Name:

Index Number:



CATHOLIC HIGH SCHOOL Term 1 Class Test Year 4 (Integrated Programme)

PHYSICS

Chapters 7, 8 & 10 to 15: Pressure, Kinetic Model of Matter, Temperature, Transfer of Thermal Energy, General Wave Properties, Light, Electromagnetic Spectrum & Sound

14 February 2023 40 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work that you hand in. Write in dark blue or black pen.

Do not use paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate. At the end of the examination, fasten all your work securely together.

Section A: Multiple Choice

There are **ten** questions in this section. 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 the table** provided at the end of this section.

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.

Section B: Structured

You may use an HB pencil for any diagrams or graphs.

Answer **all** questions.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show all their workings in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

The number of marks is given in brackets [] at the end of each question or part question.

For examiner's use only:

Section A	/	10
Section B	/	25
formula		
s.f.		
Total	1	35

Section A

Answer **all** the questions in this section. Record your choice in the table provided.

Answers for Section A

1	2	3	4	5	
6	7	8	9	10	

1 The figure below shows a simple hydraulic press with circular pistons X and Y.



Which of the following changes will enable a heavier load L to be lifted?

	Diameter of X	Diameter of Y
Α	doubled	remain the same
В	doubled	halved
С	remain the same	halved
D	halved	doubled

2 The apparatus which is used to demonstrate Brownian Motion is shown in the diagram.

Light is shone through the smoke cell and the motion of smoke particles inside the smoke cell is viewed through the microscope.



Why is each smoke particle seen to move in continuous random motion?

- **A** Air molecules collide with smoke particles.
- **B** Convection currents causes the air molecules to move.
- **C** Smoke particles gain kinetic energy from the light.

- **D** The smoke particles are colliding with each other.
- **3** A mercury-in-glass thermometer and a thermocouple thermometer are both calibrated using the same fixed points of 0 °C and 100 °C.

When both thermometers are used to measure the temperature of a body, the temperatures indicated on both thermometers will be exactly the same

- **A** for all temperatures at all times.
- **B** for all temperatures between 0 °C and 100 °C only.
- **C** only at the fixed points.
- **D** when converted to the Kelvin scale.
- 4 The shiny silvery walls and vacuum in between the walls in the vacuum flask will collectively reduce heat loss by
 - A conduction and convection.
 - **B** conduction and radiation.
 - **C** convection and radiation.
 - **D** conduction, convection and radiation.
- 5 The diagram shows circular wavefronts radiating from a point source P in a ripple tank. The point source is then set to vibrate with a gradually decreasing frequency.



Which of the following is the correct observation?

- A The wave travels slower and the distance between the wavefronts become larger.
- **B** The wave travels faster and the distance between the wavefronts become smaller.
- **C** The wave travels at the same speed and the distance between the wavefronts become larger.
- **D** The wave travels at the same speed and the distance between the wavefronts become smaller.

6 A water tank is lit by a lamp at the bottom of the tank. The directions of the three light rays from the lamp are shown.



What is the critical angle for the light ray in water?



7 A ray of light passes through three media as shown.



Which of the following is a possible combination of the three media?

	(1)	(2)	(3)
Α	Air	Glass	Water
В	Glass	Water	Air
С	Glass	Air	Water
D	Water	Air	Glass

- 8 Which of the following statements about electromagnetic waves is **not** correct?
 - **A** Radio waves can travel through vacuum.
 - **B** The wavelength of visible light is shorter than that of X-ray.
 - **C** Infra-red radiation is emitted by human body.
 - **D** Ultra-violet waves can cause human skin to tan.

9 In the figure below, the light source, *S*, is adjusted such that the light rays pass through the convex lens, *L*, and is reflected back by the mirror, *M*, to form a sharp image at the light source.



- **A** 10 cm **B** 15 cm **C** 20 cm **D** 35 cm
- **10** A tuning fork produces a sound of frequency 90 Hz that propagates in air as a series of compressions and rarefactions. The shaded areas P in the figure below represent regions where air molecules are the most crowded together.

The distance between the centre of the first and the centre of the fifth shaded areas is 12.0 m.



End of Section A

Section B

Answer **all** the questions in this section.

11 A gas supply is connected to a mercury manometer as shown in Fig. 11.1 and an identical gas supply is connected to a water manometer as shown in Fig. 11.2.



		[1]
(b)	Mark clearly on Fig.11.1 a point X where the pressure is the greatest.	[1]
(c)	The density of mercury is 13 600 kg / m^3 and the density of water is 1000 k	kg / m³.
	Determine the height, <i>h</i> , of the water level in Fig. 11.2.	

h = _____ [2]

12 Fig.12.1 shows a pressure cooker that consists of a strong aluminium container fitted with a variable loading pin valve and a safety valve.





(a) Explain in terms of molecules, why the pressure of the air in the pressure cooker increases as its temperature is increased.

[2] (b) Explain why the walls of the container has to be thick, (i) _____ [1] (ii) the safety valve is necessary. _____ _____ [1]

- **13** Fixed points are used in the calibration of thermometers such as the *steam point*.
 - (a) State what is meant by the *steam point*.
 _______[1]
 - (b) With the aid of a fully labelled diagram, explain how the steam point of water is calibrated on an unmarked thermometer.

 [3]

14 Fig. 14.1 shows a type of meal called "sukiyaki" or "hot pot". The hot pot is heated with a small gas heater. The fresh food held by a pair of chopsticks is put into the water inside the pot to be cooked.

9



Fig. 14.1

(a) Draw the convection current flow in the water inside the pot.

[1]



(b) Explain how heat is transferred by convection in the pot.

(c) Explain, in terms of the mechanisms of heat transfer through conduction, why it is advisable for a person to use wooden chopsticks instead of metal chopsticks.

[2]

[2]

15 Fig. 15.1 shows a simplified structure of a slide projector. It projects the image of slide *AB* onto the screen using a mirror M and a converging lens L.



Fig. 15.1

- (a) Complete the diagram by drawing a ray from *A* and *B* respectively to show how the slide is projected onto the screen to form a sharp and magnified image. [2]
- (b) State one other characteristic of the image formed on the screen. [1]

16 A sound of a constant frequency of 1.50 kHz is emitted from a speaker.

Fig. 16.1 shows the graph of the displacement of air particles with the distance from the speaker.



(c) The source now emits another sound with a similar waveform but of twice the pitch and same loudness.

On Fig. 16.1, sketch the graph of this wave for the same number of cycles. [2]