Baulkham Hills High School

Yearly Examination

2017

Year 11

Physics

Book I

Multiple Choice Questions

General Instructions:

- Reading time 5 minutes
- Working time 2 hours
- Write using black pen
- Show all working
- Include units
- Draw diagrams, tables, and graphs in pencil
- Board approved calculators may be used
- A data sheet, formulae sheet, and Periodic Table are provided
- Where additional space exists you may continue your answer below the lines provided.
- Additional answer booklets are available if more space is required for an answer

Total Marks: 75

This paper consists of TWO sections.

Section I – Multiple Choice
20marks

- Attempt Questions 1-20
- Allow about 30 minutes for this section

Section II – Extended Response
55 marks

- Attempt Questions 21-34
- Allow about 90 minutes for this section
- **All working** must be shown in answers which include calculations
- Always include **correct units** in your answer

Booklets and papers, used or unused, are NOT to be taken from the examination centre.

Section I – (Questions 1-20) – Multiple Choice
20marks
Select the alternative, A, B, C or D which <u>best answers</u> the question and indicate your choice on the Multiple Choice Answer Sheet.

1. A car is moving along a flat road at 50 km/h and runs out of petrol. The driver takes it out of gear and lets it slowly coast to a stop. Besides the lack of petrol, the car slowly stopped because

   (A) friction and air resistance were the only horizontal forces

   (B) its mass was less without the petrol

   (C) the weight is equal to the reaction force of the road

   (D) the total force on the car was zero

2. Which of the following lists only contain vector quantities?

   (A) impulse, friction, velocity, momentum

   (B) weight, work, gravitational potential energy, acceleration

   (C) impulse, time, kinetic energy, friction

   (D) work, mass, time, gravitational potential energy

3. What was Alexander Friedmann's best known contribution to astronomy?

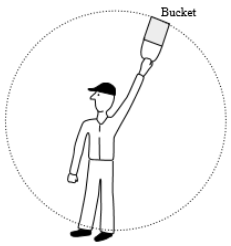
   (A) Predicting the law of periods

   (B) Predicting the expansion of the universe

   (C) Developing the concept of a heliocentric universe

   (D) Developing the universal law of gravity

4. A boy swings a bucket in a vertical circular path over his head, as shown.



   When the bucket of water is near the top of the circle, the water does not fall out because

   (A) Only the bucket is accelerating

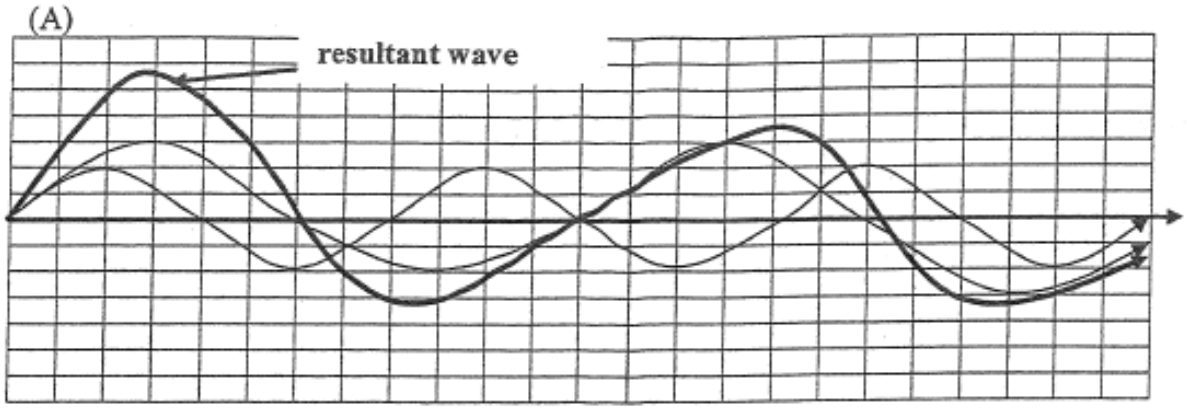
   (B) the water has no weight at the top of the circle

   (C) a force pulls the water outwards toward the bottom of the bucket

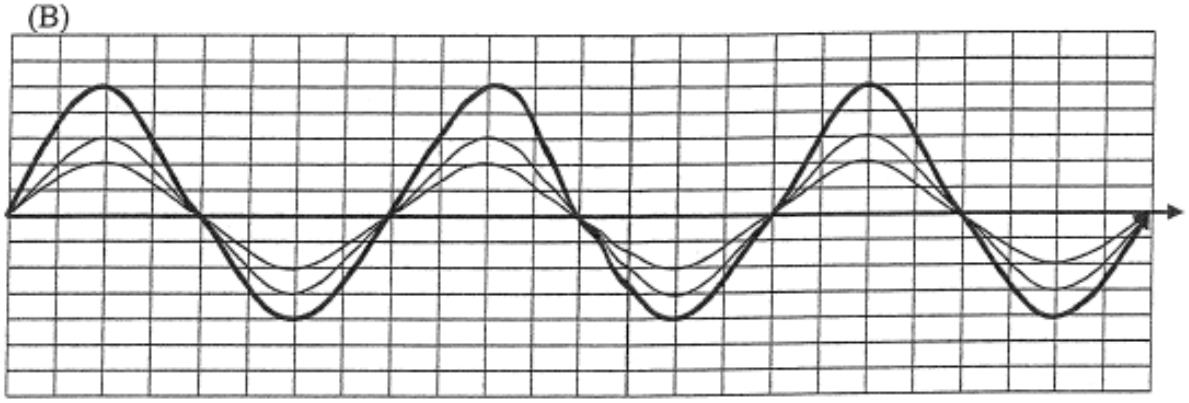
   (D) the acceleration of the bucket is greater in magnitude than the acceleration due to gravity

5. Which graph below correctly applies the law of superpostion by producing the correct resultant wave?

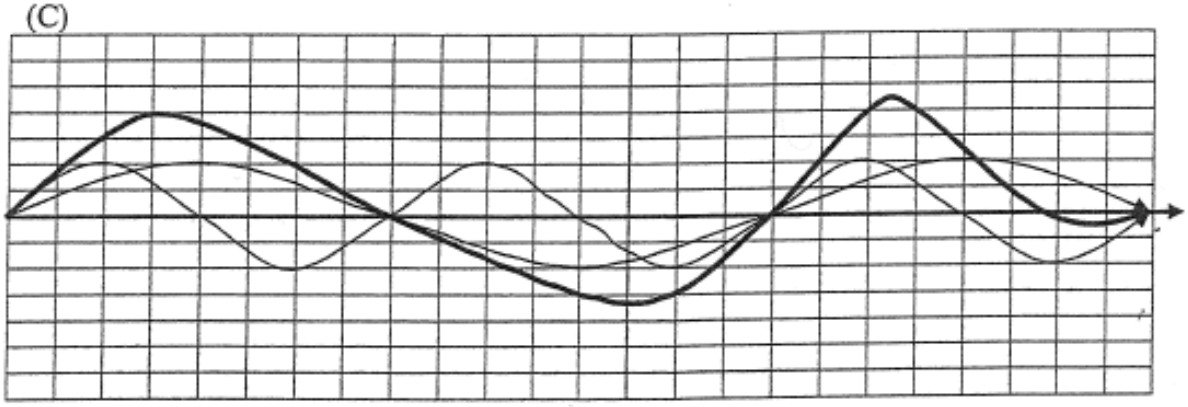
(A)



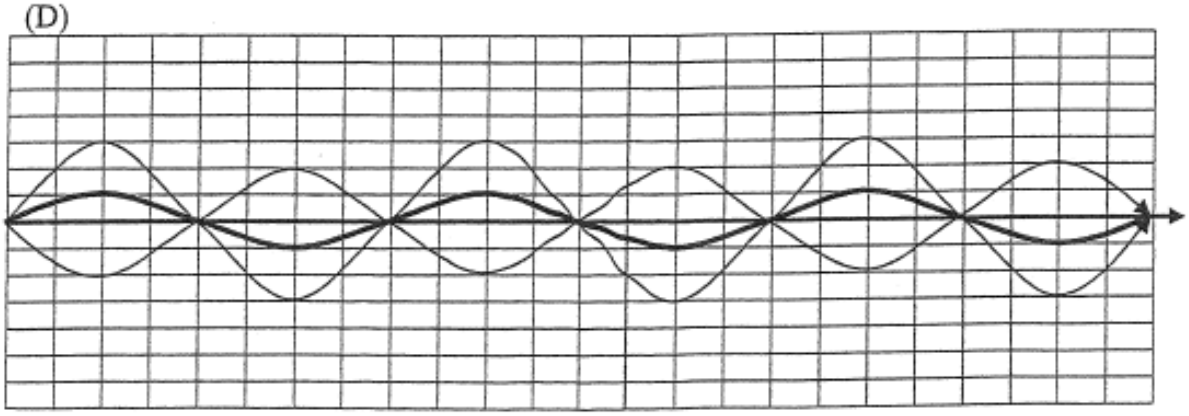
(B)



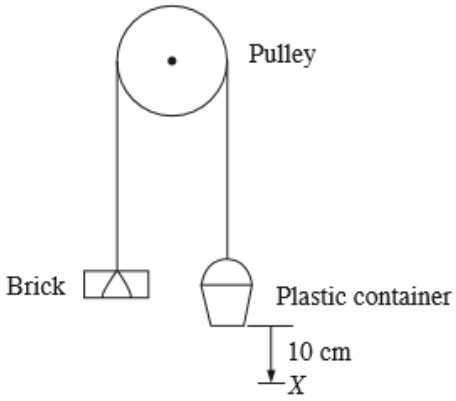
(C)



(D)



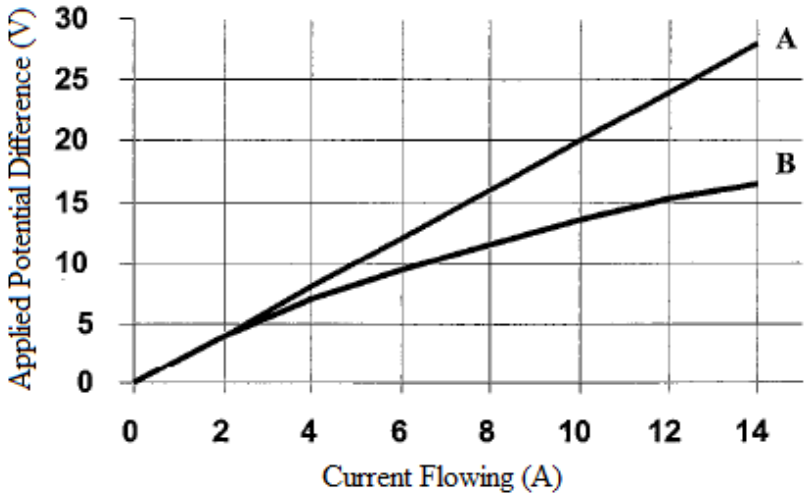
6. Some students set up the equipment shown below. They added sand to the plastic container until the weight of the container and its contents exactly balanced the weight of the brick. The string used had negligible mass.



One of the students then moved the plastic container 10 cm downward to position X, held it steady, and released it. When the container was released it

(A) moved slowly back to its original position
(B) started to move downward
(C) oscillated up and down several times before stopping at its original position
(D) remained at position X

7. Resistor A is connected in a circuit and the current through the resistor is measured while the potential difference applied across its end is varied. Resistor A is then replaced by resistor B and the measurement repeated. The results are presented in the graph below.



Which statement about this information is correct?

(A) resistor B is ohmic while resistor A is non-ohmic

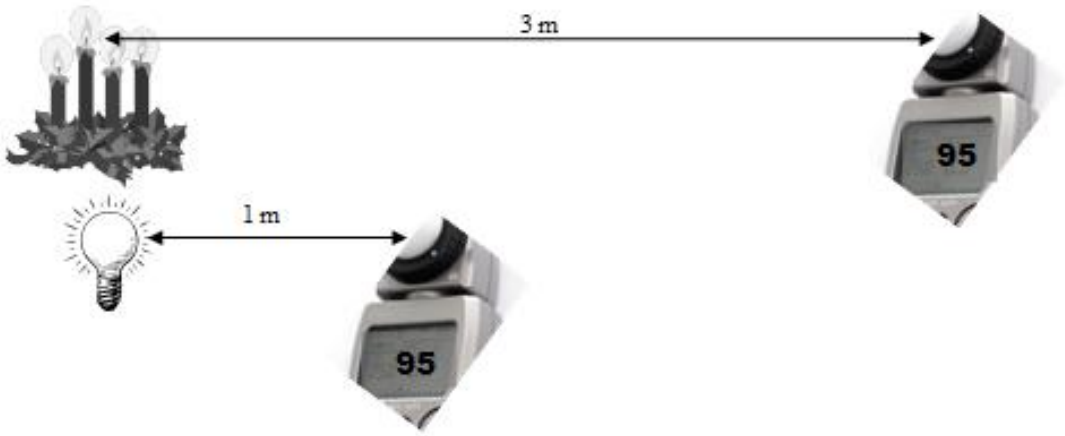
(B) if 10 V is applied across the ends of resistor B, 5 A would flow through it

(C) the resistance of resistor B does not exceed the resistance of resistor A

(D) the measurements are invalid because the independent variable has been plotted on the vertical axis of the graph

8. A student wanted to compare the brightness of a small globe to that of a set of four candles.

He recorded the intensity of the globe at a distance of 1 metre. He needed a distance of 3 m between the light meter and the candles to get the same intensity reading as he did with the small globe.



What should the reading on the light meter be if it was held one metre from the candles?

(A) 31.7

(B) 285

(C) 570

(D) 855

9. Light rays can be sent down optical fibres with little loss of energy because they are totally internally reflected within the fibre. The light rays are totally internally reflected within an optic fibre because:

(A) The angle between the incident ray and the normal to the surface is always equal to the critical angle

(B) The angle between the incident ray and the normal to the surface is always less than the critical angle

(C) The angle between the incident ray and the normal to the surface is always greater than the critical angle

(D) The angle of incidence is equal to the angle of refraction

10. The quantity which does not change during refraction is the:

(A) amplitude of light

(B) wavelength of light

(C) frequency of light

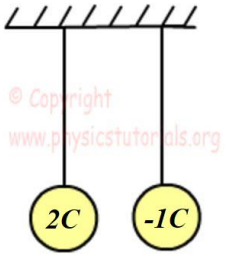
(D) speed of light

Use this information for Questions11 and 12.

Two low mass conducting spheres are hung on a rod 2 cm apart; they carry electrical charges as shown in the diagram. Initially the balls are held in position as shown. The force between the charged balls can be determined using Coulomb's Law, which is given by the equation:

$$F = k\frac{q_1\, q_2}{d^2}$$

where k is Coulombs constant, q_1 and q_2 are charges and d is the distance between them.



11. Which is the best description of what is likely to happen when the balls are released?

    (A) Both balls will swing away from each other.

    (B) The negative ball will move towards the positive ball, touch, and remain there.

    (C) Both balls will initially move away from each other then come together.

    (D) Both balls will initially move towards each other, touch, and then move away.

12. If the ***2C*** ball experiences a force F due to the ***-1C*** ball, what force would it experience if the charge on the ***-1C*** ball was doubled to ***-2C***?

    (A) ½F

    (B) F

    (C) 2F

    (D) 4F

13. Astronomy advances with advances in technology. Which scientist is best known for his accurate records of the position of the stars using a highly accurate astrolabe?

    (A) Brahe

    (B) Ptolemy

    (C) Galileo

    (D) Kepler

14. Which of the following can be best related to Kepler?

(A) Predicting the law of periods

(B) Predicting the expansion of the universe

(C) Developing the concept of a heliocentric universe

(D) Developing the universal law of gravity

15. Which type of radiation has the highest ionising potential?

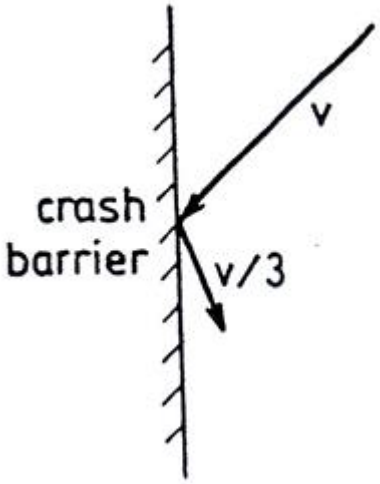
(A) Alpha

(B) Beta

(C) Gamma

(D) Neutron

16. A car travelling on a horizontal road surface at velocity v collides with a crash barrier and comes off intact with a velocity v/3 as shown in the diagram below.



The kinetic energy of the car before the collision is **E**. The kinetic energy lost by the car in the collision is

(A) **E/3**

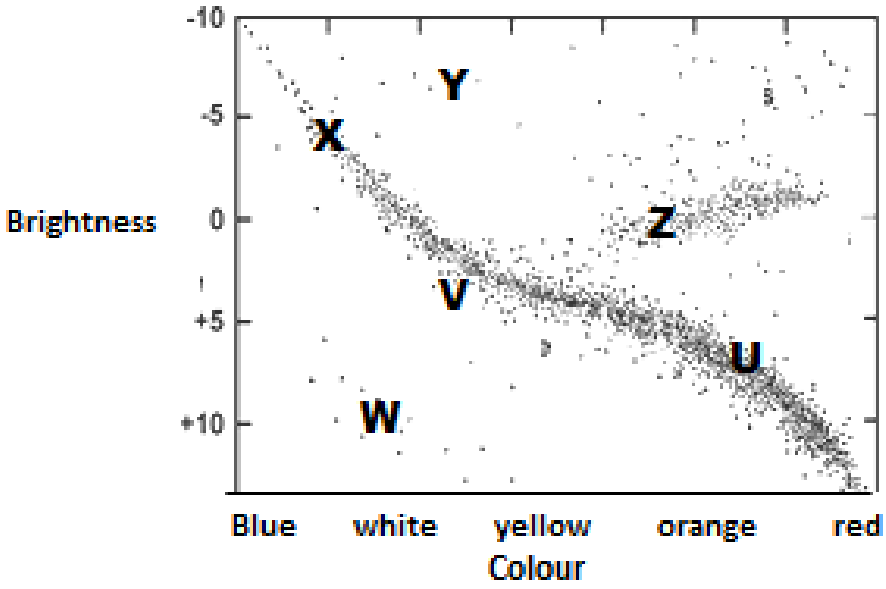
(B) **8E/9**

(C) **2E/3**

(D) **E/9**

Use this information for Questions17 and 18.

The H-R diagram below shows several specific stars labelled U–Z.



17. Which combination of stars below would be fusing hydrogen as their main fuel source?

    (A) V and W

    (B) U and X

    (C) Y and Z

    (D) V and Z

18. Which star would have the Black Body curve with the dominant wavelength being the shortest?

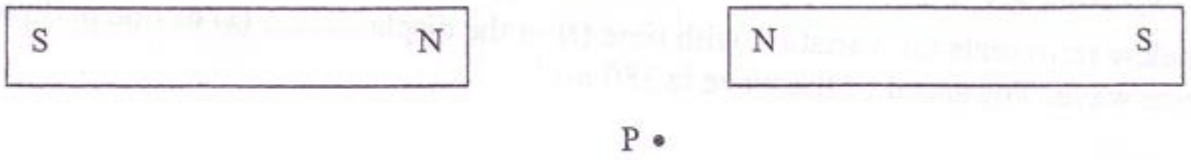
    (A) Star W

    (B) Star U

    (C) Star Z

    (D) Star X

19. The diagram shows two bar magnets near each other.



Which alternative best predicts the direction of the *total magnetic field* at point P*?*

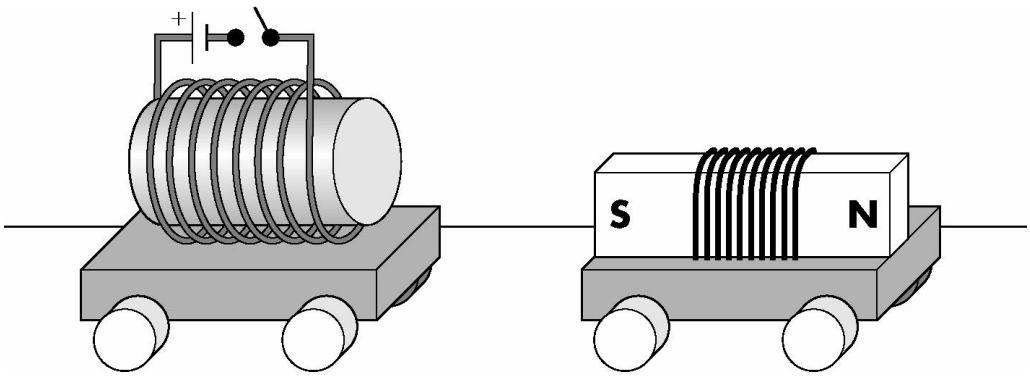
a) 

b) 

c) 

d) 

20. The diagram below shows an air solenoid mounted on a frictionless trolley near a bar magnet mounted on a trolley. Both the trolleys have the same total mass.



What will happen when the switch is closed?

(A) Both trolleys will move towards one another with the same acceleration.

(B) The air solenoid trolley will move to the right and the magnet trolley will remain at rest.

(C) The air solenoid trolley will move to the left and the magnet trolley will remain at rest.

(D) Both trolleys will move apart from one another with the same magnitude of acceleration.

End of Section I

End of Section 1

2017
Year 11 Physics
Yearly Examination

You may use this page as a scratch pad
Material on this page WILL NOT be ASSESSED

Name: …… Teacher:……..…….

Baulkham Hills High School

Yearly Examination

2017

Year 11

Physics

Book II

Answer Booklet

Section I – Multiple Choice
20 marks

Select the response A, B, C or D which best answers the question by placing an 'X' on the grid below

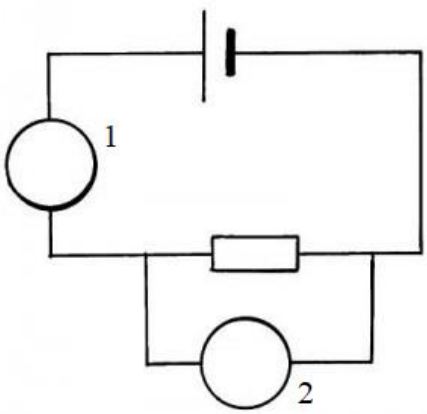
1	**A**	**B**	**C**	**D**
2	**A**	**B**	**C**	**D**
3	**A**	**B**	**C**	**D**
4	**A**	**B**	**C**	**D**
5	**A**	**B**	**C**	**D**
6	**A**	**B**	**C**	**D**
7	**A**	**B**	**C**	**D**
8	**A**	**B**	**C**	**D**
9	**A**	**B**	**C**	**D**
10	**A**	**B**	**C**	**D**

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**

Section II – (Questions 21-34) – Extended Response
55 marks
Write your answers to this section in the spaces provided
Individual marks are indicated for each question

Question 21 (10 marks)

The diagram shows a simple idealized electric circuit.



(a) Items 1 and 2 represent standard electrical meters

i) Identify meter 1: …… **1**

Describe the meter's electrical resistance and justify your answer **1**

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ii) Identify meter 2: …… **1**

Describe the meter's electrical resistance and justify your answer **1**

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iii) State whether the electrical current (I) flows clockwise or anticlockwise and state the unit of current **1**

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Question 21 continues on the next page

Question 21 (continued)

(b) i) Define the term voltage **2**

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ii) Assume that the DC power supply in the diagram is a 3 V battery. How many joules of energy are delivered to the resistor when 90 C of charge is passed through the resistor? **1**

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iii) Find the current in the circuit if it takes 40 seconds to deliver the 90 Coulombs of charge. **1**

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iv) State what happens to the energy that has been delivered to the resistor by the 90 C of charge. **1**

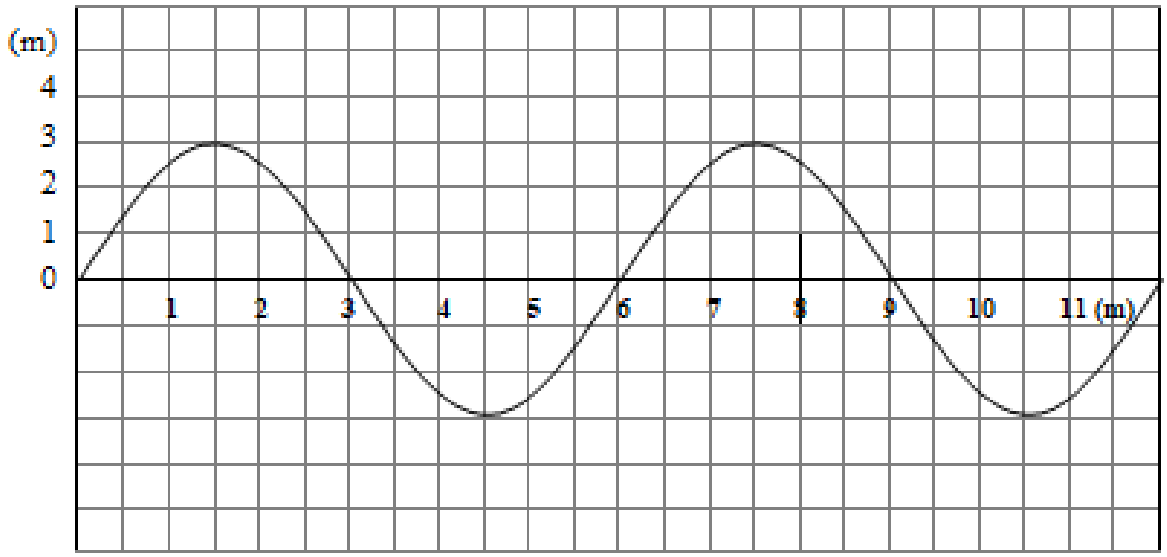
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Question 22 (5 marks)

The graph below is a model of a wave. Assume the wave is travelling at 20 m/s.



(a) (i) Identify an example of a wave which could be represented by the graph **1**

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(ii) Choose a label for the horizontal axis: …… **1**

Choose a label for the vertical axis: ……

(iii) Is this a transverse or a longitudinal wave? …… **1**

(b) Find the following properties of the wave: **2**

(i) Wavelength

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(ii) Amplitude

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(iii) Displacement at 2.5 m

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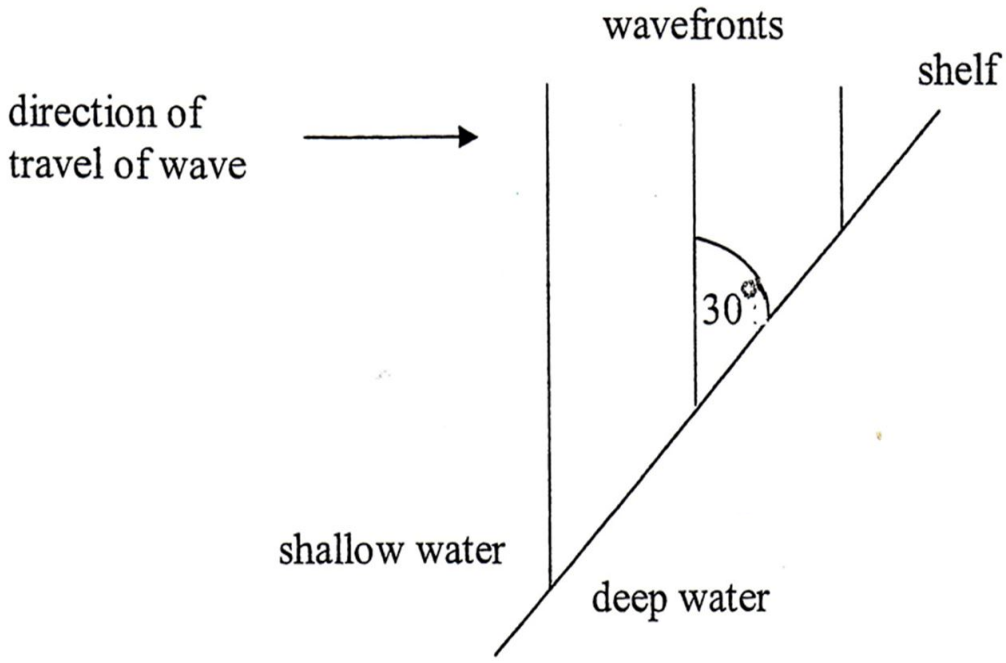
(iv) Period

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Question 23 (4 marks)

A water wave encounters a shelf that divides the water into two separate depths as shown in the figure below. The water to the right of the shelf is deeper than that to the left of the shelf. The wave travels at a slower speed in shallow water when compared to the speed in deeper water.



The angle between the wave fronts in the shallow water and the shelf is 30^{o}. The speed of the wave in the shallow water is 15 cms^{-1} and in the deeper water is 20 cms^{-1}.

(a) Draw a ray diagram on the figure above by: **2**

Step 1 On the figure, draw in and label an *incident ray* and any other lines in order to identify and label the *angle of incidence*

Step 2: After completing Part (c) below, finish the ray diagram: draw and label the *refracted ray* and any other lines in order to identify and label the *angle of refraction.*

(b) With reference to your answer of part (a), state Snell's law in terms of wave velocity. **1**

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(c) For the wave in the deeper water, determine the angle of refraction. **1**

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Question 24 (3 marks)

Describe ONE application of a *concave* reflecting surface. **3**

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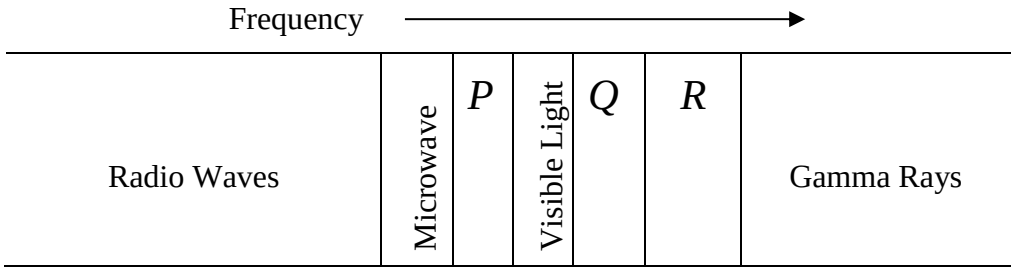
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In the box below Include a labelled sketch to illustrate your answer.

Question 25 (6 marks)

The diagram shows an incomplete *electromagnetic spectrum.*



(a) Complete the table below by identifying the types of waves labelled P, *Q*, R and stating a method of detection for each. No two wave types may have the same detection method. **3**

Label	Type of Wave	Method of Detection
P		
Q		
R		

(b) Identify the major difference between electromagnetic waves and other types of transverse wave. **1**

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(c) Explain why the limited range of the electromagnetic spectrum available for communication purposes is a problem. **2**

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Question 26 (4 marks)

(a) Outline why household wiring systems are parallel rather than series circuits. **1**

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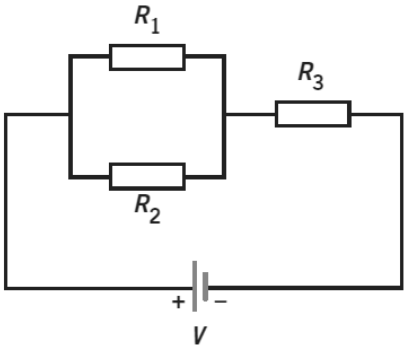
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The figure depicts two parallel resistors in series with one resistor plus power supply.



Assume the values of the resistors are $R_1 = 15\ \Omega$, $R_2 = 30\ \Omega$, $R_3 = 50\ \Omega$.

(b) Which resistor, R_1 or R_2, will carry the most current? Justify your answer (calculations should not be needed) **1**

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(c) Calculate the value of the equivalent resistor which can replace the 3 resistors in the circuit. **2**

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Question 27 (5 marks)

(a) State the purpose of the earthing wire in a house and outline how it works. **2**

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(b) Circuit Breakers are standard fuse box components required by legislation in the modern Australian house. Explain why these devices are necessary. **2**

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(c) Identify another electrical safety feature used in buildings **1**

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Question 28 (3 marks)

(a) Define the term kilowatt-hour **1**

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(b) Why are kilowatt-hours used in electricity bills? **1**

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(c) Convert 6 kWh to Joules **1**

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Question 29 (2 marks)

The table shows information about several household appliances. **2**

Appliance	Information on Appliance
Kettle	240 V, 1200 W
Radiator	240 V, 2200 W
Laptop Computer	10 V, 3.4 A

- A household power point can safely draw a maximum 15A.
- Assume that in your kitchen, a power point has a four-plug power-board attached.
- The laptop battery is flat so it needs to be plugged into the power-board

Determine whether you can work on your computer while the kettle and radiator are on. Justify your answer.

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Question 30 (4 marks)

(a) Define refractive index (n) and explain why n cannot be less than one. **2**

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(b) Calculate the critical angle of total internal reflection for a diamond air interface. The refractive index of diamond is 2.419 and of air is 1.000 **2**

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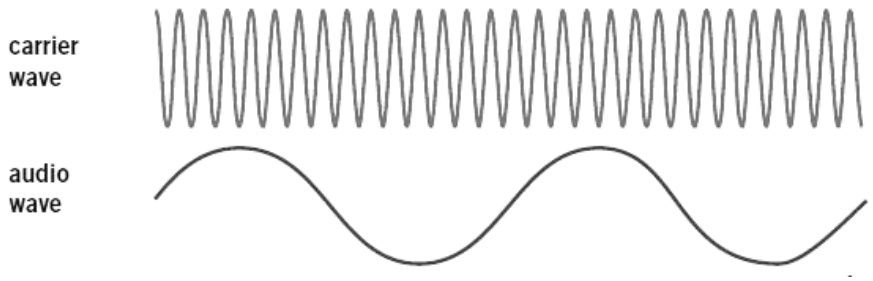
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Question 31 (2 marks)

A carrier wave and an audio wave are shown below.



(a) In the box, sketch the amplitude modulated wave

1

(b) In the box, sketch the frequency modulated wave

1

Question 32 (3 marks)

Assess the effect of sunspot activity on the Earth's power grid and satellite communication. **3**

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Question 33 (1 mark)

As the Universe expanded and cooled after the Big Bang matter particles lost kinetic energy which in turn allowed disks of matter to form. On the other hand, dark matter did not lose energy and so formed spherical halos around the galaxy center.

Outline the mechanism by which particulate matter lost kinetic energy. **1**

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Question 34 (3marks)

Scientists today accept that the universe is expanding. **3**
Outline the origin of this idea and the main piece of evidence on which this theory is based.

Include the work of at least one NAMED scientist in your answer.

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End of Section II
End of Paper

End of Paper

2017
Year 11 Physics
Yearly Examination

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