	Name:		Index Number:		Class:	
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CATHOLIC HIGH SCHOOL End-of-Year Examination Year 3 (Integrated Programme)

PHYSICS

04 October 2019 2 hours 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Section A: Multiple Choice

Write in soft pencil. Do not use paper clips, glue or correction fluid. Write your name, index number and class on the Answer Sheet in the spaces provided.

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 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.

Sections B & C: Structured and Free Response

Write your name, index number and class on all the work that you hand in. Write in dark blue or black pen. You may use an HB pencil for any diagrams or graphs. Do not use paper clips, glue or correction fluid.

Section B

Answer **all** questions.

Section C

Answer **all** questions. Question 9 has a choice of parts to answer.

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

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

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.

For examiner's use only:

Section A	/ 30
Section B	/ 40
Section C	/ 30
formula	
s.f.	
Total	/ 100

At the end of the examination, fasten all your work securely together.

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

This document consists of **30** printed pages.

Section A

Answer all the questions in this section.

- 1 Which of the following is **not** a base unit?
 - A ampere
 - **B** joule
 - **C** kelvin
 - D mole

2 What is a reasonable estimate for the volume of a half-metre rule in the school laboratory?

Α	0.75 cm ³	В	7.5 cm ³	С	75 cm ³	D	750 cm ³
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3 A student uses a micrometer to measure the thickness of a sheet of glass.



Figure 1



Figure 1 shows the reading on the micrometer when it is tightened with nothing between the jaws. Figure 2 shows the reading taken with the sheet of glass between the jaws.

What is the thickness of the sheet of glass?

- **A** 2.05 mm
- **B** 2.55 mm
- **C** 2.80 mm
- **D** 3.05 mm
- 4 A 3 N force and a 4 N force are acting at a point.

Which of the following cannot be the magnitude of the resultant force?

A 4 N **B** 5 N **C** 7 N **D** 8 N

5 The graph below shows how the displacement of an object from point O varies with time.



Which of the following describes the motion of the object?

- A The object is initially stationary. Then it moves away from O and finally stops.
- **B** The object is initially stationary. Then it moves towards O and finally stops.
- **C** The object is moving at constant velocity. Then it slows down and stops.
- **D** The object slides along a flat surface. Then it slides down a smooth incline plane and finally stops.
- 6 Which of the following is an example of Newton's third law?
 - **A** The driving force of the engine of a car and the air resistance against the car.
 - **B** The weight of a box and the normal contact force acting on it.
 - **C** The weight of a parachutist and the air resistance acting against his motion at terminal velocity.
 - **D** The weight of a truck and the gravitational pull of the truck on earth.
- 7 A force of 55 N pushes two blocks of masses 6.0 kg and 4.0 kg along a smooth, flat surface.



What is the acceleration of the two blocks?

A 2 m/s^2 B 5.5 m/s^2 C 9.2 m/s^2 D 13.

8 A resultant force acts on an object and causes it to move in a straight line.

The graph shows how the resultant force varies with time.



Which graph is the velocity-time graph of the object?



9 The diagram shows a crate resting on a slope.



Which arrow shows the direction of the frictional force acting on the crate?

10 Which property of a body resists a change in its state of rest or motion?

Α	acceleration	В	force
С	mass	D	velocity

11 The gravitational field strength on the surface of Mars is 3.7 N/kg, while that on the surface of the Moon is 1.6 N/kg.

A piece of rock weighs 60 N on the Moon. Which of the following statements is true when the rock is on Mars, as compared to when it is on the Moon?

	weight of rock	mass of rock
Α	smaller	smaller
в	smaller	same
С	larger	same
D	same	larger

12 An irregular shaped object has a mass of 45 g. It displaces 30 cm³ of water when fully submerged.

What is the density of the object?

Α	1.5 kg/m³	В	15 kg/m³	С	150 kg/m³	D	1500 kg/m ³
	•		•		Ű,		•

13 The diagram shows a toy, which consists of objects X, Y and Z suspending from two light rods. The masses of X, Y and Z are such that the rods are horizontal.



Which row gives a possible combination of the masses X, Y and Z?

	mass of X / g	mass of Y / g	mass of Z / g
Α	10	60	30
В	20	20	20
С	20	20	40
D	20	40	20

14 Which of the following pairs of forces can be applied to the rod to produce a couple?



The diagram shows the distance-time graph of a car travelling on a straight road up a slope. 15



Which quantity for the car is constant, but not zero?

- A acceleration
- **B** gravitational potential energy
- C kinetic energyD resultant force
- 16 The diagram shows a child on a slide.



The weight of the child is 250 N. The height of the slide is 7.0 m. The work done against friction as the child descends the slide is 1300 J.

What is the change in gravitational potential energy and what is the final kinetic energy of the child?

	change in gravitational potential energy / J	final kinetic energy / J
Α	1750	450
в	1750	1750
С	17500	16200
D	17500	17500

- 17 Car A has a mass of *m* and is travelling with speed *v*. Car B has a mass of 2*m*. If the kinetic energy of both cars are the same, what is the speed of car B?
 - **A** $\frac{v}{\sqrt{2}}$ **B** $\frac{v}{2}$ **C** v **D** $\sqrt{2}v$
- **18** A stone is thrown vertically upwards and follows the path as shown.



Q is the highest point reached by the stone. P and R are at the same vertical height, which is half the height of Q. The stone hits the ground at S. Air resistance can be taken to be negligible.

Which of the following statements is not correct?

- A The kinetic energy of the stone at P is the same as that at R.
- **B** The kinetic energy of the stone at P is half the initial kinetic energy of the stone just before it hits the ground at S.
- **C** The kinetic energy of the stone at Q is maximum.
- **D** The total energy of the stone, at any point, is constant.
- **19** In a hydroelectric power station, 1200 kg of water flows through a pipe and falls through a vertical drop of 15 m every minute.

The gravitational field strength g is 10 N/kg.

What is the power output?

A 0.30 kW B 3.0 kW C	30 kW D 180 kW
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20 The diagram represents a wave.



Which distance gives the amplitude of the wave?

21 A transverse wave travels to the right along a spring. The graph below shows the displacement of particles P and Q at a particular instant.



Which of the following statements is true?

- **A** P and Q are moving in opposite directions.
- **B** P has a greater speed than Q.
- **C** P is moving vertically upwards.
- **D** Q is momentarily at rest.
- **22** A water wave travels from deep water to shallow water in a ripple tank.

What happens as the wave moves into the shallow water?

- **A** The speed of the wave increases.
- **B** The speed of the wave remains constant.
- **C** The wavefronts are closer.
- **D** The wavefronts are further apart.

23 A ray of light is incident on a mirror. Upon reflection, the light ray is deviated through an angle of 100° from the original path as shown.



What is the angle of incident?

A 40° **B** 50° **C** 60° **D** 80°

24 A thin converging lens has a focal length of 12.0 cm. An object is placed at a distance of 6.0 cm from the lens.

Which of the following describes the image?

- A diminished
- **B** magnified
- C same size as the object
- D real
- 25 Which of the following shows the components of electromagnetic spectrum in increasing frequency?

	increasing frequency							
Α	gamma rays	infra-red	microwaves					
в	infra-red visible light		ultra-violet	radio waves				
С	microwaves	visible light	ultra-violet	X-rays				
D	radio waves	visible light	infra-red	gamma rays				

- 26 Which of the following electromagnetic wave is used to sterilise surgical equipment?
 - A microwaves
 - B radio waves
 - **C** ultra-violet
 - D X-rays

27 A sound wave passes through air. The diagram shows the arrangement of the air particles at one instant.



Which positions are one wavelength apart?

- A W and X
- B W and Z
- **C** X and Y
- **D** Y and Z
- 28 The graph represents two sound waves, X and Y.



Which of the following is true?

- **A** The pitch of X is higher than Y, and higher in volume.
- **B** The pitch of X is higher than Y, but lower in volume.
- **C** The pitch of X is lower than Y, and lower in volume.
- **D** The pitch of X is lower than Y, but higher in volume.
- 29 An ultrasound with a speed of 1400 m/s in human tissue is used during a pre-natal scan.

If the wavelength is 0.70 mm, what is the frequency of the ultrasound?

- $\textbf{A} \quad 9.8\times10^2 \text{ Hz}$
- $\textbf{B} \quad 2.0\times10^3 \text{ Hz}$
- \mathbf{C} 2.0 × 10⁵ Hz
- \mathbf{D} 2.0 × 10⁶ Hz

30 A ship that is stationary on the surface of the sea sends pulses of sound vertically downwards towards the sea bed. Each pulse that reflects from the sea bed is received 1.0 s after it is sent out.

A whale swims under the boat and a pulse is received 0.60 s after it is sent out.

The speed of sound in sea water is 1500 m/s.

What is the distance of the whale above the sea bed?

A 300 m **B** 450 m **C** 600 m **D** 750 m

END OF SECTION A