Student Number: _____

NORTHERN BEACHES SECONDARY COLLEGE

MANLY SELECTIVE CAMPUS

PRELIMINARY HIGHER SCHOOL CERTIFICATE

YEARLY EXAMINATION

2015

PHYSICS

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Approved calculators may be used
- Write your student number in the space provided

This paper has two parts, Part A and Part B

Part A – 20 marks
- Attempt Questions 1-20
- Allow about 35 minutes for this part

Part B – 50 marks
- Attempt Questions 21-30
- Allow about 1 hour and 25 minutes for this part

Weighting: 35%

PART	TOTALS	MARKS
A	20	
B	50	
TOTAL	70	

Part A – 20 marks

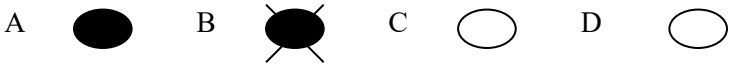
Attempt Questions 1-20
Allow about 35 minutes for this part

Use the multiple-choice answer sheet.

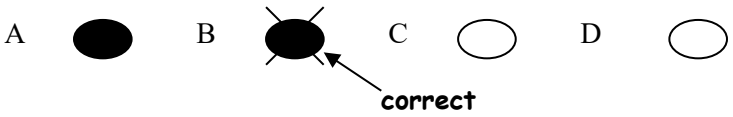
Select the alternative A,B,C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

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



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



1 The acceleration due to gravity on the Moon is much lower than that on Earth. Compared to Earth, an astronaut on the Moon will have:

(A) The same mass and weight.

(B) A lower mass and lower weight.

(C) A lower mass and the same weight.

(D) The same mass and lower weight.

2 Why is Newton's First Law, or Law of Inertia, not easily observed?

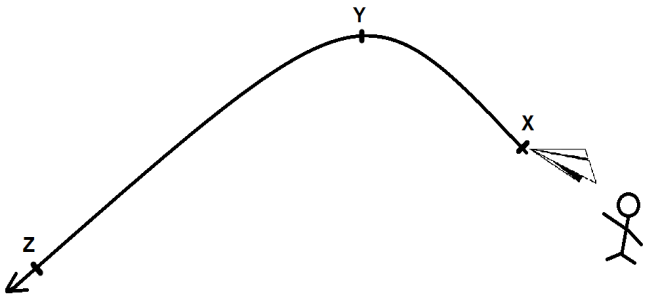
(A) Because it is a theoretical model which does not apply to the real world.

(B) Because forces such as air resistance and friction affect the motion of objects.

(C) Because the Law ignores the effects of gravity on objects.

(D) Because objects in motion require a constant force to maintain their velocity.

3 Dylan threw a paper plane and it followed the flight path as shown below:



Which statement about the paper plane's kinetic energy during the flight is correct?

(A) The kinetic energy decreased from X to Y then increased from Y to Z.

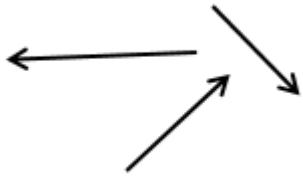
(B) The kinetic energy increased from X to Y then decreased from Y to Z.

(C) The kinetic energy increased from X to Y then increased again from Y to Z.

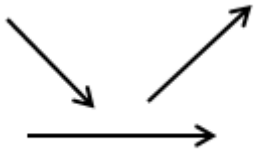
(D) The kinetic energy remained constant throughout the flight

4 Three forces acting on a point object are shown to scale, but have been jumbled. In which alternative does the object have zero acceleration?

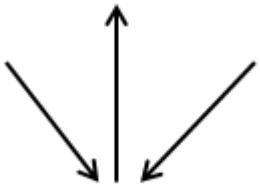
(A)



(B)



(C)



(D)

5 When a collision occurs within a closed system, momentum is conserved because:

(A) the net force is zero.

(B) no forces act.

(C) no energy is lost.

(D) the collision is elastic.

6 The diagram shows a sound wave moving through a string of particles. The wave is travelling from left to right as shown.

What feature is indicated by the region X?

(A) Crest

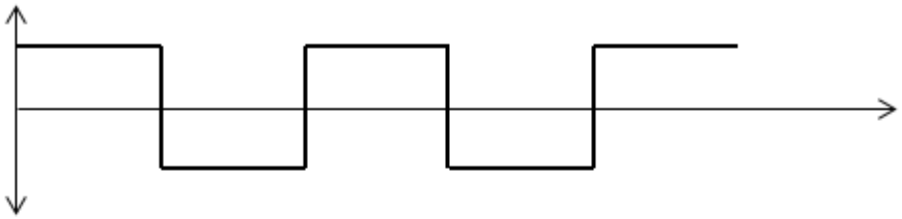
(B) Trough

(C) Compression

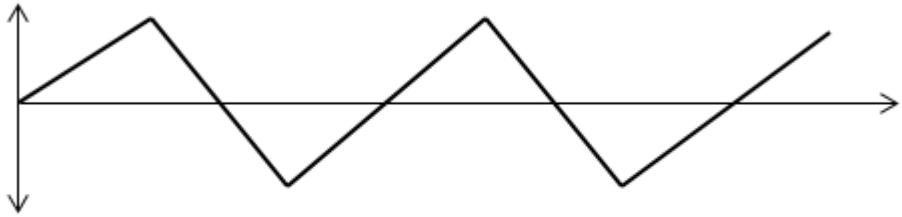
(D) Rarefaction

7 Of the following, which wave is most likely carrying information?

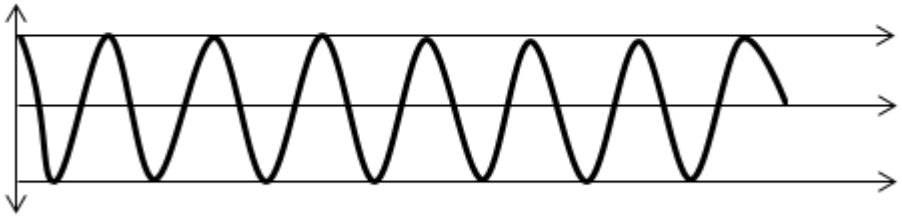
(A)



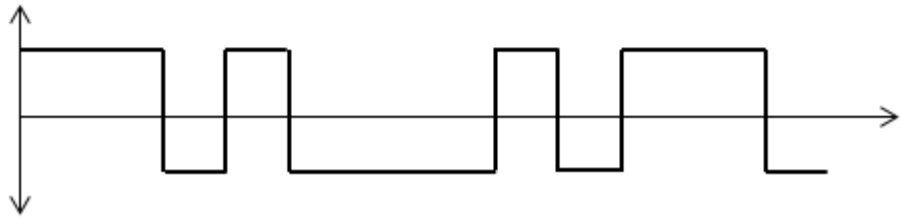
(B)



(C)



(D)



8 Which list contains communication devices that store and/or transmit data in digital form only?

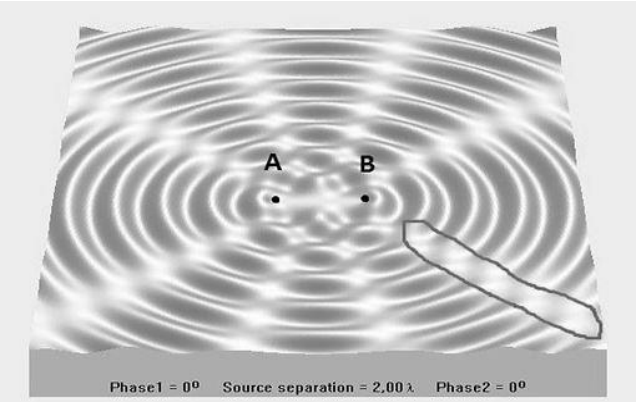
(A) microphone, CD player, speakers, mobile phone

(B) FM radio broadcast, microphone, DVD player, TV transmission

(C) AM radio broadcast, mobile phones, GPS satellites, speakers

(D) CD player, mobile phones, Internet, memory chips

9 The following water ripple pattern is generated by placing two sources of vibration in water at locations A and B.



In the circled region there is an obvious lack of vertical displacement in water level.

How can this be explained?

(A) Destructive interference due to the waves produced at A and B being out of phase by 90^0 in this region

(B) Constructive interference due to the waves from A and B being continually produced in phase with each other

(C) Destructive interference due to waves produced at A and B being out of phase by 180^0 in this region

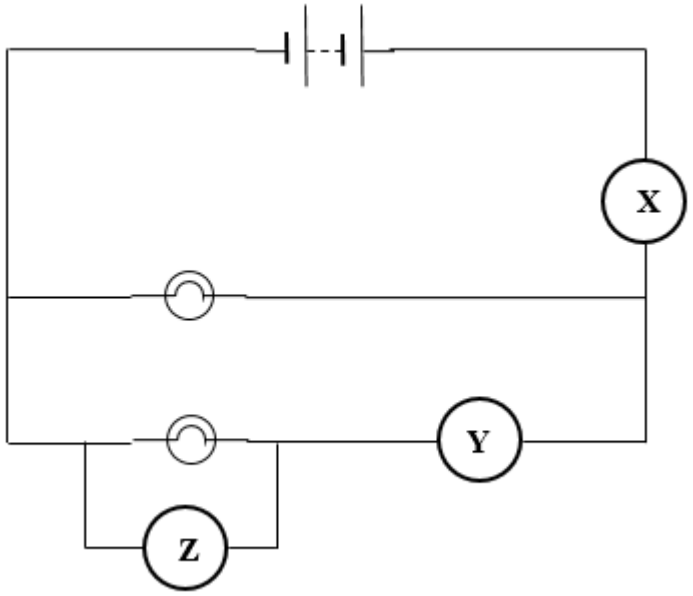
(D) Constructive interference due to the waves from A and B having the same amplitude and wavelength

11 In an analogy for energy in an electric circuit, students are given money from the teacher to go to the school canteen and buy food, return, receive more money from the teacher and go back to the canteen.

In this analogy, the money, students, canteen and the teacher best represent:

	Money	**Students**	**Canteen**	**Teacher**
(A)	electrons	energy	battery	electrical device
(B)	energy	electrons	electrical device	battery
(C)	energy	electrons	battery	electrical device
(D)	electrical device	energy	battery	electrons

12 A circuit was correctly constructed with globes, ammeters and voltmeters, as shown.



The meters labelled **X**, **Y**, and **Z** are:

	X	**Y**	**Z**
(A)	ammeter	ammeter	ammeter
(B)	voltmeter	ammeter	ammeter
(C)	ammeter	ammeter	voltmeter
(D)	ammeter	voltmeter	voltmeter

13 If the temperature of a conductor is increased, what will happen to its resistance?

(A) It will increase.

(B) It will decrease.

(C) It will remain constant.

(D) It will depend on the material conductor is made of.

14 Which electrical safety device is most suited for ensuring that the current in a circuit does not exceed 10 A?

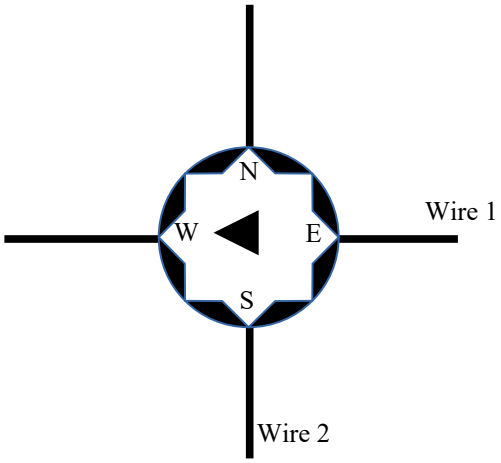
(A) Double insulation.

(B) Circuit breaker.

(C) Residual current device.

(D) Earth wire.

15 A compass is placed on top of two perpendicular wires as shown. The needle is pointing west.



Which way is the electrical current flowing?

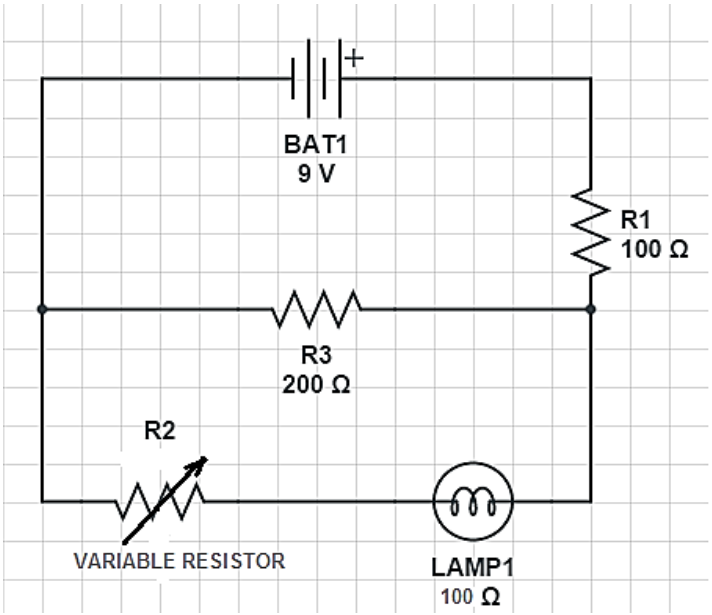
(A) From left to right in wire 1.

(B) From right to left in wire 1.

(C) From top to bottom in wire 2.

(D) From bottom to top in wire 2.

The diagram of a circuit is used for Questions 16 and 17.



16 If the total resistance of this circuit is 200 Ω, what is the value of the variable resistor?

(A) 0 Ω
(B) 50 Ω
(C) 100 Ω
(D) 200 Ω

17 Which action will make LAMP1 glow brighter?

(A) Reduce the resistance of R2

(B) Reduce the resistance of R3

(C) Increase the resistance of R1

(D) Decrease the voltage from the battery

18 What is the colour of a star related to?

(A) Its surface temperature.

(B) Its energy source.

(C) Its luminosity.

(D) Its distance.

19 The characteristic that alpha, beta and gamma radiation have in common is that they all:

(A) have high penetrating power.

(B) have high ionising power.

(C) travel at the speed of light.

(D) originate from the nucleus.

20 An alpha particle in a uniform electric field experiences an acceleration due to the field. If a proton replaced the alpha particle at exactly the same position in the electric field, which of the following observations would be correct?

(A) The proton will accelerate at half the rate of the alpha particle

(B) The proton will accelerate at the same rate of the alpha particle.

(C) The proton will accelerate at double the rate of the alpha particle.

(D) The proton will accelerate at four times the rate of the alpha particle.

2015 PRELIMINARY SCHOOL CERTIFICATE EXAMINATION

Physics Student ID: _____

Part B – 50 marks
Attempt Questions 21–30
Allow about 1hour 25 minutes for this part
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.

Question 21 (3marks)

Marks

The tyres of a sports car are able to apply a force of 1.1 x 10^4 N to the road. The car has a mass of 1222 kg and is travelling at 100 km/h. **3**

Will the car be able to travel around a corner of radius 63m at its current speed?
Justify your answer with relevant formulae or principles

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Question 22 (5 marks) **Marks**

The refraction of waves is used in many applications.

(a) (i) Identify the property of waves that, when it changes, causes refraction. **1**

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(ii) What is meant by a medium's "refractive index"? **1**

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(b) (i) Under what conditions can total internal reflection occur? **2**
A diagram may be used in your answer.

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(ii) Identify one application of total internal reflection. **1**

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Question 23 (3 marks)

Describe the similarities and the differences between the electric field between parallel charged plates and the electric field surrounding a point charge. **3**

Question 24 (4 marks)

The Hertzsprung-Russell diagram is one of the most powerful tools for analysing the evolution of stars.

(a) Explain why luminosity, rather than the brightness of stars, is used on the vertical axis on the Hertzsprung-Russell diagram. **2**

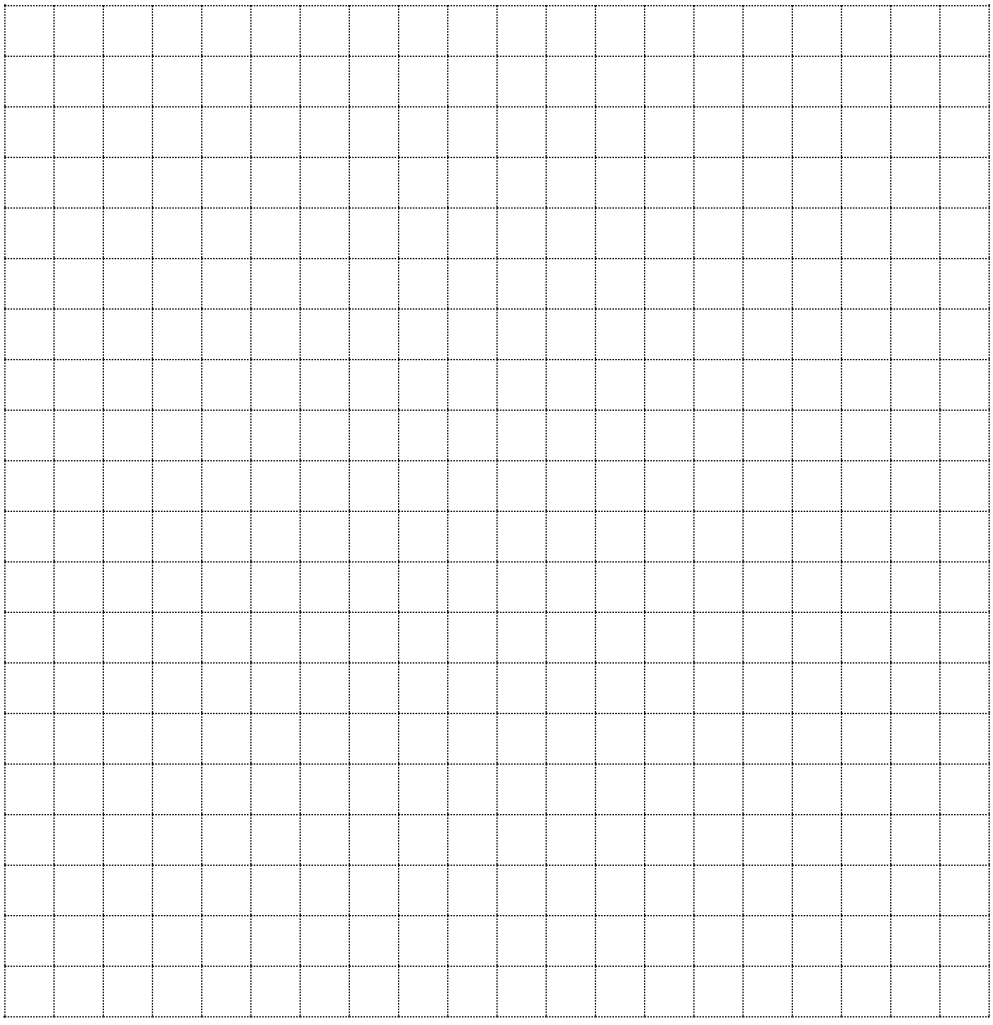
(b) Compare the nature of energy sources between main sequence stars and white dwarfs **2**

Question 25 (12 marks)

A car is speeding on a road due east while being chased by a truck 45 metres behind.

(a) Graph the displacement vs. time graph for both vehicles on the same graph based on the data below. **4**

Time (s)	0	2	4	6	8	10
Car's displacement from start (m)	45	105	166	222	285	346
Truck's displacement from start (m)	0	71	149	212	278	350



Question 25 continues on page 14

Question 25 (continued)

(b) Using your graph, determine the time it takes for the truck to catch up to the car. Clearly show how you obtained this answer from the graph. **1**

(c) Determine the velocity of the car relative to the truck. **2**

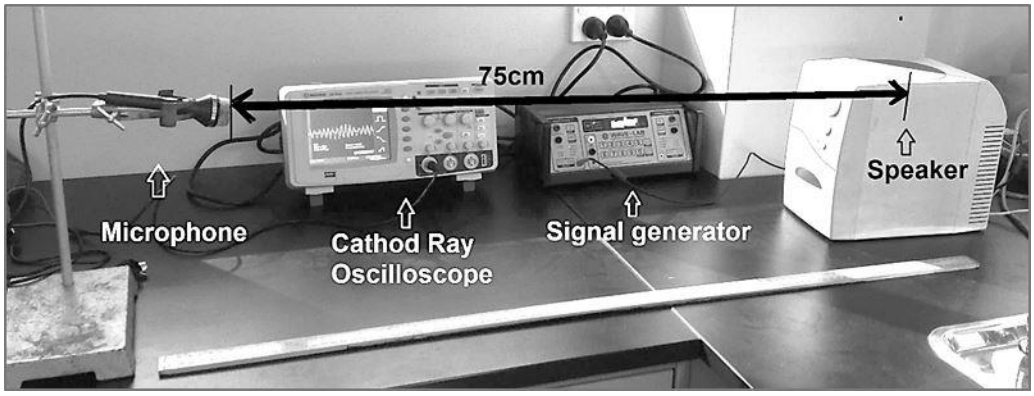
(d) The truck collides with the back of the car. **3**
The truck slows down to 120 kmh^{-1}.
Assume the car weighs 1.30 metric ton and the truck weighs 4.50 metric ton.

Calculate the car's speed after the collision, assuming that momentum is conserved and the car is free to move forward after the truck collides with it.

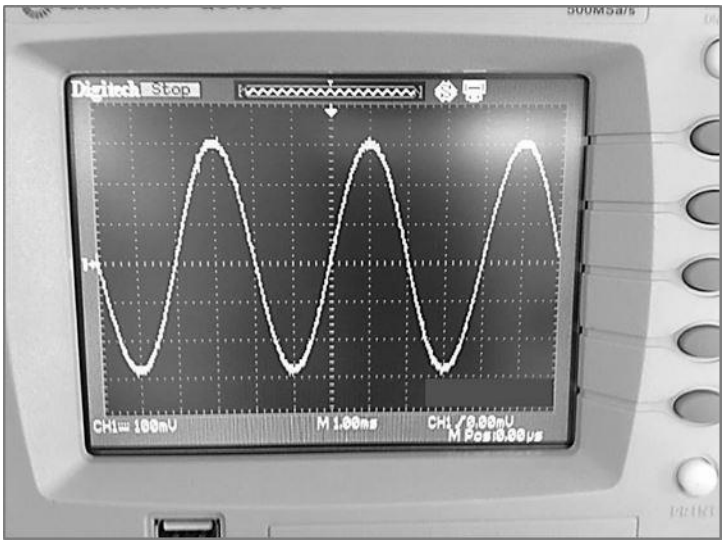
(e) List TWO safety devices that can minimize injury to vehicle occupants during a collision. Explain the physics of how one of these works. **2**

Question 26 (8 marks) **Marks**

Catherine was working on the experiment below to determine the relationship between volume of sound and distance from a source.



With the microphone 75 cm away from the speaker she obtained a reading from the oscilloscope as shown below.



Each grid represents 100 mV on the vertical axis and 1.00 ms on the horizontal axis.

(a) Identify the amplitude of the signal. **1**

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(b) Prove that the signal above has a frequency of 250 Hz. **2**

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Question 26 continues on page 16

Question 26 (continued)

(c) The microphone was repositioned to a distance of 7.50 metres away from the speaker. **3**

Calculate the expected amplitude of the signal that would be measured by the oscilloscope.

(d) Describe how you could improve the validity of the results of this experiment. **2**

Question 27 (3 marks) **Marks**

Describe the observations made by Hubble that led him to the conclusion that our Universe is expanding. **3**

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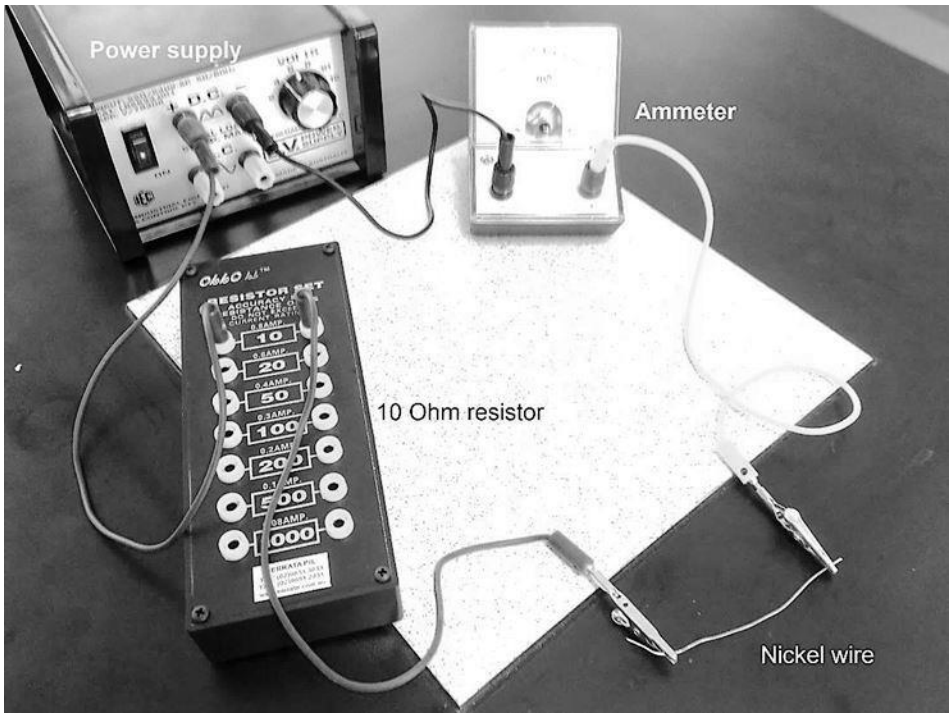
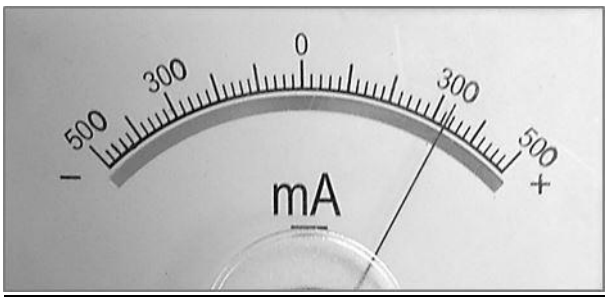
Question 28 (6 marks)

Sophia wants to determine the resistance of a piece of nickel wire.
She set up the experiment as illustrated.



The image below shows the ammeter's reading when the power supply is set at 4.00V DC.



(a) Prove that the resistance of the nickel wire is 2.12 Ω. **2**

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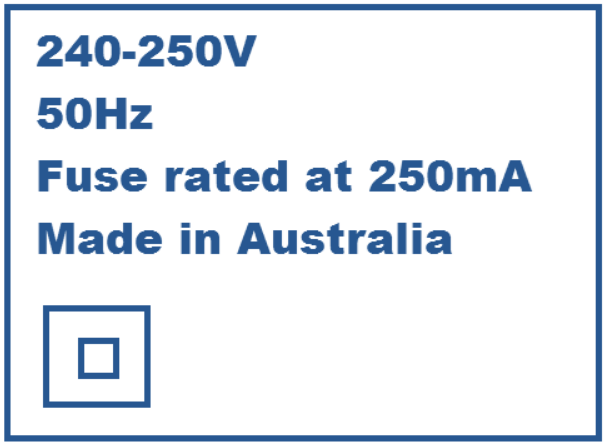
Question 28 continues on page 19

Question 28 (continued)

(b) The back of the power supply has the warning label shown below. **2**



Explain the necessity of the 10 Ω resistor in this experiment.

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(c) Calculate the energy consumed by the 10 Ω resistor in 5 minutes. **2**
Express your answer in kWh.

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Question 29 (4 marks) **Marks**

Name one electrical safety device used in the home. Describe the principles of its operation. **4**

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Question 30 (2 marks) **Marks**

Discuss a problem caused by the limited range of the electromagnetic spectrum available for communication purposes. **2**

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End of paper

2015 PRELIMINARY EXAMINATION

Physics

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 m s^{-2}
Speed of light, c	3.00×10^{8} m s^{-1}
Magnetic force constant,	2.0×10^{-7} N A^{-2}
Universal gravitational constant, G	6.67×10^{-11} N m^2 kg^{-2}
Mass of Earth	6.0×10^{24} kg
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}

FORMULAE SHEET

$$v = f\lambda$$

$$I \propto \frac{1}{d^2}$$

$$\frac{v_1}{v_2} = \frac{\sin i}{\sin r}$$

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

$$R = \frac{V}{I}$$

$$P = VI$$

$$\text{Energy} = VIt$$

$$v_{av} = \frac{\Delta r}{\Delta t}$$

$$a_{av} = \frac{\Delta v}{\Delta t} \text{ therefore } a_{av} = \frac{v-u}{t}$$

$$\Sigma F = ma$$

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

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

$$W = Fs$$

$$p = mv$$

$$\text{Impulse} = Ft$$

$$E_p = -G\frac{m_1 m_2}{r}$$

$$F = mg$$

$$v_x^2 = u_x^2$$

$$v = u + at$$

$$v_y^2 = u_y^2 + 2a_y\Delta y$$

$$\Delta x = u_x t$$

$$\Delta y = u_y t + \frac{1}{2}a_y t^2$$

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

$$F = \frac{Gm_1 m_2}{d^2}$$

$$E = mc^2$$

$$l_v = l_0\sqrt{1-\frac{v^2}{c^2}}$$

$$t_v = \frac{t_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$m_v = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

FORMULAE SHEET

$$\frac{F}{l} = k\frac{I_1 I_2}{d}$$

$$F = BIl\sin\theta$$

$$\tau = Fd$$

$$\tau = nBIA\cos\theta$$

$$\frac{V_p}{V_s} = \frac{n_p}{n_s}$$

$$d = \frac{1}{p}$$

$$M = m - 5\log\left(\frac{d}{10}\right)$$

$$\frac{I_A}{I_B} = 100^{(m_B - m_A)/5}$$

$$m_1 + m_2 = \frac{4\pi^2 r^3}{GT^2}$$

$$F = qvB\sin\theta$$

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

$$E = hf$$

$$c = f\lambda$$

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

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

$$Z = \rho v$$

$$\frac{I_r}{I_0} = \frac{\left[Z_2 - Z_1\right]^2}{\left[Z_2 + Z_1\right]^2}$$

$$A_0 = \frac{V_{\text{out}}}{V_{\text{in}}}$$

$$\frac{V_{\text{out}}}{V_{\text{in}}} = -\frac{R_{\text{f}}}{R_{\text{i}}}$$

Student Number: _____

PERIODIC TABLE OF THE ELEMENTS

KEY

Atomic number	
Chemical symbol	
Relative atomic mass	
Name of element	

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	Lanthanoids 57-71 * -	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	Actinoids 89-103 ** -	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						

***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

Elements with atomic numbers 113 and above have been reported but not fully authenticated.
Standard atomic weights are abridged to four significant figures.
Elements with no reported values in the table have no stable nuclides.

Student Number _____

MANLY SELECTIVE CAMPUS

2015 YEAR 11 PRELIMINARY YEARLY EXAMINATION
PHYSICS– 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 ⬭

Student Number: _____

NORTHERN BEACHES SECONDARY COLLEGE

MANLY SELECTIVE CAMPUS

PRELIMINARY HIGHER SCHOOL CERTIFICATE

YEARLY EXAMINATION

2015

PHYSICS

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Approved calculators may be used
- Write your student number in the space provided

This paper has two parts, Part A and Part B

Part A – 20 marks
- Attempt Questions 1-20
- Allow about 35 minutes for this part

Part B – 50 marks
- Attempt Questions 21-30
- Allow about 1 hour and 25 minutes for this part

Weighting: 35%

PART	TOTALS	MARKS
A	20	
B	50	
TOTAL	70	

Part A – 20 marks

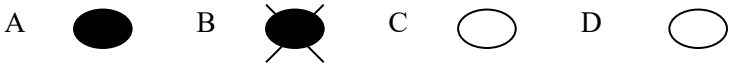
Attempt Questions 1-20
Allow about 35 minutes for this part

Use the multiple-choice answer sheet.

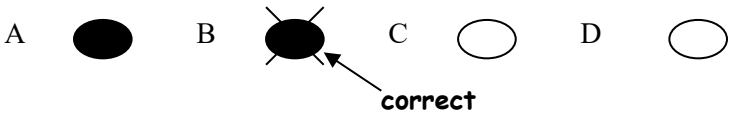
Select the alternative A,B,C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

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



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



1 The acceleration due to gravity on the Moon is much lower than that on Earth. Compared to Earth, an astronaut on the Moon will have:

(A) The same mass and weight.

(B) A lower mass and lower weight.

(C) A lower mass and the same weight.

(D) The same mass and lower weight.

2 Why is Newton's First Law, or Law of Inertia, not easily observed?

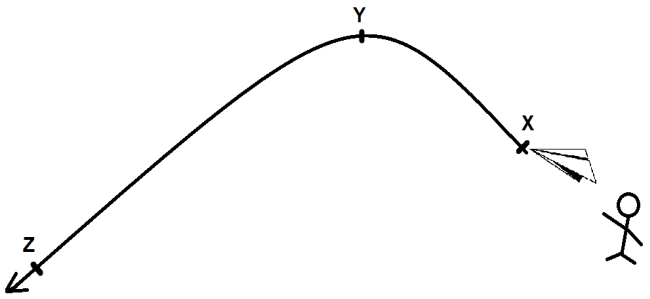
(A) Because it is a theoretical model which does not apply to the real world.

(B) Because forces such as air resistance and friction affect the motion of objects.

(C) Because the Law ignores the effects of gravity on objects.

(D) Because objects in motion require a constant force to maintain their velocity.

3 Dylan threw a paper plane and it followed the flight path as shown below:



Which statement about the paper plane's kinetic energy during the flight is correct?

(A) The kinetic energy decreased from X to Y then increased from Y to Z.

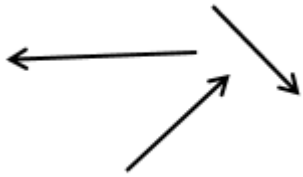
(B) The kinetic energy increased from X to Y then decreased from Y to Z.

(C) The kinetic energy increased from X to Y then increased again from Y to Z.

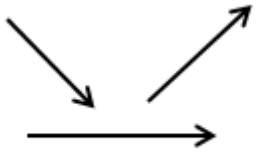
(D) The kinetic energy remained constant throughout the flight

4 Three forces acting on a point object are shown to scale, but have been jumbled. In which alternative does the object have zero acceleration?

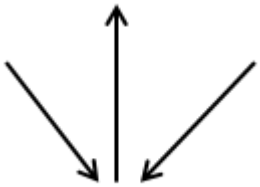
(A)



(B)



(C)



(D)

5 When a collision occurs within a closed system, momentum is conserved because:

(A) the net force is zero.

(B) no forces act.

(C) no energy is lost.

(D) the collision is elastic.

6 The diagram shows a sound wave moving through a string of particles. The wave is travelling from left to right as shown.

What feature is indicated by the X?

(A) Crest

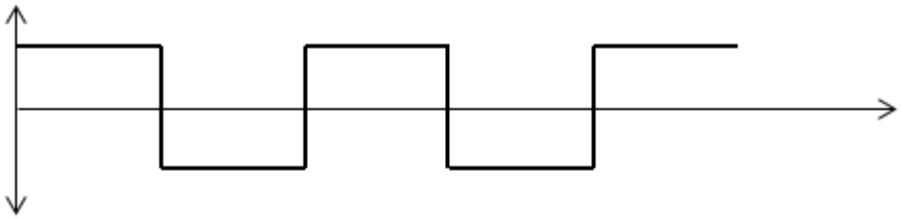
(B) Trough

(C) Compression

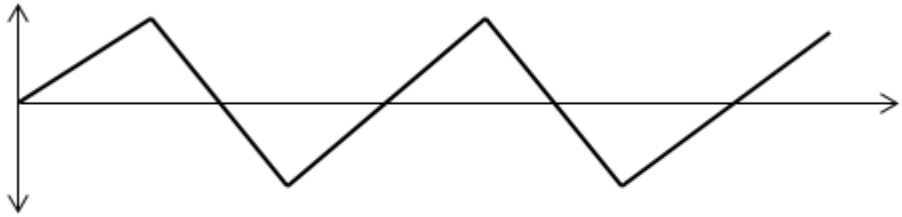
(D) Rarefaction

7 Of the following, which wave is most likely carrying information?

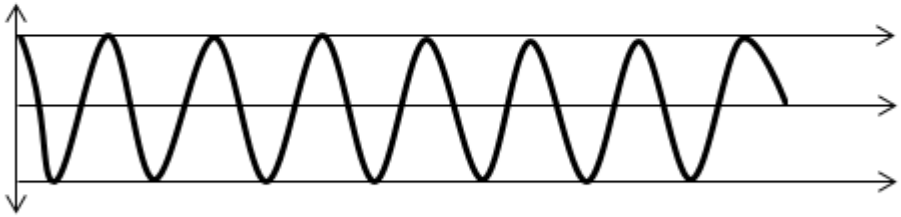
(A)



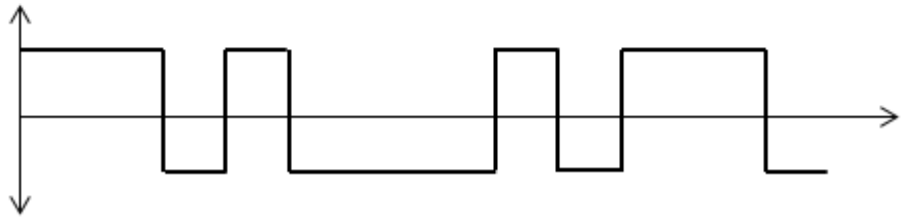
(B)



(C)



(D)



8 Which list contains communication devices that store and/or transmit data in digital form only?

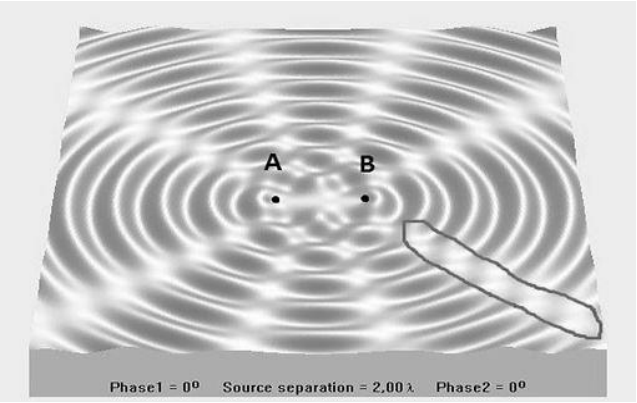
(A) microphone, CD player, speakers, mobile phone

(B) FM radio broadcast, microphone, DVD player, TV transmission

(C) AM radio broadcast, mobile phones, GPS satellites, speakers

(D) CD player, mobile phones, Internet, memory chips

9 The following water ripple pattern is generated by placing two sources of vibration in water at locations A and B.



In the circled region there is an obvious lack of vertical displacement in water level.

How can this be explained?

(A) Destructive interference due to the waves produced at A and B being out of phase by 90^0 in this region

(B) Constructive interference due to the waves from A and B being continually produced in phase with each other

(C) Destructive interference due to waves produced at A and B being out of phase by 180^0 in this region

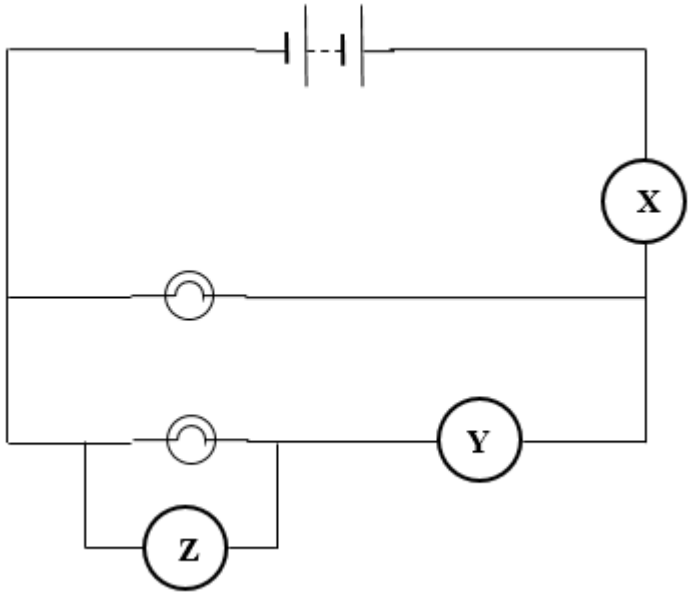
(D) Constructive interference due to the waves from A and B having the same amplitude and wavelength

11 In an analogy for energy in an electric circuit, students are given money from the teacher to go to the school canteen and buy food, return, receive more money from the teacher and go back to the canteen.

In this analogy, the money, students, canteen and the teacher best represent:

	Money	**Students**	**Canteen**	**Teacher**
(A)	electrons	energy	battery	electrical device
(B)	energy	electrons	electrical device	battery
(C)	energy	electrons	battery	electrical device
(D)	electrical device	energy	battery	electrons

12 A circuit was correctly constructed with globes, ammeters and voltmeters, as shown.



The meters labelled **X**, **Y**, and **Z** are:

	X	**Y**	**Z**
(A)	ammeter	ammeter	ammeter
(B)	voltmeter	ammeter	ammeter
(C)	ammeter	ammeter	voltmeter
(D)	ammeter	voltmeter	voltmeter

13 If the temperature of a conductor is increased, what will happen to its resistance?

(A) It will increase.

(B) It will decrease.

(C) It will remain constant.

(D) It will depend on the material conductor is made of.

14 Which electrical safety device is most suited for ensuring that the current in a circuit does not exceed 10 A?

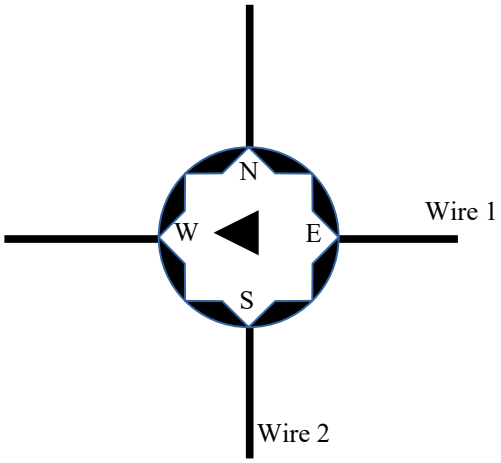
(A) Double insulation.

(B) Circuit breaker.

(C) Residual current device.

(D) Earth wire.

15 A compass is placed on top of two perpendicular wires as shown. The needle is pointing west.



Which way is the electrical current flowing?

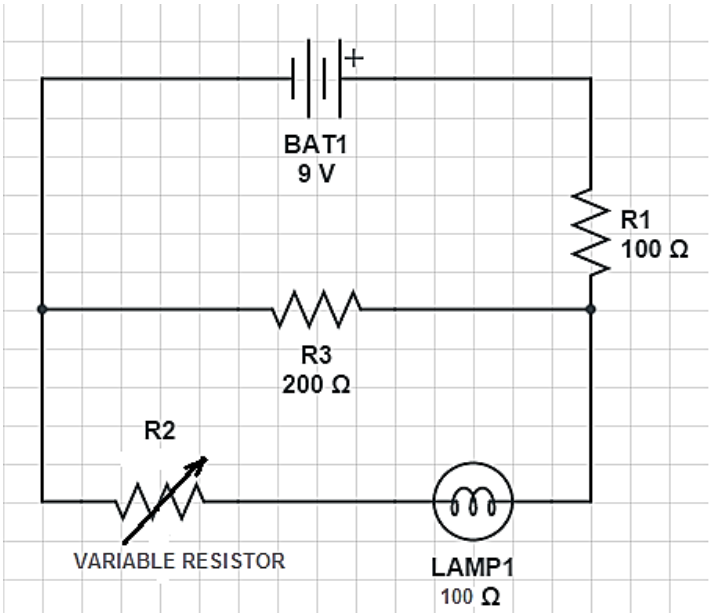
(A) From left to right in wire 1.

(B) From right to left in wire 1.

(C) From top to bottom in wire 2.

(D) From bottom to top in wire 2.

The diagram of a circuit is used for Questions 16 and 17.



16 If the total resistance of this circuit is 200 Ω, what is the value of the variable resistor?

(A) 0 Ω
(B) 50 Ω
(C) 100 Ω
(D) 200 Ω

17 Which action will make LAMP1 glow brighter?

(A) Reduce the resistance of R2

(B) Reduce the resistance of R3

(C) Increase the resistance of R1

(D) Decrease the voltage from the battery

18 What is the colour of a star related to?

(A) Its surface temperature.

(B) Its energy source.

(C) Its luminosity.

(D) Its distance.

19 The characteristic that alpha, beta and gamma radiation have in common is that they all:

(A) have high penetrating power.

(B) have high ionising power.

(C) travel at the speed of light.

(D) originate from the nucleus.

20 An alpha particle in a uniform electric field experiences an acceleration due to the field. If a proton replaced the alpha particle at exactly the same position in the electric field, which of the following observations would be correct?

(A) The proton will accelerate at half the rate of the alpha particle

(B) The proton will accelerate at the same rate of the alpha particle.

(C) The proton will accelerate at double the rate of the alpha particle.

(D) The proton will four times the rate of the alpha particle.

2015 PRELIMINARY SCHOOL CERTIFICATE EXAMINATION

Physics Student ID: _____

Part B – 50 marks
Attempt Questions 21–30
Allow about 1hour 25 minutes for this part
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.

Question 21 (3marks)

Marks

3

The tyres of a sports car are able to apply a force of 1.1 x 10^4 N to the road. The car has a mass of 1222 kg and is travelling at 100 km/h.

Will the car be able to travel around a corner of radius 63m at its current speed?
Justify your answer with relevant formulae or principles

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

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

$$r = \frac{1222 \times \left(\frac{100}{3.6}\right)^2}{1.1 \times 10^4}$$

$$r = 85.7\ m$$

No. This car has insufficient friction to able to successfully manoeuvre a corner of 63m at 100km/h. 86m is the minimum radius.
OR

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

$$F = \frac{1222 \times \left(\frac{100}{3.6}\right)^2}{63}$$

$$F = 14966N$$

No. This car has insufficient friction to able to successfully manoeuvre a corner $F_c > F_f$ 14966N > 11000N.

OR

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

$$v = \sqrt{\frac{rF}{m}} = \sqrt{\frac{63x1.1x10^4}{1222}} = \sqrt{567} = 24ms^{-1}$$

Therefore maximum speed that can be travelled is less than current speed and car will not travel around corner.
NB can also calculate required force and state that this exceeds available force.

Marking Guidelines	Marks
• Correctly substitutes and solves the centripetal force equation • Identifies that the car could not make that corner at 100km/h • Justifies	**3**
• Incorrect calculation but makes an accurate judgement from calculation OR completes calculation accurately without justifying the text	**2**
• Judgement or a calculation attempt	**1**

Question 22 (5 marks) **Marks**

The refraction of waves is used in many applications.

(a) (i) Identify the property of waves that, when it changes, causes refraction. **1**

Marking Guidelines	Marks
• Identifies velocity (or speed)	**1**

(ii) What is meant by a medium's "refractive index"? **1**

Marking Guidelines	Marks
• Gives an accurate definition	**1**

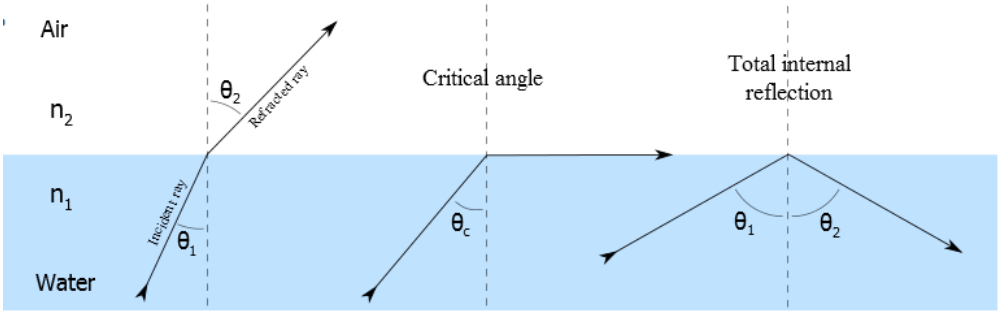
The refractive index n of an optical medium is defined as the ratio of the speed of light in a vacuum, c = 3.00 x 10^8 m/s, to the velocity v of the light in the medium

$$n = \frac{c}{v}.$$

(b) (i) Under what conditions can total internal reflection occur? **2**
A diagram may be used in your answer.

Marking Guidelines	Marks
• Correct conditions required are identified • Diagram or illustration assists response OR • Written description is clear in meaning	**2**
• A correct, relevant condition is identified	**1**

- Wave needs to meet a boundary from a more optically dense medium to a less optically dense medium
- Incident angle has to be greater than the critical angle



(ii) Identify one application of total internal reflection. **1**

Marking Guidelines	**Marks**
• Identifies one application of total internal reflection	**1**

optic fibres connecting mobile phone towers of different cells used for communication

Question 23 (3 marks)

Describe the similarities and the differences between the electric field between parallel charged plates and the electric field surrounding a point charge. **3**

Marking Criteria	Marks
• Atleast 3 Similarities and/or differences are described, including shape and uniformity aspects	3
• 2 similarities and/or differences described	2
• A similarity OR a difference described	1

The E field around a point charge decreases in strength with distance from the charge and always points away from the +ve charge, whereas between parallel plates the field is uniform in strength, but again, always is directed away from the +ve charge plate. The direction of the E field gives the direction of the force on a +ve charge at that point in the field.

Point charge	Parallel plates
Field lines spread out radially	Equidistant and parallel field lines means
field strength attenuates with distance from source	constant electric field strength
field direction defined by direction of force a positive charge experiences	field direction defined by direction of force a positive charge experiences

Question 24 (4 marks)

The Hertzsprung-Russell diagram is one of the most powerful tools for analysing the evolution of stars.

(a) Explain why luminosity, rather than the brightness of stars, is used on the vertical axis on the Hertzsprung-Russell diagram. **2**

Criteria	Marks
• Describes the difference between luminosity and brightness and relates this to using luminosity for direct star to star comparisons	2
• Identifies the difference between brightness and luminosity	1

Answer may include:
The HR diagram is designed to compare the characteristics such as colour and surface temperature between different groups of stars. However, while some stars might seem equally bright to us on Earth, they might not share the same distance, which makes comparison invalid as distance affects the apparent brightness we observe on Earth. Hence, we use luminosity, which is brightness at equal distance, to make it a valid comparison.

(b) Compare the nature of energy sources between main sequence stars and white dwarfs **2**

Criteria	Marks
• Identifies 2 similarities and/or differences between the two type of stars	2
• Identifies one similarity or difference between the two types of stars	1

Answer may include:

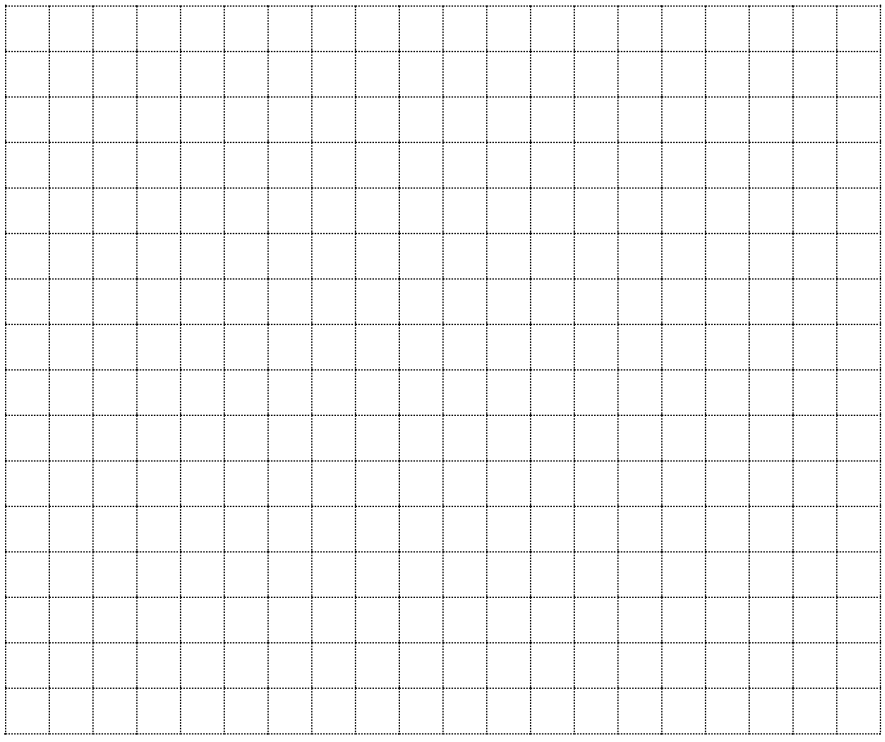
- Main sequence stars' energy source is mainly from the fusion of hydrogen to form helium. White dwarves no longer fuse any elements their energy comes from the remnant thermal energy that will slowly dissipate with time.
- Both type of stars' energy output have a finite lifetime.
- Main sequence stars' luminosity varies with mass whereas white dwarf stars' luminosity is more regular

Question 25 (12 marks)

A car is speeding on a road due east while being chased by a truck 45 metres behind.

(a) Graph the displacement vs. time graph for both vehicles on the same graph based on the data below. **4**

Time (s)	0	2	4	6	8	10
Car's displacement from start (m)	45	105	166	222	285	346
Truck's displacement from start (m)	0	71	149	212	278	350



Criteria	Marks
• Correctly orientated the axis with even scaling and labels • Accurately plots the data for the car and truck • Sets of data identified • Appropriate lines of best fit	**4 (1 for each)**
• Any three of the above	**3**
• Any two of the above	**2**
• Any one of the above	**1**

Question 25 (continued)

(b) Using your graph, determine the time it takes for the truck to catch up to the car. Clearly show how you obtained this answer from the graph. **1**

Criteria	Marks
• Clearly shows using the intercept of the graph to determine the time	1

Suggested answer:
~9.0 seconds

(c) Determine the velocity of the car relative to the truck. **2**

Criteria	Marks
• Determines the relative velocity with working shown	2
• Determines the relative velocity OR • Determines both the speed of the car and the truck	1

Suggested answer:
From gradient of the graph:
$V_{car} \sim 30\ ms^{-1}$ East
$V_{truck} \sim 35\ ms^{-1}$ East
$V_{car/truck} = 30\text{-}35 = -5 = 5\ ms^{-1}$ west

(d) The truck collides with the back of the car. **3**
The truck slows down to 120 kmh^{-1}.
Assume the car weighs 1.30 metric ton and the truck weighs 4.50 metric ton.

Calculate the car's speed after the collision, assuming that momentum is conserved and the car is free to move forward after the truck collides with it.

Criteria	Marks
• Shows fully substituted equation • Correctly determines car's speed after collision • Correct units	3
• Any number of the above	1

Suggested answer:
120 kmh^{-1} = 33.33ms^{-1}
1300 x 30 + 4 500 x 35 = 1.3 V + 4500 x 33.33
V = 35.769 ms^{-1} = 35.8 ms^{-1}

(e) Explain how TWO safety devices can minimize injury to vehicle occupants during a collision. **2**

Criteria	Marks
• Identifies any TWO valid car safety features that would reduce damage in a collision • Correctly explains the physics behind the workings of one of these safety features	2
• One of the above	1

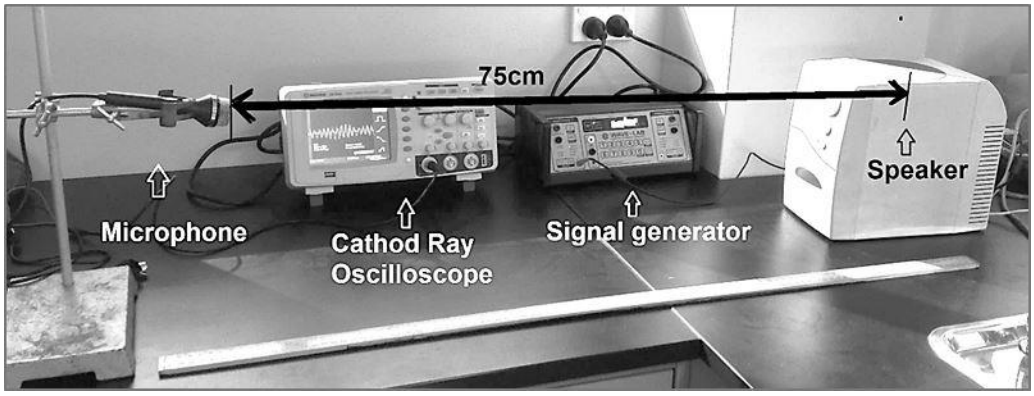
Answer may include:

Crumple zone: Position in front and sometimes at the rear of a car, such that in a collision, it crushes in a controlled manner, converting some of the kinetic energy into deformation, reducing harm to the passenger.

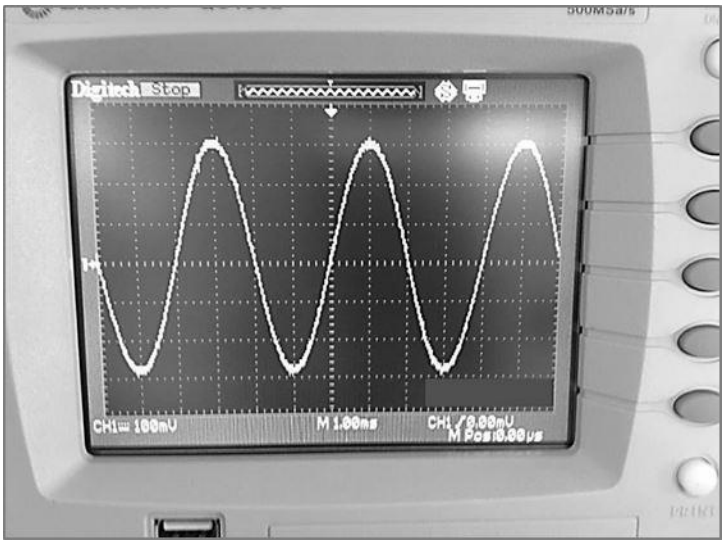
Air bag: Positioned between the steering wheel, passenger side of the dashboard and sometimes the sides of the cabin. It inflates during the impact and increases impact time to reduce force of impact when passenger's head is press against the interior of the car.

Question 26 (8 marks) **Marks**

Catherine was working on the experiment below to determine the relationship between volume of sound and distance from a source.



With the microphone 75 cm away from the speaker she obtained a reading from the oscilloscope as shown below.



Each grid represents 100 mV on the vertical axis and 1.00 ms on the horizontal axis.

(a) Identify the amplitude of the signal. **1**

Criteria	Marks
• Correctly identifies the amplitude	1

Suggested answer:
3 x 100 mV =300 mV

(b) Prove that the signal above has a frequency of 250 Hz. **2**

Criteria	Marks
• Correctly determines the frequency	2
• Determines the period correctly OR • Some degree of arithmetic or substitution error OR	1

• Misinterpretation of graph but logical approach to calculation	

Suggested answer:
T = 4 x 1.00 ms = 4.00 ms
F = 1/T = 1/0.004 = 250 Hz

Question 26 (continued)

(c) The microphone was repositioned to a distance of 7.50 metres away from the speaker. **3**

Calculate the expected amplitude of the signal that would be measured by the oscilloscope.

Criteria	Marks
• Correctly determines the amplitude with correct unit	3
• Makes some errors in approach and arithmetic	2
• Makes substantial errors in approach and arithmetic	1

7.5/0.75 =10
$D^2 = 100$
Volume at 7.5 metres = 300/100=3.0 mV

(d) Describe how you could improve the validity of the results of this expt **2**

Criteria	Marks
• Describes one way to improve the validity, specific to THIS experiment	2
• Identifies one way to improve the validity, specific to THIS experiment	1

Suggested answer may include:
- Better control of variables
- Reduce errors in measurement (especially with experimental technique)
- Improve (make more accurate) the equipment used

Question 27 (3 marks) **Marks**

Describe the observations made by Hubble that led him to the conclusion that our Universe is expanding. **3**

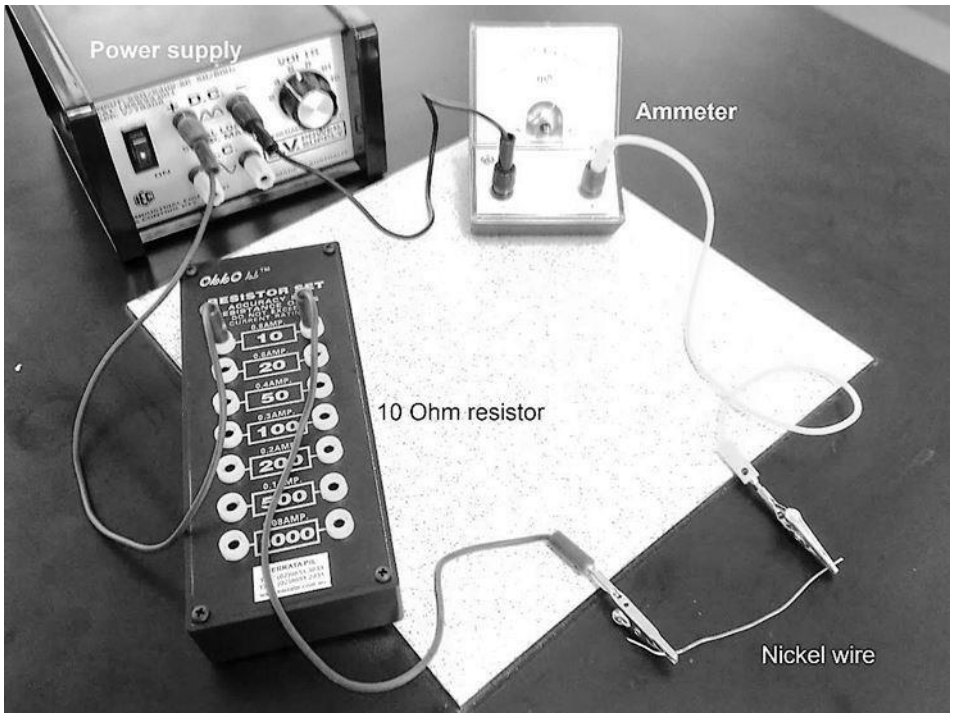
Marking Criteria	Marks
• Hubble's observation described in detail • Expansion of universe conclusion linked to observations • Response is in a clear and logical manner • All statements are factually correct	**3**
• Hubble's observations described • Expansion of universe conclusion linked to observations	**2**
• An aspect of Hubble's observations outlined	**1**

Hubble observed the spectra of a number of galaxies. He found that the spectral lines were shifted to the red end of the spectrum – i.e. red shift. There was a greater degree of red shift with the more distant galaxies. This relationship gave rise to the Hubble constant and led Hubble to conclude that the universe must be expanding, as there could be no other explanation for his observations.

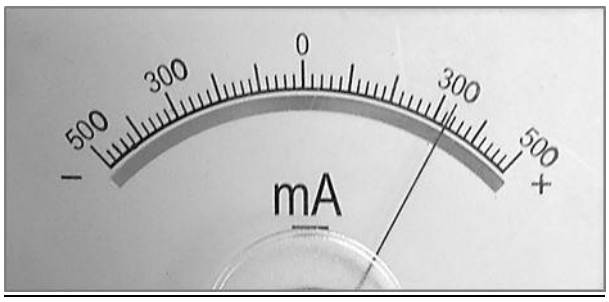
The link between greater distance of galaxies and their increased red shift was not well established. Some weaker responses suggested that red tinging of light was the same as the shift of spectral lines towards the red end of the spectrum – note that an emission line can be of any colour other than red (even violet) and still display red shift due to the Doppler effect.

Question 28 (6 marks)

Sophia wants to determine the resistance of a piece of nickel wire.
She set up the experiment as illustrated.



The image below shows the ammeter's reading when the power supply is set at 4.00V DC.



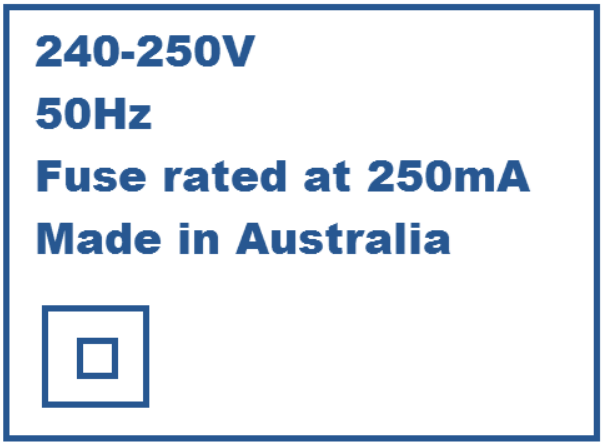
(a) Prove that the resistance of the nickel wire is 2.12 Ω. **2**

Criteria	Marks
• Shows logical calculation to determine the resistance correctly	2
• Provides correct formula with some degree of error either in arithmetic or substitution	1

Suggested answer:
$R_T = V/I = 4/0.33 = 12.12$
$R_{wire} = 12.12 - 10 = 2.12\ \Omega$

Question 28 (continued)

(b) The back of the power supply has the warning label shown below. **2**



Explain the necessity of the 10 Ω resistor in this experiment.

Criteria	Marks
• Substantiates claim by calculations	2
• Identifies the lack of resistance will increase current thereby blowing the fuse	1

Suggested answer:
If the 10 Ω resistor is no longer in the circuit, the total resistance will become 2.12 Ω. This means power supply will have to provide 4/2.12 = 1.89A, which is way above the rating of the fuse and likely to break the circuit.
Some responses noted that the 330mA reading in the circuit was already above the 250mA rating for the fuse so the removal of the extra resistor would make the current much higher and so melt the fuse.

(c) Calculate the energy consumed by the 10 Ω resistor in 5 minutes. **2**
Express your answer in kWh.

Criteria	Marks
• Shows logical calculation to determine the energy consumption correctly	2
• Provides correct equation with some degree of error either in arithmetic or substitution or partial calculations that result in power rather than energy	1

Suggested answer:
$P = IV = I^2 R = 0.33 \times 3.3 = 1.089$ Watts
$W = Pt = 1.089/1000 \times 5/60 = 0.09075 \times 10^{-3} = 9.08 \times 10^{-5}$ kWh
There was a lot of calculation in this question for only 2 marks any many good answers only scored 1 mark**.**

Question 29 (4 marks) **Marks**

Name one electrical safety device used in the home and describe the principles of its operation. **4**

Criteria	Marks
• Links the behaviour of the safety device to the principles of its operation	4
• Describes the physical behaviour of the named safety device	3-2
• Identifies a safety device	1

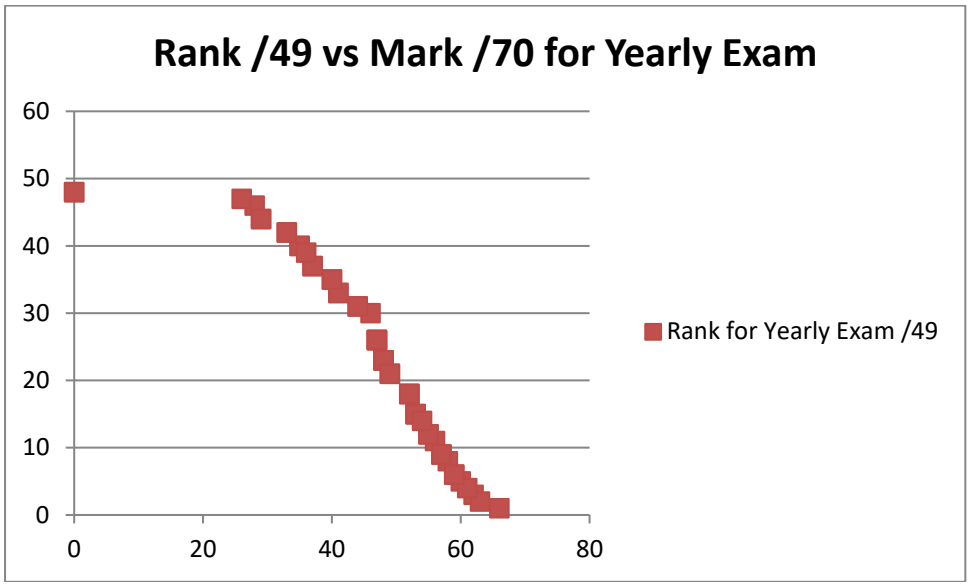
Sample answer
Residual Current Devices monitor the current on both the active and neutral conductors in a house, and interrupt the circuit if there is a difference of more than 30mA in a very short time.

Question 30 (2 marks) **Marks**

Discuss a problem caused by the limited range of the electromagnetic spectrum available for communication purposes. **2**

Criteria	Marks
• Discusses a problem caused by limited range of EM spectrum	2
• Identifies one problem caused by limited range of EM spectrum	1

Sample answer
Because there is only a limited range of frequencies available for communication, it is likely that several people or devices will want to communicate on the same "channel" at the same time. This can cause interference that results in lower transmission rates or scrambled messages.
Some responses indicated the ambiguity of the term 'range' to mean the distance travelled by the wave before its intensity is reduced to a level which is difficult to detect.
Many weaker responses used a significant amount of their answer by restating the question and therefore reduced the quality of their answer.



End of paper

2015 PRELIMINARY EXAMINATION

Physics

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 m s^{-2}
Speed of light, c	3.00×10^{8} m s^{-1}
Magnetic force constant,	2.0×10^{-7} N A^{-2}
Universal gravitational constant, G	6.67×10^{-11} N m^2 kg^{-2}
Mass of Earth	6.0×10^{24} kg
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}

FORMULAE SHEET

$$v = f\lambda$$

$$I \propto \frac{1}{d^2}$$

$$\frac{v_1}{v_2} = \frac{\sin i}{\sin r}$$

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

$$R = \frac{V}{I}$$

$$P = VI$$

$$\text{Energy} = VIt$$

$$v_{av} = \frac{\Delta r}{\Delta t}$$

$$a_{av} = \frac{\Delta v}{\Delta t} \text{ therefore } a_{av} = \frac{v-u}{t}$$

$$\Sigma F = ma$$

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

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

$$W = Fs$$

$$p = mv$$

$$\text{Impulse} = Ft$$

$$E_p = -G\frac{m_1 m_2}{r}$$

$$F = mg$$

$$v_x^2 = u_x^2$$

$$v = u + at$$

$$v_y^2 = u_y^2 + 2a_y\Delta y$$

$$\Delta x = u_x t$$

$$\Delta y = u_y t + \frac{1}{2}a_y t^2$$

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

$$F = \frac{Gm_1 m_2}{d^2}$$

$$E = mc^2$$

$$l_v = l_0\sqrt{1-\frac{v^2}{c^2}}$$

$$t_v = \frac{t_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$m_v = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$$

FORMULAE SHEET

$$\frac{F}{l} = k\frac{I_1 I_2}{d}$$

$$F = BIl\sin\theta$$

$$\tau = Fd$$

$$\tau = nBIA\cos\theta$$

$$\frac{V_p}{V_s} = \frac{n_p}{n_s}$$

$$d = \frac{1}{p}$$

$$M = m - 5\log\left(\frac{d}{10}\right)$$

$$\frac{I_A}{I_B} = 100^{(m_B - m_A)/5}$$

$$m_1 + m_2 = \frac{4\pi^2 r^3}{GT^2}$$

$$F = qvB\sin\theta$$

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

$$E = hf$$

$$c = f\lambda$$

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

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

$$Z = \rho v$$

$$\frac{I_r}{I_0} = \frac{\left[Z_2 - Z_1\right]^2}{\left[Z_2 + Z_1\right]^2}$$

$$A_0 = \frac{V_{\text{out}}}{V_{\text{in}}}$$

$$\frac{V_{\text{out}}}{V_{\text{in}}} = -\frac{R_{\text{f}}}{R_{\text{i}}}$$

Student Number: _____

PERIODIC TABLE OF THE ELEMENTS

KEY

Atomic number	
Chemical symbol	
Relative atomic mass	
Name of element	

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	Lanthanoids 57-71 * -	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	Actinoids 89-103 ** -	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						

***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

Elements with atomic numbers 113 and above have been reported but not fully authenticated.
Standard atomic weights are abridged to four significant figures.
Elements with no reported values in the table have no stable nuclides.

Student Number _____

MANLY SELECTIVE CAMPUS

2015 YEAR 11 PRELIMINARY YEARLY EXAMINATION
PHYSICS– 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 ○