Hwa Chong Institution Examinations
Secondary 3 Integrated Programme

CANDIDATE NAME					
CLASS				REGISTER NUMBER	

PHYSICS **SAMPLE PAPER A**

Paper 1 Multiple Choice **45 mins**

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and register number on the Answer Sheet.
DO **NOT** WRITE IN ANY BARCODES

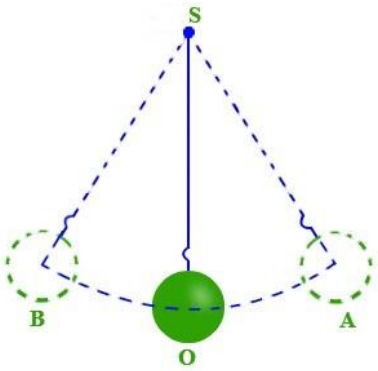
There are **thirty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** or **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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 the question booklet.

When necessary, take g to be 10 m s^{-2} or 10 N kg^{-1}.

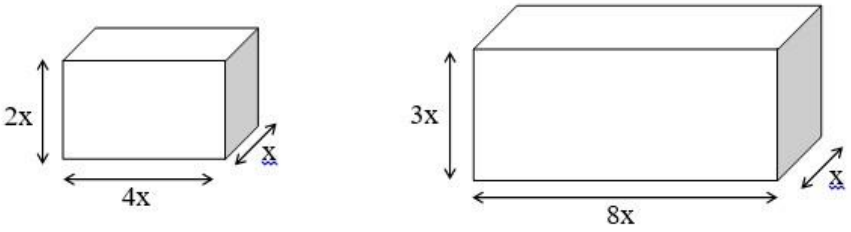
1 An oscillating pendulum is shown below.



If it takes 0.25 s to move from O to A, what is the period of the oscillating pendulum?

A 0.50 s.
B 0.75 s
C 1.00 s
D 1.25 s.

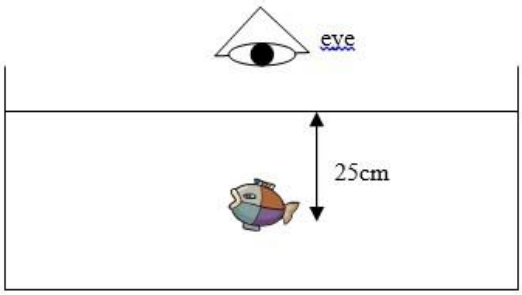
2 The diagram shows two blocks made from the same material. The weight of the small block is W.



What is the weight and the density of the larger block?

	weight	**density**
A	2W	$\frac{W}{12x^3}$
B	2W	$\frac{W}{12gx^3}$
C	3W	$\frac{W}{8x^3}$
D	3W	$\frac{W}{8gx^3}$

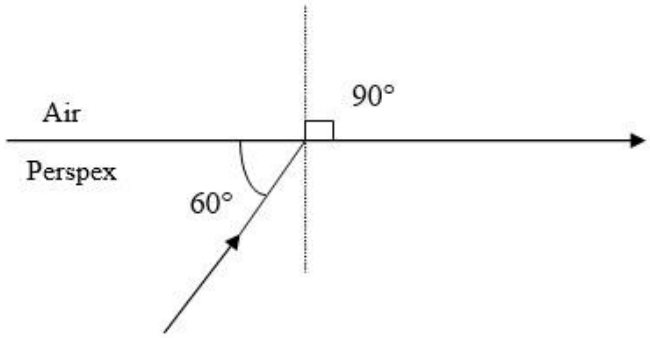
3 The diagram shows a tank with a fish at a depth of 25.0 cm from the surface. When the tank was viewed normally from the top by a student, the fish appears to be at a depth of 15.0 cm from the surface.



The fish then swims to a depth of 40.0 cm. When viewed normally from the top, what is its apparent depth?

A 9.4 cm **B** 20.0 cm **C** 24.0 cm **D** 30.0 cm

4 What is the absolute refractive index for the block of perspex shown in the diagram?



A 0.50 **B** 0.87 **C** 1.2 **D** 2.0

5 The focal length of a converging lens is 10.0 cm.

What is a possible value for the object distance if the lens is to be used in the diagram shown above?

A 20.0 cm **B** 15.0 cm **C** 10.0 cm **D** 5.0 cm

6 A cup is placed in front of a window and the view outside is a distant building. Two photos P_1 and P_2 as shown below are taken with the same single-lens camera.

Photo P_1

Photo P_2

Which of the following statements about the two photos must be correct?

A In P_1, the images of the cup and the building are on different sides of the lens of the camera.

B In P_1, the image of the cup is real while that of the building is virtual.

C On taking P_2, the image distance of the building is shorter than the image distance of the cup on taking P_1.

D On taking P_2, the image distance of the building is longer than the image distance of the cup on taking P_1.

7 Which of the following lists only vector quantities?

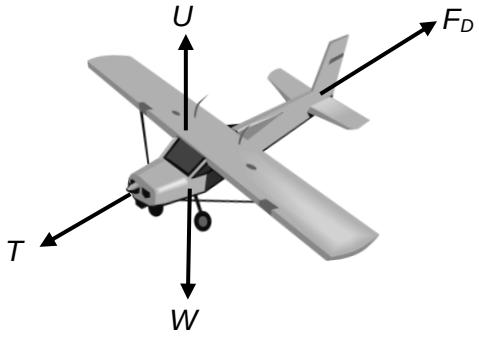
A Energy, mass and force

B Acceleration, force and pressure

C Time, weight and velocity

D Velocity, weight and friction

8 The diagram below shows the forces acting on a toy aeroplane accelerating horizontally at a constant height in the air.



F_D: Drag force

T: Thrust by engine

U: Upward force on wings

W: Weight

Which of the following rows correctly describes the relationship between the forces?

	Horizontal	Vertical
A	$T = F_D$	$U = W$
B	$T = F_D$	$U > W$
C	$T > F_D$	$U = W$
D	$T > F_D$	$U > W$

9 Which are the possible applications for the type of electromagnetic waves ***H*** and ***K*** in the electromagnetic spectrum?

Radio waves	***H***	Visible light	Ultraviolet radiation	***K***

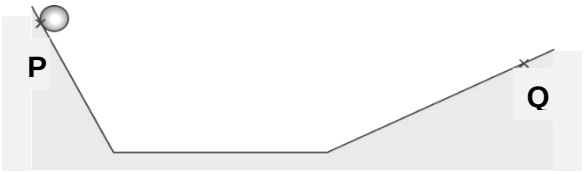
	Application of ***H***	Application of ***K***
A	Remote control	Telecommunication
B	Detect bone fracture	Measuring temperature
C	Mobile phone communication	Cancer treatments
D	Sterilisation of medical equipment	Killing germs and bacteria to preserve food

10 A table–tennis ball is dropped from the same height in a vacuum and then in air.

What effect will air resistance have on its time of fall and its average acceleration?

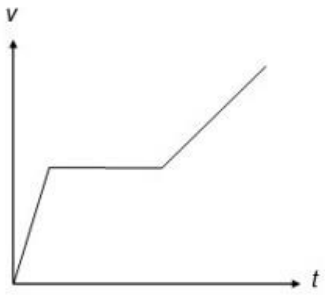
	time of fall	**acceleration**
A	increase	decrease
B	increase	same
C	same	decrease
D	same	increase

11 A ball runs on a frictionless rail from **P** to **Q**.

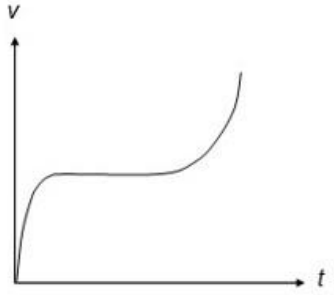


Which of the following velocity-time graphs best represents the motion of the ball?

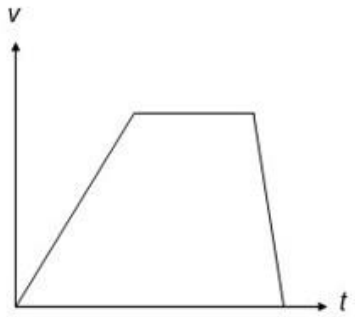
A



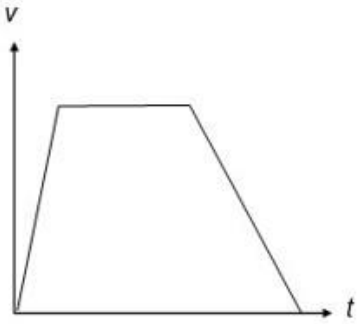
B



C

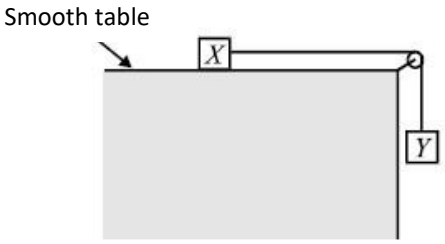


D



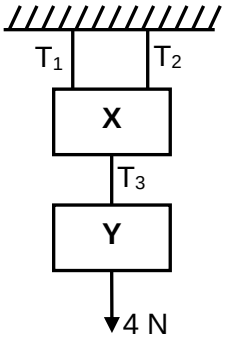
12 Two identical blocks *X* and *Y* are connected by a light string passing over a smooth pulley as shown above. The two blocks are released from rest. After a while, the string is cut.

Which of the following correctly describes the motion of the blocks immediately after the string was cut?



	X	Y
A	stops moving	accelerates at 10 m s^{-2}
B	moves with constant velocity	accelerates at 5.0 m s^{-2}
C	accelerates at 10 m s^{-2}	moves with constant velocity
D	moves with constant velocity	accelerates at 10 m s^{-2}

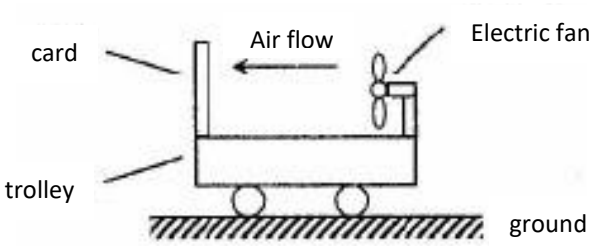
13 Two blocks **X** and **Y** of weights 6 N and 12 N respectively are suspended by 3 strings as shown in the figure below. A downward force of 4 N is applied to **Y**.



What are the tensions T_1, T_2, and T_3 in the 3 strings?

	T_1 / N	T_2 / N	T_3 / N
A	3	3	4
B	11	11	12
C	3	3	16
D	11	11	16

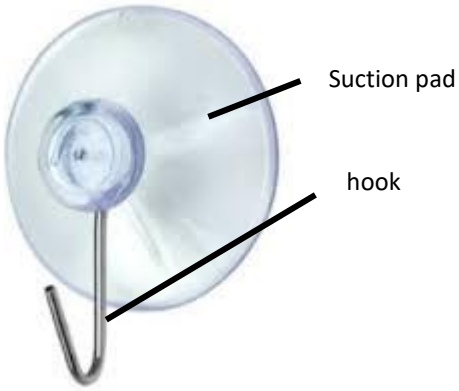
14 An electric fan is installed at one end of a trolley and a card is fixed at the other end with the largest surface area of the card facing the fan (Assuming all the air from the fan is directed onto the card)



What happens to the trolley when the electric fan is turned on?

A The trolley remains stationary.
B The trolley moves to the right.
C The trolley moves to the left.
D The trolley moves to and fro along the ground.

15 The photograph below shows a suction hook sticking a hook to a vertical wall. The suction hook is made up of a suction pad and a hook.



Which of the following forces balances the gravitational force acting on the suction hook by the Earth?

A The friction between the suction pad and the wall.
B The force exerted by the air molecules on the suction pad.
C The normal reaction exerted by the wall on the suction pad.
D The gravitational force acting on the Earth by the suction hook.

16 A railway train engine of mass *m* moves along a horizontal track with uniform speed *v*. The total resistive force acting on the engine is *F*.

Which of the following is the power of the engine?

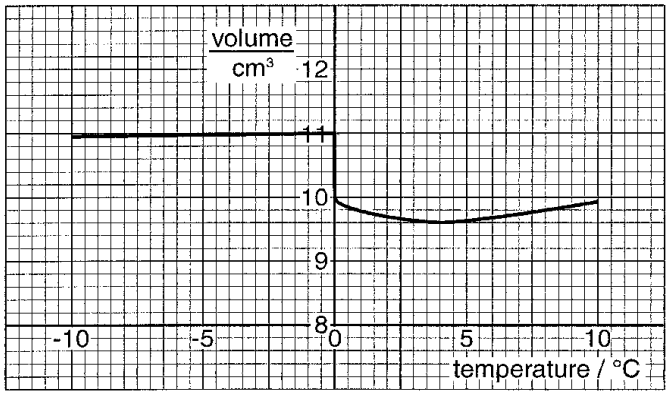
A F/(mv)
B Fv
C (mv)/F
D v/F

17 Which of the following statement(s) is/ are correct?

I Power is the rate of work done.
II Power cannot be created or destroyed.
III Power is only found in electrical circuits.
IV Power is a measure of the efficiency of objects.

A I only.
B II and IV only.
C III and IV only.
D I, II and IV only.

18 The graph below shows 10 g of ice cubes (below freezing point) being heated up from -10˚C to +10˚C.



At which temperature is the highest density attained?

A - 5.0˚C **B** 0˚C **C** 4.0˚C **D** 10.0˚C

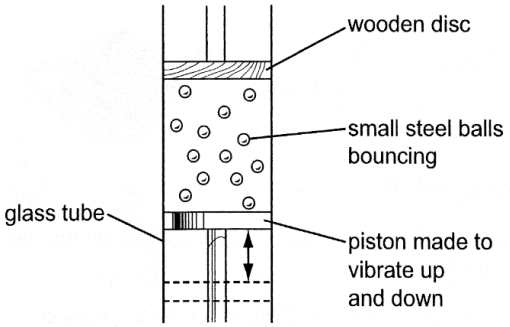
19 When a gas in a cylinder is compressed at constant temperature by a piston, the pressure of the gas exerting on the wall of the cylinder increases. Consider the following three statements.

I. The rate at which the molecules collide with the piston increases.
II. The average speed of the molecules increases.
III. The molecules collide with each other more often.

Which statement(s) correctly explain the increase in pressure of the gas exerting on the wall of the cylinder?

A I only.
B II only.
C I and II only.
D I and III only.

20 The diagram shows a model used to demonstrate the behaviour of gas molecules. When the piston is vibrated more rapidly, the wooden disc is forced further up the tube.



Which of the following correctly describes what the model demonstrated?

A The gas is cooled and its pressure is increased.
B The gas is cooled and its pressure returns to its original pressure.
C The gas is heated and its pressure is increased.
D The gas is heated and its pressure is decreased.

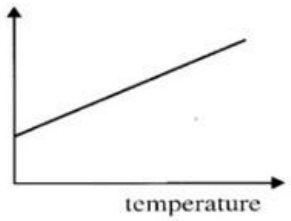
21 What is reduced when a mercury thermometer is made using a larger bulb, but with a capillary tube of the same diameter and length?

A Range **B** Linearity **C** Accuracy **D** Sensitivity

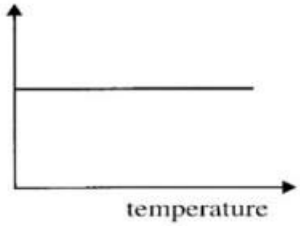
22 The graphs show how certain physical property of four substances varies with the temperature.

Which of the following substances must **not** be used in a thermometer?

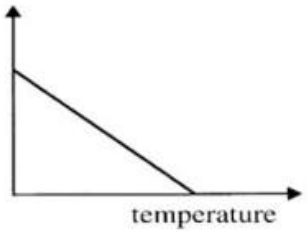
A



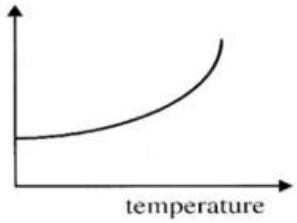
B



C

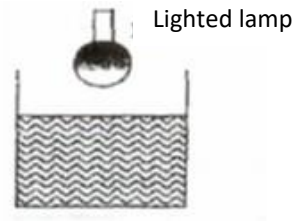


D

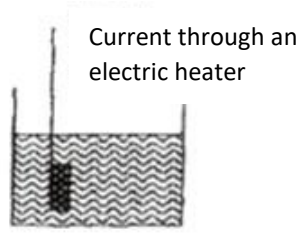


23 The diagrams below show 4 beakers of water.

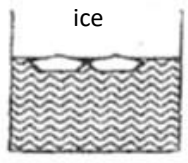
I



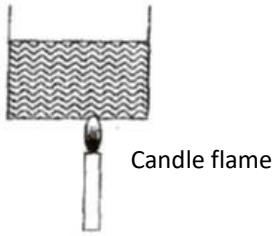
II



III



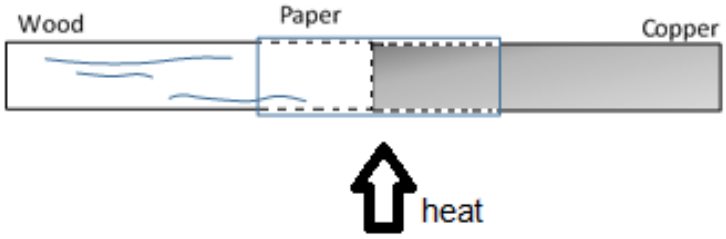
IV



Which of the following beaker(s) will convection current be produced in the water?

A IV only .
B II and IV only .
C II, III and IV only.
D All of the above.

24 An experiment is carried out to investigate heat transfer. A rod is constructed, one end of which is copper and the other end of wood. The middle section of the rod is wrapped with paper (with the paper covering a section of the wood as well as a section of the copper) and heated over a bunsen flame.

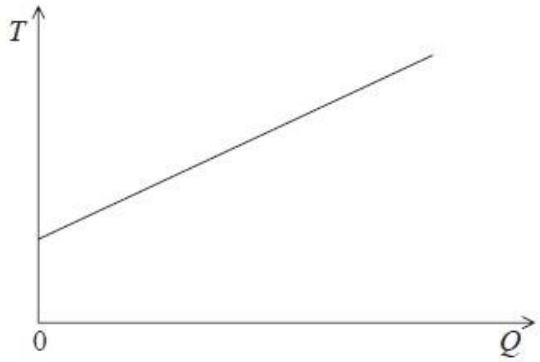


Which of the following shows the part where the paper burns?

A only where it covers the wood because wood is a poor conductor of heat
B only where it covers the copper because copper is a good conductor of heat
C in the middle because that is where it is being heated
D equally on both sides

25 The specific heat capacity *c* of a solid block of mass *m* is determined by heating the block and measuring its temperature.

The graph below shows the variation of the temperature *T* of the block with the thermal energy *Q* transferred to the block.

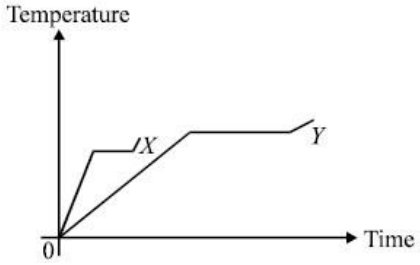


Which of the follow expression gives the gradient of the line?

A c / m
B m / c
C mc
D 1 / (mc)

26 Two solid substances *X* and *Y* of equal mass are separately heated by two identical heaters.

The diagram below shows the variation of the temperatures of the substances with time.

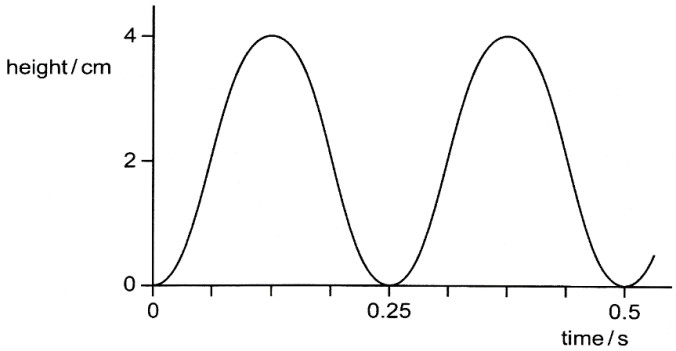


I The melting point of *X* is higher than that of *Y.*
II The specific heat capacity of *X* is smaller than that of *Y.*
III The specific latent heat of fusion of *X* is smaller than that of *Y*.

Which of the following statements is/are correct?

A I only.
B III only.
C I and II only.
D II and III only.

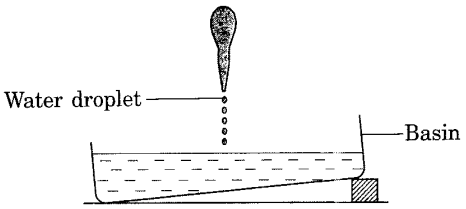
27 The diagram represents the motion of a wave in a ripple tank.



What are the amplitude and frequency of this wave?

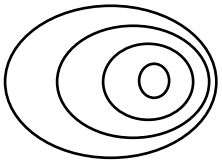
	amplitude / cm	**frequency / Hz**
A	2	2
B	2	4
C	4	2
D	4	4

28 A tilted basin contains water. Water is dripped at a constant rate into the basin as shown in the diagram below.

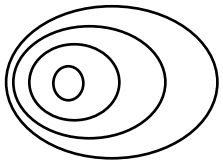


Which of the following pattern of the wavefronts will be observed in the basin?

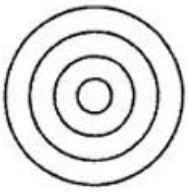
A



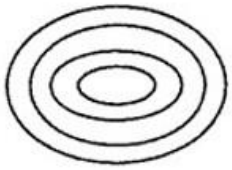
B



C



D



29 Monochromatic light travels from air into water.

Which of the following describes the changes in wavelength and speed?

	Wavelength	**Speed**
A	Increases	Decreases
B	Increases	Increases
C	Decreases	Increases
D	Decreases	Decreases

30 Visible light has wavelengths between 0.40 μm and 0.70 μm, and its speed in a vacuum is 3.0×10^8 m/s.

What is the maximum frequency of visible light?

A 1.2×10^{11} Hz
B 4.3×10^{11} Hz
C 4.3×10^{14} Hz
D 7.5×10^{14} Hz

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