

Visit
FREETESTPAPER.com
for more papers



Website: freetestpaper.com



[Facebook.com/freetestpaper](https://www.facebook.com/freetestpaper)



[Twitter.com/freetestpaper](https://www.twitter.com/freetestpaper)

Candidate Name _____

Class _____ Register No. _____

--	--



**PEIRCE SECONDARY SCHOOL
END OF YEAR EXAMINATION 2022
SECONDARY THREE EXPRESS**

**SCIENCE (PHYSICS,CHEMISTRY)
Paper 1 (Multiple Choice)**

**5076/01
7th Oct 2022
Paper 1 : 1 hour**

Additional Materials: Multiple Choice Answer Sheet, Periodic Table

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, class and register number on the Answer Sheet in the spaces provided.

There are **forty** questions in 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 answer sheet.

Read the instructions on the Answer Sheet 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.

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

This paper consists of **16** printed pages and **0** blank page.

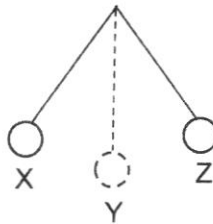
Setter: Miss Tan Yew Geok and Miss Pang Yin Yin

2

1 Which set of physical quantities contains only scalars?

- A density, mass, time
- B current, power, weight
- C energy, pressure, velocity
- D acceleration, time, volume

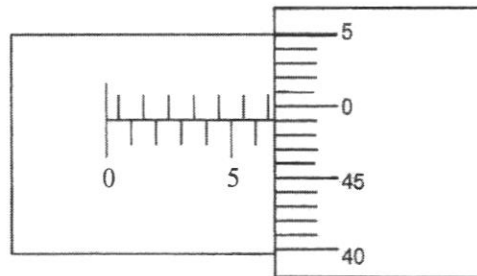
2 The time taken for the pendulum to swing from X to Y is 0.3 s.



What is the time taken to complete 10 oscillations?

- A 0.6 s
- B 1.2 s
- C 12.0 s
- D 24.0 s

3 The figure below shows part of a micrometer screw gauge.

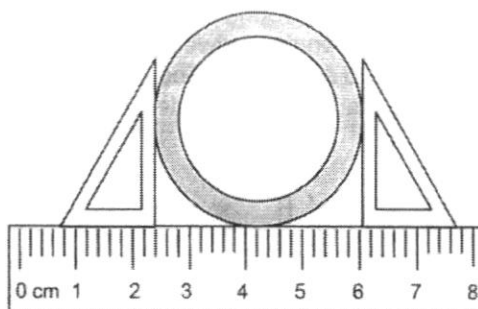


What is the reading shown?

- A 5.39 mm
- B 5.49 mm
- C 5.99 mm
- D 6.99 mm

3

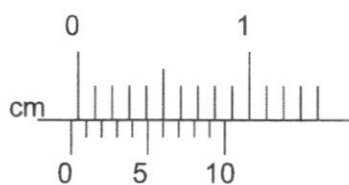
- 4 The figure below shows a thick-walled tube placed against two set squares. The thickness of the wall is 2 mm.



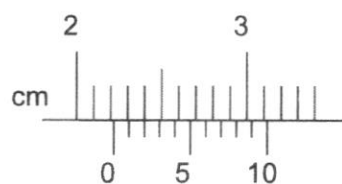
What is the internal diameter of the tube?

- A** 2.9 cm **B** 3.0 cm **C** 3.2 cm **D** 3.4 cm
- 5 A pair of vernier calipers is used to measure the diameter of a boiling tube.

The diagrams below show the reading when the jaws are closed without the boiling tube and when the jaws are closed around the boiling tube.



jaws closed without
the boiling tube



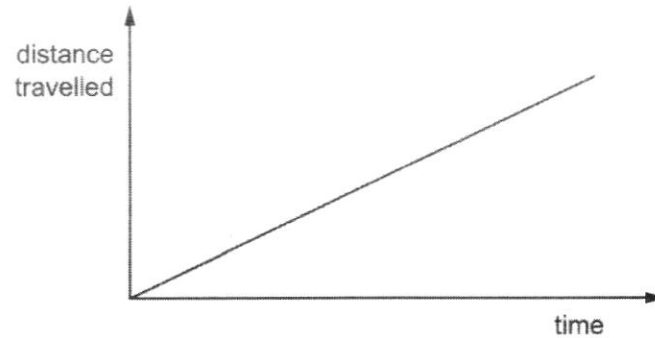
jaws closed around
the boiling tube

What is the diameter of the boiling tube?

- A** 2.16 cm **B** 2.18 cm **C** 2.26 cm **D** 2.28 cm

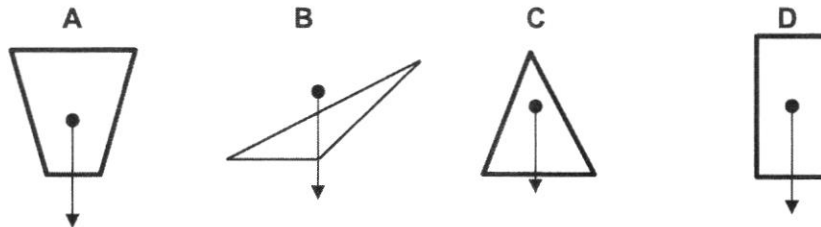
4

- 6 The distance travelled by a car is increasing uniformly as it is driven along a straight road up a hill.



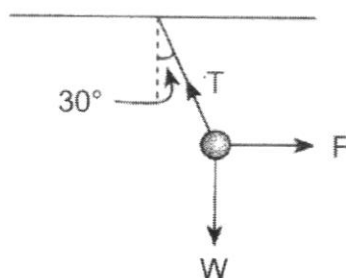
Which quantity for the car is constant but not zero?

- A acceleration
 - B potential energy
 - C resultant force
 - D speed
- 7 The diagram below shows four objects placed on a slope. The dot in each object indicates its centre of gravity. Which object is the most unstable?

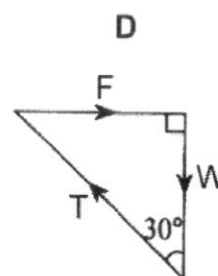
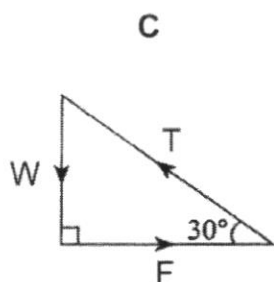
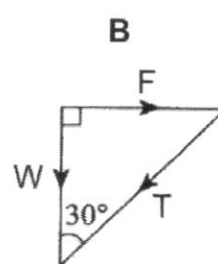
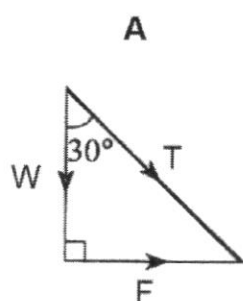


5

- 8 The figure below shows a load of weight W hanging by a string and is in equilibrium.



Which vector diagram represents T , F and W acting on the load?



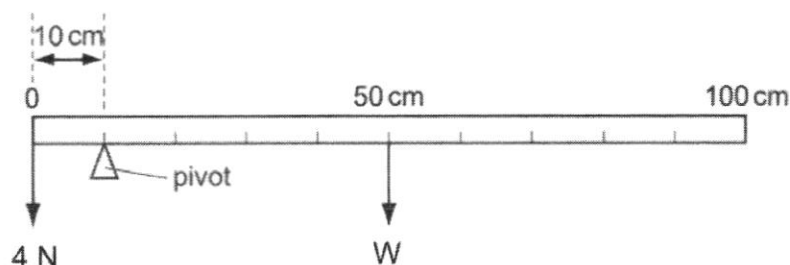
6

- 9 The atmospheric pressure is 100 kPa.

What is the force exerted by the atmosphere on a rectangular surface that measures 0.5 m by 0.4 m?

- A 20 kN B 50 kN C 200 kN D 500 kN

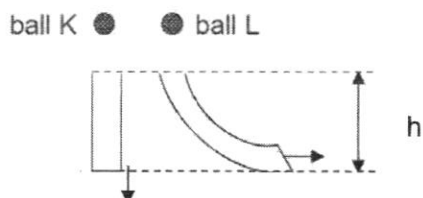
- 10 A uniform metre rule is balanced by a 4 N weight as shown in the diagram.



What is the weight W of the metre rule?

- A 0.8 N B 1 N C 4 N D 16 N

- 11 Two balls of equal mass are dropped from the same height down frictionless chutes that reach the ground as shown below.

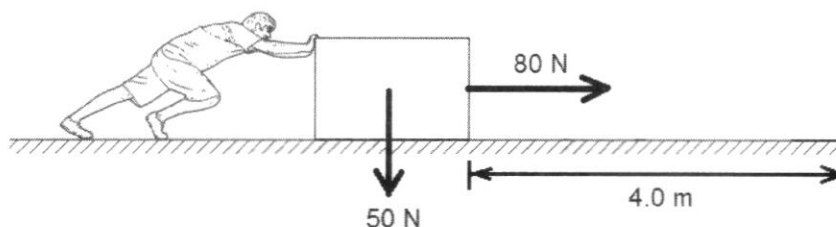


Which of the following is true of the kinetic energy of the two balls as they emerge from the chutes?

- A Kinetic energy of ball K and ball L is zero.
 B Kinetic energy of ball K is equal to that of ball L.
 C Kinetic energy of ball K is less than that of ball L.
 D Kinetic energy of ball K is greater than that of ball L.

7

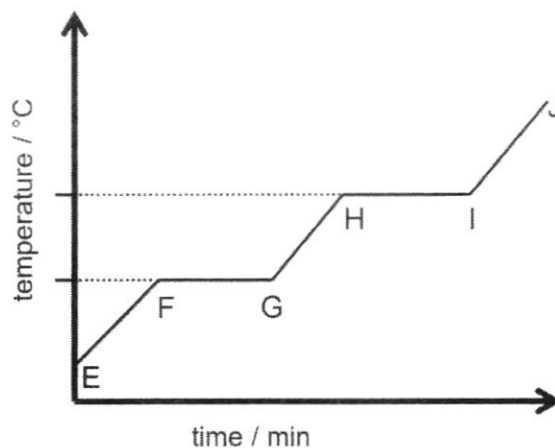
- 12 A man pushes a box weighing 50 N across a floor. He exerts a force of 80 N and the box moves 4.0 m in 5.0 seconds.



What is the average power developed by the man?

- A** 40 W **B** 64 W **C** 1 000 W **D** 1 600 W
- 13 A solid melts and turns into a liquid at a fixed temperature.
Which statement is correct?
- A** The molecules expand.
B The molecules move faster.
C The molecules lose energy.
D The molecules move further apart.
- 14 Which of the following methods would not produce a convection current in a container filled with water at 30 °C?
- A** Floating a piece of ice on the water.
B Lighting a candle beneath the container.
C Dropping a piece of hot metal into the water.
D Placing a 100 W lighted bulb just above the water surface.

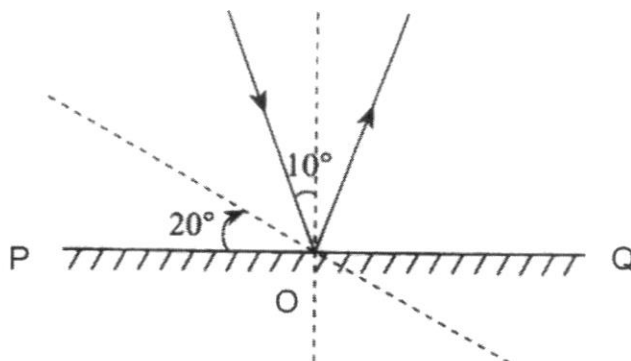
- 15 The figure shows a temperature-time graph of a solid being heated.



During which portion(s) of the graph is/are there gain in kinetic energy of the molecules in the substance?

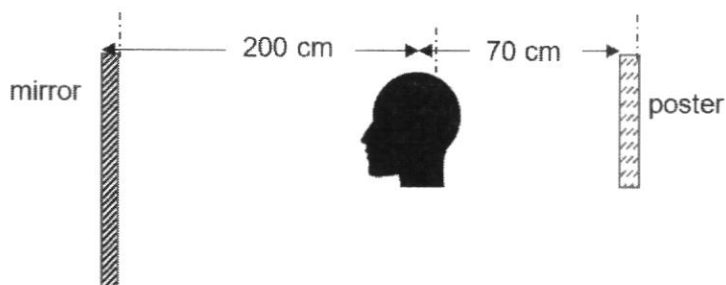
- A FG & HI
 - B EF, GH & IJ
 - C all parts of the graph
 - D no parts of the graph
- 16 Which action cannot change the rate at which water evaporates from a dish?
- A Increase the depth of water in the dish.
 - B Put the dish and water out in the hot sun.
 - C Fan the air above the surface of the water.
 - D Use a dish with a greater expose surface area.

- 17 The figure below shows a light ray with an incident angle of 10° being reflected by a plane mirror PQ. The mirror is then rotated clockwise through an angle of 20° .



What is the new angle of reflection of the light ray?

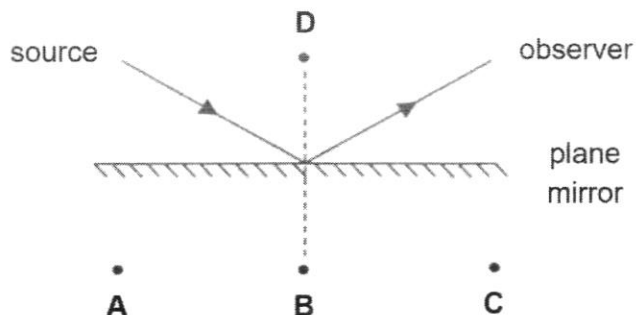
- A 10° B 15° C 20° D 30°
- 18 A plane mirror is placed at a distance 200 cm in front of a man. A poster is fixed 70 cm behind the eyes of the man.



What is the distance of the image of the poster from the man?

- A 70 cm B 270 cm C 470 cm D 540 cm

- 19 In the diagram below, the light ray leaves a light source and reflects from a plane mirror. At which point does the image of the source appear to be located?

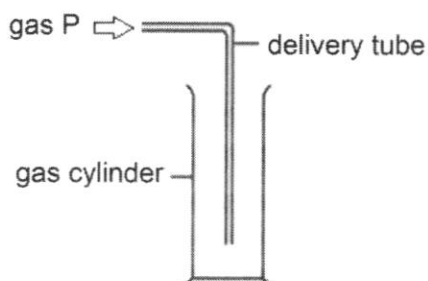


- 20 An object is placed in front of a thin converging lens at a distance more than twice the focal length of the lens.

Which is the correct description of the image formed?

- A real, inverted, magnified
- B real, inverted, same size
- C real, inverted, diminished
- D virtual, upright, magnified

- 21 Which of the following pieces of apparatus is **not** suitable for accurately measuring out 25.0 cm^3 of water?
- A beaker
B burette
C measuring cylinder
D pipette
- 22 Gas P can be collected using the apparatus as shown. Based on the diagram, what can you infer about gas P?



- A It is denser than air.
B It is insoluble in water.
C It is less dense than air.
D It is soluble in water.
- 23 Copper(II) sulfate crystals can be separated from sand by using the following processes.
What is the correct order for the processes?

	first → last			
A	filter	dissolve	evaporate	crystallise
B	dissolve	evaporate	crystallise	filter
C	dissolve	evaporate	filter	crystallise
D	dissolve	filter	evaporate	crystallise

24 Which of the following properties shows that a solid is pure?

- A It has no effect on red or blue litmus paper.
- B It is colourless and odourless.
- C It melts at a fixed temperature at a given pressure.
- D It turns Universal Indicator green.

25 Which changes occur when a liquid becomes a gas?

	Separation of particles	Energy of particles	Attractive force between particles
A	Decreases	Increases	Decreases
B	Decreases	Decreases	Increases
C	Increases	Increases	Decreases
D	Increases	Decreases	Increases

26 Which statement about the kinetic particle theory is **not** true?

- A It describes the different states of matter.
- B It explains the changes of state.
- C It explains the different properties of solid, liquid and gas.
- D It explains why substances have different pH range.

27 Which list contains an element, a mixture and a compound?

- A Argon, hydrogen, copper(II) sulfate
- B Salt, iron, water
- C Sea water, lead, ammonia
- D Sulfur, air, chlorine

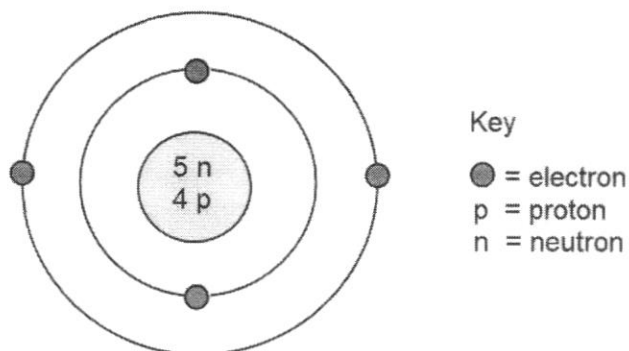
13

- 28 Which of the following gives the correct coefficients for balancing the following chemical equation?



	α	β	δ	θ
A	1	1	1	1
B	1	2	1	1
C	2	1	1	2
D	2	2	2	2

- 29 The diagram represents an atom of an element.



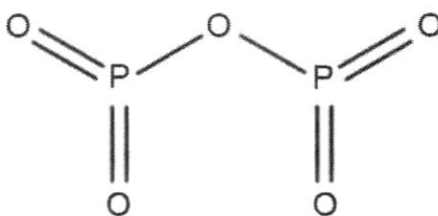
Which symbol represents this atom?

- A ${}^4_2\text{He}$
- B ${}^9_4\text{Be}$
- C ${}^{11}_5\text{B}$
- D ${}^{16}_8\text{O}$
- 30 Which of the following is different for isotopes of the same element?
- A chemical reactions
- B nucleon number
- C proton number
- D valence electrons

- 31 An element Y reacts with chlorine to form ionic solid with the formula YCl .
What is the electronic configuration of Y?

A 2,6
B 2,8,1
C 2,8,2
D 2,8,7

- 32 What is the total number of electrons shared in this molecule?



- A 8
B 10
C 18
D 20
- 33 20 cm^3 of carbon monoxide reacts with 20 cm^3 of oxygen. The equation for the reaction is shown.



What is the **total** volume of gas remaining at the end of the reaction?
(all volumes are measured at r.t.p)

A 5 cm^3
B 10 cm^3
C 20 cm^3
D 30 cm^3

34 Which is equivalent to 1 mol of water?

- A 0.5 g of water
- B 2 mol of hydrogen molecules and 1 mol of oxygen molecules
- C 24 dm³ of water vapour at r.t.p.
- D 6×10^{23} hydrogen and oxygen atoms

35 The table gives some information about three indicators.

indicator	colour at pH = 1	pH at which colour changes	colour at pH = 12
naphthyl red	red	4	yellow
bromocresol purple	yellow	6	purple
thymolphthalein	colourless	9	blue

Which colours would be seen when each indicator is put separately into pure water?

	naphthyl red	bromocresol purple	thymolphthalein
A	red	yellow	blue
B	yellow	yellow	colourless
C	yellow	yellow	blue
D	yellow	purple	colourless

36 Which of the following is an amphoteric oxide?

- A Copper (II) oxide
- B Magnesium oxide
- C Sulfur dioxide
- D Zinc oxide

37 Which salt can be prepared by titration?

- A Copper (II) chloride
- B Iron (II) chloride
- C Lead (II) chloride
- D Sodium chloride

38 Which metal reacts rapidly with steam, but very slowly with cold water?

- A Calcium
- B Copper
- C Iron
- D Potassium

39 The table below shows the reactions of four metals with water, steam and dilute hydrochloric acid.

	manganese	platinum	magnesium	chromium
water	x	x	✓	x
steam	✓	x	✓	x
dilute hydrochloric acid	✓	x	✓	✓

Which of the following shows the correct order of increasing reactivity?

- A magnesium, manganese, chromium, platinum
 - B platinum, chromium, magnesium, manganese
 - C platinum, chromium, manganese, magnesium
 - D platinum, manganese, chromium, magnesium
- 40 Which of the following condition will **most** likely cause the iron nail to rust?
- A The nail is placed in a container with a damp cotton wool.
 - B The nail is placed in a container with drying agent.
 - C The nail is placed in a container of boiled water with a layer of oil on the surface of the water.
 - D The nail is greased and is placed in a container with water.

2

Section A

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

- 1** Fig. 1.1 shows the speed of a car on a straight level road after it started from rest. The mass of the car was 1700 kg.

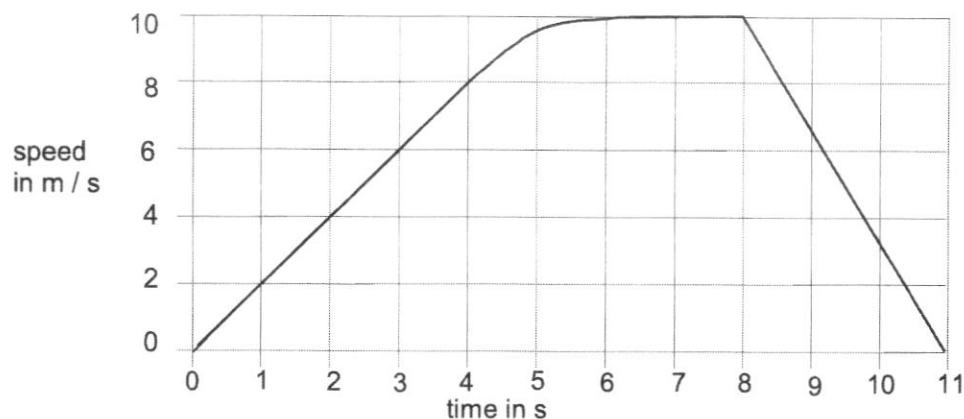


Fig. 1.1

- (a) Calculate the acceleration of the car at $t = 2$ s.

acceleration = ... m / s^2 [2]

- (b) Describe the motion of the car from $t = 8$ s to $t = 11$ s.

.....

..... [1]

- (c) Calculate the distance travelled from $t = 6$ s to $t = 11$ s.

distance = ... m [2]

3

- 2 A 100 g cube of side 2.0 cm is placed on a table top as shown in Fig. 2.1.

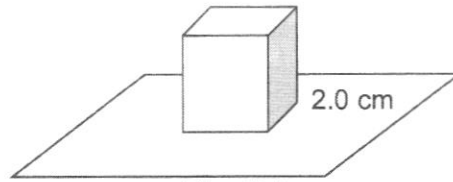


Fig. 2.1

- (a) Calculate the weight of the cube. Take $g = 10 \text{ N / kg}$.

weight = ... N [2]

- (b) Calculate the pressure that the cube exerts on the table.

pressure = ... Pa [2]

- (c) Calculate the density of the cube in kg / m^3 .

density = ... kg / m^3 [2]

- (d) State whether the cube will float, sink or be suspended in the liquid when it is placed in a container containing a liquid of density $14\,000 \text{ kg / m}^3$.
Explain your answer.

.....

 [2]

4

- 3 A rocket has a mass of 500 kg. The rocket has a weight of 9 000 N in planet X.

(a) Calculate the gravitational field strength, g , of planet X.

$g = \dots\dots\dots \text{N / kg [1]}$

- (b) At lift-off, the rocket engine exerts an upward force of 25 000 N. What is the initial acceleration of the rocket at lift-off?

acceleration = $\dots\dots\dots \text{m / s}^2$ [2]

- 4 Fig. 4.1 shows a boy and a girl on a playground see-saw. The see-saw is pivoted at its centre of gravity, **X**. Their mother has to hold the girl's end in order to keep the see-saw level. The boy's mass is 50 kg and the girl's mass is 30 kg. The strength of the Earth's gravitational field is 10 N / kg. All the distances are shown in Fig. 4.1.

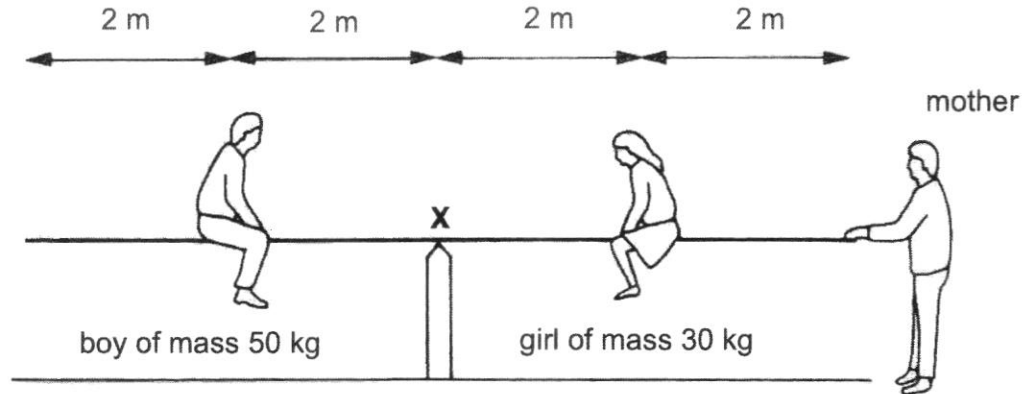


Fig. 4.1

- (a) Calculate the moment of the boy's weight about the pivot, **X**.

moment = ... Nm [1]

- (b) Calculate the moment of the girl's weight about the pivot, **X**.

moment = ... Nm [1]

6

- (c) Calculate the force their mother must apply on the end of the see-saw to keep it level.

force = ... N [2]

- (d) The see-saw has a weight of 300 N. Calculate the reaction force acting on the see-saw by the pivot at X.

reaction force = ... N [2]

- 5 Many road accidents are caused by tall vehicles like the one shown in Fig. 5.1. Although these vehicles are considered stable, "incorrect loading" may reduce their stability to a dangerous level.

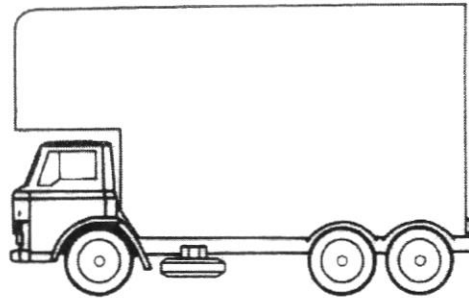


Fig. 5.1

- (a) Explain what is meant by the centre of gravity of a body.

.....
 [1]

- (b) State the effect of the position of the centre of gravity on the stability of a body.

.....
 [1]

- (c) Explain how 'incorrect loading' may reduce the stability of the vehicle and why that may be dangerous.

.....

 [2]

- 6 An electric kettle boils water using a heating element at the bottom as shown in Fig. 6.1.

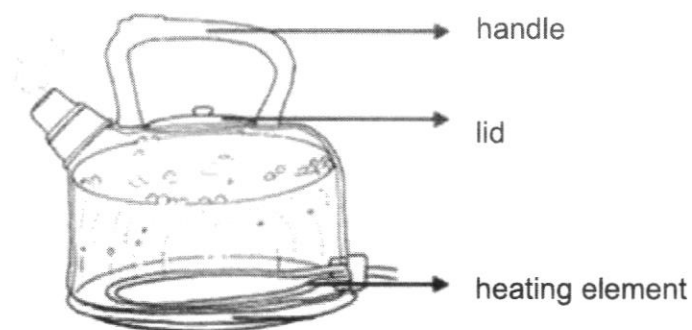


Fig 6.1

- (a) State the main process of heat transfer which is used to boil the water.
 [1]
- (b) Explain how the water in the kettle is heated up.

 [3]
- (c) Suggest a suitable material for the handle of the electric kettle.
 Explain your choice of answer.

 [2]

- (d) When the lid of the kettle is removed, state how the time taken to boil the water may change. Explain your answer.

.....

.....

..... [2]

- (e) The electric kettle has a power rating of 2000 W. It takes 3 minutes to boil the water.

Calculate the amount of energy supplied to the water.

energy = ... J [3]

- 7 (a) The image formed by a plane mirror is upright and virtual.

Write down **two** other properties of the image.

.....

..... [1]

- (b) On Fig. 7.1, draw **two** light rays to show how the eye sees the image of the dot on the mirror. [2]

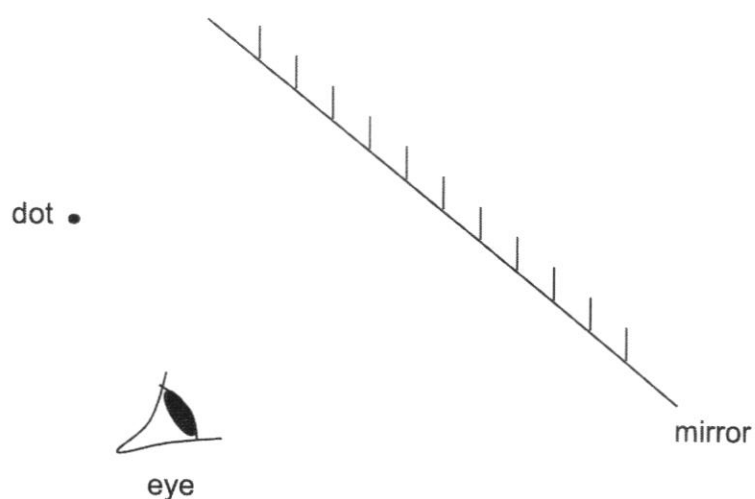


Fig 7.1

- (c) A ray of light in the air enters a glass block as shown in Fig 7.2.

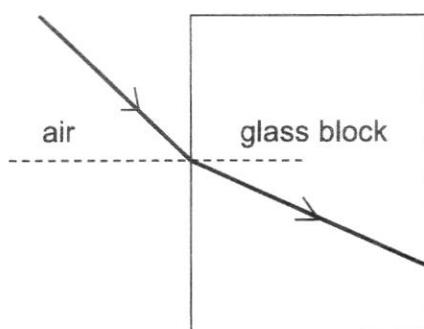


Fig. 7.2

Complete the diagram to show the path of the light ray as it emerges from the glass block. [1]

- (d) Given that the speed of light in vacuum is 3.0×10^8 m / s and the refractive index of glass is 1.5, calculate the speed of light in the glass block.

speed = ... m / s [2]

- (e) Fig. 7.3 shows a ray of light passing through a semi-circular transparent plastic block.

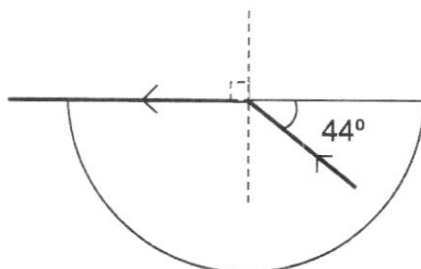


Fig 7.3

- (i) State the critical angle of this plastic block.

..... [1]

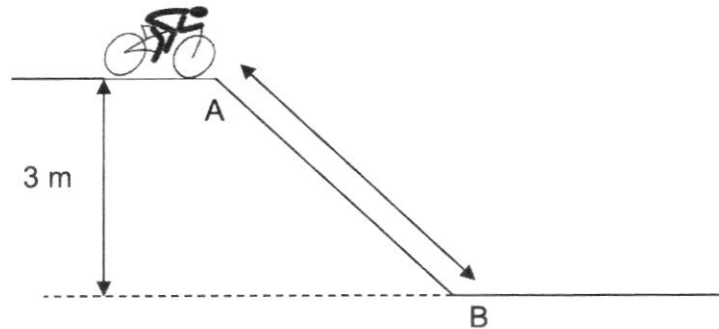
- (ii) Calculate the refractive index of this plastic block.

refractive index = ... [1]

Section B

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

- 8 James has a mass of 80 kg. He goes for a cycling expedition and encounters a steep artificial ramp as shown in Fig. 8.1. Upon reaching point A, he stops pedalling and leaves the point with an initial speed of 5.0 m / s. He takes a total of 2.0 s to travel from A to B. Ignore the effects of air resistance and friction.

**Fig 8.1**

- (a) Write down the energy conversion from point A to point B.
..... [1]
- (b) Calculate the total energy he possesses at point A. Take $g = 10 \text{ N / kg}$.

total energy = ... J [2]

- (c) Calculate his speed at point B.

speed = ... m / s [2]

14

- (d) Calculate his acceleration along the slope AB.

acceleration = ... m / s² [2]

- (e) Describe and explain the motion of James after point B.

.....

 [2]

- (f) Assuming that the effects of air-resistance and friction are present, describe James' motion after point B.

.....
 [1]

- 9 Mr Tan participates in a marathon race. Upon finishing the race, his body temperature reaches 39°C .

- (a) Using kinetic theory, describe how his perspiration can allow his body to cool down after a while.

.....

.....

.....

.....

..... [3]

- (b) State two differences between evaporation and boiling.

.....

.....

..... [2]

While preparing for another night marathon race, Mr Tan has two running jerseys to choose from. One is totally white and the other is totally black. Both are of the same design and are made of the same material.

- (c) State and explain which jersey he should wear for him to cool down faster after the race.

.....

.....

.....

..... [2]

To cool his temperature further, Mr Tan went for an ice bath after the race. He immersed himself into a tub of ice. It was observed that some of the ice begins to melt, and the temperature of the ice and water remains constant at 0 °C.

- (d) Name the main process of heat transfer that allows his body to cool when he is in the tub of ice.

..... [1]

- (e) In terms of the water molecules, explain why the temperature of the tub of ice remains constant throughout the process.

.....
.....
.....
..... [2]

- 10** Tower cranes on building sites have a counterweight made of concrete, which balances the load during lifting as shown in Fig. 10.1.

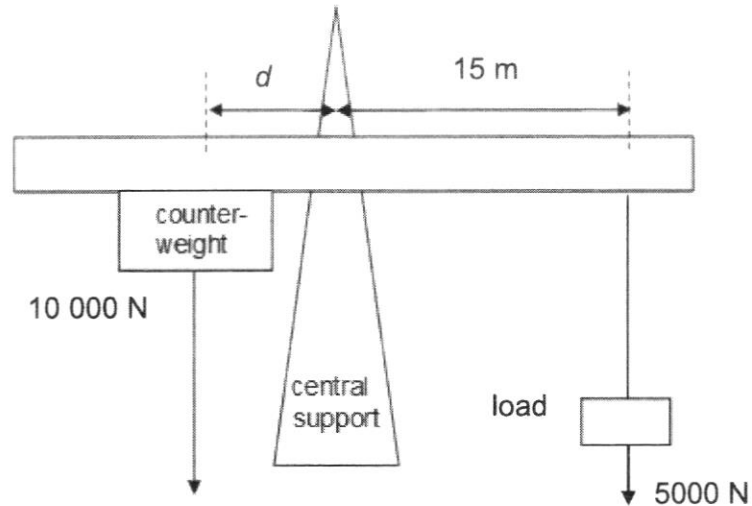


Fig 10.1

- (a)** State the principle of moments.

.....

 [2]

- (b)** A counterweight of 10 000 N needs to be placed d m away from the central support to balance a load of weight 5000 N as shown in Fig. 10.1. Calculate the value of d . Ignore the weight of the crane.

$d = \dots\dots\dots$ m [2]

- (c) The 500 kg load is lifted through a vertical distance of 0.10 km.
Calculate the work done by the crane.

work done = ... J [2]

- (d) To balance a new load at the same position, the counterweight must be shifted to a position 12 m away from the central support.
Calculate the mass of this load.

mass = ... kg [2]

- (e) A mobile crane has many wheels and outriggers as shown in Fig 10.2.

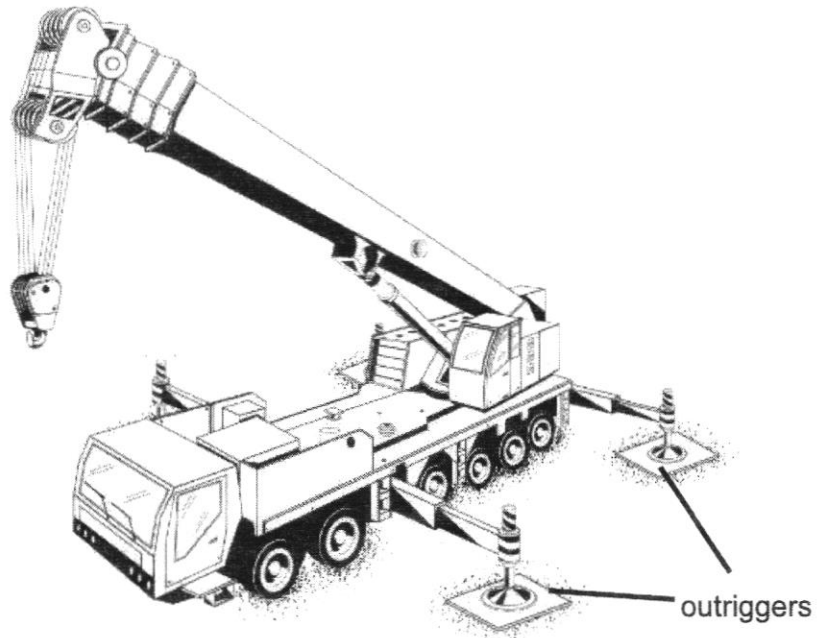


Fig 10.2

Explain how these wheels and outriggers will help in preventing the crane from sinking into the ground.

.....

.....

.....

..... [2]

END OF PAPER 2

2022 Sec 3E End-Of-Year Exam**SciPhysics Paper 1 (5076/01)**

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

A – 4

B – 5

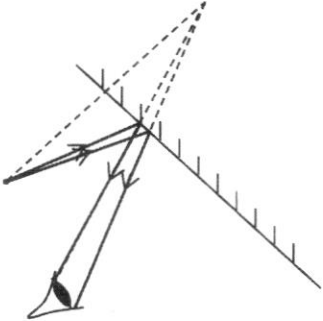
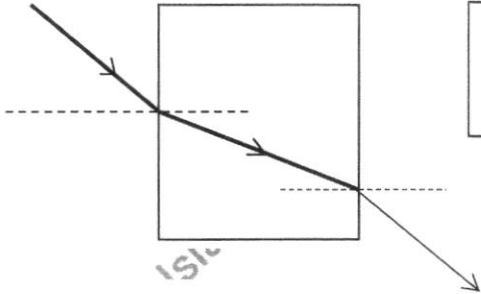
C – 5

D – 6

Paper 2
Section A

1a	$a = (v - u)/t$ or rise/run $= (6 - 0)/3$ or $4/2$ $= 2 \text{ m/s}^2$	M1 A1
1b	Uniform/ constant deceleration OR uniform / constant decrease in speed OR decrease in speed at a uniform / constant rate	B1
1c	Distance = area under graph $= 2 \times 10 + 0.5 \times 3 \times 10$ OR $\frac{1}{2} \times (5 + 2) \times 10$ $= 35 \text{ m}$	M1 A1
		5
2a	$W = mg$ $= 0.1(10)$ $= 1.0 \text{ N}$	M1 A1
2b	$\text{pressure} = \frac{F}{A}$ $= \frac{1.0}{0.02 \times 0.02}$ $= 2500 \text{ Pa}$	M1 A1 (Allow ecf)
2c	$\rho = \frac{m}{V}$ $= \frac{0.1}{(0.02)^3}$ $= 12\,500 \text{ kg/m}^3$	M1 A1
2d	It will <u>float</u> as its <u>density is less</u> than the density of the liquid. If the answer in 2(c) shows a value greater than $14\,000 \text{ kg/m}^3$, accept the following answer: It will <u>sink</u> as its <u>density is greater</u> than the density of the liquid.	B2
		8
3a	$W = mg$ $9000 = 500 \times g$ $g = 9000/500 = 18 \text{ N/kg}$	B1
3b	$F = ma$ $(25\,000 - 9\,000) = 500 \times a$ $a = 32 \text{ m/s}^2$	M1 A1
		3

4a	$M = F \times d$ $= (50 \times 10) \times 2$ $= 1\,000 \text{ Nm}$	B1
4b	$M = F \times d$ $= (30 \times 10) \times 2$ $= 600 \text{ Nm}$	B1
4c	Taking moments about the pivot. Clockwise moments = Anticlockwise moments $(F \times 4) + 600 = 1\,000$ $F = 100 \text{ N}$	M1 A1 (Allow ecf)
4d	Total forces acting upwards = total forces acting downwards $R = 500 + 300 + 300 + 100$ $R = 1\,200 \text{ N}$	M1 A1 (Allow ecf)
		6
5a	The centre of gravity (c.g) of a body is the point through which the whole weight of the body appears to act.	B1
5b	The higher the centre of gravity of a body, the lower is its stability or vice-versa.	B1
5c	'Incorrect loading' can cause the centre of gravity to be raised and thus reducing the stability of the vehicle. The vehicle may topple when there is a force acting on it (e.g. a strong wind or when turning – centripetal force)	B1 B1
		4
6a	Convection	B1
6b	The water near the heating element <u>gains heat and expands</u> . Its <u>density decreases and the water rises</u> [1]. The <u>surrounding cooler and denser water sinks</u> [1], <u>setting up a convection current</u> [1] in the kettle.	B3
6c	<u>Plastic</u> (or any poor conductor of heat) It is a <u>poor conductor of heat</u> .	B1 B1

6d	The time taken will <u>increase</u> [1] as the water will <u>lose heat</u> by convection <u>to the surrounding</u> [1] cooler air.	B2
6e	$P = \frac{E}{t}$ $E = (2000)(60 \times 3)$ $= 360\,000 \text{ J}$ If time is not converted to seconds, award 1 mark only for method.	M2 A1
		11
7a	laterally inverted, same size as the object, same distance away from the mirror as the object – any two	B1
7b	 [1] correct lines (dotted and non-dotted) [1] correct arrows	B2
7c	 [1] must be visually parallel and with arrow head	B1
7d	$1.5 = \frac{3.0 \times 10^8}{\text{speed of light in glass}}$ $\text{speed of light in glass} = \frac{3.0 \times 10^8}{1.5}$ $= 2.0 \times 10^8 \text{ m/s}$	M1 A1

7e	(i) 46°	B1								
	(ii) $n = \frac{1}{\sin 46^\circ} \approx 1.4$ or 1.39	B1								
		8								
	Section B									
8a	Gravitational Potential Energy (and kinetic energy) is converted to Kinetic Energy	B1								
8b	Total energy = $(80)(10)(3) + \frac{1}{2}(80)(5)^2$ $= 2400 + 1000 = 3400 \text{ J}$	M1 A1								
8c	$3400 = \frac{1}{2}(80)v^2$ $v^2 = 85$ $v = 9.22 \text{ m/s}$	M1 A1								
8d	$a = \frac{v - u}{t}$ $a = \frac{9.22 - 5}{2.0}$ $= 2.11 \text{ (3sf) m/s}^2$	M1 A1								
8e	He will continue to move at <u>a constant speed</u> [1] of 15 m / s as there is <u>no net force</u> [1] acting horizontally on him.	B2								
8f	(f) He will <u>decelerate</u> [1] and <u>come to rest</u> after some time.	B1								
		10								
9a	The water droplets in his sweat <u>gain heat energy from his body</u> [1] and the surrounding to <u>overcome the attractive forces</u> [1] between them as they <u>evaporate</u> [1] As his body loses heat, its temperature drops.	B3								
9b	<table><tr><th>Boiling</th><th>Evaporation</th></tr><tr><td>Relatively fast process</td><td>Relative slow process</td></tr><tr><td>Occurs throughout the liquid</td><td>Occurs only at the surface of the liquid</td></tr><tr><td>Occurs at a fixed temperature for a pure substance</td><td>Occurs at any temperature</td></tr></table>	Boiling	Evaporation	Relatively fast process	Relative slow process	Occurs throughout the liquid	Occurs only at the surface of the liquid	Occurs at a fixed temperature for a pure substance	Occurs at any temperature	B2
Boiling	Evaporation									
Relatively fast process	Relative slow process									
Occurs throughout the liquid	Occurs only at the surface of the liquid									
Occurs at a fixed temperature for a pure substance	Occurs at any temperature									

	<table><tr><td>Bubbles are formed in the liquid</td><td>No bubble is formed</td></tr><tr><td>Temperature of liquid remains constant</td><td>Temperature of liquid usually decreases</td></tr><tr><td>Thermal energy is supplied by an external energy source</td><td>Thermal energy is usually supplied by surrounding</td></tr></table>	Bubbles are formed in the liquid	No bubble is formed	Temperature of liquid remains constant	Temperature of liquid usually decreases	Thermal energy is supplied by an external energy source	Thermal energy is usually supplied by surrounding	
Bubbles are formed in the liquid	No bubble is formed							
Temperature of liquid remains constant	Temperature of liquid usually decreases							
Thermal energy is supplied by an external energy source	Thermal energy is usually supplied by surrounding							
	Any two							
9c	<u>Black</u> [1] as it is a <u>good emitter of radiation</u> [1]. Hence it will allow heat to be radiated faster to the surrounding.	B2						
9d	Conduction	B1						
9e	Energy absorbed is used to <u>weaken the intermolecular bonds</u> of the molecules OR to <u>increase the internal potential energy</u> of the molecules. There is <u>no change in internal kinetic energy</u> of the molecules.	B1 B1						
		10						
10a	When a system is <u>at equilibrium</u> [1], the <u>sum of clockwise moments about the pivot is equal</u> to the <u>sum of anticlockwise moments about the same pivot</u> [1].	B2						
10b	ACM = CM $10000d = 15(500 \times 10)$ $d = 7.5 \text{ m}$	M1 A1						
10c	Work done = $5000 \times (0.10 \times 1000)$ $= 500\,000 \text{ J}$	M1 A1						
10d	ACM = CM $12(10000) = 15W$ $W = 8000 \text{ N}$ $\therefore m = \frac{8000}{10} = 800 \text{ kg}$	M1 A1						
10e	The wheels and the outriggers increase the <u>contact area surface area with the ground</u> . This would <u>decrease the pressure on the ground</u> , and reduce the chance of sinking into the ground.	B1 B1						
		10						