Name:	Index Number:	Class:	
			·



CATHOLIC HIGH SCHOOL Preliminary Examination Secondary 4 (O-Level Programme)

PHYSICS

Paper 1 Multiple Choice

6091/01

15 September 2022 1 hour

Additional Materials: **Multiple Choice Answer Sheet**

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use paper clips, glue or correction fluid.

Write your name, index number and class on this paper and on the Answer Sheet in the spaces provided.

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 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.

For examiner's use only:

Total	1	40
Overall	Marks	%
Paper 1	40	30%

Тарсі і	10	0070
Paper 2A	50	F0%
Paper 2B	30	50%
Paper 3	40	20%



1 The diagram shows a wooden cube being measured using vernier calipers.

A 1.6 mm **B** 2.6 mm **C** 2.8 mm **D** 8.0 mm

Micrometers, metre rules, tapes and vernier calipers are used for measuring lengths.Which row identifies the most suitable device to measure the stated length accurately?

	length	measuring device
Α	0.15 mm	micrometer
В	0.50 mm	metre rule
С	0.50 mm	vernier calipers
D	0.15 m	tape

3 The graph below shows how the velocity of a car changes with time.



Which of the following can be deduced from the graph?

- A The car accelerates, then moves with a constant velocity.
- **B** The car accelerates, then comes to a rest.
- **C** The car decelerates, then moves with a constant velocity.
- **D** The car decelerates, then stops moving.
- **4** A satellite is orbiting around the Earth.

Which statement is correct?

- A There is a force on the satellite away from the Earth.
- **B** There is a force on the satellite in the direction in which it travels.
- **C** There is a force on the satellite opposite to the direction in which it travels.
- **D** There is a force on the satellite towards the Earth.
- **5** Two blocks are joined together.



One block has a density of 6.0 g / cm^3 and the other has a density of 9.0 g / cm^3 .

What is the overall density of the two blocks joined together?

A 7.0 g / cm³ **B** 7.5 g / cm³ **C** 8.0 g / cm³ **D** 15 g / cm³

6 A ball was thrown upwards near the surface of the Earth with a velocity of 50 m / s. After 5 seconds, it came to a rest.

The same ball was thrown up with the same velocity near the surface of planet X. After 5 seconds, it was still moving upwards with a velocity of 30 m / s.

What was the ratio of the gravitational field strength near the surface of planet X to the gravitational field strength near the surface of the Earth? (The gravitational field strength g on Earth is 10 N / kg.)

A 0.40 **B** 0.60 **C** 1.7 **D** 2.5

- 7 Why is it better to use a long spanner rather than a short one to tighten a screw?
 - **A** Less force is needed.
 - **B** Less friction is present.
 - **C** Less turning effect is needed.
 - **D** Less work is needed.
- 8 A boy who weighs 500 N stands on a uniform plank with supports at P and Q.

The weight of the plank is 100 N and the distances between the boy and the supports are shown in the diagram below.



What are the upward forces acting on the plank at P and Q?

	Р	Q
Α	267 N	333 N
В	272 N	328 N
С	294 N	306 N
D	300 N	300 N

9 When a student tries to touch his toes while standing flat against a wall, the student will probably fall over.



Why of the following statements explains this?

- **A** The student's centre of gravity is located directly above his support area.
- **B** The student's centre of gravity is located outside his support area.
- **C** The student's overturning moment is larger than the moment due to his own weight.
- **D** The student's weight is too low.
- **10** The diagram below shows a simple mercury barometer placed in a science laboratory.



The space above the mercury column **contains air**.

Which of the following shows the distance that is used in determining atmospheric pressure?

A AB B AC C BC D BD

11 The diagram shows two pieces of apparatus, with similar cross-sectional areas.

One is filled with water and the other is filled with mercury. Water is much less dense than mercury.



At which point is the liquid pressure greatest?

- 12 What type of energy may be released when atoms are re-arranged?
 - A chemical potential energy
 - **B** geothermal energy
 - **C** nuclear energy
 - **D** wind energy
- **13** A gas trapped in a cylinder is compressed at constant temperature by a piston.

Which of the following will not change?

- A density
- B mass
- **C** molecular spacing
- D pressure
- **14** A glass jug is designed so that it does not break when boiling water is poured into it.

What type of glass should be used?

	thickness	expansion
Α	thick	expands greatly when heated
В	thick	expands little when heated
С	thin	expands greatly when heated
D	thin	expands little when heated

15 In countries with cold weathers, houses can reduce heat loss through the roofs by having a layer of fibre glass on the floor of each roof.

This layer of fibre glass consists of a very large number of very small glass fibres, which are laid over each other.

Why is this layer of fibre glass effective as a heat insulator?

- A Glass fibres are good reflectors of radiation.
- B Glass fibres have a low heat capacity.
- **C** Glass fibres prevent the faster-moving air molecules from escaping.
- **D** Glass fibres reduce air movement and air is a good insulator of heat.
- 16 Why is mercury suitable to use as the liquid in many thermometers?
 - **A** It can be seen easily.
 - **B** It expands evenly with a rise in temperature.
 - **C** It freezes at a high temperature.
 - **D** It has a high density.
- **17** As the temperature is raised, the molecules gain energy and vibrate more vigorously about their fixed positions.

- Eventually they have enough energy to overcome the strong forces between them so they can move past each other, although the weaker forces still do not allow them complete freedom of movement.

- During the entire process, the internal energy of the molecules increases.

Which of the following describes the above entire process?

- **A** a liquid boiling to become a gas
- **B** a solid melting to become a liquid
- **C** a solid melting to become a liquid, then boiling to become a gas
- **D** a solid undergoing sublimation
- **18** An electric kettle with a power rating of 300 W requires 15 min to heat up 1 kg of water from 25 °C to 60 °C.

Given that the specific heat capacity of water is 4200 J / (kg K), what is the amount of energy that is wasted?

A 4 500 J **B** 123 000 J **C** 147 000 J **D** 270 000 J

19 On a hot day, the drink in a bottle can be kept cool by standing the bottle in a bowl of water and placing a wet cloth over it.



Why is the drink kept cool?

- A Hot air cannot escape from the bottle.
- **B** The cloth conducts heat from the bottle into the water.
- **C** The drink cannot evaporate from the bottle.
- **D** Water evaporating from the cloth cools the drink.
- 20 In an experiment using a ripple tank, plane wavefronts arrive at a plane surface.



Which row correctly describes the waves after they are reflected from the surface?

	speed of waves	wavelength λ
Α	faster	shorter
В	slower	shorter
С	the same	longer
D	the same	the same

21 A transverse wave is set up across a string. The diagram below is a snapshot of the wave at a certain instant of time.

The direction of motion of the wave is towards the right.



Which one of the following correctly indicates the direction of the velocities of the points labelled P, Q and R?

	Р	Q	R
Α	1	\rightarrow	\rightarrow
В	↑	↑	\downarrow
С	\downarrow	↑	1
D	\downarrow	\downarrow	1

22 A ball lying on the surface of water vibrates up and down 4 times in 2.0 s when a water wave passes through.

The distance between two successive crests of the water wave is 10 cm.

What is the speed of the water wave?

A 0.050 m/s B 0.10 m/s C 0.20 m/s D 2.0 m	A (0.050 m / s	В	0.10 m / s	С	0.20 m / s	D	2.0 m
---	------------	-------------	---	------------	---	------------	---	-------

23 A ray of light enters a glass block. The angles that the ray of light makes with the normal are labelled in the diagram below.



Which of the following graphs is correct?



24 Which of the following describes the characteristics of the image formed on the film of a simple camera?

	characteristics of image						
Α	real inverted diminished						
В	real	inverted	magnified				
С	virtual	upright	diminished				
D	virtual	upright	magnified				





Which of the diagram(s) is/are correct?

- **A** (1) **B** (2) **C** (1) and (2) **D** (1), (2) and (3)
- **26** The wavelengths of visible light range from 4×10^{-7} m to 7×10^{-7} m.

Which of the following wavelengths for infra-red radiation, red light and violet light are possible?

	infra-red radiation	red light	violet light
Α	1 × 10⁴ m	4 × 10⁻² m	7 × 10⁻ ⁷ m
В	1 × 10⁴ m	7 × 10⁻ ⁷ m	4 × 10⁻² m
С	1 × 10⁻ ⁷ m	4 × 10⁻² m	7 × 10⁻ ⁷ m
D	1 × 10⁻ ⁷ m	7 × 10⁻ ⁷ m	4 × 10⁻² m

27 A digital video camera recorder has a night shot function for capturing images in the dark.

Which of the following is used by the recorder in capturing images in the dark?

- A infra-red radiation
- B radio waves
- **C** ultra-violet rays
- D X-rays
- **28** Two identical loudspeakers X and Y are emitting the same sound waves.

A microphone detects a maximum loudness when it is 0.2 m from X and 0.4 m from Y.

It detects a minimum loudness when it is 1.0 m from X and 0.4 m from Y.

What is the possible wavelength of the sound waves?

Α	0.1 m	В	0.2 m	С	0.4 m	D	0.5 m

29 The diagram shows the trace produced on a cathode-ray oscilloscope (c.r.o.) by a sound wave.



Which trace is produced when the loudness of the sound wave is **decreased**, and the pitch of the sound wave is **increased**?



30 The diagram shows two light insulating spheres suspended from the ceiling. Both spheres are positively charged.



An earthed metal plate is then inserted mid-way between the two spheres, as shown below.



What will happen to the two spheres?

- A The two spheres will move closer to touch the metal plate and remain in contact.
- **B** The two spheres will move closer to touch the metal plate and then repel from each other.
- **C** The two spheres will move further away from each other.
- **D** The two spheres will vibrate back and forth on the respective sides of the metal plate.

31 The flash on a camera operates when a charge of 6.0 C passes through in 3.2 ms.

What is the average current in the camera?

- **A** 0.53 A **B** 1.9 A **C** 530 A **D** 1900 A
- 32 The graph below shows the relationship between the current *I* in a conductor and the potential difference *V* across it. When V < 1.8 V, the current is negligible.



Which statement about the conductor is correct?

- **A** It does not obey Ohm's law. When V > 1.8 V, its resistance is 4.0 Ω .
- **B** It does not obey Ohm's law. When V = 3.0 V, its resistance is 10 Ω .
- **C** It obeys Ohm's law when V > 1.8 V. When V = 3.0 V, its resistance is 4.0 Ω .
- **D** It obeys Ohm's law when V > 1.8 V. Its resistance is increasing throughout.
- **33** The diagram below shows four resistors connected in a circuit.



What is the potential difference between X and Y?

A 0 V **B** 1.5 V **C** 3 V **D** 4.5 V

34 In the diagram below, the light intensity on the electrical component R increases.



What happens to the brightness of the two lamps L_1 and L_2 ?

	L ₁	L_2
Α	decreases	decreases
В	decreases	increases
С	stays the same	decreases
D	stays the same	increases

- 35 Why are the metal casings of electrical appliances earthed?
 - **A** to complete the circuit
 - **B** to ensure the casing is not at a dangerous potential
 - **C** to ensure the fuse blows when the current in the appliance is too large
 - **D** to protect the appliance from overheating
- **36** The diagram below shows the usage of three electrical appliances in a day.

appliance	rating	duration	cost
electric heater	220 V, 2500 W	30 minutes	C ₁
television	220 V, 270 W	5 hours	C ₂
lamp	220 V, 150 W	8 hours	C ₃

Which of the following shows the correct comparison of the costs?

A $C_1 > C_2 > C_3$ **B** $C_2 > C_1 > C_3$ **C** $C_2 > C_3 > C_1$ **D** $C_3 > C_2 > C_1$

37 The diagram shows a sensitive device surrounded by a shield that prevents the magnetic field from reaching the device.



How does the shield protect the device?

- A It channels the magnetic field around the shield until it emerges from the right side of the shield.
- **B** It makes the magnetic field weaker.
- **C** It repels the magnetic field.
- **D** Its left side scatters the magnetic field in all directions.
- **38** A coil P of *N* turns is made from a length *L* of wire. The coil carries a current *I* when between two magnetic poles.



A similar coil Q of 2N turns is made from a length 2L of identical wire. It also carries a current *I* when between the two magnetic poles.

Which coil has the greater resistance and which coil experiences the greater turning effect?

	greater	greater
	resistance	turning effect
Α	Р	Р
В	Р	Q
С	Q	Р
D	Q	Q

39 Each of the diagrams shows a cross-section through two parallel, current-carrying conductors.

Which diagram shows the shape of the magnetic field pattern and the directions of the forces on the two conductors?



40 The diagram below shows a **modified** generator which makes use of a split-ring commutator, instead of slip rings.



Which of the following statements is correct?

- **A** The direction of the induced current is constant in the coil.
- **B** The generator does not work.
- **C** The induced current flows in one direction only through the resistor.
- **D** The magnitude of the induced current is constant.