

(b) Describe how protein is being chemically digested in the digestive system.

.....

.....

.....

..... [2]

- (c)** Starch can be digested using carbohydrases.

An experiment was conducted with starch solution and carbohydrases.

1 cm³ of starch solution and 1 cm³ of carbohydrase were mixed in a test tube. After 15 minutes, two drops of iodine solution was added to the mixture.

Describe the expected observations in the experiment after iodine solution was added. Explain the observations made.

observations

.....

explanation

.....

.....

.....

[3]

- (d)** Would you recommend a diabetic patient to consume the pasta? Explain your answer.

.....

.....

.....

.....

[2]

[Total: 8]

B7 Fig. 7.1 shows the human female reproductive organs.

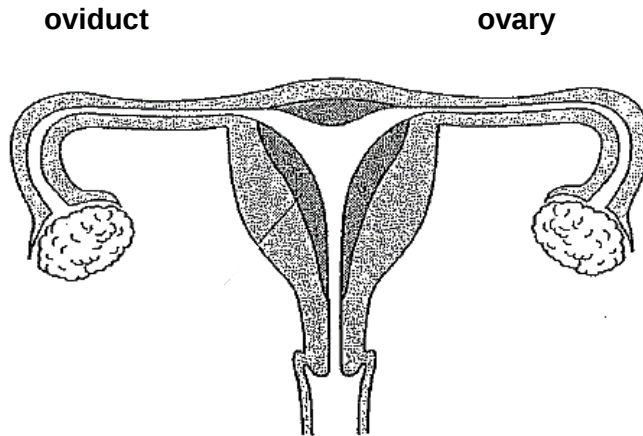


Fig. 7.1

- (a) (i) Draw lines from the words “oviduct” and “ovary” to label these structures on the diagram. [2]
- (ii) Describe the function of each of these structures.
- oviduct
-
- ovary
- [2]
- (b) One method of birth control involves a surgical procedure (operation) to ensure that the egg does not reach the uterus.
- (i) Mark **X** on Fig. 7.1 to show where this surgical procedure takes place. [1]
- (ii) State one advantage and one disadvantage of this method of birth control.
- advantage
-
-
- disadvantage
-
- [2]

[Total: 7]

SECTION C (30 marks)

Answer **all** the questions in the spaces provided.

- C1** The plug is attached to a small electric immersion heater. The heating element of the immersion heater is enclosed inside a metal tube. Heat energy is generated when an electric current passes through the heating element.

Fig. 8.1 shows an immersion heater being used to heat up water in a cup.

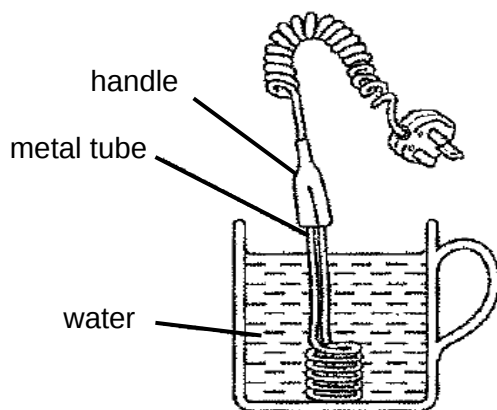


Fig. 8.1

- (a)** State a material that can be used to make the handle of the immersion heater and explain your choice of material.

.....
 [2]

- (b)** The immersion heater is placed in a cup of cold water and switched on.

Name the process of heat transfer and explain how the cup of water is heated up.

process

.....

explanation

.....

.....

..... [3]

- (c) It takes 1 minute to boil 250 ml of water in the cup. During the day, 6 cups of the same volume of water were boiled. The power rating of the immersion heater is 0.5 kW, and the cost of electricity is 25 cents per kWh.

- (i) Explain what is meant by power with respect to the immersion heater.

.....

..... [1]

- (ii) Calculate the energy required to boil 6 cups of water.

energy = kWh [2]

- (iii) Calculate the total cost of using the immersion heater to boil 6 cups of water.

cost =cents [1]

- (d) Describe the changes in the movement of the water molecules when it is being boiled.

.....

..... [1]

[Total: 10]

C2 Fig. 9.1. shows a circuit diagram.

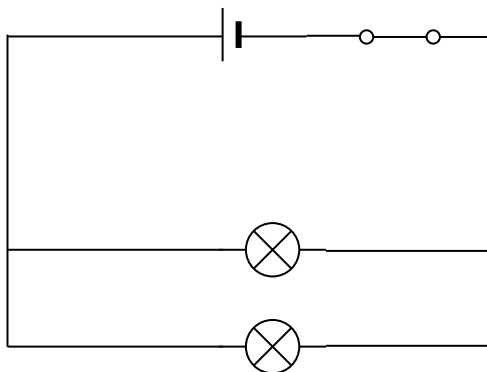


Fig. 9.1

- (a)** Draw on Fig. 9.1, to show the position that you would place
- (i)** the ammeter to measure the total current of the light bulbs. [1]
 - (ii)** the voltmeter to measure the potential difference of a light bulb. [1]

- (b) Fig. 9.2 shows a circuit diagram of two fixed resistors connected with a light bulb in a parallel arrangement.

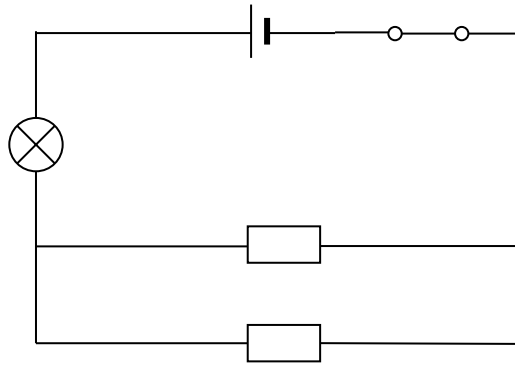


Fig. 9.2

- (i) Draw in the space below, the circuit diagram of two fixed resistors connected to a light bulb, a cell and an open switch, in a series arrangement.

[2]

- (ii) Describe and explain the difference in observation of the light bulb between the series and the parallel arrangement, when the switch is closed.

.....

.....

.....

[3]

- (c) To protect users from the harmful effects of electricity, safety devices are used in electrical appliances.

Fig. 9.3 shows the wiring of a three-pin plug.

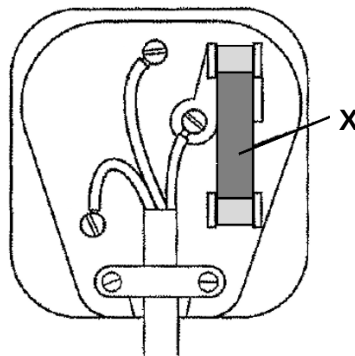


Fig. 9.3

- (i) Identify the safety device labelled X.

..... [1]

- (ii) Describe how the safety device protects an electrical equipment from excessive current flow.

.....

 [2]

[Total: 10]

- C3** A mountaineer undergoes training to scale Mount Everest. As part of his training, he performs physical exercises at high altitudes and climbs mountains in the surrounding area.

To monitor his progress, he undergoes regular blood tests to measure the number of red blood cells in his blood. Blood samples were taken on day 0, when he commenced his training and with further samples taken on days 2, 5, 10 and 14.

- (a)** Fig. 10.1 shows the calculated average red blood cell count for each day.

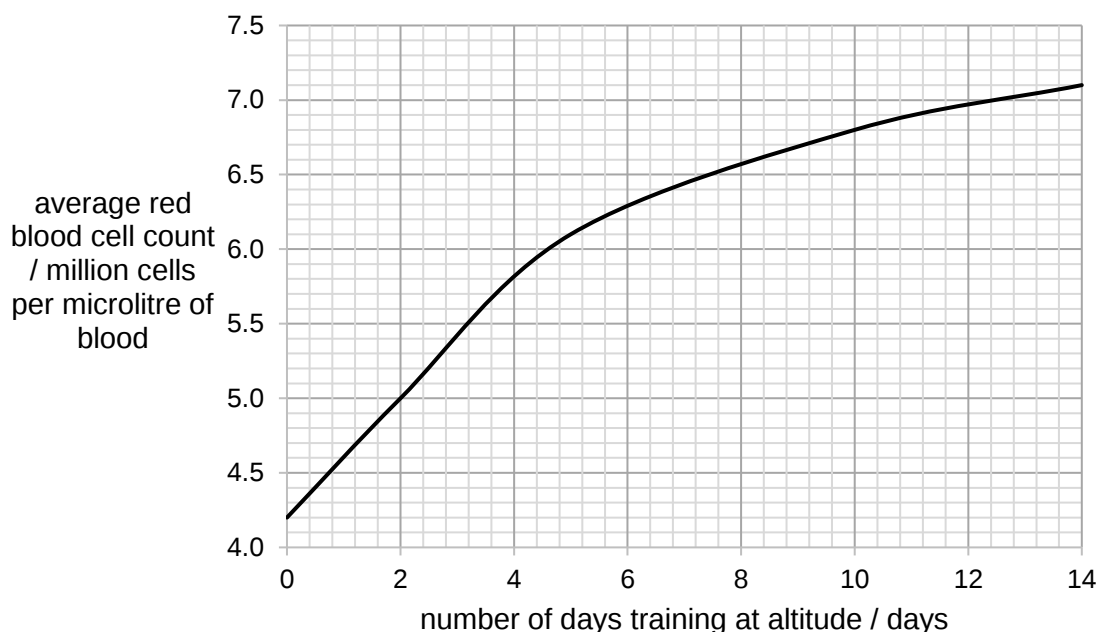


Fig. 10.1

- (i)** In the space provided, using Fig. 10.1, calculate the **increase** in the average red blood cell count between day 2 and day 8.

..... million cells per microlitre of blood [1]

- (ii)** Suggest why mountaineers need to train at high altitudes before scaling high mountains.

.....

 [2]

(b) Fig. 10.2 shows the human circulatory system.

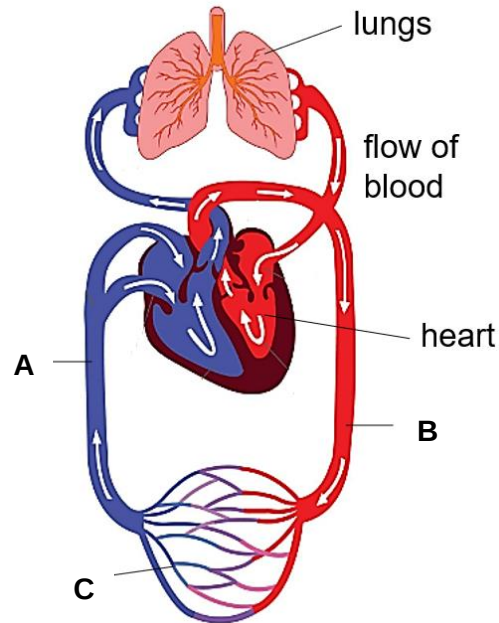


Fig. 10.2

(i) Name blood vessels **A** and **B**.

A

B

[2]

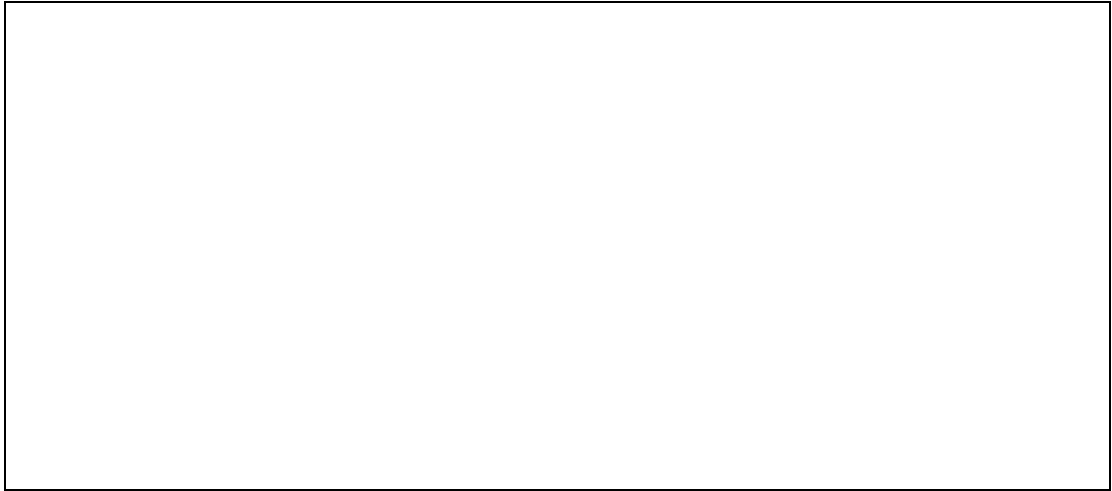
(ii) Describe the processes that occur in the blood vessel **C** that leads to movement of oxygen between blood vessel **C** and the surrounding body tissues.

.....

[2]

- (c) The mountaineer injured himself during a training climb and suffered a cut on his hand.

In the space provided, given that a cell in the hand is a typical animal cell, **draw** and **label** a hand cell.



[3]

[Total: 10]

END OF PAPER