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Name: _____	Class: Sec _____	Index No.: _____
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3E
MERIDIAN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2022
SCIENCE (PHYSICS/CHEMISTRY)**Paper 1****5076/01**

13 October 2022

SECONDARY 3 EXPRESS**1 hour**
Additional Material:
 OTAS
READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
 Do not use staples, paper clips, glue or correction fluid.
 Write your name, class and index number on the OTAS.

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 separate OTAS.

Read the instructions on the OTAS very carefully.

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 15.

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

The total number of marks for this paper is **40**.

Take g to be 10 N/kg or 10 m/s^2

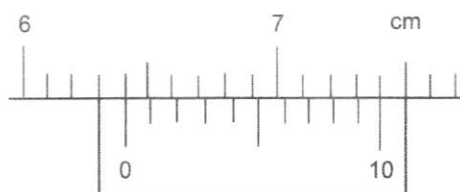
For Examiner's Use	
Total Marks	

This question paper consists of **15** printed pages, including this page.

[Turn over

2

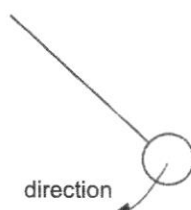
- 1 The diagram shows part of a vernier scale.



What is the correct reading?

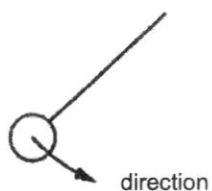
- A 6.30 cm B 6.40 cm C 6.50 cm D 7.50 cm
- 2 A pendulum has a period of 0.8 s.

The diagram below shows the position and the direction of the pendulum 2.2 s later after the stopwatch is started.

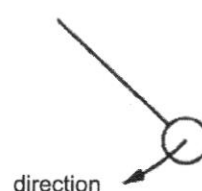


Which diagram shows the position and the direction of the pendulum when the stopwatch started the timing?

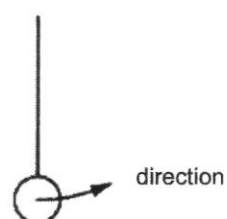
A



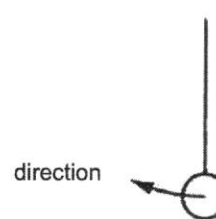
B



C



D



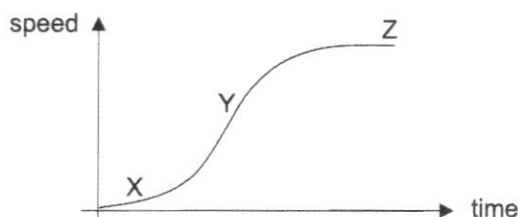
3

- 3 A car at rest accelerates to a speed of 28 m/s in 7.0 s.

What is the average acceleration of the car?

- A 0.25 m/s² B 4.0 m/s² C 10.5 m/s² D 21 m/s²

- 4 The graph shows the speed of a car as it moves from rest.

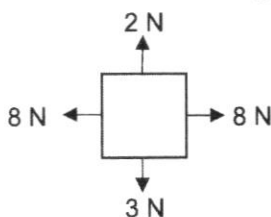


Which statement is correct?

- A At X, the car has uniform speed.
 B At Y, the car is not accelerating.
 C At Z, the car has uniform speed.
 D At Z, the car is at rest.
- 5 A 3 N and 4 N force act on an object at a point.

What value of the resultant force is possible?

- A 0 N B 6 N C 8 N D 10 N
- 6 Four forces act on an object. The directions and magnitudes of the forces are shown.



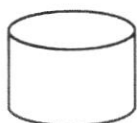
Which statement is correct?

- A The box is moving down with uniform speed.
 B The box is moving left with uniform speed.
 C The box is accelerating upwards.
 D The box is accelerating downwards.

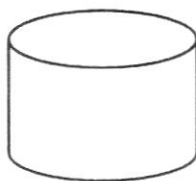
7 Which of the following objects has the lowest inertia?

- A A 1 kg rock accelerating at 1 m/s^2
- B A 20 kg ball rolling at 10 m/s
- C A 50 kg man running at 10 km/h
- D A stationary 100 kg box

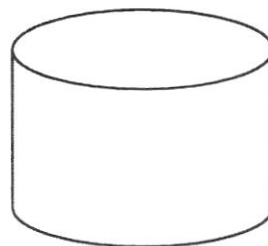
8 Three objects are made of the same material but have different sizes.



X



Y



Z

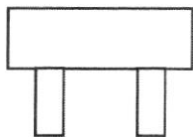
Which object has the greatest density?

- A X
- B Y
- C Z
- D they all have the same density

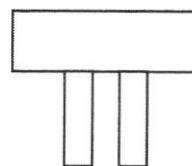
9 A student designed four stools, to be made using the same material.

Which stool is the most stable?

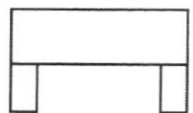
A



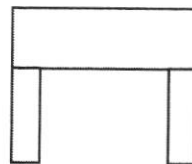
B



C

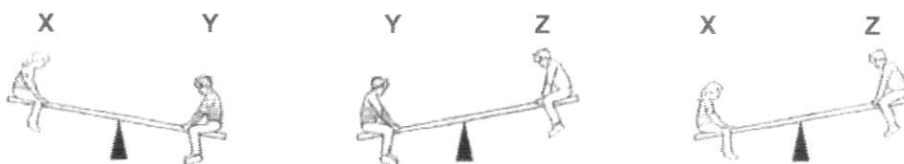


D



5

- 10 Three children, X, Y and Z, are using a see-saw to compare their weights.



Which answer shows the correct order of the children's weights?

lightest $\longrightarrow$ heaviest

- | | | | |
|----------|---|---|---|
| A | X | Z | Y |
| B | Y | Z | X |
| C | Z | X | Y |
| D | Z | Y | X |
- 11 What is the SI Unit for pressure?
- A** N/cm^2 **B** N/mm^2 **C** m/s^2 **D** Pa
- 12 A girl who was standing decides to lie flat on the ground.
- Which of the following statements about the girl is correct?
- A** The density of the girl increases.
B The mass of the girl increases.
C The pressure exerted by the girl on the ground decreases.
D The weight of the girl increases.
- 13 What is a property of both liquids and solids?
- A** They fill every part of their containers.
B They are incompressible.
C They can flow.
D They have molecules in fixed position.

14 Which form of energy, that molecules have, is related to a change in state?

- A chemical B gravitational C kinetic D potential

15 By which heat transfer process(es) does energy from the sun reach the Earth?

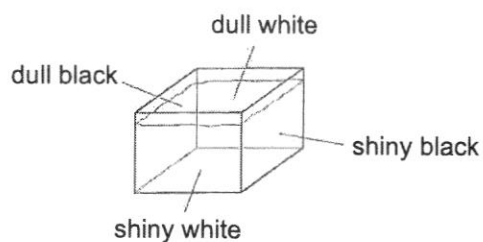
- A conduction
B convection
C radiation
D all of the above

16 A gas stove is used to cook some soup in a metal bowl.

Which row describes how thermal energy is transferred through the metal bowl and throughout the soup?

	metal bowl	soup
A	conduction	conduction
B	conduction	convection
C	convection	conduction
D	convection	convection

17 The diagram shows a copper box filled with boiling water. The outside surface of each side is different.



From which side will the most heat escape by radiation?

- A dull black
B dull white
C shiny black
D shiny white

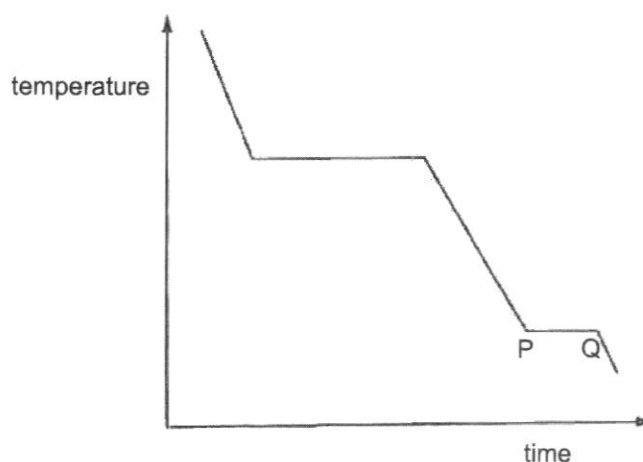
7

18 Which changes of state occur as a result of the addition of thermal energy?

- A boiling and melting
- B boiling and solidification
- C condensation and melting
- D condensation and solidification

19 A substance was heated in an enclosed space until it became a gas.

After the heater was removed, the temperature of the substance was recorded at regular intervals. The graph shows the temperature plotted against time.



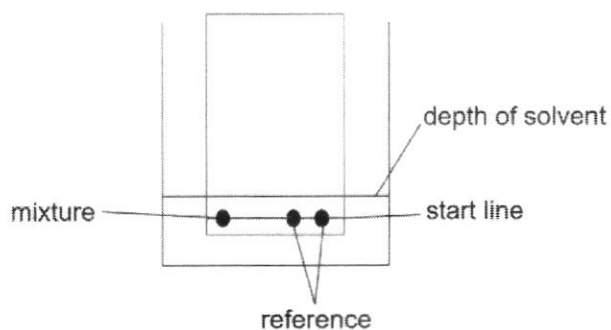
What does section PQ represent?

- A boiling B condensation C melting D solidification

20 Which statement about the evaporation of a liquid is **not** correct?

- A It changes the liquid into a gas.
- B It cools the liquid.
- C It occurs only at the boiling point of the liquid.
- D It takes place at the surface of the liquid.

- 21 A student wanted to find out the different types of substances present in an unknown mixture. He set up the following as shown.



Which error has the student made?

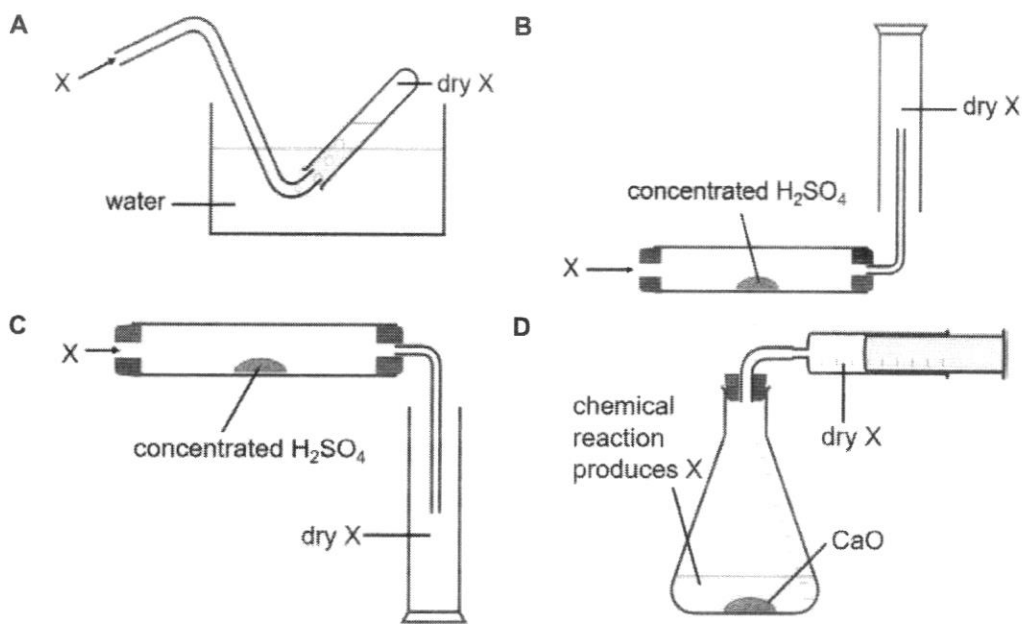
- A The reference spots are too close to one another.
 - B The depth of solvent is above the start line.
 - C The spots are on the start line.
 - D The beaker containing the solvent is not covered.
- 22 Which method can be used to separate a mixture of two liquids containing components with different boiling points?
- A evaporation
 - B crystallisation
 - C chromatography
 - D distillation

9

- 23 A student wishes to collect a dry sample of gas X. Drying agents such as concentrated sulfuric acid and calcium oxide are used to remove water from the gas formed.

Gas X is denser than air, very soluble in water and is acidic in nature.

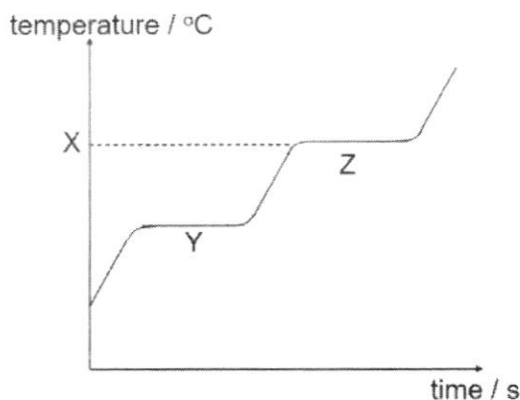
Which method is most suitable to collect a dry sample of the gas X?



- 24 Which of the following gives the correct description of the changes that occur when a solid melts to become a liquid?

	distance between particles	movement of particles	forces between particles
A	no change	more rapid	increase
B	increase	more rapid	decrease
C	Increase	slow down	decrease
D	no change	slow down	decrease

- 25 The following diagram shows the temperature change when a substance undergoes heating.



Which of the following gives the correct description labelled X, Y and Z?

	X	Y	Z
A	melting point	liquid only	gas only
B	melting point	liquid only	liquid + gas
C	boiling point	liquid + solid	gas only
D	boiling point	liquid + solid	liquid + gas

- 26 Which of the following pair of molecules have the same number of shared electrons used in covalent bonding?

A	F_2 and Cl_2	B	O_2 and N_2
C	CO_2 and N_2	D	H_2 and N_2

- 27 A substance X

- has low melting point;
- does not conduct electricity in all states;
- dissolves in organic solvent only.

What could X be?

- A $Mg(NO_3)_2$
 B Zn
 C Ar
 D H_2O

- 28 Chlorine has several isotopes but the two most stable ones are $^{35}_{17}\text{Cl}$ and $^{37}_{17}\text{Cl}$.

Which of the following statements about the 2 isotopes is **not** correct?

- A They have the same number of neutrons.
- B They have different number of neutrons.
- C They have the same number of electrons.
- D They have the same number of protons.

- 29 X is in Group III and Y is in Group VII.

Which of the following shows the correct chemical formula for the compound formed by X and Y?

- | | | | |
|---|---------------|---|------------------------|
| A | XY | B | X_2Y_3 |
| C | XY_3 | D | X_3Y_7 |

- 30 Sulfur trioxide is an important ingredient in making detergents and disinfectants. It is formed by reacting sulfur dioxide with oxygen gas.

Which chemical equation correctly describes the formation of sulfur trioxide?

- A $2\text{S} + 3\text{O}_2 \rightarrow 2\text{SO}_3$
- B $\text{SO}_2 + \text{O} \rightarrow \text{SO}_3$
- C $\text{SO} + \text{O}_2 \rightarrow \text{SO}_3$
- D $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$

- 31 Antacids are medicines that help to neutralise the excess acid in your stomach to relieve stomach discomfort and heartburn.

What could be the pH of a solution containing antacids?

- | | | | |
|---|---|---|---|
| A | 2 | B | 6 |
| C | 7 | D | 9 |

- 32** The pH of soil in Singapore ranges from 3.7 – 6.2. The table below shows the optimum type of soil for growing different crops.

crop	optimum type of soil for growing
sugar beet	alkaline
garlic	alkaline
asparagus	neutral
potato	acidic

Which crop would you advise the farmer to grow on his farm?

- A** sugar beet **B** asparagus
C garlic **D** potato

- 33** An unknown oxide W reacts with sodium hydroxide to form a salt but does not react with hydrochloric acid.

What could W be?

- A** zinc oxide **B** magnesium oxide
C carbon monoxide **D** sulfur dioxide

- 34** Which of the following is an amphoteric oxide?

- A** TiO **B** Ag_2O
C Li_2O **D** Al_2O_3

- 35** Alkali metals are Group I elements that react with water to give an alkali and a gas.

The gas will

- A extinguish a lighted splint with a pop sound.
- B form a white precipitate with limewater.
- C re-ignite a glowing splint.
- D turn damp red litmus blue.

- 36 Student B wants to prepare calcium sulfate in the laboratory and wrote down the steps on the board. His teacher spotted an error.

What is the error in the procedure?

- 1 Mix solutions of calcium nitrate and sodium sulfate.
- 2 Filter the mixture and collect the filtrate.
- 3 Heat filtrate to form a saturated solution
- 4 Cool to allow crystals to form. Collect the crystals by filtering.
- 5 Wash with distilled water and dry crystals.

- A He should have used calcium hydroxide in step 1 instead.
B He should have used sulfuric acid in step 1 instead.
C He should have collected the residue in step 2 instead.
D He should not have heated the filtrate in step 3.

- 37 Epsom salt has the formula MgSO_4 and people have been using Epsom salt baths to relief aching muscles.

Which pair of substances is most suitable for its preparation?

- A magnesium and sulfur
B magnesium carbonate and sulfuric acid
C magnesium nitrate and sodium sulfate
D magnesium chloride and sulfuric acid

- 38 A new element, with symbol Ja, was discovered with one valence electron.

Which of the following statements about Ja is correct?

- A It is a non-metal.
B It is in the same group as K.
C It is in the same period as Na.
D It has the same number of electron shells as K.

- 39 Which of the following shows an atom in the Periodic Table with a full valence shell?
- A Ar
 - B Al
 - C B
 - D Ca
- 40 Which of the following statements correctly describes the trends in the Periodic Table?
- A The number of electron shells increases down a group.
 - B The number of valence electrons decreases across a period.
 - C The number of protons decreases down a group.
 - D The metallic character increases across a period.

Name: _____	Class: Sec _____	Index No.: _____
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3E
MERIDIAN SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2022
SCIENCE (PHYSICS/CHEMISTRY)**Paper 2****5076/02**

12 October 2022

SECONDARY 3 EXPRESS**1 hour 15 minutes****Additional Material:**

Nil

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work that you hand in.
 You may use an HB pencil for any diagrams, graphs, tables or rough working.
 Write in dark blue or black pen.
 Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
 You may lose marks if you do not show your working or if you do not use appropriate units.

Section AAnswer **all** questions.

Write your answers in the spaces provided on the question paper.

Section BAnswer **all** questions.

Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
 The number of marks is given in brackets [] at the end of each question or part question.

Take g to be 10 N/kg or 10 m/s^2 .

For Examiner's Use	
Section A	/ 45
Section B	/ 20
Total Marks	/ 65

This question paper consists of **12** printed pages.**[Turn over]**

Section A

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

- 1 Fig. 1.1 shows the speed of a 550 kg object as it changes with time.

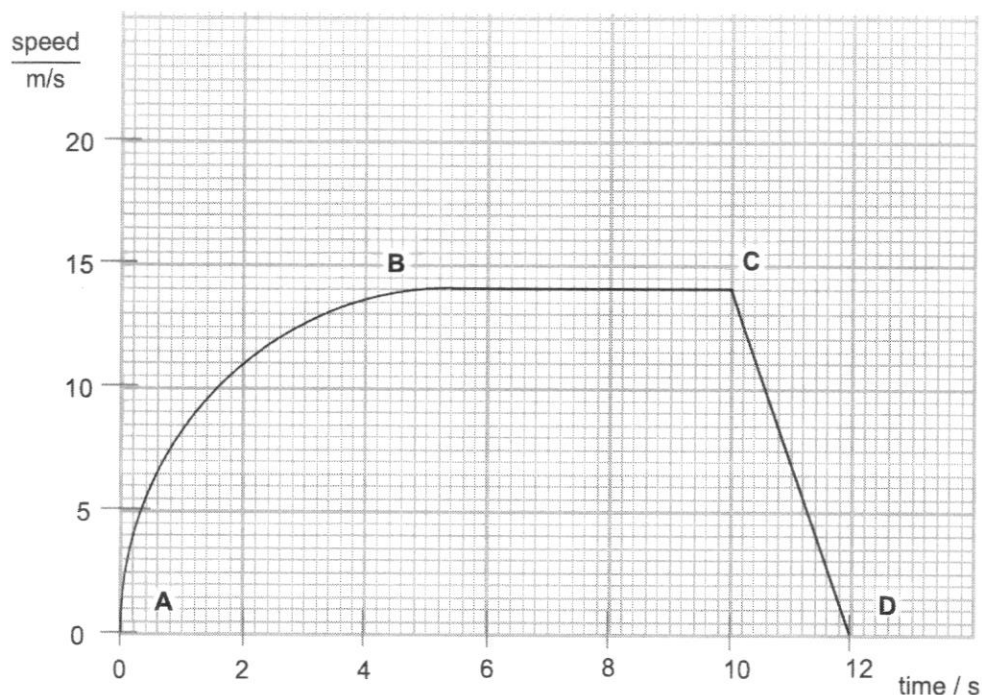


Fig. 1.1

- (a) Describe the motion of the object as it moves from point A to B.

..... [1]

- (b) Calculate the deceleration of the object between points C and D.

deceleration = m/s^2 [2]

- (c) Explain why, at section BC, an applied force is acting on the object but the object is moving at constant speed.

..... [1]

- (d) A second object, initially at rest, accelerates uniformly over 100 m in 10 s.

On Fig. 1.1, draw a line to represent the motion of this second object. [2]

3

- 2 (a) State the difference between scalar and vector quantities.

.....
 [1]

- (b) Give one example each of a vector and a scalar quantity.

vector quantity :

scalar quantity : [2]

- (c) Complete Table 2.1.

Table 2.1

physical quantity	name of SI unit	symbol of SI unit
weight		
		K

[2]

- 3 A rock sample taken from the moon has a mass of 0.25 kg.

- (a) The astronaut who brought the rock sample reported that the rock sample had a weight of 0.425 N on the moon.

Calculate the gravitational field strength of the moon.

gravitational field strength of the moon = N/kg [2]

- (b) The mass of the rock sample on Earth was found to be unchanged at 0.25 kg.

Explain why the mass of the rock sample remains unchanged.

.....
 [2]

- (c) The rock sample was placed into 100 cm³ of water in a measuring cylinder. The new reading of the measuring cylinder is 160 cm³.

Calculate the density of the rock sample.

density = g/cm³ [2]

4

- 4 A uniform metre rule is balanced at the 50 cm mark. Weights of 1.5 N and 3.0 N are hung from the 10 cm and 40 cm mark respectively as shown in Fig. 4.1.

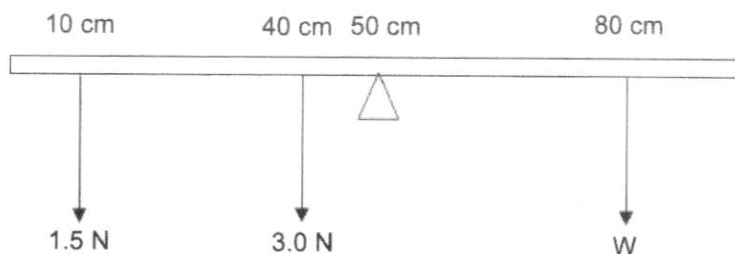


Fig. 4.1

A weight W hanging from the 80 cm mark balances the system.

- (a) State the principle of moments.

.....

 [2]

- (b) Calculate the moment produced by the 1.5 N about the pivot and state its direction.

moment = Ncm

direction = [1]

- (c) Calculate the magnitude of weight W required to balance the system.

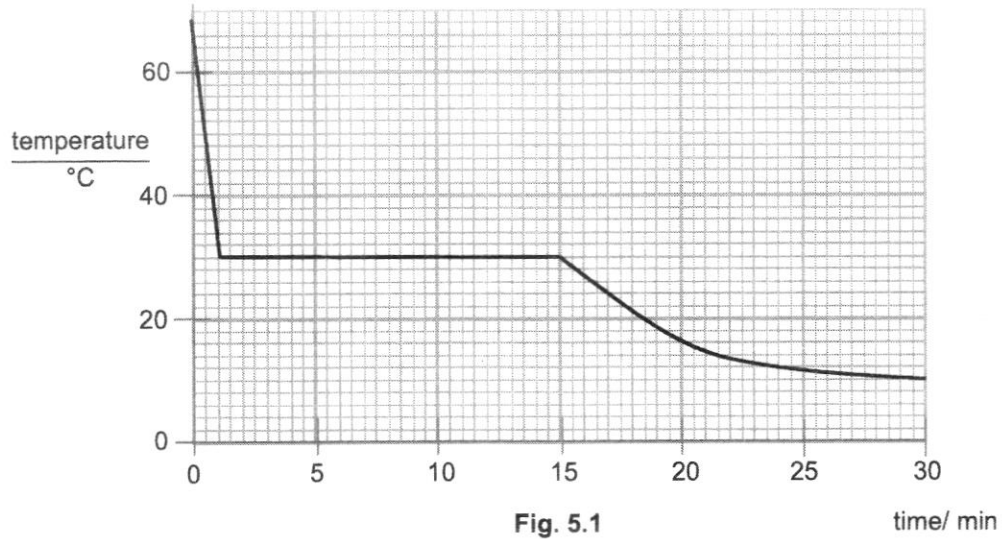
weight W = N [3]

- (d) Explain why the weight of the metre rule has no effect on the value of weight W needed to balance the system.

.....
 [1]

5

- 5 The temperature of a liquid, substance Y, is measured at regular time intervals as it cools. Fig. 5.1 shows the graph that is plotted from the results.



- (a) Describe what is happening to substance Y during the following time intervals:

(i) 0 to 1 min

..... [1]

(ii) 1 to 15 min

..... [1]

(iii) 15 to 30 min

..... [1]

- (b) Explain using kinetic model why the temperature remains constant between 1 min and 15 min.

..... [1]

- (c) From Fig. 5.1, determine the freezing point of substance Y.

..... [1]

6

- 6 When switched on, the filament lamp shown in Fig. 6.1 loses energy by conduction, convection and radiation.

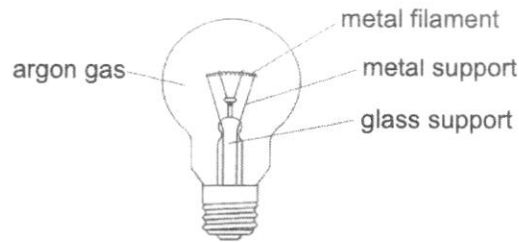


Fig. 6.1

Describe how energy is lost from the metal filament

- (a) by conduction,

..... [1]

- (b) by convection,

.....

 [2]

- (c) by radiation.

..... [1]

- 7 A small rocket has a mass of 300 kg. The gravitational field strength is 10 N/kg.

- (a) It is launched upwards from the Earth and reaches a speed of 500 m/s in 3.0 s.

Calculate the average acceleration of the rocket.

acceleration = m/s² [2]

- (b) Calculate the average force from the engine needed to give this acceleration.

Assume that the mass of the rocket remains constant and the average air resistance is 1000 N.

force = N [2]

7

- 8 Fig. 8.1 shows a tank together with some of its specifications.



Specifications

total mass	46 000 kg
total base area	6.5 m ²
maximum speed	60 km/h
main gun	125 mm

Fig. 8.1

- (a) Calculate the pressure the tank exerts on the ground.

pressure = Pa [2]

- (b) Explain why a tank uses wide tracks which allows it to sink less deep into mud as compared to a similar tank with the same mass but uses wheels.

.....
 [2]

- 9 Fig. 9.1 shows two empty metal cups A and B.

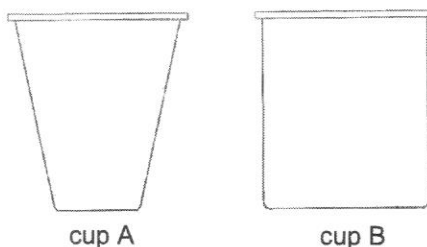


Fig. 9.1

- (a) State which cup is more stable. Give two reasons for your answer.

The more stable cup is

reason 1

.....

reason 2

.....

[2]

- (b) Cup A is completely filled with water.

- (i) It is observed that it becomes more unstable.

Explain why this is so.

.....

.....

[1]

- (ii) A larger force is required to get it to start moving.

Explain why this is so.

.....

.....

[1]

Section B

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

- 10 Fig. 10.1 shows a hydraulic system that is used to raise heavy rocks in a construction site. The hydraulic system uses oil in an enclosed system with a small piston and a large piston at opposite ends of the system.

The pressure exerted by the oil on both pistons is equal.

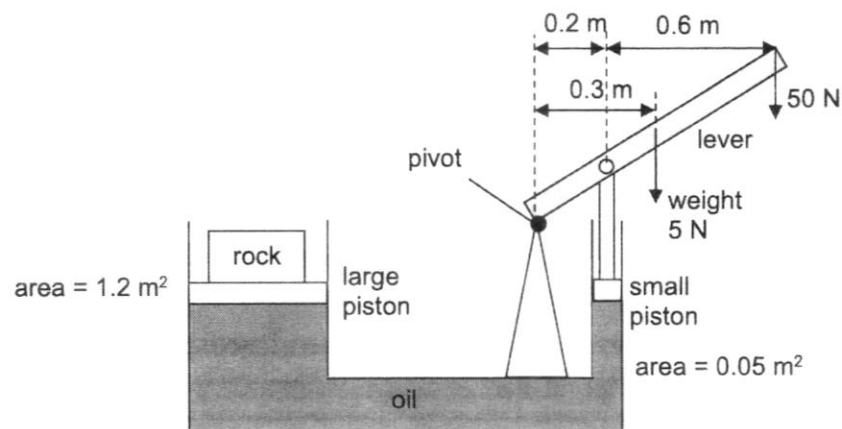


Fig. 10.1

A lever with a weight of 5 N is pivoted at one end and a force of 50 N is applied to the other end of the lever.

- (a) Calculate the force exerted on the small piston when the force of 50 N is applied on the lever.

force = N [2]

- (b) Determine the pressure exerted by the small piston on the oil.

pressure = Pa [2]

- (c) Determine the weight of the rock that is being lifted.

weight = N [2]

- (d) The designer changes the lever of the hydraulic system to another lever made of a lighter (but equally strong) material.

To lift the same rock, state whether the force needed at the lever will increase, decrease or remain unchanged.

..... [1]

- (e) Explain why oil is used in this hydraulic system.

.....
 [1]

- (f) As the rock is lifted at constant speed, state the magnitude of the resultant force on the rock and explain how you obtained your answer.

.....

 [2]

- 11 A copper bar of density 8.9 g/cm^3 , length of 20 cm, height of 9.0 cm and a width of 4.0 cm, rests on a horizontal surface, as shown in Fig. 11.1.

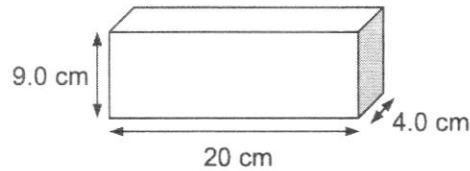


Fig. 11.1

- (a) For this copper bar, calculate

(i) the volume,

volume = cm^3 [1]

(ii) the mass.

mass = kg [2]

- (b) The bar may be moved so that any one of its faces is in contact with the surface.

Calculate the greatest pressure that the bar can exert on the surface. The gravitational field strength is 10 N/kg .

greatest pressure = N/cm^2 [2]

- (c) One end of the copper bar is heated and it was noticed that the other end of the rod felt hot after a short period of time.

State the heat transfer process and explain, in molecular terms, how heat from the hot end of the bar reached the other end of the bar.

.....

.....

.....

.....

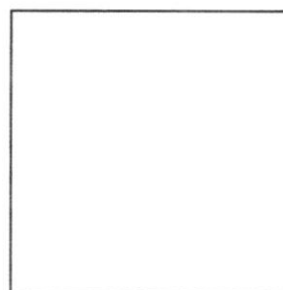
[2]

- (d) The copper bar is heated until it melts.

- (i) In the boxes below, sketch the arrangement of the copper molecules before and after it was in molten form.



before melting



when melted

[1]

- (ii) The molten copper is then recast into two identically sized rods and cooled to the same temperature as the original copper bar.

State how the density and mass of each rod compares to the copper bar.

density :

mass :

[2]

– END OF PAPER –

Meridian Secondary School
Sec 3E Science (Physics) End-of-Year Examination 2022
Marking Scheme

ANSWERS FOR PAPER 1

No.	Answer	No.	Answer	No.	Answer	No.	Answer
1	B	6	D	11	D	16	B
2	D	7	A	12	C	17	A
3	B	8	D	13	B	18	A
4	C	9	C	14	D	19	D
5	B	10	C	15	C	20	C

ANSWERS FOR PAPER 2

General Observations:

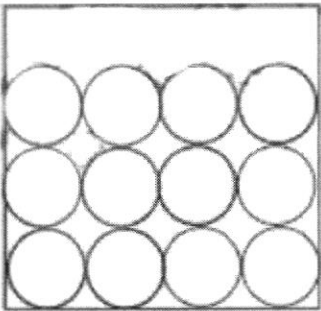
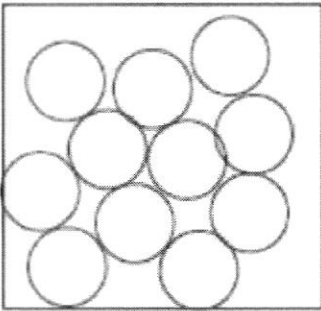
Section A (45m)

Qn	Answer	Marks
1	(a) Non-linear acceleration (or decreasing acceleration) (b)(i) $a = (v-u)/t$; $a = (0 - 14) / 2$ $= -7 \text{ m/s}^2$ Therefore deceleration is 7 m/s^2 (ii) The object has no acceleration and as $F = ma$ there is no resultant force. Fig. 1.1 (c) given that distance = 100 m and $t = 10 \text{ s}$, distance = area under graph $100 = \frac{1}{2} \times 10 \times \text{final speed}$ final speed = 20 m/s	[1] [1] [1] [1] [1] – 20 m/s @ 10 s [1] – straight line for 10 s from $u=0 \text{ m/s}$
2	(a) Unlike scalar quantities, <u>vector quantities have direction</u> in addition to magnitude.	[1]

	(b) Some examples of vectors : acceleration, force, velocity Some examples of scalars : mass, speed, density, time (c) <table border="1"> <thead> <tr> <th>physical quantity</th><th>name of SI unit</th><th>symbol of SI unit</th></tr> </thead> <tbody> <tr> <td>weight</td><td><i>Newton</i></td><td><i>N</i></td></tr> <tr> <td>temperature</td><td><i>Kelvin</i></td><td><i>K</i></td></tr> </tbody> </table>	physical quantity	name of SI unit	symbol of SI unit	weight	<i>Newton</i>	<i>N</i>	temperature	<i>Kelvin</i>	<i>K</i>	[1] per 2 correct boxes for total of [2]
physical quantity	name of SI unit	symbol of SI unit									
weight	<i>Newton</i>	<i>N</i>									
temperature	<i>Kelvin</i>	<i>K</i>									
3	(a) $W = mg$; $0.425 = 0.25 \times g$ $g = 1.7 \text{ N/kg}$ (b) Despite the change in environment the <u>number of molecules in the rock is constant</u>. <u>Mass is the measure of the amount of matter in the body.</u> (c) $v = 60 \text{ cm}^3$ & $m = 0.25 \text{ kg} = 250 \text{ g}$ density = m / V ; density = $250 / 60$ $= 4.17 \text{ g/cm}^3$	[1] [1] [1] [1] [1] [1]									
4	(a) For <u>equilibrium</u>, the <u>sum of clockwise moments is equal to the sum of anti-clockwise moments</u> about the <u>same point</u> (b) $M = Fd$; $M = 1.5 \times 40 = 60 \text{ Nm}$ (anti - clockwise) (c) For equilibrium, $\Sigma M_{\text{cw}} = \Sigma M_{\text{acw}}$ $(W \times 30) = (3 \times 10) + (1.5 \times 40)$ $30 W = 30 + 60$ $W = 3 \text{ N}$ (d) The weight <u>acts through the pivot</u> producing to turning effect	[2] 1 per point missing [1] [1] [1] [1] [1]									
5	(a)(i) it is cooling (ii) it is solidifying (iii) it is cooling (b) Substance Y is losing energy to the surrounding. The intermolecular bonds strengthen as a result. (c) 30°C	[1] [1] [1] [1] [1]									
6	(a) It conducts through the metal support. (b) The <u>argon gas at the filament heats up, becomes less dense and rises. The cooler argon gas, which is denser, is displaced and sinks.</u> This forms convection currents. (c) By infra-red radiation	[1] [1] [1] [1]									

7	(a) $a = (v-u)/t$; $a = (500-0)/3$ $= 167 \text{ m/s}^2$ (b) $F_A - F_f - \text{weight} = ma$; $F_A - 1000 - 3000 = 300 \times 167$ $F_A = 54\,100 \text{ N}$ (accept 54 000N)	[1] [1] [1] ecf [1] ecf
8	(a) $W = mg = 46\,000 \times 10 = 460\,000 \text{ N}$ $P = F/A$; $P = 460\,000 / 6.5$ $= 70800 \text{ Pa}$ (accept 70769 Pa) (b) The <u>contact area of the tracks with the ground is larger</u> than wheels. As $P = F/A$, the resultant <u>pressure on the ground is low</u>.	[1] [1] [1] [1]
9	(a) B B has a larger base area. B has a lower centre of gravity. (b)(i) The centre of gravity rises. (ii) The added water increases its inertia due to increase in mass	[1] [1] for both reasons [1] [1]

Section B

10	(a) For equilibrium, $\Sigma M_{oil} = \Sigma M_{air}$ $(50 \times 0.8) + (5 \times 0.3) = (F \times 0.2)$ $41.5 = 0.2F$ $F = 207.5 \text{ N}$ (b) $P = F/A$; $P = 207.5 / 0.05 \text{ (ecf)}$ $= 4150 \text{ Pa (ecf)}$ (c) Pressure of oil on both pistons is equal. At large piston, $4150 = \text{weight} / 1.2 \text{ (ecf)}$ $\text{weight} = 4980 \text{ N (ecf)}$ (d) The force required will increase. (e) Oil cannot be compressed. (f) The resultant force is <u>zero</u>. This is because the object is moving at constant speed with no acceleration and as $f = 0$, the resultant force is zero.	[1] [1] [1] ecf [1] ecf [1] ecf [1] ecf [1] [1] [1] [1]
11	(a)(i) $V = 9 \times 20 \times 4 = 720 \text{ cm}^3$ (ii) density = m/V ; $8.9 = m / 720$ $m = 6408 \text{ g}$ $= 6.41 \text{ kg (accept 6.408 kg)}$ (b) smallest area, $A = 4 \times 9 = 36 \text{ cm}^2$ $\text{weight} = mg = 6.41 \times 10 = 64.1 \text{ N (ecf)}$ Greatest pressure, $P = 64.1 / 36$ $= 1.78 \text{ N/cm}^2$ (c) Conduction The molecules at the heated end vibrate faster, colliding with the nearby molecules and transferring thermal energy. Being a metal free electrons also help transfer thermal energy (d)(i)  before melting  when melted (ii) density : unchanged mass : halved/decreased	[1] [1] [1] [1] [1] [1] [1] [1] [1] [1] [1] each