Anglo-Chinese School
(Independent)

END-OF-YEAR EXAMINATION 2019
YEAR 3 INTEGRATED PROGRAMME

PHYSICS **PAPER 1**

Monday **7 October 2019** **1 hour**

INSTRUCTIONS TO STUDENTS
Write and shade your index number in the box provided on the OTAS sheet.

Do not open this booklet until you are told to do so.

INFORMATION FOR STUDENTS

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 using **2B soft pencil** to shade in the OTAS sheet provided.

Calculators are allowed for this paper. Take g = 10 N/kg.

There are **18** printed pages.

Multiple Choice Questions [40 Marks]

Shade your answers in the OTAS sheet

1 A pair of vernier calipers is used to measure the thickness of 100 sheets of paper. The zero error and the measured thickness of the 100 sheets (in centimetres) are as shown in **Fig. 1.1** and **Fig. 1.2** respectively.

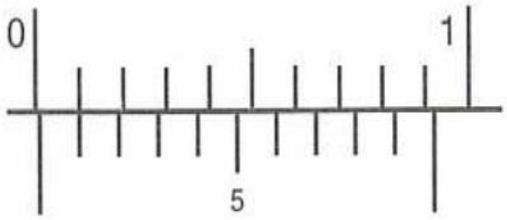


Fig. 1.1

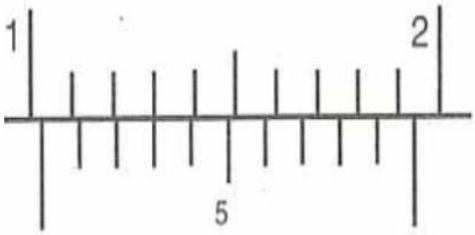


Fig. 1.2

What is the actual thickness of 1 sheet of the paper?

A 1.02×10^{-2} cm

B 1.03×10^{-2} cm

C 1.04×10^{-2} cm

D 1.02 x 100 cm

2 Which of the following consists entirely of scalar quantities?

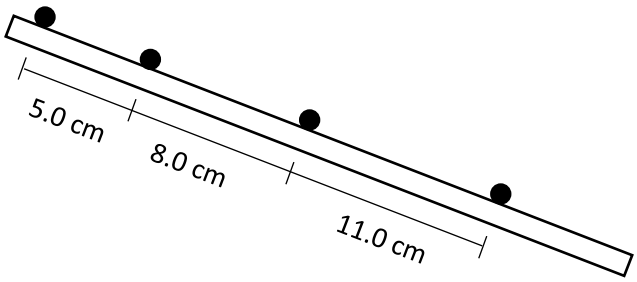
A power, energy and time

B weight, length and speed

C acceleration, force and velocity

D speed, displacement and mass

3 The figure below shows a stroboscopic (an instrument similar to ticker tape) photograph of a ball rolling down a slope.



The stroboscope is flashing at a period of 0.10 s. What is the acceleration of the ball?

A 30 cm s^{-2}

B 80 cm s^{-2}

C 200 cm s^{-2}

D 300 cm s^{-2}

4 A car undergoes uniform deceleration along a straight road. It travels a distance of 100 m when it slows down from 35 m s^{-1} to 15 m s^{-1}. How much longer will the car travel to come to a stop?

A 3.0 s

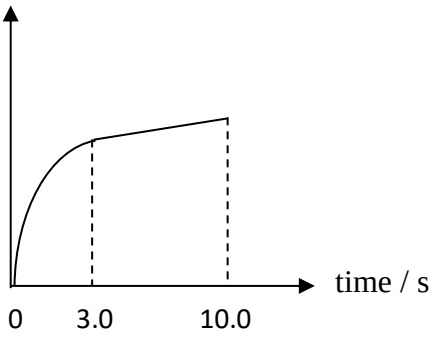
B 4.0 s

C 5.7 s

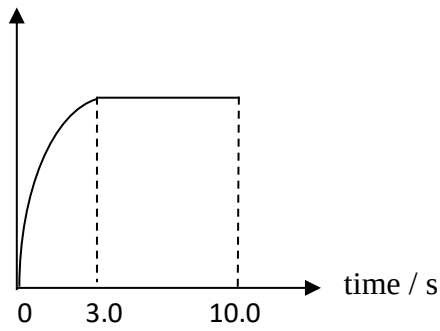
D 7.0 s

5 An E-scooter accelerates from rest for 3.0 s and then maintains a constant speed till it reaches its destination at t = 10.0 s. Which diagram shows the correct motion?

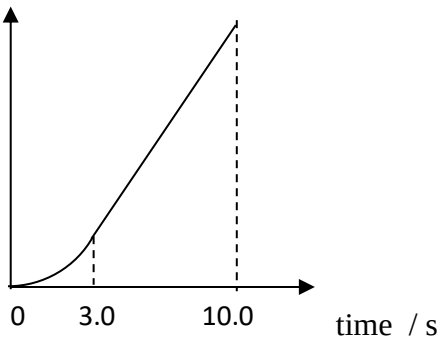
A



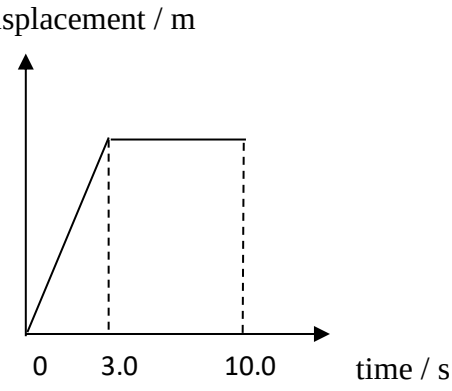
B



C



D



6 A hammer and feather are both released from rest at the same height and at the same time. Assuming air resistance is negligible, which statement below is true?

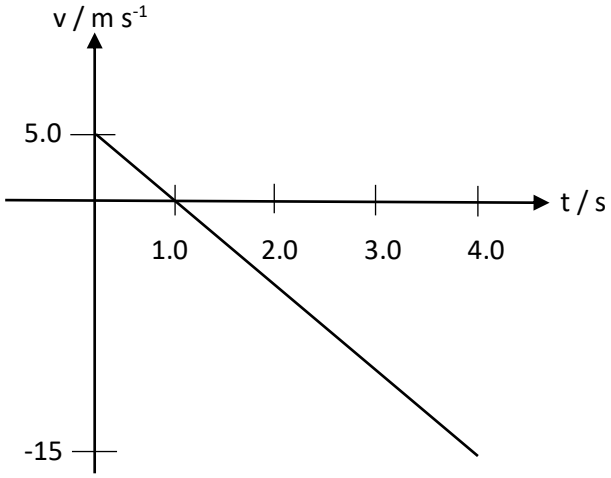
A The gravitational forces acting on them are equal.

B They have the same gravitational potential energy at the point of release.

C They reach the ground with the same speed.

D The acceleration of the hammer is higher than that of the feather.

7 A stone is thrown vertically upwards from the top of a cliff with an initial velocity of 5.0 m s^{-1}. It reaches the bottom of the cliff at t = 4.0 s with a velocity of – 15 m s^{-1}. How high is the cliff?



A 2.5 m

B 20 m

C 25 m

D 40 m

8 A rocket in space accelerates from rest for a period of time and then shuts down its engine. Which statement below describes the motion of rocket after shutting down its engine?

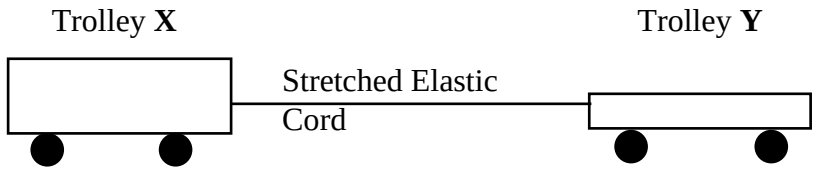
A The rocket comes to a rest immediately.

B The rocket decelerates to a rest.

C The rocket continues to move with uniform velocity.

D The rocket continues to accelerate.

9 The figure below shows two trolley, **X** and **Y**, held stationary and connected to each other by a stretched elastic cord. The mass of **Y** is half the mass of **X**. The two trolleys are then stretched apart with a small displacement.



When the trolleys are released at the same instant, the initial acceleration of **X** is 2.0 m s^{-2} to the right. What is the initial acceleration of **Y** towards the left?

A 0.67 m s^{-2}

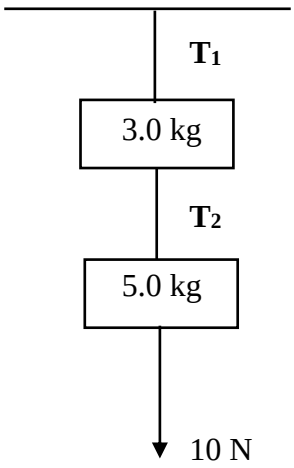
B 1.0 m s^{-2}

C 2.0 m s^{-2}

D 4.0 m s^{-2}

10 Two blocks of mass 3.0 kg and 5.0 kg are connected by two light strings and are pulled by a 10 N as shown in the figure below. Find the tension $\mathbf{T_1}$ and $\mathbf{T_2}$ in the strings.

	T1	**T2**
A	40 N	60 N
B	60 N	40 N
C	60 N	90 N
D	90 N	60 N



11 A constant force of 20 N is used to pull a 4.0 kg block along a straight horizontal track. The block moves with an acceleration of 3.0 m s^{-2}. What is the friction acting on the block?

A 8.0 N

B 12 N

C 20 N

D 40 N

12 A 2.0 kg block of copper is brought from Earth to Planet **X**. Given that the gravitational field strength of Earth and Planet **X** are 10.0 N kg^{-1} and 3.0 N kg^{-1} respectively, how will the properties of the copper block change?

	Inertia	**Weight**	**Density**
A	Decreases	Decreases	Decreases
B	Decreases	Decreases	Remains Unchanged
C	Remains Unchanged	Decreases	Decreases
D	Remains Unchanged	Decreases	Remains Unchanged

13 **Fig. 13.1** shows object **A** with 2.0 cm^3 hole drilled into it. Object **A** has a mass of 100 g and volume of 130 cm^3 after the hole is drilled. The hole is then filled with another material of density 3.0 g cm^{-3}, as shown in **Fig. 13.2**.

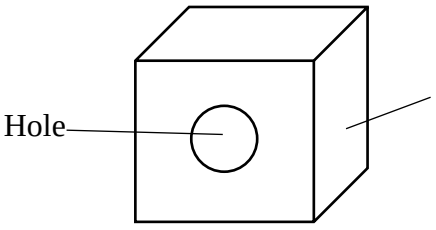


Fig. 13.1

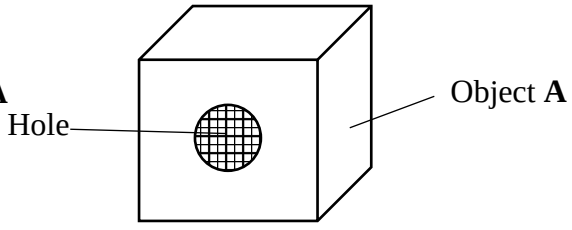


Fig. 13.2

What is the density of the composite object in **Fig. 13.2**?

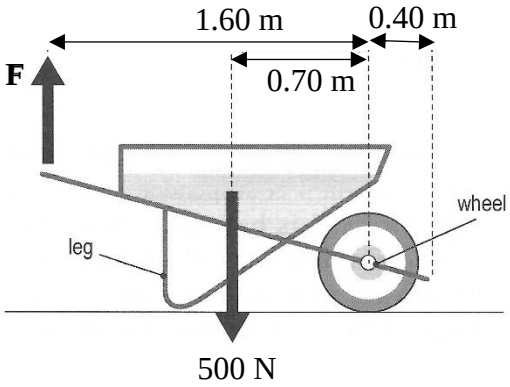
A 0.80 g cm^{-3}

B 0.82 g cm^{-3}

C 1.88 g cm^{-3}

D 3.77 g cm^{-3}

14 The figure below shows a vertical force, **F**, being applied to raise a wheelbarrow which has a total weight of 500 N.



What is the force **F** required to raise the legs of the wheelbarrow of the ground?

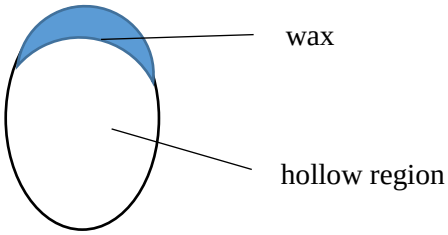
A 180 N

B 220 N

C 280 N

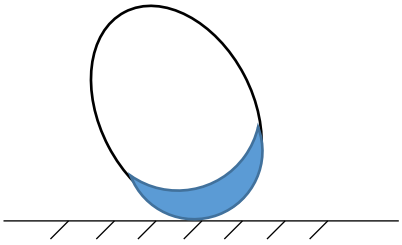
D 700 N

15 An empty egg- shell contains solidified wax as shown below.

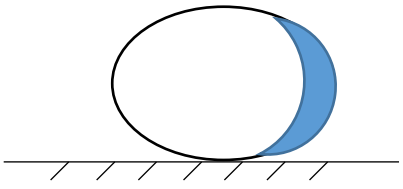


At which position is the egg- shell most stable when placed on a flat, horizontal surface?

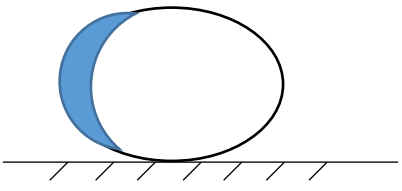
A



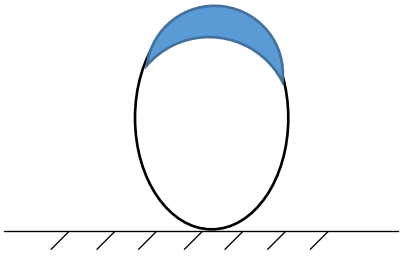
B



C



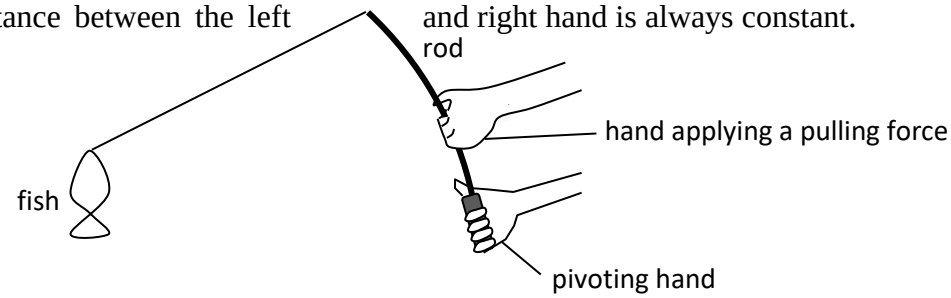
D



16 Which of the following describes the stability of an upright whiteboard marker on a table and a pendulum at rest?

	Whiteboard marker	**Pendulum**
A	Stable	Neutral
B	Neutral	Stable
C	Unstable	Unstable
D	Unstable	Stable

17 Which of the two fishing rods, a long one or a short one, allows one to pull in a fish with minimum effort and why? Assume that the rods have identical masses and that the distance between the left and right hand is always constant.



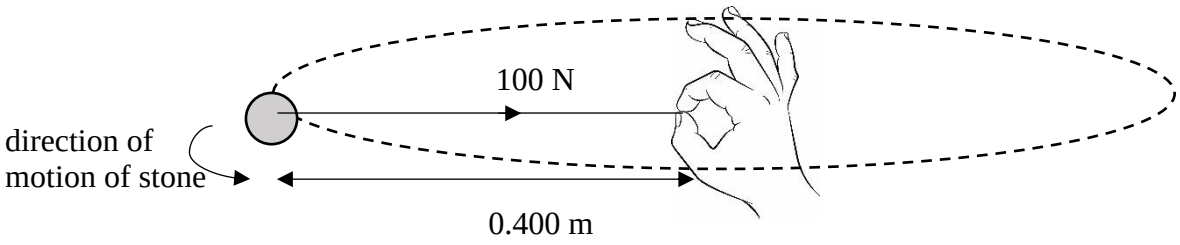
A The long rod, because the perpendicular distance between the line of action of the force exerted by the hand and the pivot is larger.

B The long rod, because the force can be exerted nearer to the fish.

C The short rod, because the perpendicular distance between the line of action of the force exerted by the fish and the pivot is smaller.

D The short rod, because the perpendicular distance between the line of action of the force exerted by the hand the pivot is smaller.

18 A 300 g bob is tied to a 0.400 m long string. It is twirled in a horizontal circle as shown. The only horizontal force acting on the stone is the 100 N tension by the string. Assuming there is negligible air resistance, find the work done by this tension.



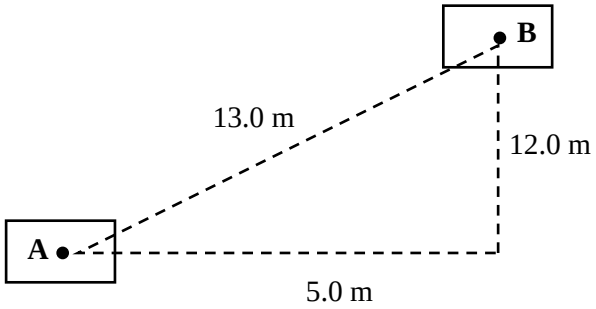
A 0 J

B 0.12 J

C 0.40 J

D 1.2 J

19 A box of mass 5.0 kg is lifted diagonally from point **A** to point **B** as shown. What is the gravitational potential energy gained by the box?



A 250 J

B 600 J

C 650 J

D 850 J

20 An object is dropped vertically downwards from the top of a tall building with an initial speed of 11 m s^{-1}. As it falls freely under gravity, it speeds up to 13 m s^{-1} and loses 480 J of gravitational potential energy. What is the mass of the object?

A 5.7 kg

B 6.7 kg

C 20 kg

D 240 kg

21 An 80 W incandescent light bulb is only 40 % efficient, with some of its energy is emitted as heat, rather than visible light. The bulb is switched on for an hour. Determine the energy wasted.

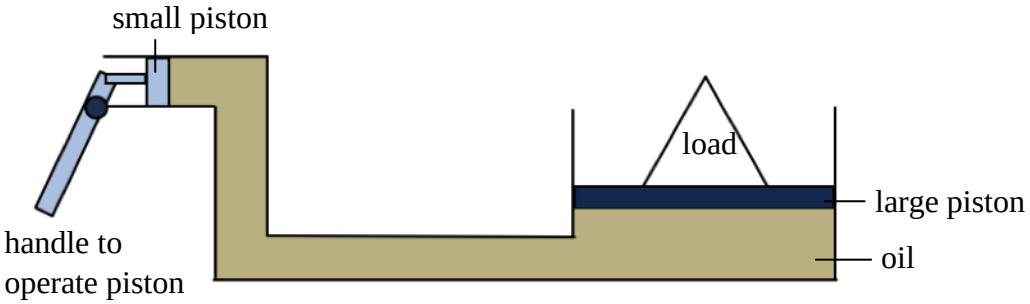
A 32 J

B 48 J

C 1.2×10^5 J

D 1.7×10^5 J

22 A hydraulic press, shown in the diagram below, can be used to lift heavy loads with little effort. The small piston has a cross-sectional area of 10 cm^2, while the large piston has a cross-sectional area of 50 cm^2. The fluid enclosed in the system is oil and the system is largely frictionless. If the load on the large piston is 1000 N, determine the minimum force that the small piston needs to exert on the oil to lift the load.



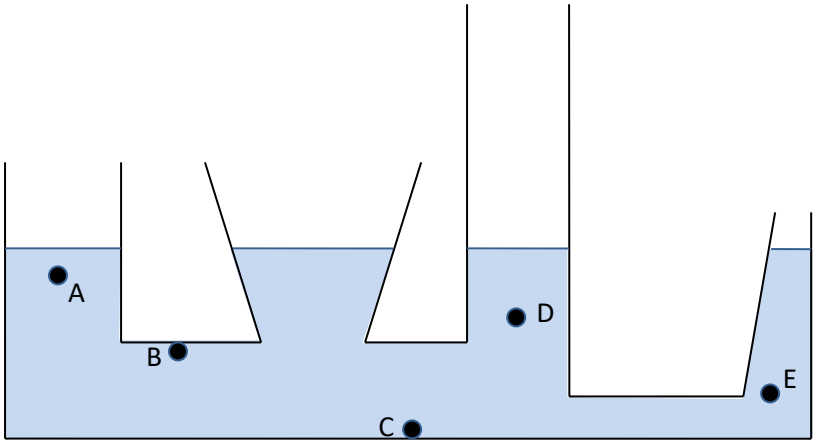
A 2

B 20

C 200

D 2000

23 Arrange the positions in the container in order of increasing pressure.



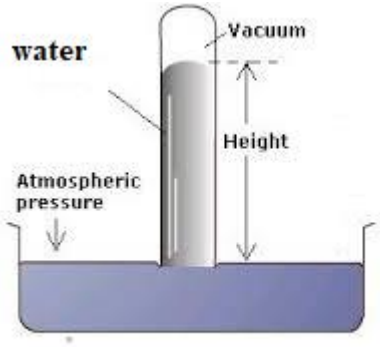
A A, D, B, E, C

B A, B, D, C, E

C B, A, D, C, E

D A, D, E, B, C

24 A water barometer is constructed as shown in the diagram below. If the setup is placed on Earth, calculate the height h, of the water level, given that the density of water is 1000 kg m $^{-3}$ and the atmospheric pressure is 1.0 x 10^5 Pa.



A 76 cm

B 7.6 m

C 10 m

D 100 m

25 A substance consists of particles that are close together and moving past each other at random. The average speed of the particles gradually increases. Which statement best describes the substance?

A A solid is being heated.

B A liquid is being heated.

C A solid melts to form a liquid.

D A liquid boils to form gas.

26 Which statement below best describes Brownian motion?

A The gas or liquid molecule travels in a straight line until its direction is randomized by a collision with another molecule.

B A gas or liquid molecule travels a set path due to an outside disturbance.

C A solid molecule vibrates in its place.

D A gas molecule spins randomly.

27 Two iron blocks, **P** and **Q** are in thermal contact. The initial temperature of **P** and **Q** are 10°C and 50°C respectively. Which of the following(s) is / are true when **P** and **Q** are at thermal equilibrium?

(i) The final temperature of **P** will be higher than the temperature of **Q**.

(ii) The net flow of heat between **P** and **Q** is zero

(iii) The final temperature of **P** and **Q** is at 30 °C.

(iv) There is no heat flow between the 2 blocks.

A **(ii)** only.

B **(iii)** only.

C **(i)** and **(iii)**.

D **(ii)** and **(iv)**.

28 Heat transfer can occur through three modes: conduction, convection and radiation. The best example of heat transfer by conduction is

A from the boiler to the hot water storage tank in the domestic hot water system.

B from the hotplate to the contents of a saucepan.

C through glass into a greenhouse.

D from the Sun to the Earth.

29 A boy who was sweating profusely stood under a rotating fan. What was the main reason for him to feel cooler after some time?

A The fan set up convection currents around him.

B The fan increased the rate of evaporation of sweat from his body.

C The fan lowered his surrounding temperature.

D The fan absorbed the heat radiated from his body faster.

30 Which one of the following is not suitable as a thermometric property?

A Resistance of a piece of wire

B Friction between two surfaces

C Volume of a fixed mass of liquid

D Pressures of a fixed mass of gas at constant volume

31 In a melting point experiment of a thermometric substance, the temperature of the liquid is recorded every half a minute. The table below shows:

Time/ min	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Temperature/ ˚C	95	86	67	55	55	55	54	50	48	42	36

This substance is intended to be used in the making of a liquid based temperature sensor. What temperature could be used as the lower fixed point of the sensor?

A 0 ˚C

B 36 ˚C

C 55 ˚C

D 95 ˚C

32 A laboratory thermometer gave a reading of -1 °C and 99 °C when inserted into melting ice and boiling water at standard atmospheric pressure respectively. What is the error when the same thermometer is used to measure the difference between the melting point and the boiling point of ethanol?

A -1 °C

B 0 °C

C 1 °C

D 2 °C

33 A thermocouple showed 2 mV when connected to pure melting ice at junction **X** and liquid **A** of temperature of 30 °C at junction **Y** as shown in **Fig. A** below:

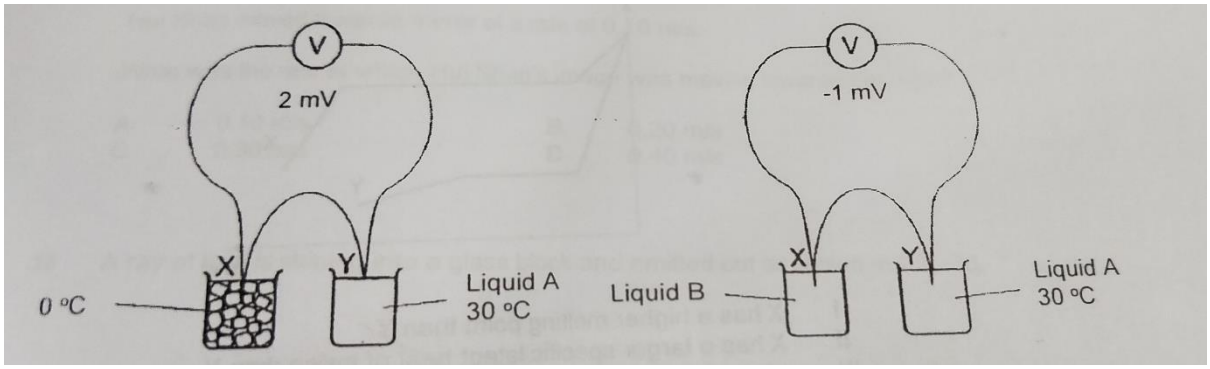


Fig. A **Fig. B**

What is the temperature of liquid **B** when joint **X** is inserted into it as shown in **Fig. B**?

A 60 °C

B 45 °C

C 15 °C

D -15 °C

34 An immersion heater of 100 W is placed in a polystyrene cup of negligible heat capacity which contains 0.50 kg of water. It raises the temperature by 50 ˚C in one hour. How much heat is lost to the surroundings? The specific heat capacity of water is 4.2 kJ/(kgK)

A 495 J

B 105 kJ

C 255 kJ

D 360 kJ

35 The temperature of boiling water can be raised by

I adding some salt.

II heating the water more strongly.

III increasing the external pressure.

IV increasing the surface area of the boiling water.

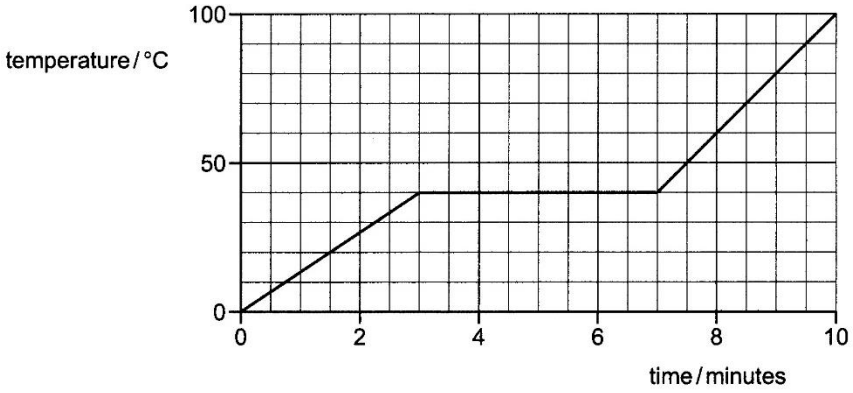
A **I** only.

B **I** and **III**.

C **I, II** and **IV.**

D **I, III** and **IV.**

36 The graph shows the temperature-time graph for a sample of wax.



The mass of the wax is 200 g. Thermal energy is supplied to the wax at a constant rate of 12 000 J/minute. What is the latent heat of fusion of the wax?

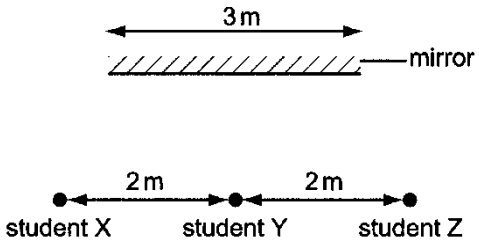
A 180 J g^{-1}

B 240 J g^{-1}

C 420 J g^{-1}

D 600 J g^{-1}

37 Three students stand 2 m apart in front of a plane mirror that is 3 m long.



Student **Y** is standing opposite the mid-point of the mirror. How many students can see the images of the other two?

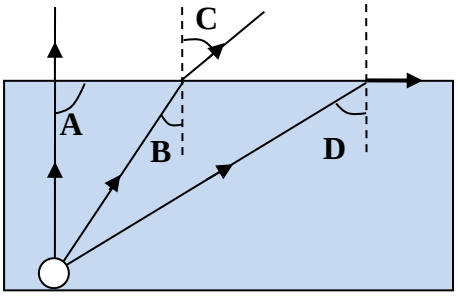
A 0

B 1

C 2

D 3

38 A swimming pool is lit by a lamp at the bottom of the pool. The directions of three rays from the lamp are shown. Which of the marked angles is the critical angle for the light?



lamp

39 An object is placed 5 cm from a converging lens with a focal length of 3 cm. What type of image is produced?

A Real, upright and diminished

B Real, inverted and magnified

C Virtual, upright and magnified

D Virtual, inverted and diminished

40 A film projector magnifies a 100 cm^2 film strip on a screen. If the linear magnification is 4.0, the area of the magnified film on the screen is

A 1600 cm^2

B 800 cm^2

C 400 cm^2

D 200 cm^2

[END OF PAPER]