Neap:

HSC Trial Examination 2019

Physics

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- A data sheet, formulae sheets and Periodic Table are provided at the back of this paper
- For questions in Section II, show all relevant working in questions involving calculations

Total marks: 100

Section I – 20 marks (pages 2–6)

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

Section II – 80 marks (pages 7–21)

- Attempt Questions 21–39
- Allow about 2 hours and 25 minutes for this section

sStudents are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2019 HSC Physics Examination.

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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. A paper plane was thrown horizontally out of a window 22.8 m high with a velocity of 0.76 m s^{-1}.

Using the acceleration due to gravity and ignoring air resistance, how long did it take for the plane to hit the ground?

(A) 2.16 s
(B) 2.55 s
(C) 3.14 s
(D) 4.65 s

2. A circular race track was constructed for car enthusiasts. It had a radius of 4.5 km and it banked at an angle of 8° to the horizontal. A car of mass 1375 kg and a driver of mass 75 kg were riding on a section of the race track.

What is the velocity of the car and driver if there is no friction between the tyres of the car and the race track?

(A) 2.49 m s^{-1}
(B) 17.8 m s^{-1}
(C) 78.7 m s^{-1}
(D) 87.7 m s^{-1}

3. A plane propeller has blades that are 8 m in length that rotate with a period of 0.32 s.

At what speed do the tips of the propellers travel?

(A) 79 m s^{-1}
(B) 155 m s^{-1}
(C) 157 m s^{-1}
(D) 2035 m s^{-1}

4. What is the correct unit for angular velocity?

(A) rad s^{-1}
(B) rad
(C) m s^{-1}
(D) θ

5. Which one of the following is NOT one of Kepler's Laws?

(A) The planets move in elliptical orbits with the Sun at one focus.

(B) The line connecting a planet to the Sun sweeps out equal areas in equal intervals of time.

(C) For every planet, the ratio of the cube of the average orbital radius, r, to the square of the period of revolution, T, is the same constant, k, as in the equation $\frac{r^3}{T^2} = k$.

(D) The weight of an object on the Earth's surface is due to the gravitational attraction of Earth.

6. An old television was pulled apart in class. The teacher noticed that one side of the plate had a potential of 240 V and the plate directly opposite had a potential of 0 V. The distance between these two plates that were of parallel arrangement was 102 cm.

What would be the work done to move a proton a distance of 0.47 m towards the negative plate?

(A) 8.86×10^{-18} J

(B) 200 V m^{-1}

(C) 1.77×10^{-17} J

(D) 3.76×10^{-17} J

7. A proton travels at half the speed of light at an angle of 7.5° to the direction of the magnetic field in a particle accelerator. The accelerator has a magnetic field strength of 2.0×10^{-2} T.

What is the magnitude of the force that the particle will experience from the magnetic field?

(A) 2.356×10^{-13} N

(B) 6.273×10^{-14} N

(C) 6.172×10^{-14} N

(D) 1.19×10^{-15} Nm

8. A first-hand investigation was conducted in class to determine the forces between parallel current-carrying conductors with different currents applied, all in the same direction. One of the students learned the following data:

- The current in wire 1 was 1.37 A.
- The current in wire 2 was 0.74 A.
- The distance between both wires was 2 cm.

What would the force per unit length be using the data gained?

(A) 1.0×10^{-5} N m^{-1} attractive

(B) 1.0×10^{-5} N m^{-1} repulsive

(C) 1.0×10^{-6} N m^{-1} attractive

(D) 2.0×10^{-5} N m^{-1} repulsive

9. An ideal laptop charger with 1600 turns in the primary coil and 800 turns in the secondary coil draws a current of 3.34 A.

What is the current in the primary coil?

(A) 0.67 A
(B) 1.67 A
(C) 1.73 A
(D) 6.68 A

10. When turning a spanner to tighten a bolt, which one of the following describes how to achieve maximum effect?

(A) The force should be applied at right-angles to the spanner at the smallest distance possible from the point of the bolt.
(B) The force should be applied at 45° to the spanner at the smallest distance possible from the point of the bolt.
(C) The force should be applied at right-angles to the spanner at the middle distance between the bolt and end of the spanner.
(D) The force should be applied at right-angles to the spanner at the largest distance possible from the point of the bolt.

11. What did James Clerk Maxwell find through the unification of the theories of electricity and magnetism?

(A) Light is a mechanical wave.
(B) Light is comprised of corpuscular particles.
(C) Light is a form of an electromagnetic wave.
(D) Light travels slower in denser materials.

12. The star Rigel emits a continuous electromagnetic spectrum with a peak wavelength of approximately 550 nm.

Based on this wavelength, what is the surface temperature of Rigel?

(A) 5.269 K
(B) 5169 K
(C) 5269 K
(D) 6000 K

13. A laser with an unknown wavelength is bought from a market stall. It is pointed through a card that has a pair of small slits cut 90 μm apart. A wall is 6 m away from the card. When the laser is shone through the slits, bright spots appear on the wall and are measured to be 3 cm apart.

What is the wavelength of the laser?

(A) 427 nm
(B) 439 nm
(C) 450 nm
(D) 459 nm

14. Which one of the following statements best describes polarisation?

(A) Polarisation occurs when a transverse wave is allowed to vibrate in only one direction.
(B) Polarisation occurs when a longitudinal wave is allowed to vibrate in only one direction.
(C) Polarisation occurs when a transverse wave is allowed to vibrate in two directions.
(D) Polarisation occurs when a longitudinal wave is allowed to vibrate in two directions.

15. A stationary observer on Earth measures a spaceship travelling at 2.75×10^8 m s^{-1}. When stationary, the spaceship's length is 42 m.

What is the length of the spaceship as seen by the stationary observer?

(A) 16.79 m
(B) 39.21 m
(C) 40.21 m
(D) 45.14 m

16. During recent experiments at the Large Hadron Collider, scientists accelerated electrons to travel at 2.2×10^6 m s^{-1}.

Calculate the de Broglie wavelength of these electrons.

(A) 0.03 nm
(B) 0.13 nm
(C) 0.23 nm
(D) 0.33 nm

17. Which one of the following best defines nuclear fission?

(A) Nuclear fission is the combining of light nuclei to form heavier nuclei.
(B) Nuclear fission is when a nucleus is split into two or more fragments and releases a number of protons and positrons.
(C) Nuclear fission is when a nucleus is split into two or more fragments and releases a number of neutrons.
(D) Nuclear fission is when an atom is split into smaller atoms through electrolysis.

18. Consider the following list of characteristics for particles.

I heavy
II light
III charge +2
IV charge of –1
V charge of +1

Which of the above characteristics would describe an alpha particle when compared to a beta particle?

(A) I and IV
(B) I, IV and V
(C) II and III
(D) I and III

19. Which one of the following terms describes something that is required to separate a nucleus from its constituent nucleons?

(A) the CNO cycle
(B) gravitational potential energy
(C) elastic potential energy
(D) binding energy

20. Which one of the following is NOT one of the four fundamental forces of nature?

(A) gravity
(B) electrostatic charge
(C) weak nuclear
(D) strong nuclear

Section II

Attempt Questions 21–39
Allow about 2 hours and 25 minutes for this section

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.

Question 21 (7 marks)

A teacher's demonstration with a bottle rocket was conducted on an oval. The teacher had the bottle rocket on a tabletop 80 cm above the ground. The students used a data logger to calculate that the initial velocity of the bottle was 17 m s^{-1} at an angle of 45° above the horizontal. The maximum height above the ground that the bottle rocket reached, according to the students, was 8.17 m.

(a) How long did it take for the bottle rocket to reach the ground? **3**

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(b) What was the final velocity and angle of the bottle rocket? **4**

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Question 22 (4 marks)

An astronaut on the International Space Station was conducting maintenance on the exterior. The astronaut used a spanner to tighten a lock on a window. They used a spanner that was 46 cm long and applied a force of 92 N perpendicular to the radius.

(a) What torque did the astronaut apply? **2**

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(b) If the force was applied at an angle of 50° to the spanner length, how much force would the astronaut need to apply in order to produce the same torque as in part (a)? **2**

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Question 23 (5 marks)

Compare the gravitational force the Sun exerts on Earth and Mercury using the following data: **5**

- mass of the Sun = 2.00×10^{30} kg
- mass of Mercury = 3.29×10^{23} kg
- mean radius of Earth's orbit around the Sun = 1.50×10^{11} m
- mean radius of Mercury's orbit around the Sun = 5.79×10^{7} km

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Question 24 (6 marks)

(a) Distinguish between escape velocity and orbital velocity. Include the formulae for both velocities in your answer. **4**

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(b) Outline ONE use for low-Earth orbit and ONE use for geostationary satellites. **2**

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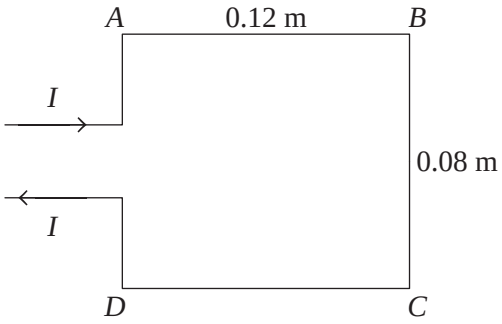
Question 25 (5 marks)

A motor uses a 150-turn coil that has dimensions of 0.08 m by 0.12 m, as shown in the diagram below. A current of 1.5 A flows through the coil. The coil is vertical and is in a magnetic field of 0.06 T directed upwards (up the page).



(a) What is the magnitude and direction of the force exerted on side *AB*? **3**

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(b) What is the magnitude and direction of the force exerted on side *BC*? **1**

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(c) On the diagram above, show the direction in which the coil will begin to rotate. **1**

Question 26 (2 marks)

Compare and explain the function of a split-ring commutator and slip rings in generators. **2**

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Question 27 (2 marks)

A coil has an area of 2.5×10^{-3} m^2. A magnetic flux of 0.15 Wb passes through the coil. **2**

Calculate the flux density inside the coil when the coil is 45° to the magnetic field.

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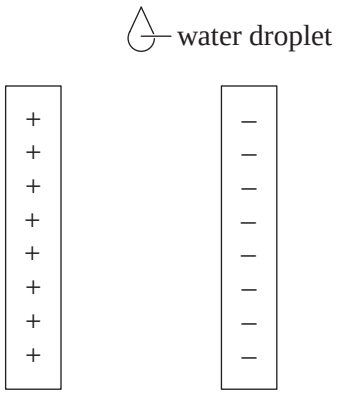
Question 28 (7 marks)

A dropper bottle was used to release a single drop of water between two vertical charged parallel plates, which fell straight down at 0.25 m s^{-1}. The average drop of water has a mass of 2.0×10^{-2} kg and a charge of –1.2 μC, and the field between the plates is 6000 V m^{-1}. The apparatus is shown below.



(a) Calculate the acceleration of the water droplet, ignoring acceleration due to gravity. **3**

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(b) Calculate the speed of the water droplet 0.5 s after it enters the field. **4**

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Question 29 (5 marks)

Throughout history, light has been a mystery that scientists have tried to explain. During the 1700s, the two prominent scientists Newton and Huygens feuded over their different hypotheses on whether light is a particle or a wave.

(a) Compare Newton's and Huygens' models of light, including ONE similarity and ONE difference between them. **3**

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(b) Justify whose model of light was correct. Give reasons for your answer. **2**

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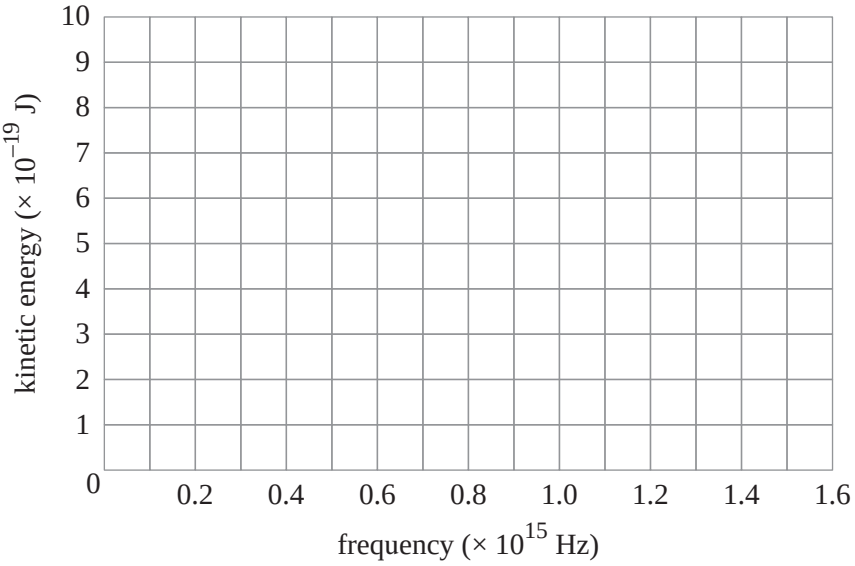
Question 30 (7 marks)

A group of students conducted a photoelectric experiment in class to measure the work function of a photo emitter. Their results are shown in the following table.

Wavelength of light (nm)	*Frequency of light ($\times 10^{15}$ Hz)*	*Energy carried by light beam (eV)*	*Kinetic energy of emitted electrons ($\times 10^{-19}$ J)*
200	1.49	6.21	7.30
300	1.00	4.09	3.97
400	0.76	3.10	2.33
500	0.59	2.50	1.34
600	0.50	2.02	0.66
700	0.43	1.77	0.23

(a) Graph the frequency of light ($\times 10^{15}$ Hz) on the horizontal axis against the kinetic energy ($\times 10^{-19}$ J) on the vertical axis. Include a line of best fit. **2**



Question 30 continues on page 16

Question 30 (continued)

(b) Use your graph from part (a) to determine the value for the work function of the emitter. Express your answer in eV. **3**

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(c) Use your graph from part (a) to determine a value for Planck's constant. Show your working. **2**

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End of Question 30

Question 31 (3 marks)

Consider the following statement that was made when the Large Hadron Collider was being used: **3**

Particle accelerators cannot accelerate particles to and beyond the speed of light.

Assess why this statement continues to be true.

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Question 32 (1 mark)

During your studies you conducted an investigation to examine a variety of spectra produced by either discharge tubes, reflected light or incandescent filaments. **1**

Outline ONE safety precaution that should be observed while conducting this investigation.

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Question 33 (8 marks)

(a) Assess the limitations of the Rutherford and Bohr atomic model. **6**

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(b) Rutherford and Bohr's model of the atom is sometime referred to as 'classical physics'. **2**

Explain why Schrödinger's quantum mechanics improved our understanding of the model of the atom.

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Question 34 (3 marks)

Describe ONE experiment conducted by a scientist that provided support for the existence of the electron and its properties. **3**

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Question 35 (2 marks)

Sketch a diagram that demonstrates the difference between nuclear fusion and nuclear fission in the space below. **2**

Question 36 (2 marks)

A class of students went on an excursion to Australia's Nuclear Science and Technology Organisation (ANSTO) in Sydney. During a routine walk around the facility, the tour guide stated that a radioactive sample scientists were studying in the building had a decay constant of 1.7×10^{-9} s^{-1}. **2**

Calculate the half-life of this sample.

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Question 37 (4 marks)

(a) State the difference between emission spectra and absorption spectra. **2**

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(b) The Hertzsprung–Russell diagram graphs spectral class against three other factors. **2**

Name TWO of the factors that you would see on a Hertzsprung–Russell diagram on either the vertical or the horizontal axis.

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Question 38 (3 marks)

(a) Describe 'redshift'. **2**

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(b) Name the scientist who used redshift to support the Big Bang Theory. **1**

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Question 39 (4 marks)

(a) A massive star is losing mass at a rate of 5.6×10^9 kg s^{-1}. **2**

How much energy is being produced per second in total radiation in this case? Show all working.

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(b) Most stars follow the same order of stellar evolution. **2**

Complete the table below showing the stellar evolution of a typical star.

	Stage of stellar evolution
1.	
2.	main sequence star
3.	
4.	white dwarf

End of paper

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

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 m s^{-1}
Earth's gravitational acceleration, g	9.8 m s^{-2}
Speed of light, c	3.00×10^{8} m s^{-1}
Electric permittivity constant, ε_0	8.854×10^{-12} A^2 s^4 kg^{-1} 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

$v = f\lambda$

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

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

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

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

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

$n_{\text{x}} = \frac{c}{v_{\text{x}}}$

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

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

$I_1{r_1}^2 = I_2{r_2}^2$

$Q = mc\Delta T$

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

Formulae sheet (continued)

Electricity and magnetism

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

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

$$W = qV$$

$$W = qEd$$

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

$$B = \frac{\mu_0 NI}{L}$$

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

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

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

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

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

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

$$V = IR$$

$$P = IV$$

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

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

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

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

$$V_p I_p = V_s I_s$$

Quantum, special relativity and nuclear

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

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

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

$$E = mc^2$$

$$E = hf$$

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

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

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

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

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

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

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 **Uut** Ununtrium	114 **Fl** Flerovium	115 **Uup** Ununpentium	116 **Lv** Livermorium	117 **Uus** Ununseptium	118 **Uuo** Ununoctium

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 (Febuary 2010 version) is the principal source of all other data. Some data may have been modified.

Neap: HSC Trial Examination 2019

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

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