Neap

Trial Examination 2023

HSC Year 12 Physics

General Instructions	
	• Reading time – 5 minutes • Working time – 3 hours • Write using black pen • Draw diagrams using pencil • Calculators approved by NESA may be used • A data sheet, formulae sheet and Periodic Table are provided at the back of this paper

Total Marks: 100	
	Section I – 20 marks (pages 2–9) • Attempt Questions 1–20 • Allow about 35 minutes for this section **Section II – 80 marks (pages 11–32)** • Attempt Questions 21–32 • Allow about 2 hours and 25 minutes for this section

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2023 HSC Year 12 Physics examination.

SECTION I

20 marks
Attempt Questions 1–20
Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

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1 Polonium-214 undergoes decay according to the equation

$$^{214}_{84}\text{Po} \rightarrow {}^{X}_{Y}\text{Pb} + {}^{4}_{2}\text{He}.$$

Which row of the table identifies the values of X and Y and describes the decay?

	X	Y	*Description of decay*
A.	210	82	alpha decay with a positive alpha particle
B.	212	80	beta decay with a positive beta particle
C.	212	80	alpha decay with a negative alpha particle
D.	214	82	beta decay with a negative beta particle

2 The table shows the energy levels in a hydrogen atom.

Energy level	*Energy of electron (J)*
$n = 1$	0
$n = 2$	1.63×10^{-18}
$n = 3$	1.94×10^{-18}
$n = 4$	2.04×10^{-18}

An electron in the $n = 4$ level transitions to the $n = 3$ level.

How does the energy change as the electron moves between levels?

A. 1.00×10^{-19} J absorbed

B. 1.00×10^{-19} J emitted

C. 2.04×10^{-18} J absorbed

D. 2.04×10^{-18} J emitted

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3 Which row of the table identifies the quark compositions of protons and neutrons?

	Protons	*Neutrons*
A.	2 up quarks, 1 down quark	1 up quark, 2 down quarks
B.	1 up quark, 2 down quarks	2 up quarks, 1 down quark
C.	2 up quarks, 1 top quark	2 top quarks, 1 up quark
D.	1 down quark, 2 top quarks	2 down quarks, 1 top quark

4 The primary coil in a transformer has 50 turns and a voltage of 168 V. The secondary coil has a voltage of 4200 V.

What is the ratio of primary turns to secondary turns in the transformer?

A. 1 : 25

B. 1 : 1250

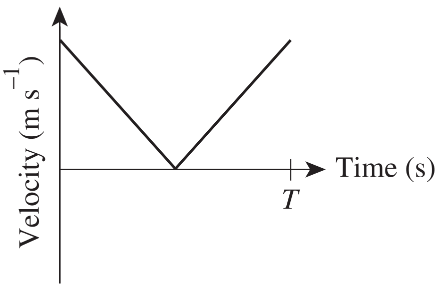
C. 25 : 1

D. 1250 : 1

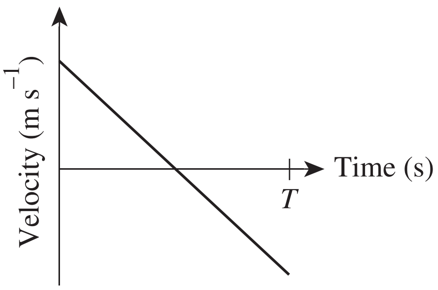
5 A tennis player launches a tennis ball vertically upwards. At time T, the tennis player catches the ball when it returns to its starting position.

Which of the following graphs shows the tennis ball's velocity over time?

A.



B.



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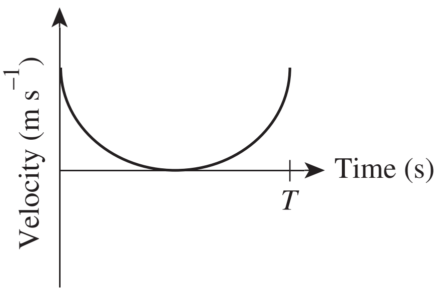
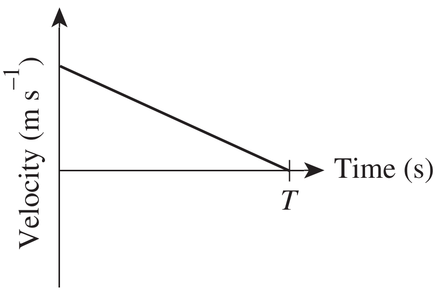
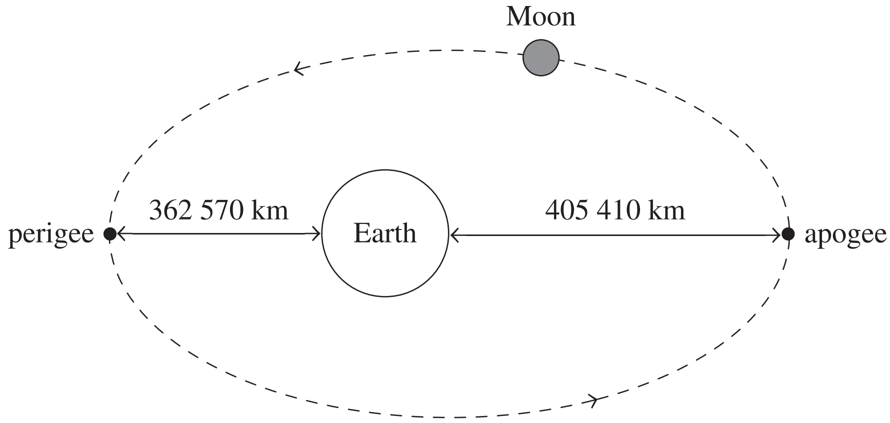


D.



6 The diagram shows the perigee and apogee of the Moon – two points in the Moon's elliptical orbit around Earth.



Which of the following statements is correct?

A. When the Moon reaches the apogee, its gravitational potential energy and kinetic energy will be at minimums. It will move at a low velocity.

B. When the Moon reaches the apogee, its gravitational potential energy and kinetic energy will be at maximums. It will move at a high velocity.

C. When the Moon reaches the perigee, its gravitational potential energy will be at a minimum and its kinetic energy will be at a maximum. It will move at a high velocity.

D. When the Moon reaches the perigee, its gravitational potential energy and kinetic energy will be at maximums. It will move at a low velocity.

7 A student with a mass of 65 kg is asked to determine their weight while they travel in an elevator. The elevator goes through three stages of movement.

- During stage 1, the elevator moves upwards at a constant velocity of 9.8 m s^{-1}.
- During stage 2, the elevator accelerates upwards at 5 m s^{-2}.
- During stage 3, the elevator accelerates downwards at 5 m s^{-2}.

Which row of the table identifies the student's weight during the different stages of the elevator's movement?

	Stage 1	*Stage 2*	*Stage 3*
A.	65 kg	115 kg	15 kg
B.	65 kg	15 kg	115 kg
C.	637 N	312 N	962 N
D.	637 N	962 N	312 N

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8 Two current-carrying wires are parallel to each other and separated by a distance of 0.05 m. They carry currents of 0.5 A and 0.3 A in opposite directions.

If the distance between the wires were increased to 0.1 m, the force acting on the 0.3 A wire would be

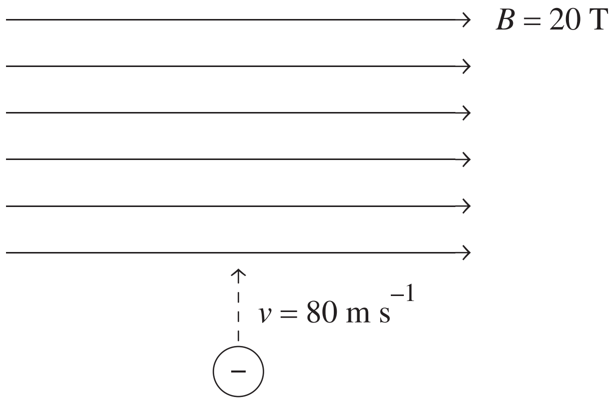
A. a quarter of the original value.

B. half of the original value.

C. 0.6 of the original value.

D. double the original value.

9 An electron travels into a uniform magnetic field as shown.



What is the force acting on the electron?

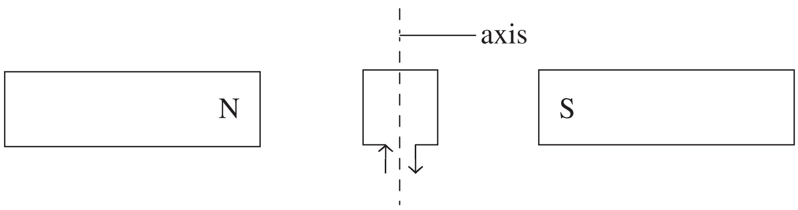
A. 0.4×10^{-20} N up the page

B. 4.0×10^{-20} N out of the page

C. 2.6×10^{-16} N out of the page

D. 2.6×10^{-16} N into the page

10 A rectangular coil has the dimensions 3.0 cm × 4.0 cm and carries a current of 15.0 mA in a uniform magnetic field of 3.0 T. The coil has 20 turns of wire and is free to rotate about the axis as shown.



If the coil is rotated by 25°, what is the torque acting on the coil?

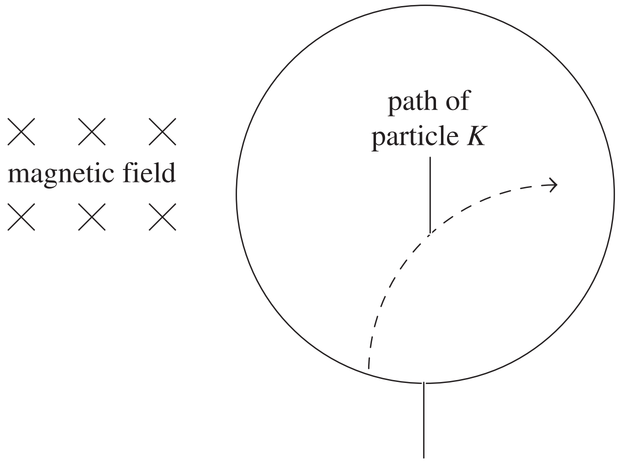
A. 9.79×10^{-4} Nm clockwise

B. 9.79×10^{-4} Nm anticlockwise

C. 4.56×10^{-4} Nm clockwise

D. 4.56×10^{-4} Nm anticlockwise

11 Particle K was accelerated to a velocity of 2.5×10^4 m s^{-1} in a particle accelerator. It then entered a cloud chamber placed in a uniform magnetic field directed into the page with a strength of 1.8×10^{-6} T. The radius of particle K's arc was found to be 5.0 cm.



Which row of the table is correct?

	Charge-to-mass ratio of particle K	*Charge of particle K*
A.	2.8×10^9 C kg^{-1}	negative
B.	2.8×10^9 C kg^{-1}	positive
C.	2.8×10^{11} C kg^{-1}	negative
D.	2.8×10^{11} C kg^{-1}	positive

12 A scientist finds that the frequency of incident light on a piece of metal is greater than the threshold frequency.

The scientist decides to investigate how changing the light may affect the photoelectrons emitted by the piece of metal. They apply the following two conditions as part of their investigation.

1. The intensity of the light is decreased, and the frequency is kept constant.
2. The frequency of the light is increased, and the intensity is kept constant.

The scientist records the maximum kinetic energy of the photoelectrons and the number of photoelectrons emitted under each condition, and compares these results to the initial observation.

Which row of the table best describes the results of the scientist's investigation?

	Maximum kinetic energy of the photoelectrons	*Number of photoelectrons emitted*
A.	increases under conditions 1 and 2	increases under conditions 1 and 2
B.	increases under condition 1 and remains constant under condition 2	decreases under condition 1 and remains constant under condition 2
C.	remains constant under condition 1 and increases under condition 2	decreases under condition 1 and remains constant under condition 2
D.	remains constant under condition 1 and decreases under condition 2	decreases under conditions 1 and 2

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13 Galaxies *X* and *Y* are on opposite sides of Earth and are moving away from Earth at a speed approaching the speed of light, which is approximately 0.95*c*.
Which of the following statements is correct?

A. Light from galaxy *Y* will hit Earth and galaxy *X* at a speed of 3.00×10^8 m s^{-1} as the speed of light is constant relative to all observers.

B. Light from galaxy *Y* will hit Earth at a speed of 3.00×10^8 m s^{-1} and galaxy *X* at a speed of 0.95*c*.

C. Light from galaxy *Y* will hit galaxy *X* at a speed of 3.00×10^8 m s^{-1} and Earth at a speed of 0.95*c*.

D. Light from galaxy *Y* will hit Earth and galaxy *X* at a speed of 0.95*c*.

14 In 2224, there is an space race from the Ultima space station to the Extrema space station. Ren and Annika are two competitors in this race. After a collision with space junk, Ren experiences issues with her navigation system. While waiting for the system to reboot, she observes Annika race past her. Annika moves straight ahead on a path parallel to Ren's.
While observing Annika, Ren considers the following conclusions about their positions.

1. She and Annika are both moving towards the Extrema space station; however, Annika is moving faster.
2. She is moving backwards towards the Ultima space station, and Annika is stationary.
3. She is moving faster than Annika, and they are both moving backwards towards the Ultima space station.

Which of Ren's conclusions could be correct?

A. conclusion 1 only

B. conclusions 1 and 3 only

C. conclusions 1, 2 and 3

D. none of the conclusions

15 Students plotted the radiation of stars against their wavelengths.
If a star has a surface temperature of 4000 K, what is the maximum wavelength of the radiation emitted by the star?

A. 0.725×10^{-7} m

B. 7.25×10^{-6} m

C. 725×10^{-7} nm

D. 725 nm

16 Enriched uranium is made up of 2% uranium-235 by mass, and the remaining 98% is uranium-238. Pressurised water reactors use uranium-235 to produce energy. A fission reaction that could occur in a pressurised water reactor is as follows.

$$^{235}_{92}\text{U} + ^{1}_{0}\text{n} \rightarrow ^{140}_{56}\text{Ba} + ^{93}_{36}\text{Kr} + 3^{1}_{0}\text{n}$$

The table shows the masses of the reactants and products in the reaction.

Product/reactant	*Mass (amu)*
uranium-235	235.044
barium-140	139.91061
krypton-93	92.93127
neutron	1.00866

Assuming that all of the uranium-235 nuclei undergo fission, how much energy would be released if 1 kg of enriched uranium was used in a pressurised water reactor?

A. 3.00×10^{-11} J

B. 1.42×10^{12} J

C. 1.98×10^{16} J

D. 1.08×10^{42} J

17 In a Physics class, students conduct three experiments in which they observe various light sources through a spectroscope.

- Experiment 1 uses an incandescent lamp.
- Experiment 2 uses a sodium lamp.
- Experiment 3 uses an incandescent lamp and passed the light through sodium vapour.

Which row of the table identifies what the students would observe through the spectroscope in each experiment?

	Experiment 1	*Experiment 2*	*Experiment 3*
A.	continuous spectrum of colours	two yellow lines on a dark background	fully coloured background with two black lines
B.	continuous spectrum of colours	fully coloured background with two black lines	two yellow lines on a dark background
C.	two yellow lines on a dark background	full spectrum of colours	fully coloured background with two black lines
D.	fully coloured background with two black lines	two yellow lines on a dark background	full spectrum of colours

18 An electron is accelerated from rest in an evacuated glass tube with a voltage of 3200 V through a uniform magnetic field of 2.2×10^{-3} T at right angles to the electron's path.

What is the speed of the electron?

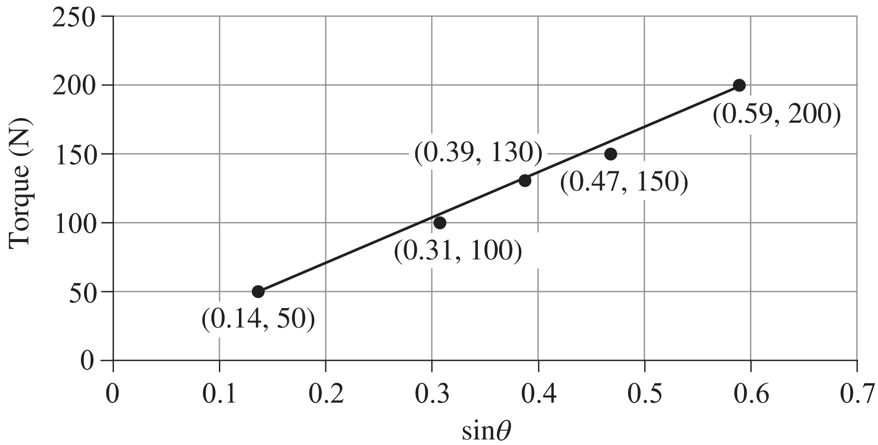
A. 2.56×10^{-16} m s^{-1}

B. 5.13×10^{-16} m s^{-1}

C. 3.35×10^{7} m s^{-1}

D. 1.12×10^{15} m s^{-1}

19 An engineer turns a nut by applying a constant force to a 25.00 cm spanner. They applied this force at different angles and measured the torque. The graph shows the data collected by the engineer.



What is the magnitude of the force applied to the nut?

A. 14.8 N

B. 84.8 N

C. 339 N

D. 1333 N

20 Ella has a mass of 65.00 kg and boards a ride at an amusement park. The ride has a central structure with four 15.00 m steel arms extending from it. Each arm is attached to a steel carriage that has a mass of 550.0 kg and can carry one occupant. When the ride is activated, the arms rotate around the central structure, completing 10 full rotations per minute.

What is the magnitude of the force that the steel arm needs to apply to Ella's carriage so that it continues to move in uniform circular motion?

A. 6744 N

B. 9037 N

C. 10 116 N

D. 363 819 N

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HSC Year 12 Physics

Section II Answer Booklet

80 marks
Attempt Questions 21–32
Allow about 2 hours and 25 minutes for this section

Instructions	
	• Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response. • Show all relevant working in questions involving calculations. • Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 21 (6 marks)

Kai is a team-based ball game from the the Torres Strait. The traditional balls, known as 'kai', such as those made by the Meriam people from Mer Island, were formed out of plaited strips from pandanus plants. A kai is thrown at a speed of 25.0 m s^{-1} at 30° above the surface of Earth and lands on Earth a certain time later. Assume that there is no air resistance.

(a) Determine the maximum height of the kai above the surface of Earth. **2**

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(b) Determine the flight time of the kai. **2**

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(c) Determine the horizontal range of the kai. **2**

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Question 22 (8 marks)

A 1300 kg car makes a turn on a circular bend of road at a speed of 80 km per hour. The bend is not banked and has a radius of 40 m.

(a) What is the magnitude of the centripetal force required for the car to make this turn? **2**

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(b) What is the magnitude of the centripetal acceleration of the car around the bend? **2**

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(c) If the bend were banked at an angle of 8°, calculate the magnitude of the centripetal force exerted by the road on the car. Support your answer with a diagram that identifies the relevant forces and vector components. **4**

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Question 23 (8 marks)
A satellite of mass 250 kg is launched from Earth's surface and enters a uniform circular orbit at 5.0×10^5 m above Earth's surface.

(a) Calculate the orbital velocity of the satellite. **2**

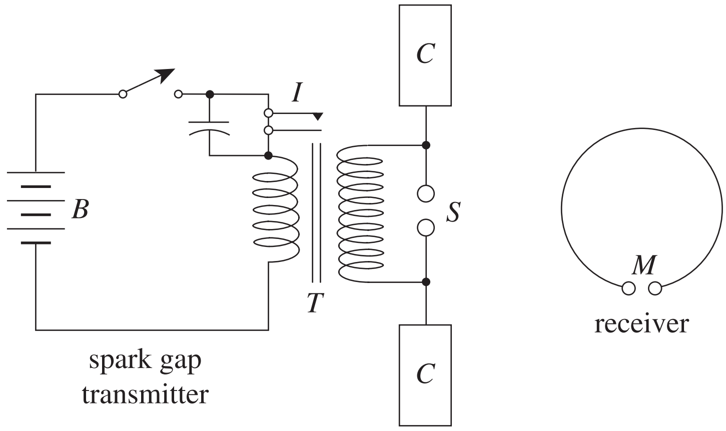
(b) Calculate the magnitude of the gravitational potential energy of the satellite. **2**

(c) Calculate the escape velocity of the satellite from its current position in orbit. **2**

(d) If the satellite were lifted into a higher orbit, explain why work would need to be done by the satellite's engines to change its orbital path. **2**

Question 24 (5 marks)

In 1888, Heinrich Hertz produced and detected radio waves using the apparatus shown in the diagram. The transmitting antenna (*C*) oscillated electrons up and down at a known frequency when a spark was present in the spark gap (*S*). Hertz conducted his work in a dark room so he could observe this spark easily.



Source: Based on Chetvorno (2018), *Hertz transmitter and receiver – English* [diagram]. Accessed December 2022. https://commons.wikimedia.org/wiki/File:Hertz_transmitter_and_receiver_-_English.svg. Licensed under CC BY-SA 3.0, https://creativecommons.org/licenses/by-sa/3.0/legalcode.

(a) Using a diagram, describe how radio waves are propagated. **3**

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Question 24 continues on page 16

Question 24 (continued)

(b) Hertz was able to demonstrate that radio waves have many wave properties including polarisation. Explain how Hertz could have used the receiver to determine if radio waves were polarised. **2**

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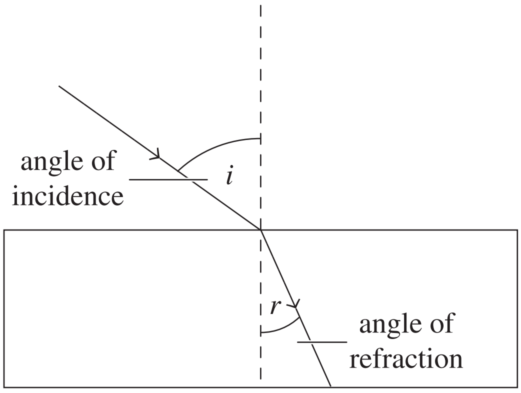
End of Question 24

Question 25 (5 marks)

The diagram shows light moving through a glass prism. **5**



Compare how Huygens's and Newton's models would explain the movement of light through the glass prism.

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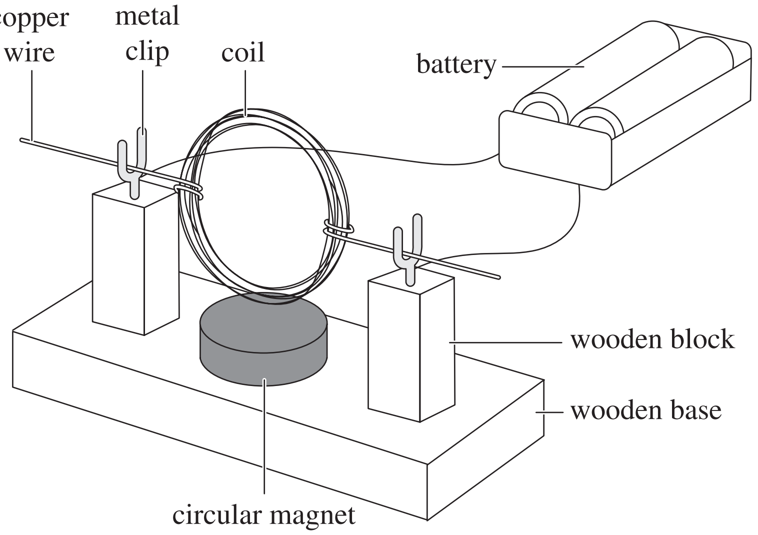
Question 26 (9 marks)

In a Physics class, students are investigating the use of models. Their teacher sets up a series of models in the classroom. The diagram shows model 1, which is a working motor. The students observe the coil rotating about its central axis when it is connected to the batteries. **9**



Model 2 is a plate of plum pudding labelled as 'an early atomic model'.

Assess the effectiveness of models 1 and 2 in improving the students' understanding of the concepts represented by the models.

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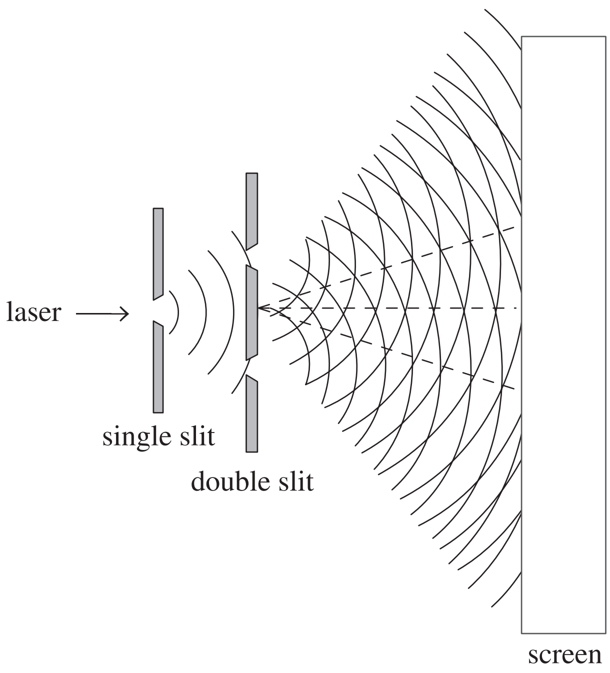
Question 27 (6 marks)

A group of students conducted an experiment in which they directed a red laser of wavelength 633 nm at a screen through a piece of equipment with a double slit in it.

(a) Complete the table by conducting a risk assessment for this experiment. Provide relevant headings for each column. **2**

(b) Consider the experiment shown in the diagram. **2**



Sketch the bands that would be expected to appear on the screen.

Question 27 continues on page 21

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Question 27 (continued)

(c) If the students directed the red laser onto a double slit separated by 0.42 mm, what would be the distance between the bright bands that are shown on a screen 1.2 m away? **2**

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End of Question 27

Question 28 (4 marks)

One of Einstein's thought experiments involved a train, lights and mirrors. **4**

A student conducts a similar thought experiment in which an observer inside a train carriage directs light so that it bounces off a mirror and reaches a detector. Diagram 1 shows the path of the light in the frame of reference of the observer inside the train, and diagram 2 shows the path of the light in the frame of reference of the observer outside the train.

Diagram 1: Frame of reference of observer inside the train

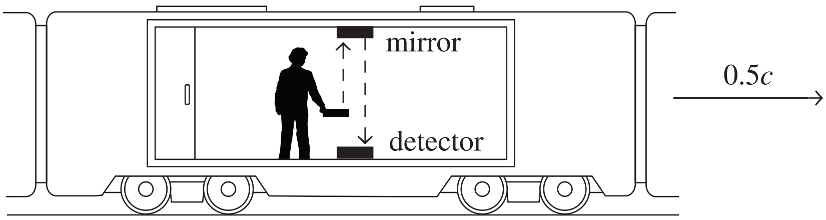
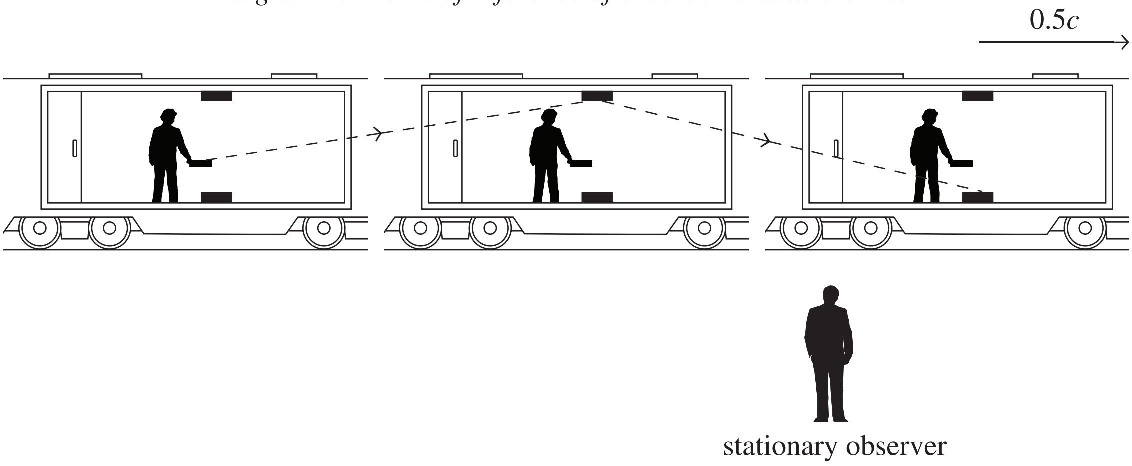


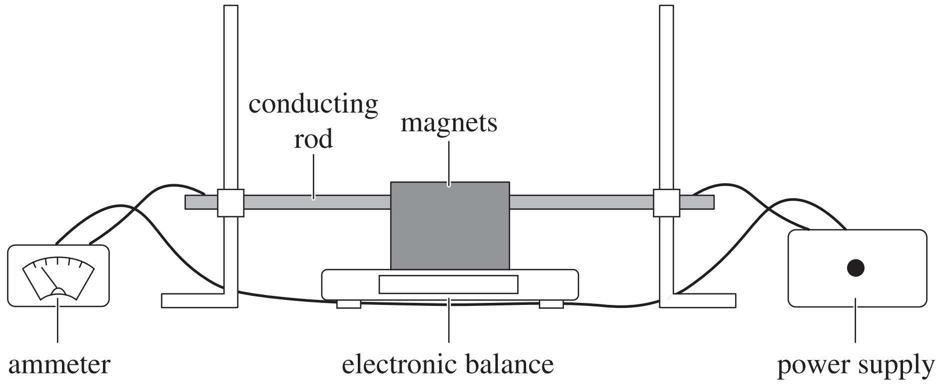
Diagram 2: Frame of reference of observer outside the train



Analyse the diagrams and explain the differences between what the two observers see.

Question 29 (7 marks)

A group of students were conducting an experiment and set up a current balance.

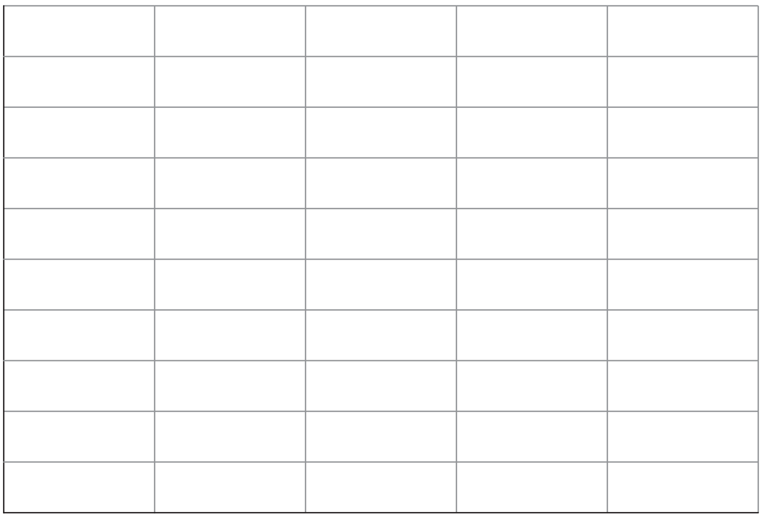


The conducting rod was positioned between two magnets. The balance was initially set at zero. When the students changed the current flowing through the apparatus, the readings on the balance changed due to the force acting up or down.

The students steadily increased the current, which was measured using the ammeter, and recorded the mass displayed on the balance. They then used the measured current and mass to calculate the force acting on the magnets. Their results are shown in the table.

Current (A)	*Mass (kg)*	*Force (N)*
1.1	-0.55×10^{-3}	5.61×10^{-5}
2.1	-1.02×10^{-3}	1.04×10^{-4}
2.9	-1.43×10^{-3}	1.46×10^{-4}
3.6	-1.86×10^{-3}	1.90×10^{-4}
4.3	-2.15×10^{-3}	2.19×10^{-4}

(a) Plot a graph of force versus current. Include a line of best fit. **3**



Question 29 continues on page 24

Question 29 (continued)

(b) Identify the relationship between force and current shown in the graph from part (a) and state TWO assumptions that must be made for this relationship to exist. **2**

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(c) Calculate the gradient of the graph from part (a) and identify what the gradient represents. In your response, include any relevant equation(s). **2**

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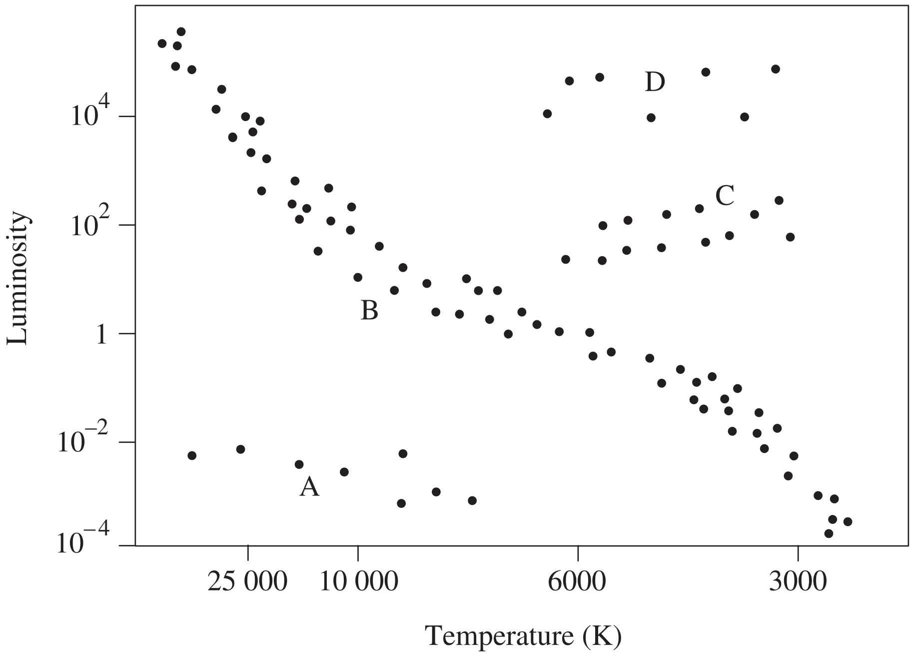
End of Question 29

Question 30 (8 marks)

The Hertzsprung–Russell diagram shows data about the stars in the solar neighbourhood. **8**



Explain how this data may be used to understand the evolution of stars in the solar neighbourhood. In your response, identify the type of stars located in areas A–D and refer to the relevant nucleosynthesis reactions that occur in the identified stars.

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Question 31 (5 marks)

A popular theme park ride is the 'giant drop'. This ride often uses large, permanent magnets under the seats on the ride as a brake. The seats are attached to cables that are used to raise the seats to the top of a tower. The seats are released and as they fall, the magnets pass the bottom section of the tower, which has copper fins that cause the seats to slow down.

A teacher demonstrates this concept to their Physics class using a bar magnet and two pipes made of different materials. They drop the magnet through a PVC pipe and record the time it takes for the magnet to hit the floor, then repeat the action with a copper pipe of the same length and diameter.

The teacher makes the following comment about the giant drop.

> 'The ride is moving quite fast, so the occupants in the seats stop quickly but smoothly. They do not feel a rough jolt. This is much better than if the ride used conventional brakes applied by an operator.'

(a) Using Lenz's law, explain the expected results of the experiment and how they relate to the giant drop. **3**

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(b) Is the teacher's comment correct? Explain your answer. **2**

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Question 32 (9 marks)

In the late nineteenth and early twentieth centuries, experimental discoveries revolutionised the accepted understanding of the nature of matter on an atomic scale.

(a) Describe the nuclear model of the atom developed by Rutherford. **2**

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(b) Atomic models have evolved over time as new technology and discoveries improve our understanding. **4**

Explain how de Broglie's atomic model overcame ONE limitation of Bohr's atomic model.

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(c) The distance between protons in a nucleus is 1.0×10^{-15} m. At this distance, the gravitational force is -2.2×10^{-34} N and the electrostatic force is 230 N. **3**

Explain why these forces cannot account for nuclear stability and describe the properties of the force that holds the nucleus together. In your response, refer to the data provided.

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DATA SHEET

Charge on electron, q_e	-1.602×10^{-19} C
Mass of electron, m_e	9.109×10^{-31} kg
Mass of neutron, m_n	1.675×10^{-27} kg
Mass of proton, m_p	1.673×10^{-27} kg
Speed of sound in air	340 ms^{-1}
Earth's gravitational acceleration, g	9.8 ms^{-2}
Speed of light, c	3.00×10^{8} ms^{-1}
Electric permittivity constant, ε_0	8.854×10^{-12} $\text{A}^2\ \text{s}^4\ \text{kg}^{-1}\ \text{m}^{-3}$
Magnetic permeability constant, μ_0	$4\pi \times 10^{-7}$ N A^{-2}
Universal gravitational constant, G	6.67×10^{-11} N m^2 kg^{-2}
Mass of Earth, M_E	6.0×10^{24} kg
Radius of Earth, r_E	6.371×10^{6} m
Planck constant, h	6.626×10^{-34} J s
Rydberg constant, R (hydrogen)	1.097×10^{7} m^{-1}
Atomic mass unit, u	1.661×10^{-27} kg 931.5 MeV/c^2
1 eV	1.602×10^{-19} J
Density of water, ρ	1.00×10^{3} kg m^{-3}
Specific heat capacity of water	4.18×10^{3} J kg^{-1} K^{-1}
Wien's displacement constant, b	2.898×10^{-3} m K

FORMULAE SHEET

Motion, forces and gravity

$$s = ut + \frac{1}{2}at^2$$

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$\vec{F}_{\text{net}} = m\vec{a}$$

$$\Delta U = mg\Delta h$$

$$W = F_{\parallel}s = Fs\cos\theta$$

$$P = \frac{\Delta E}{\Delta t}$$

$$K = \frac{1}{2}mv^2$$

$$\sum \frac{1}{2}mv^2_{\text{before}} = \sum \frac{1}{2}mv^2_{\text{after}}$$

$$P = F_{\parallel}v = Fv\cos\theta$$

$$\Delta\vec{p} = \vec{F}_{\text{net}}\Delta t$$

$$\sum m\vec{v}_{\text{before}} = \sum m\vec{v}_{\text{after}}$$

$$\omega = \frac{\Delta\theta}{t}$$

$$a_{\text{c}} = \frac{v^2}{r}$$

$$\tau = r_{\perp}F = rF\sin\theta$$

$$F_{\text{c}} = \frac{mv^2}{r}$$

$$v = \frac{2\pi r}{T}$$

$$F = \frac{GMm}{r^2}$$

$$U = -\frac{GMm}{r}$$

$$\frac{r^3}{T^2} = \frac{GM}{4\pi^2}$$

Waves and thermodynamics

$$v = f\lambda$$

$$f_{\text{beat}} = |f_2 - f_1|$$

$$f = \frac{1}{T}$$

$$f' = f\frac{(v_{\text{wave}} + v_{\text{observer}})}{(v_{\text{wave}} - v_{\text{source}})}$$

$$d\sin\theta = m\lambda$$

$$n_1\sin\theta_1 = n_2\sin\theta_2$$

$$n_x = \frac{c}{v_x}$$

$$\sin\theta_{\text{c}} = \frac{n_2}{n_1}$$

$$I = I_{\max}\cos^2\theta$$

$$I_1r_1^2 = I_2r_2^2$$

$$Q = mc\Delta T$$

$$\frac{Q}{t} = \frac{kA\Delta T}{d}$$

FORMULAE SHEET (CONTINUED)

Electricity and magnetism

$$E = \frac{V}{d}$$

$$\vec{F} = q\vec{E}$$

$$V = \frac{\Delta U}{q}$$

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

$$W = qV$$

$$I = \frac{q}{t}$$

$$W = qEd$$

$$V = IR$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$P = VI$$

$$B = \frac{\mu_0 N I}{L}$$

$$F = qv_{\perp}B = qvB\sin\theta$$

$$\Phi = B_{\parallel}A = BA\cos\theta$$

$$F = lI_{\perp}B = lIB\sin\theta$$

$$\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$$

$$\frac{F}{l} = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{r}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\tau = nIA_{\perp}B = nIAB\sin\theta$$

$$V_p I_p = V_s I_s$$

Quantum, special relativity and nuclear

$$\lambda = \frac{h}{mv}$$

$$t = \frac{t_0}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$$

$$K_{max} = hf - \phi$$

$$l = l_0\sqrt{\left(1 - \frac{v^2}{c^2}\right)}$$

$$\lambda_{max} = \frac{b}{T}$$

$$p_v = \frac{m_0 v}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$$

$$E = mc^2$$

$$E = hf$$

$$N_t = N_0 e^{-\lambda t}$$

$$\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

$$\lambda = \frac{\ln 2}{t_{\frac{1}{2}}}$$

PERIODIC TABLE OF THE ELEMENTS

KEY

atomic number	79
symbol	Au
standard atomic weight	197.0
name	gold

1 H 1.008 hydrogen																	2 He 4.003 helium
3 Li 6.941 lithium	4 Be 9.012 beryllium											5 B 10.81 boron	6 C 12.01 carbon	7 N 14.01 nitrogen	8 O 16.00 oxygen	9 F 19.00 fluorine	10 Ne 20.18 neon
11 Na 22.99 sodium	12 Mg 24.31 magnesium											13 Al 26.98 aluminium	14 Si 28.09 silicon	15 P 30.97 phosphorus	16 S 32.07 sulfur	17 Cl 35.45 chlorine	18 Ar 39.95 argon
19 K 39.10 potassium	20 Ca 40.08 calcium	21 Sc 44.96 scandium	22 Ti 47.87 titanium	23 V 50.94 vanadium	24 Cr 52.00 chromium	25 Mn 54.94 manganese	26 Fe 55.85 iron	27 Co 58.93 cobalt	28 Ni 58.69 nickel	29 Cu 63.55 copper	30 Zn 65.38 zinc	31 Ga 69.72 gallium	32 Ge 72.64 germanium	33 As 74.92 arsenic	34 Se 78.96 selenium	35 Br 79.90 bromine	36 Kr 83.80 krypton
37 Rb 85.47 rubidium	38 Sr 87.61 strontium	39 Y 88.91 yttrium	40 Zr 91.22 zirconium	41 Nb 92.91 niobium	42 Mo 95.96 molybdenum	43 Tc technetium	44 Ru 101.1 ruthenium	45 Rh 102.9 rhodium	46 Pd 106.4 palladium	47 Ag 107.9 silver	48 Cd 112.4 cadmium	49 In 114.8 indium	50 Sn 118.7 tin	51 Sb 121.8 antimony	52 Te 127.6 tellurium	53 I 126.9 iodine	54 Xe 131.3 xenon
55 Cs 132.9 caesium	56 Ba 137.3 barium	57–71 lanthanoids	72 Hf 178.5 hafnium	73 Ta 180.9 tantalum	74 W 183.9 tungsten	75 Re 186.2 rhenium	76 Os 190.2 osmium	77 Ir 192.2 iridium	78 Pt 195.1 platinum	79 Au 197.0 gold	80 Hg 200.6 mercury	81 Tl 204.4 thallium	82 Pb 207.2 lead	83 Bi 209.0 bismuth	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89–103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganesson

Lanthanoids

57 La 138.9 lanthanum	58 Ce 140.1 cerium	59 Pr 140.9 praseodymium	60 Nd 144.2 neodymium	61 Pm promethium	62 Sm 150.4 samarium	63 Eu 152.0 europium	64 Gd 157.3 gadolinium	65 Tb 158.9 terbium	66 Dy 162.5 dysprosium	67 Ho 164.9 holmium	68 Er 167.3 erbium	69 Tm 168.9 thulium	70 Yb 173.1 ytterbium	71 Lu 175.0 lutetium

Actinoids

89 Ac actinium	90 Th 232.0 thorium	91 Pa 231.0 protactinium	92 U 238.0 uranium	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium

Standard atomic weights are abridged to four significant figures.
Elements with no reported values in the table have no stable nuclides.
Information on elements with atomic numbers 113 and above is sourced from the International Union of Pure and Applied Chemistry Periodic Table of the Elements (November 2016 version).
The International Union of Pure and Applied Chemistry Periodic Table of the Elements (February 2010 version) is the principal source of all other data. Some data may have been modified.

Neap

Trial Examination 2023

HSC Year 12 Physics

DIRECTIONS:

Write your name in the space provided.

Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.

Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark only **one** oval per question.

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows.

correct ↓

A ⊗ B ⊗ C ○ D ○

STUDENT NAME: ______________________________

STUDENT NUMBER:

1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0

SECTION I

MULTIPLE-CHOICE ANSWER SHEET

1.	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○
11.	A ○	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ○
14.	A ○	B ○	C ○	D ○
15.	A ○	B ○	C ○	D ○
16.	A ○	B ○	C ○	D ○
17.	A ○	B ○	C ○	D ○
18.	A ○	B ○	C ○	D ○
19.	A ○	B ○	C ○	D ○
20.	A ○	B ○	C ○	D ○

STUDENTS SHOULD NOW CONTINUE WITH SECTION II