CANBERRA SECONDARY SCHOOL

2021 End-of-Year Examination

Secondary Two Express

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SCIENCE (EXPRESS)

12 Oct 2021
2 hours
0800h – 1000h

Name: _____ ( ) **Class:** _____

READ THESE INSTRUCTIONS FIRST

Write in dark blue or black ink pen on both sides of the paper.
Do not use staples, paper clips, glue or correction fluid.

This paper consists of **Section A**, **Section B** and **Section C**.

Answer **all** the questions in **Section A** in the Optical Test Answer Sheet (OTAS) provided. For each question, there are four possible answers, A, B, C and D. Choose the correct answer and record your choice in soft pencil on the OTAS provided.

Answer **all** the questions in **Section B** and **Section C** in the spaces provided. The intended marks for the question are given in the brackets at the end of the question or part question [ ].

At the end of the examination, hand in both your OTAS and the question paper separately.

You **may use a calculator** for this examination.

Do not turn over the paper until you are told to do so.

A copy of the Periodic Table is printed on Page 21.

FOR MARKER'S USE		
	Marks Awarded	Max Marks
Section A		20
Section B		40
Section C		20
Total		80

This question paper consists of 21 printed pages including the cover page.

Setter: Mrs Olivia Ho

Section A (20 marks)

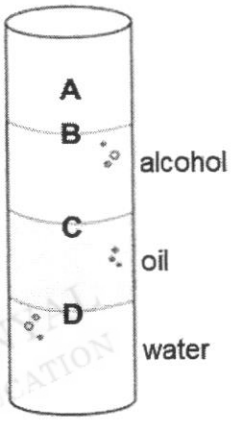
Answer **all** questions in this section on the OTAS provided.

1 A bottle of chemical with the following label was spilled onto the laboratory bench.

Which of the following is the correct procedure to follow after this incident?

A Inform the teacher and wait for adult assistance.
B Leave the chemical on the bench top and wait for it to evaporate.
C Use an alkali to neutralise the spill.
D Clean the bench with a cloth.

2 Three liquids, alcohol, oil and water, are added into a container without mixing. A solid, **X** is gently placed in the same container. Given the density of these materials, what will be the final position of solid **X**?



material	density / (g/cm^3)
alcohol	789
oil	950
water	1000
solid **X**	870

3 The table below describes four chemicals, **W**, **X**, **Y** and **Z**.

W	**X**
a clear liquid which leaves a white powder when evaporated	a white powder formed by burning magnesium in air
Y	**Z**
a brown gas with no fixed boiling point	a shiny solid which cannot be broken down into simpler substances by chemical means

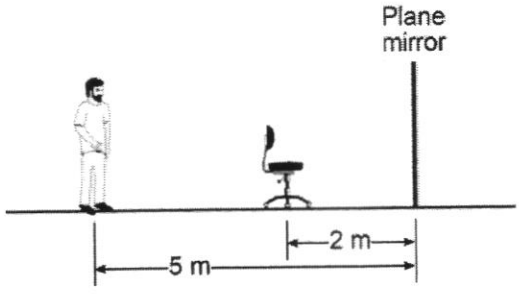
Which chemical is a compound?

A **W**
B **X**
C **Y**
D **Z**

4 When ice is melting, its particles

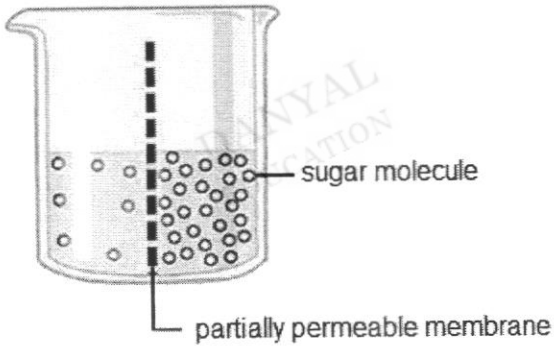
A expand.
B vibrate faster.
C vibrate slower.
D vibrate at the same speed.

5 The diagram below shows a man and a chair in front of a plane mirror. What is the distance between the man and the image of the chair?



A 3 m
B 5 m
C 7 m
D 10 m

6 The diagram below shows two samples of sugar solutions separated by a partially permeable membrane.



What happens when the solution is left to stand for a while?

A Sugar molecules move from the left to the right.
B Sugar molecules move from the right to the left.
C Water molecules move from the left to the right.
D Water molecules move from the right to the left.

7 A drop of ink is added to the bottom of a beaker containing water. The ink and water start to mix. This is because

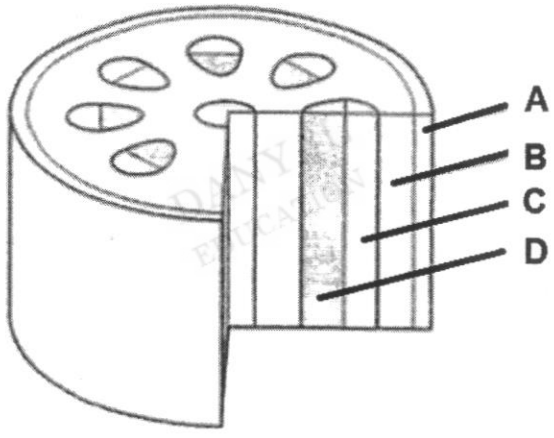
1. ink molecules move from a region of higher concentration to lower concentration.
2. water molecules move from a region of higher water potential to lower water potential.
3. osmosis has taken place.

Which of the above statements are true?

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

8 The diagram shows a section of a stem.

Which labelled tissue transports water and mineral salts towards the leaves?



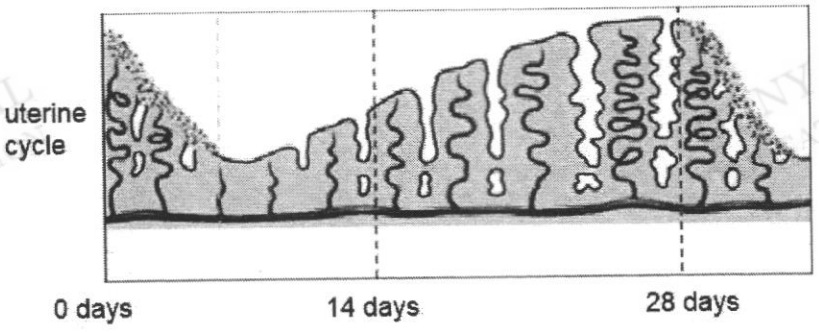
9 Which of the following is a permanent method of contraception?

A abstinence
B rhythm method
C use of condoms
D vasectomy

10 Which of the following is **not** a social problem which occurs when young people engage in premarital sex with different partners?

A abortions
B increase in use of birth control
C spread of sexually transmitted infections
D unwanted pregnancies

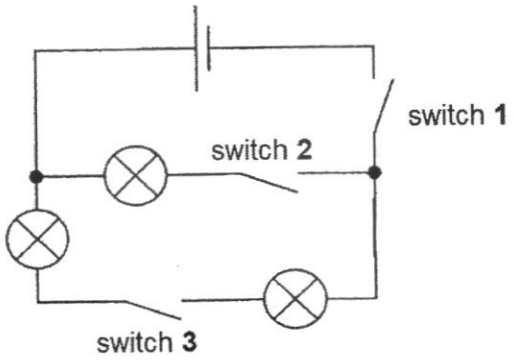
11 The diagram below shows the thickness of the uterine lining during a menstrual cycle.



What happens on day 14 of the cycle?

A menstruation
B ovulation
C fertilisation
D implantation

12 The diagram below shows a circuit with three identical light bulbs.



Which row shows the combination that ensures that only two light bulbs light up?

	switch **1**	switch **2**	switch **3**
A	open	closed	closed
B	open	open	closed
C	closed	closed	open
D	closed	open	closed

13 Which of the following may cause an electrical fire?

A disconnecting the earth wire from the device
B installing fuse with a suitable rating
C overloading of sockets
D using electrical appliances with wet hands

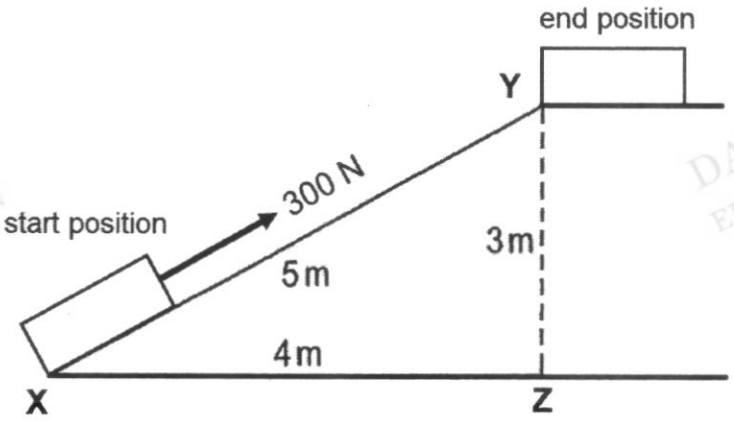
14 An air-conditioner has a power of 0.8 kW. If the cost of energy is 18 cents per kWh, what is the cost to operate the air-conditioner for 4 hours?

A 14.4 cents
B 57.6 cents
C 576 cents
D 1440 cents

15 A wooden block has a weight of 100 N on the Earth. What is the weight of the block on the Moon? The gravitational field strength of the Earth and the Moon is 10 N/kg and 1.6 N/kg respectively.

A 10 N
B 16 N
C 100 N
D 160 N

16 A box weighing 400 N is pushed up a slope from **X** to **Y** with a 300 N force.



What is the work done on the box?

A 300 J
B 1200 J
C 1500 J
D 2700 J

17 Which frequency of sound can be used to scan an unborn foetus in a mother's womb?

A 15 Hz
B 50 Hz
C 5000 Hz
D 50000 Hz

18 A bimetallic strip is made with two materials **X** and **Y**. A change in temperature causes the strip to bend as shown in the diagram below.

Which of the following statements is true?

A **X** contracts less than **Y** as the strip is heated.
B **X** contracts more than **Y** as the strip is cooled.
C **X** expands less than **Y** as the strip is cooled.
D **X** expands more than **Y** as the strip is heated.

19 Which of the following word equations shows a decomposition reaction?

A glucose + oxygen → carbon dioxide + water
B hydrogen + oxygen → water vapour
C copper (II) oxide + carbon → copper + carbon dioxide
D calcium carbonate → calcium oxide + carbon dioxide

20 The table below shows several pH indicators.

indicator	original colour	colour when added to acid
red litmus paper	red	remains red
blue litmus paper	blue	turns red
turmeric	yellow	remains yellow
red cabbage juice	purple	reddish
phenolphthalein	colourless	remains colourless
methyl orange	orange	turns red

How many indicators from the list **cannot** be used to test if a solution is an acid?

A 1
B 2
C 3
D 4

- End of Section A -

Section B (40 marks)

Answer **all** the questions in this section.
Write your answers in the spaces provided.

1 Fig. 1.1 shows how a micrometer is used to measure the thickness of a wire.

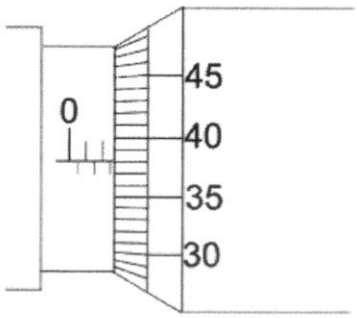


Fig. 1.1

(a) Determine the thickness of the wire.

thickness = ... mm [1]

(b) Suggest one way to improve the accuracy of this measurement.

.....

..... [1]

2 Fig. 2.1 shows a cell from an organism in an aquatic environment.

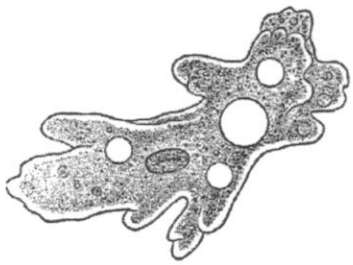


Fig. 2.1

(a) State and explain if this is an animal cell or a plant cell.

.....

..... [2]

(b) Suggest what will happen to the cell if it is placed in a concentrated salt solution.

.....

..... [1]

3 Fig. 3.1 shows a chromatogram of 3 known drugs, **A**, **B** and **C**, as well as an unknown drug **D**.

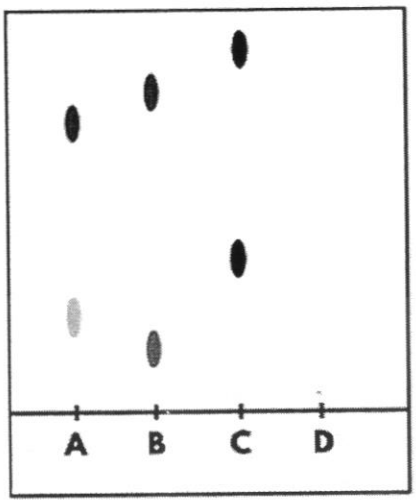


Fig. 3.1

(a) **(i)** **Draw** a dotted line, on Fig. 3.1, to show the correct solvent level at the beginning of this experiment. [1]

(ii) Explain your answer for **(a)(i)**.

.....

..... [1]

(b) Unknown drug **D** is made from mixing drugs **A** and **C** together.
Sketch, on Fig 3.1, the spots for drug **D**. [1]

4 Refer to the periodic table on **Page 21** and complete the following table.

element	atomic number	mass number	number of		
			protons	neutrons	electrons
sodium	11				
fluorine				10	

[2]

5 Fig. 5.1 shows a ray of light being reflected from a plane mirror.
The diagram is not drawn to scale.

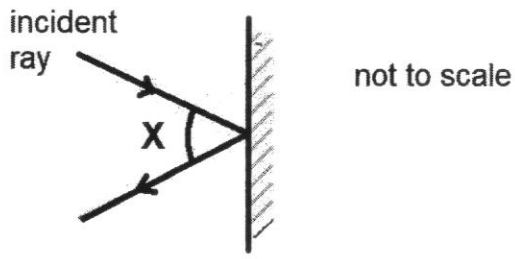


Fig. 5.1

(a) State two characteristics of an image formed by a plane mirror.

.....

..... [2]

(b) Given that the angle of incidence of the ray is 25°, state the value of angle **X**.

..... [1]

6 Fig. 6.1 shows the trend of the number of babies born to girls aged 19 and under.

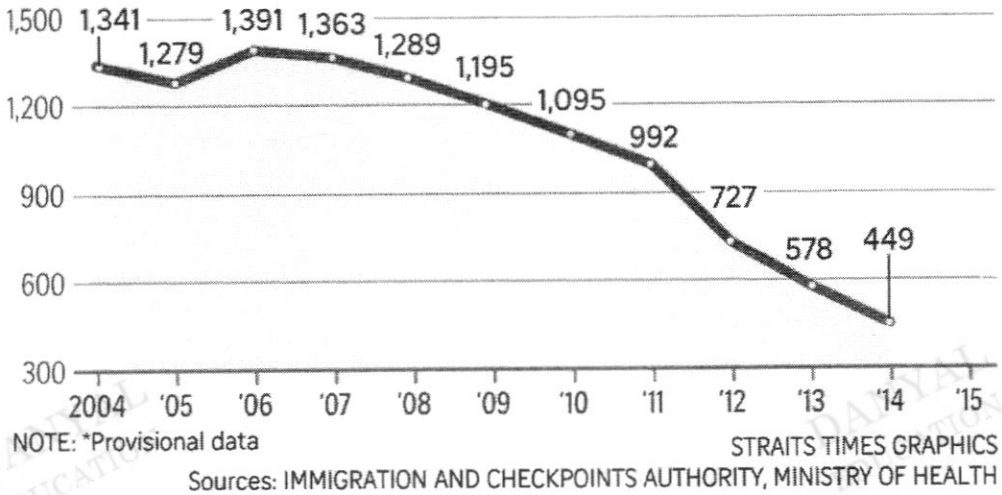


Fig. 6.1

(a) Describe the trend of teenage pregnancy shown in Fig. 6.1.

.....

..... [1]

(b) Suggest a possible difficulty faced by a teenager after giving birth to a baby.

.....

..... [1]

(c) Suggest a possible cause for the trend observed in Fig. 6.1.

.....

.....

..... [1]

(d) State a permanent birth control method for females.

..... [1]

7 Tanks are heavy vehicles which are designed to be able to travel on soft and muddy grounds. All tanks are installed with tracks, as shown in Fig. 7.1.

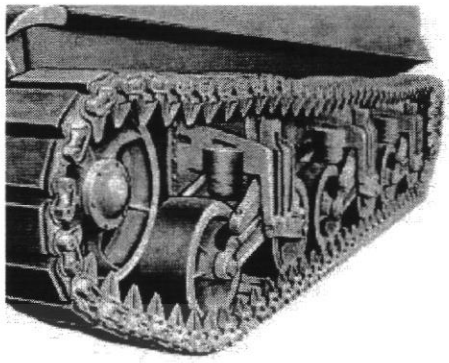


Fig. 7.1

(a) Define *pressure*.

.....

..... [1]

(b) Explain how the tracks can prevent the tank from sinking into soft ground.

.....

.....

..... [2]

8 A man stands in front of a wall and speaks loudly, as shown in Fig. 8.1.

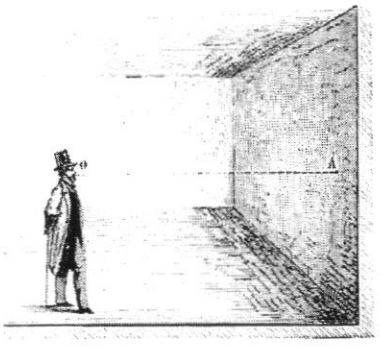


Fig. 8.1

He hears an echo after 1 second.

(a) Explain why an echo is heard by the man.

.....

..... [1]

(b) Given that the speed of sound in the air is 300 m/s, calculate the distance between the man and the wall. Show your working.

distance = ... m [2]

9 The word equations below describe two different chemical reactions.

I water → oxygen + hydrogen

II potassium hydroxide + hydrochloric acid → **X** + **Y**

(a) State the names of the reactions described by equations **I** and **II**.

reaction **I**: ..... [1]

reaction **II**: ..... [1]

(b) Describe a test to confirm the presence of hydrogen gas as a product.

.....

..... [2]

(c) For reaction **II**, identify the products.

X: ..... [1]

Y: ..... [1]

10 A 0.1 kg ball is thrown upwards at a speed of 10 m/s as shown in Fig. 10.1.

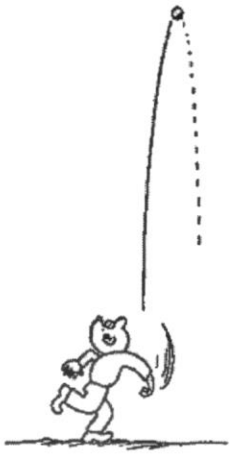


Fig. 10.1

(a) Calculate the kinetic energy of the ball once it leaves the person's hand.

kinetic energy = ... J [2]

(b) State the *principle of conservation of energy*.

.....

..... [1]

(c) Calculate the maximum height reached by the ball before it starts to fall.
The gravitational field strength is 10 N/kg.

height = ... m [2]

11 Three identical light bulbs are connected in series. Each light bulb is supplied with a voltage of 1 V. The current flowing through each light bulb is 0.5 A.

(a) Calculate the resistance of one light bulb.

resistance = ... Ω [2]

(b) In the space below, draw a circuit diagram to show the three light bulbs connected in series. Your circuit should include:

1. a battery,
2. a switch,
3. necessary components to measure the current and voltage across **one** light bulb.

[3]

(c) On your circuit diagram, draw arrows to show the direction of the flow of electrons. [1]

- End of Section B -

Section C (20 marks)

Answer **all** questions in this section.
Write your answers in the spaces provided.

12 Fig. 12.1 shows the human alimentary canal.

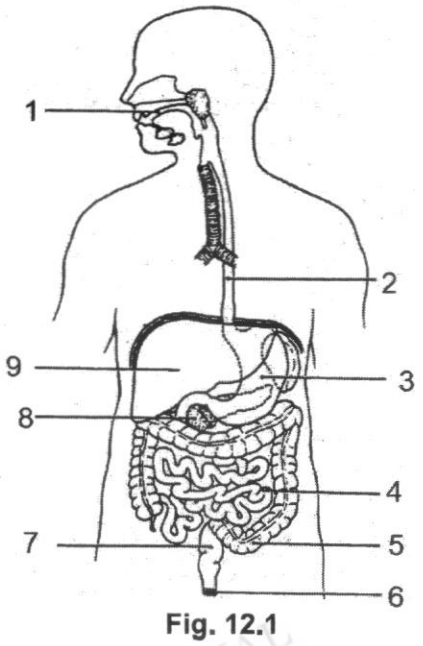


Fig. 12.1

(a) State the importance of digestion.

.....

.....

..... [2]

(b) Describe how organ **1** carries out the process of chemical digestion.

.....

..... [1]

(c) When a person consumes a protein shake, enzymes are released to aid digestion. State the organ(s) in which the digestion of protein takes place and describe the chemical digestion of proteins in these organ(s).

.....

.....

.....

..... [2]

(d) Describe the role organ **9** plays in the digestion of fats.

.....

.....

.....

..... [2]

(e) A person suffers from some injuries and has most of the organ **5** removed surgically.

(i) State the function of organ **5**.

.....

..... [1]

(ii) Suggest a side-effect of this procedure on the person.

.....

..... [1]

13 A black car and a white car of the same model are parked side by side in an open air car park at noon. Fig. 13.1 shows how the temperature inside the white car changes with time.

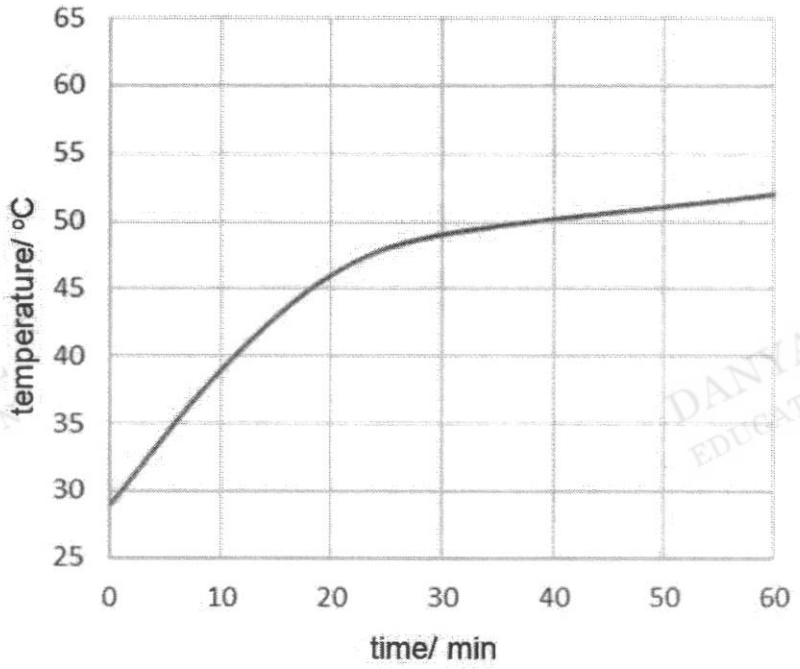


Fig. 13.1

(a) State the method of heat transfer that takes place between the sun and the white car.

.....

..... [1]

(b) On Fig. 13.1, sketch a new line to show how the temperature of the black car changes compared to the white car. [1]

(c) Explain the graph you have drawn in **(b)**.

.....

.....

..... [2]

(d) The temperature of the cars does **not** rise as fast when they are parked indoors. Explain why this is so.

.....

..... [1]

14 An air-conditioner is usually installed near the ceiling, as shown in Fig. 14.1.

Fig. 14.1

When the air-conditioner is turned on, it cools the air around it.

(a) In Fig. 14.1, sketch the movement of **warm** and **cool** air in the room, when the air-conditioner is turned on. Label the 'warm air' and 'cool air' clearly. [2]

(b) Explain how the air conditioner cools down the whole room.

.....

.....

..... [2]

(c) Another way of keeping the room cool during a hot day is to draw the curtains. The curtains trap a layer of air between itself and the window.

Explain how the curtains help to keep the room cool during a hot day.

.....

.....

..... [2]

- End of Paper-

Section A

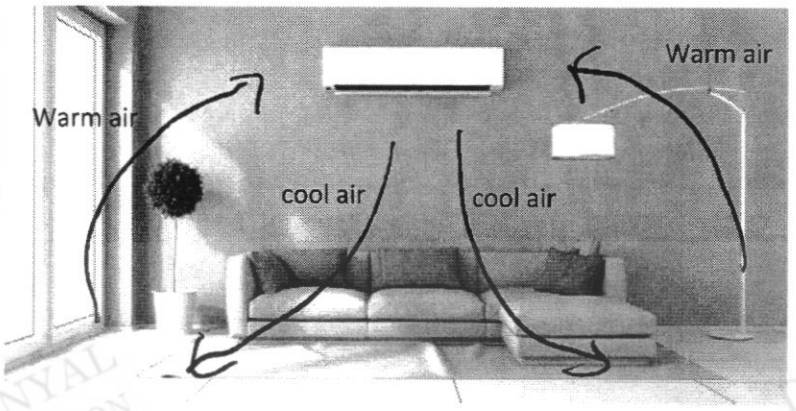
1	2	3	4	5	6	7	8	9	10
A	C	B	D	C	C	A	D	D	B
11	12	13	14	15	16	17	18	19	20
B	D	C	B	B	C	D	B	D	C

Section B

1a	2.88 mm	1
1b	Measure the wire at different positions and take average/ Take multiple measurements and obtain the average of the readings	1
2a	This is an animal cell. It does not have a cell wall / it has small vacuoles/ does not have a regular shape/ many vacuoles.	1 1
2b	The cell will **shrink** as water moves out of the cell through osmosis	1
3ai	The solvent level sketched below the starting line	1
3aii	This is so that the sample will not **dissolve in the solvent** and **fail to separate out**	1
3b	Indicate all four spots corresponding to A and C	1
4	<table><tr><th rowspan="2">substance</th><th rowspan="2">atomic number</th><th rowspan="2">mass number</th><th colspan="3">number of</th></tr><tr><th>protons</th><th>neutrons</th><th>electrons</th></tr><tr><td>Sodium atom</td><td>11</td><td>**23**</td><td>**11**</td><td>**12**</td><td>**11**</td></tr><tr><td>Fluoride atom</td><td>**9**</td><td>**19**</td><td>**9**</td><td>10</td><td>**9**</td></tr></table>	1 for each line
5a	Same size as object/ virtual image/ upright/ laterally inverted/ object distance from mirror is equal to the image distance from mirror	1 for each correct answer
5b	50°	1
6a	The number of teenage pregnancy decreases.	1
6b	They may have difficulty supporting the baby due to financial difficulties/ have to drop out of school (accept other reasonable answers)	1
6c	This may be due to improved education and awareness campaigns (accept other reasonable answers)	1
6d	Tubal **ligation**	1
7a	Pressure is force per unit area.	1
7b	The tracks have a **large contact area** with the ground The greater the **contact area**, the **smaller the pressure**.	1 1

8a	The sound wave **reflects** at the wall and travels back to the man Reject: bounce back	1
8b	V=2D/t 300 = 2D / 1 D = 150 m	 1 1
9a	I: electrolysis/ decomposition II: neutralistion	1 1
9b	Insert a **lighted splint** into the test tube. If the hydrogen gas is present, the splint will **extinguish with a pop sound**.	1 1
9c	X: potassium chloride Y: water (can be reversed)	1 1
10a	Ke = ½ mv^2 = ½ x 0.1 x 10^2 = 5.00 J	 1 1
10b	Energy cannot be created or destroyed, it can only be converted from one form to another.	1
10c	GPE = KE = 5.00 J GPE = mgh 5 = 0.1 x 10 x h h = 5.00 m	 1 1
11a	R=V/I =1/0.5 =2.00 Ω	1 1
11b	Components are all connected in series Ammeter in series Voltmeter in parallel across one light bulb	1 1 1
11c	Arrow direction from negative to positive terminal of the battery	1
12a	It breaks down **large, insoluble food** into **small soluble** particles. This allows the nutrients to be **absorbed** into **the blood stream**	1 1
12b	It produces **amylase** to break down starch into **maltose**.	1
12c	Digestion of protein takes place in stomach and the small intestine. Enzymes such as protease break down protein into amino acid.	1 1
12d	The liver produces bile. It emulsifies the fats into **smaller** fat droplets, increasing rate of digestion	1 1
12ei	The large intestine is responsible for **absorption of water and mineral salts**.	1
12eii	If this is removed, the patient may get **dehydrated easily**.	1
13a	Through **radiation**/infra-red radiation	1
13b	The line rises faster and reaches a higher temperature compared to the original line	1
13c	Black coloured materials are a **better absorber** of radiation compared to white coloured materials. It absorbs more heat and the temperature rises faster.	 1 1

	Reject: good emitter/ good emitter and absorber	
13d	Infrared radiation cannot pass through buildings easily, less heat is absorbed by radiation/ buildings have absorbed most of the heat	1

14a	Cool air moves down from the a/c Warm air moves up to complete the cycle  *Must draw both cycles	1 1
14b	The air near air-conditioner is **cooled**, contracts, and becomes **denser and sinks**. Warmer air is less **dense and rises**. This forms a **convection current** to cool down the room	1 1
14c	The curtain traps air, which is a poor conductor of heat. This reduces heat transfer through conduction. Reject: if student did not mention conduction	1 1