Name: _____ ( ) Class: _____

華僑中學
HWA CHONG INSTITUTION
Sample Paper B

PHYSICS
Paper 1

Level: Secondary Three
Duration: 45 mins

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

INSTRUCTIONS TO CANDIDATES

Write your name, class and index number in the spaces provided and shade accordingly on the OMR sheet.

There are **thirty** 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 answer sheet.

Read very carefully the instructions on the answer sheet.

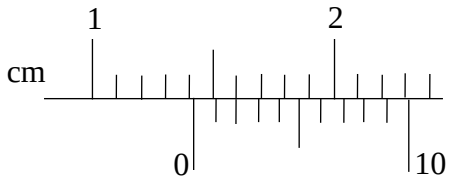
INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Take g to be 10 m s^{-2} or 10 N kg^{-1} unless otherwise stated.

1) Two physical quantities **X** and **Y** share the same physical unit. Which one of the following are possible choices for **X** and **Y**?

	X	**Y**
A	work	power
B	speed	acceleration
C	force	momentum
D	weight	tension

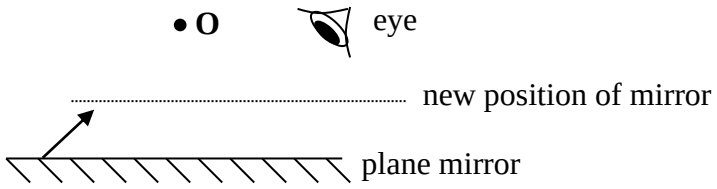
2) The diagram below shows the observed reading of a pair of vernier calipers when it was used to measure the diameter of a pendulum bob.



If this instrument had a positive zero error of 0.02 cm, what is the corrected radius of the pendulum bob?

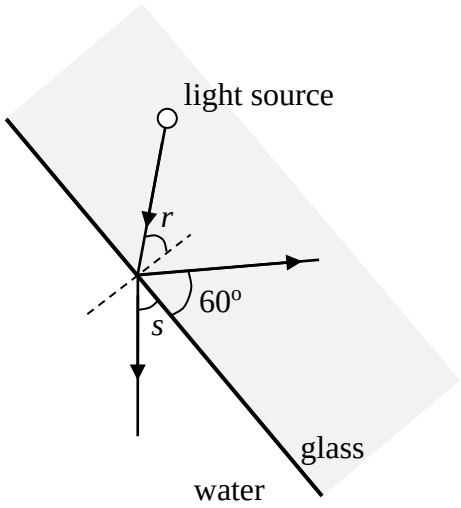
A 0.70 cm **B** 0.72 cm **C** 1.40 cm **D** 1.44 cm

3) The diagram below shows an object **O** placed in front of a plane mirror. When the mirror is pushed in the direction shown by the arrow while still being parallel to its original position, in which direction does the image of **O** appear to move?



A **B** **C** **D**

4) The diagram below shows a ray of light entering water from a glass block.

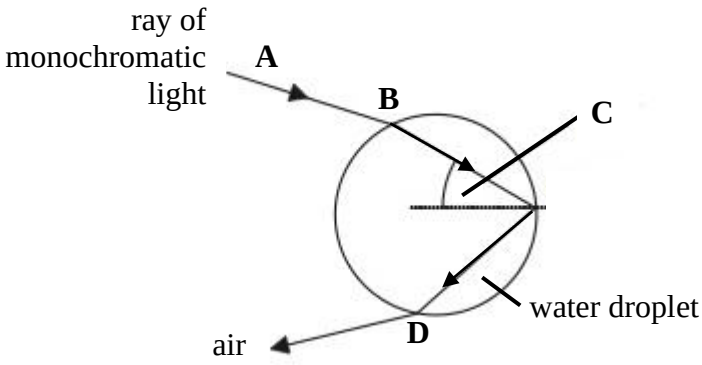


Which equation correctly gives the relative refractive index of light passing from glass into water?

A $\dfrac{\sin r}{\sin s}$ **C** $\dfrac{\sin s}{\sin 30^\circ}$

B $\dfrac{\sin(90^\circ - s)}{\sin r}$ **D** $\dfrac{\sin 30^\circ}{\sin(90^\circ - s)}$

5) A ray of monochromatic light passes through a circular water droplet as shown in the diagram below.



Which one of the following statements is true of the ray of light?

A The speed of the light at **A** is smaller than that in the water droplet.
B At **B**, the light is refracted away from the normal.
C Angle **C** is greater than the critical angle at the water-air boundary.
D The angle of incidence at **D** is greater than its angle of refraction.

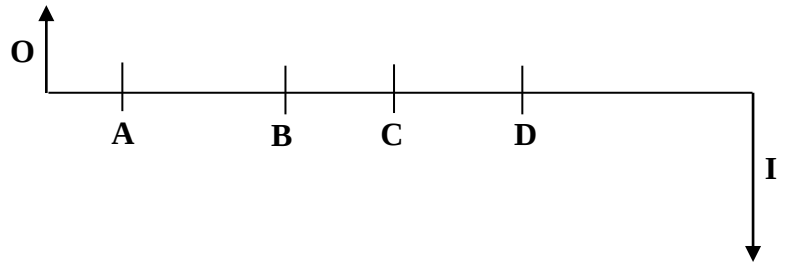
6) The table below shows the absolute refractive indices of some materials.

material	water	glycerine	glass	flint glass
absolute refractive index	1.33	1.47	1.54	1.61

A light ray passes from medium 1 into medium 2 and undergoes total internal reflection. Which one of the following is a possible combination of the two media?

	medium 1	medium 2
A	water	glass
B	glass	flint glass
C	flint glass	glycerine
D	glycerine	glass

7) The diagram below shows a thin convex lens being used to produce a real image **I** of an object **O**.



Which position (**A**, **B**, **C** or **D**) shows a possible position of the principal focus?

8) Which of the following statements is true about a slide projector?

I. The image is real and inverted.
II. The object is placed at a distance greater than the focal length.
III. When the lens is moved further away from the screen, the image becomes smaller.

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

9) Which one of the following is not true concerning electromagnetic waves?

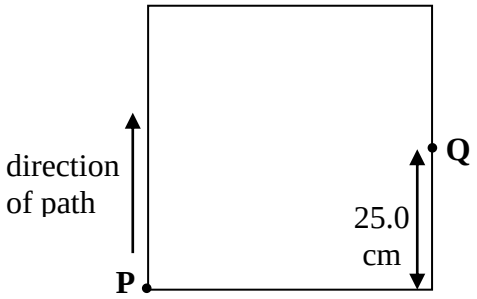
A Electromagnetic waves can be reflected.
B Electromagnetic waves can propagate without a medium.
C Electromagnetic waves travel at 3.0×10^8 m/s regardless of medium.
D In the same medium, as the wavelength of electromagnetic waves increases, its frequency decreases.

10) One type of electromagnetic radiation which is more ionising than ultraviolet radiation is commonly used as a diagnostic tool in medicine.

What is this electromagnetic radiation?

A infrared radiation
B visible light
C gamma rays
D X-rays

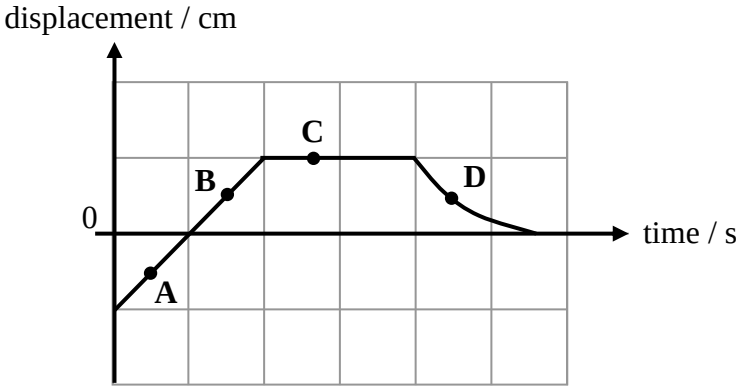
11) A toy car moves from **P** to **Q** along the path of a square of side 50.0 cm as shown in 8.0 s.



Which one of the following correctly shows the magnitudes of its average velocity and its average speed?

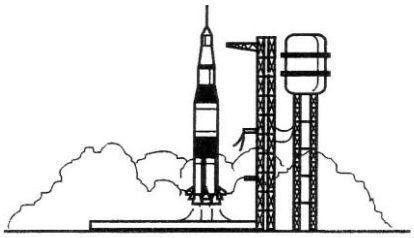
	average velocity / m s^{-1}	average speed / m s^{-1}
A	0.070	0.094
B	0.070	0.16
C	0.56	0.094
D	0.56	0.16

12) The graph below shows how the displacement of an object changes with time.



At which point on the graph (**A**, **B**, **C** or **D**) is the object accelerating?

13) A rocket rose vertically from rest on its launching pad with a constant acceleration of 7.0 m s^{-2}.



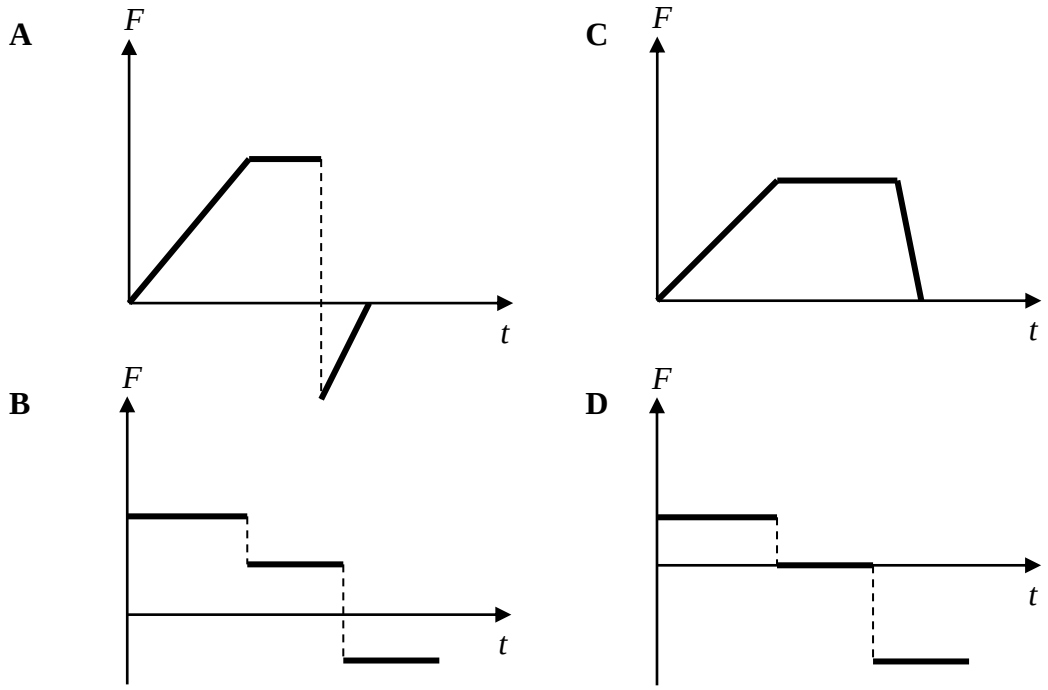
What was its speed after it had travelled 1.54 km?

A 22 m s^{-1} **C** 150 m s^{-1}
B 100 m s^{-1} **D** 310 m s^{-1}

14) An object which was released from an airplane reached its terminal velocity after falling for 25 s.
Which one of the following statement is true of the object's acceleration?

A At 10 s, the object's acceleration was decreasing.
B At 20 s, the object's acceleration was increasing.
C At 25 s, the object reached its maximum acceleration.
D At 50 s, the object's acceleration become constant.

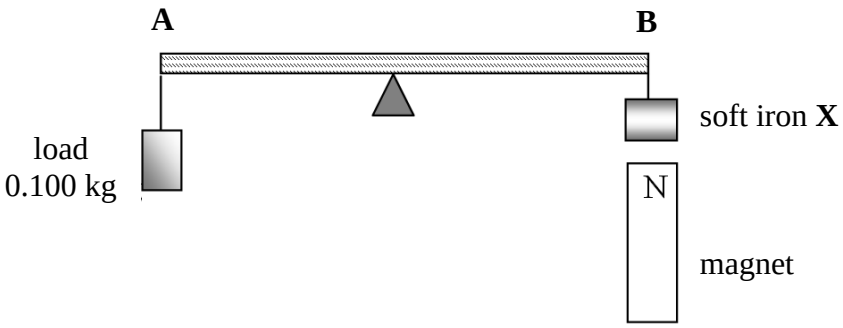
15) A cyclist accelerated down a hill from rest then travelled at constant speed before braking to a halt. Which one of the following graphs best represents the variation of the net force *F* acting on the cyclist with time *t*?



16) The acceleration due to gravity on the Earth and on the moon is 10 m s^{-2} and 1.6 m s^{-2} respectively. How will the following physical properties of an object change if it is brought from the Earth to the moon?

	inertia	density	weight
A	increase	decrease	decrease
B	same	same	decrease
C	decrease	same	same
D	same	increase	increase

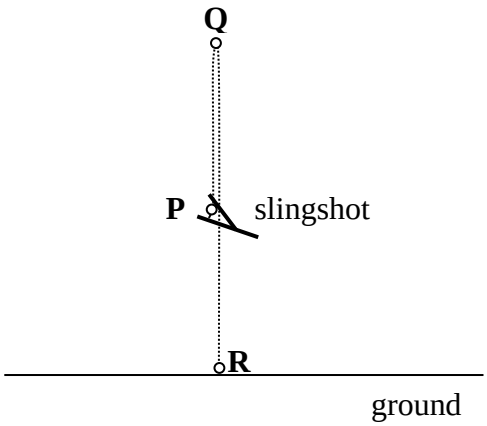
17) The apparatus shown below was setup on Earth. The setup had a piece of soft iron **X** of mass 0.040 kg fixed on one end of a uniform beam **AB** which was pivoted at its mid-point. **X** was prevented from being pulled down by a fixed magnet by a 0.100 kg load hung at **A**.



If the above experiment is now conducted on the moon where the acceleration due to gravity is 1/6 that of the Earth's. What is the mass of the load at **A** required to maintain the equilibrium of the beam?

A 0.10 kg
B 0.36 kg
C 0.40 kg
D 0.60 kg

18) A slingshot was used to shoot a stone vertically upward from a point **P**. It reaches the greatest height at **Q** before hitting the ground at **R**.



Assuming there is no air resistance, by taking the ground as the reference level for the calculation of gravitational potential energy, which one of the following statements correctly describes the energy of the stone?

A At **P**, the stone only has elastic potential energy.
B From **P** to **Q**, the stone's potential energy is only converted to kinetic energy.
C At **Q**, the stone only has gravitational potential energy.
D From **Q** to **R**, the stone's kinetic energy is converted back to potential energy.

19) A windmill is used to raise water from a well. The depth of the well is 5.0 m. The windmill raises 2.0 X 10^2 kg of water every day.

Assuming g = 10 N/kg, what is the useful power extracted from the wind?

A 1600 W
B 0.12 W
C 17 W
D 0.69 W

20) An experiment was set up to observe the Brownian motion of smoke particles in air.

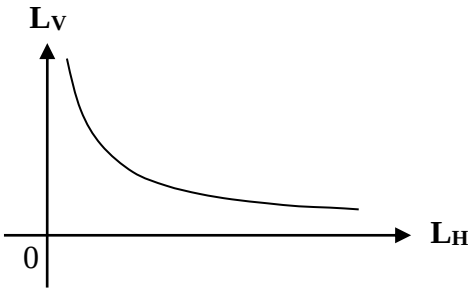
Under a microscope, points of light, which are reflections from some particles, were seen to be moving.

Which one of the following correctly describes these type of particles and their movement?

	type of particles	movement of particles
A	air	vibrating left and right
B	smoke	vibrating left and right
C	smoke	moving in no particular order
D	air and smoke	moving in no particular order

21) A student performs an experiment to determine certain properties of a fixed mass of gas.

He obtains the following graph.



Which one of the following correctly describes the vertical axis L_V and the horizontal axis L_H, of the graph and the condition which was kept constant during the experiment ?

	L_V	L_H	condition to be kept constant
A	pressure	temperature	volume
B	pressure	1 / volume	temperature
C	volume	temperature	pressure
D	volume	pressure	temperature

22) A cooking gas cylinder supplies gas to a stove which is used to cook meals. After some time, the gas pressure in the cooking cylinder drops.

Which quantity was decreased to cause this pressure change?

A size of gas molecules
B number of gas molecules
C volume of gas
D temperature of gas

23) The table below shows the length of mercury column l of an uncalibrated thermometer when its bulb was fully immersed in different substances.

substances	l / mm
pure melting ice	35
boiling water	285
water at unknown temperature, θ	100

What is the value of θ?

A 26 ^{o}C **B** 40 ^{o}C **C** 65 ^{o}C **D** 100 ^{o}C

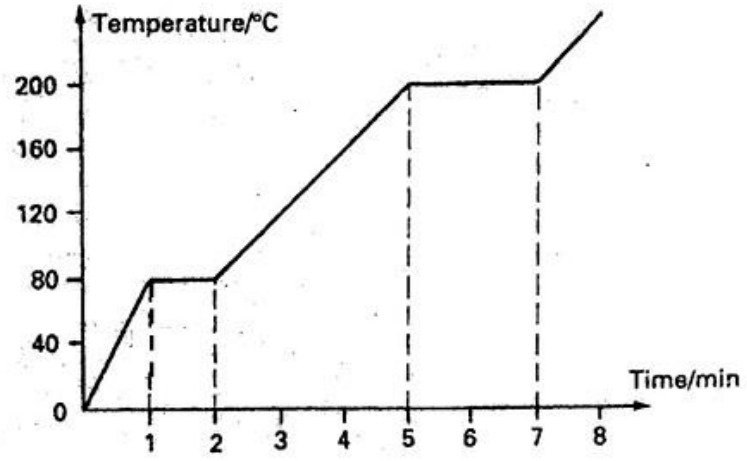
24) The temperature of a body at 50 ^{0}C is increased by (θ + 20) ^{o}C as measured on the Celsius scale. How is this temperature change expressed on the Kelvin scale?

A θ K **B** (θ + 20) K **C** (θ + 70) K **D** (θ + 343) K

25) Equal masses of water and oil are separately heated in identical containers by identical heaters for 5 minutes. Given oil has a lower specific heat capacity than water, which one of the following statements is true?

A At 3 min, water has a lower temperature than oil.
B At 3 min, water has a higher temperature than oil.
C At 5 min, both oil and water reach the same temperature.
D At 5 min, the thermal energy of oil is less than thermal energy of water.

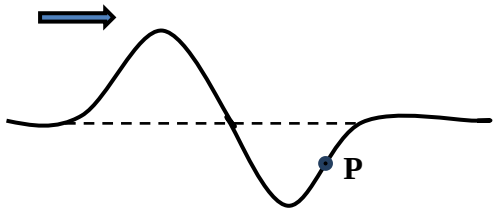
26) The diagram below shows the graph of temperature against time when substance **X,** initially a solid, was heated at a constant rate.



Which statement about substance **X** is correct?

A More energy was supplied to melt **X** than to boil **X**.
B At 4 min, **X** is partially a solid and partially a liquid.
C **X**'s specific heat capacity when in liquid is twice that when in solid.
D **X**'s specific latent heat of vaporisation is half its specific latent heat of fusion.

27) The diagram below represents a photograph of a wave pulse traveling towards the right on a long rope at a particular instant.



In which direction would point **P** on the rope move at the next instant?

A ↑ **B** ↓ **C** → **D** remain stationary

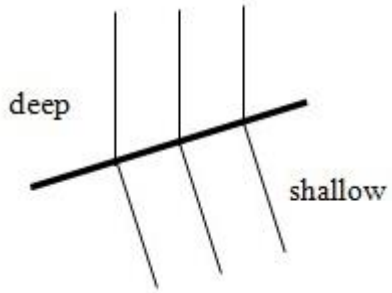
28) Which of the following applications is dependent on the propagation of longitudinal waves?

A radio waves in radar communications
B microwaves in telecommunications
C sound waves in echolocation
D light waves in optical fibres

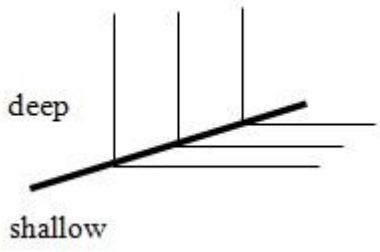
29) A long straight vibrator is used to produce plane water waves in a ripple tank.

Which diagram correctly shows the refraction of the water waves as they move from deep to shallow water in the tank?

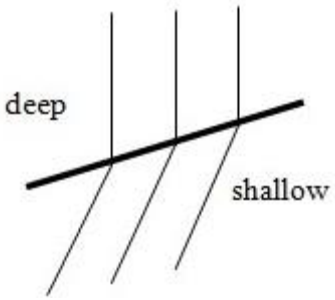
A



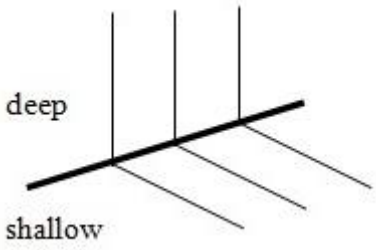
C



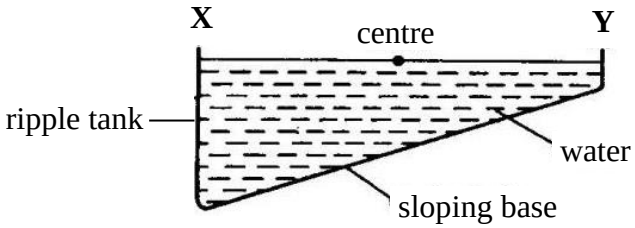
B



D



30) The diagram below shows a ripple tank with a sloping base. Waves are made in the centre of the tank and they move from the centre towards ends **X** and **Y**.



How do the wavelengths of the waves travelling towards **X** and **Y** change?

	towards **X**	towards **Y**
A	increase	decrease
B	increase	increase
C	decrease	decrease
D	decrease	increase

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