

Baulkham Hills High School

2020

YEAR 11
YEARLY
EXAMINATION

Physics

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Write using black pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- A data sheet, formulae sheet and Periodic Table are provided at the back of this paper
- For question in Section II, show all relevant working in questions involving calculations
- Write your Student ID at the bottom of this page and at the top of page 9

Total marks:
75

Section I — 20 marks (pages 2-8)

- Attempt Questions 1–20
- Allow about 30 minutes for this part

Section II — 53 marks (pages 9-20)

- Attempt Questions 21–30
 - Allow about 1 hour and 30 minutes for this part
-

Section I

20 marks

Attempt Questions 1–20

Allow about 30 minutes for this section

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

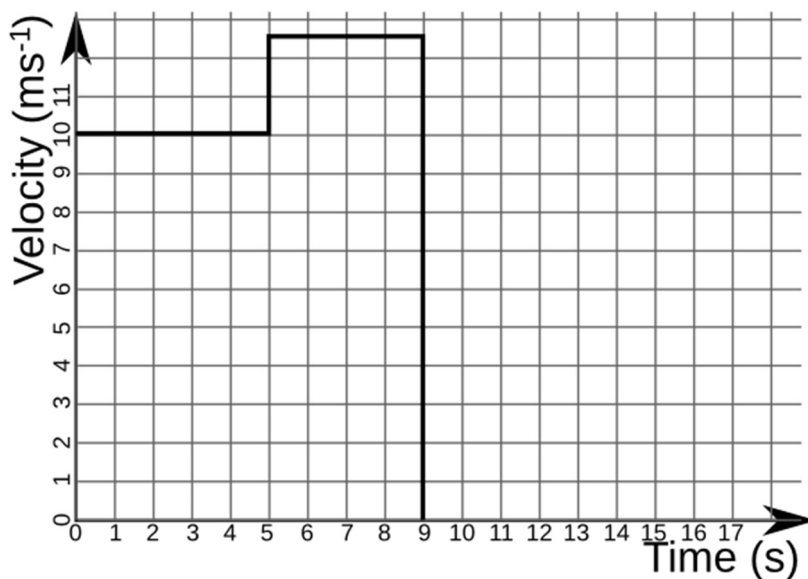
- 1 A car travels 200 m North, then 40 m East.

The magnitude of the car's displacement (x) can be calculated using

- A. $\tan x = 200/40$
- B. $200 \text{ m} + 40 \text{ m} = x$
- C. $x = (200)^2 \text{ m} + (40)^2 \text{ m}$
- D. $x^2 = (200)^2 \text{ m} + (40)^2 \text{ m}$.

Use the graph below to answer Questions 2 and 3.

A river boat was recorded to have this motion.



- 2 What was the magnitude of the river boat's acceleration at time 3 s?

- A. 0 ms^{-2}
- B. 10 ms^{-2}
- C. 30 ms^{-2}
- D. 9.8 ms^{-2}

3 What distance has the river boat travelled in the first 9.0s?

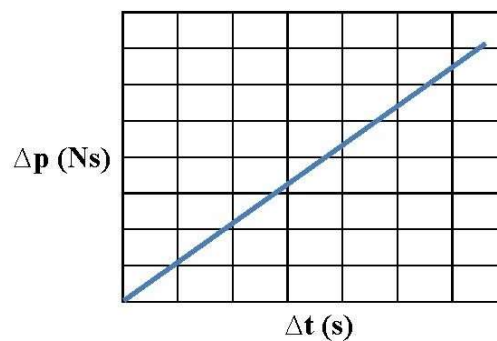
- A. 0 m
- B. 12.5 m
- C. 100 m
- D. 112.5 m

4 A radio wave has a frequency of 3.3×10^7 Hz.

What would its wavelength be closest to?

- A. 7 m
- B. 9 m
- C. 12 m
- D. 14 m

5 The graph below shows the change in momentum of a car as it accelerates.



What does the gradient of this graph represent?

- A. Force
- B. Impulse
- C. Velocity
- D. Acceleration

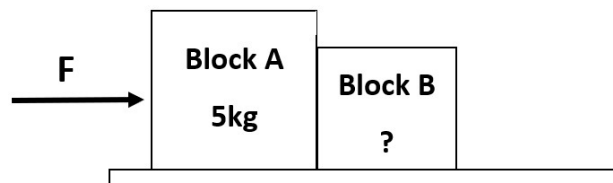
- 6 A mass of 250 kg is moved across a frictionless surface, with a constant velocity of 5 ms^{-1} .

Which of the following forces is needed to maintain the constant velocity?

- A. 0 N
- B. 0.02 N
- C. 50 N
- D. 1250 N

- 7 Students in an experiment are investigating Blocks A and B.

Both blocks are being pushed along by a force as shown. The force is measured as being 20 N and a friction force of 4 N is being applied to the blocks by the floor. The students measure that both blocks are moving with an acceleration of 2 ms^{-2} .

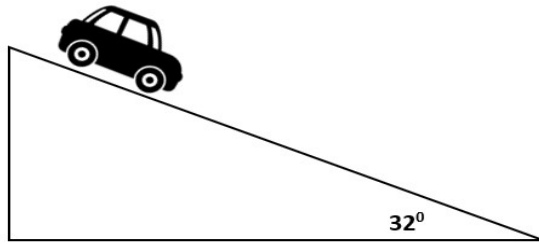


What is the mass of Block B?

- A. 1.0 kg
- B. 2.5 kg
- C. 3.0 kg
- D. 4.0 kg

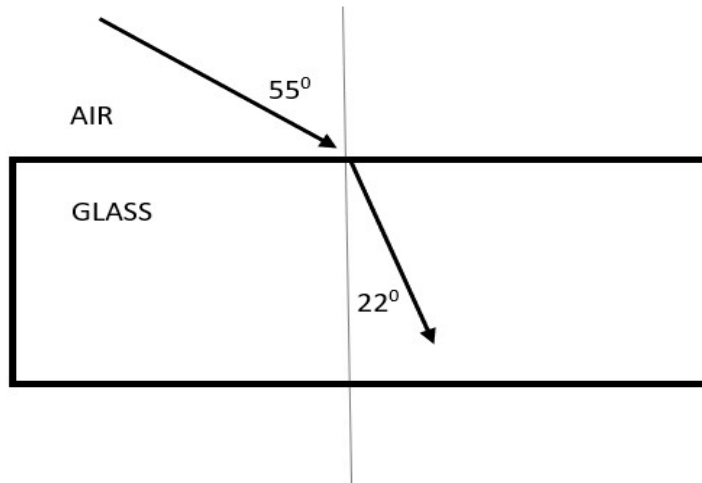
The following information relates to Questions 8 and 9.

A 1200 kg car sits on a sloped road which is inclined at 32° as shown in the diagram below. The ramp applies a frictional force of 0.2 N on the car.



8. The correct calculation for the weight force acting parallel to the ramp is
- A. $1200 (9.8) 32^\circ$
 - B. $1200 (9.8) \sin 32^\circ$
 - C. $1200 (9.8) \cos 32^\circ$
 - D. $1200 (9.8) \tan 32^\circ$
9. What is the total friction acting on the car?
- A. 0.2 N
 - B. 120N
 - C. 240N
 - D. 1 199N

- 10 The diagram shows light refracting in a glass prism.



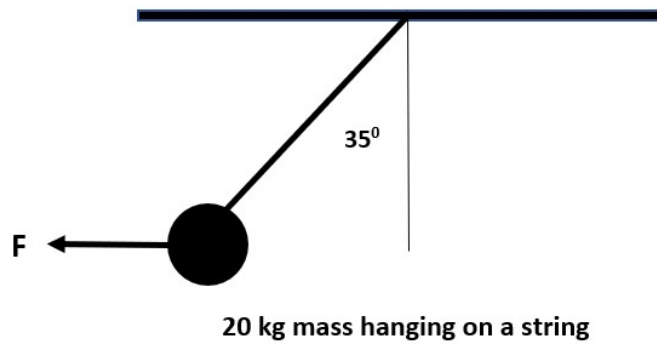
What is the refractive index of the glass?

- A. 0.5
 - B. 2.2
 - C. 2.5
 - D. 4.5
- 11 Which of the following statements is most correct?
- A. P waves are longitudinal waves.
 - B. All slinky waves are transverse in nature.
 - C. Sound waves can travel through a vacuum.
 - D. The speed of light is $3 \times 10^8 \text{ ms}^{-1}$ in all situations.
- 12 A student predicts how much the light intensity will drop off in four metres from its original source.

What is the percentage of light reaching four metres?

- A. 50%
- B. 25%
- C. 12%
- D. 6.25%

- 13 A stationary ball which has a mass of 20 kg is placed on a string and is pulled by a force, F , angled at 35° as shown:

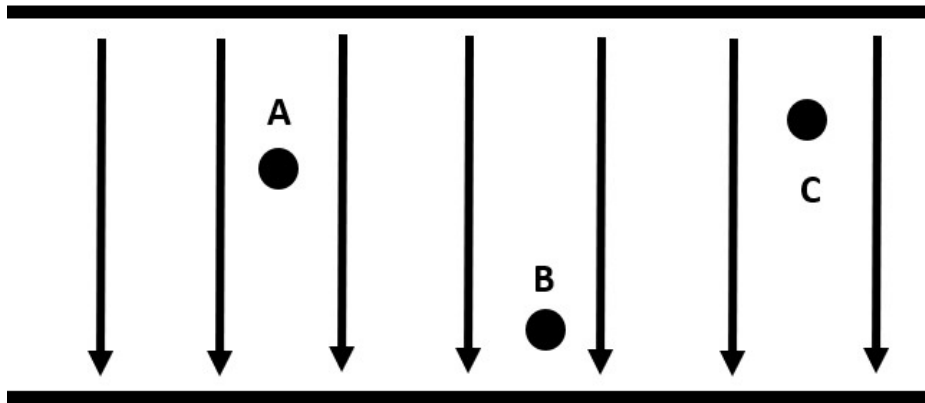


What is the size of the force, F , pulling on the mass of the ball?

- A. 112.4 N
- B. 137.2 N
- C. 160.5 N
- D. 239.3 N

Use the information below to answer Question 14.

The diagram below shows an electric field between two parallel plates. Three identical charges have been placed in the field (Charge A, B and C) and are free to move.



- 14 What do the positions of the charges show?
- A. Charge B is a positive charge
 - B. Charges A and B are experiencing different forces
 - C. Charge B is approaching a positive plate
 - D. All charges are experiencing the same force

15 Two light globes have the following electric ratings:

Globe	Potential Difference (V)	Power rating (W)
Y	12	150
Z	240	600

Identify the most correct conclusion a student can make from these ratings.

- A. Light Globe Y uses less current than Globe Z to work
- B. Light Globe Z has a greater resistance value than Globe Y
- C. Both light globes have the same energy usage
- D. Light Globe Y can be used in a household circuit

Use this information to Questions 16 and 17.

The diagram below is of a linear air track which is enabling the collision of two identical gliders, each with a mass of 20 g. The gliders are shown as they approach each other with the same speed.



16 Which two identical physics quantities are shared by these two gliders as they approach each other?

- A. Mass and velocity
- B. Mass and impulse
- C. Mass and momentum
- D. Mass and kinetic energy

17 After the collision, the two gliders stick together.

What is the final momentum of the gliders?

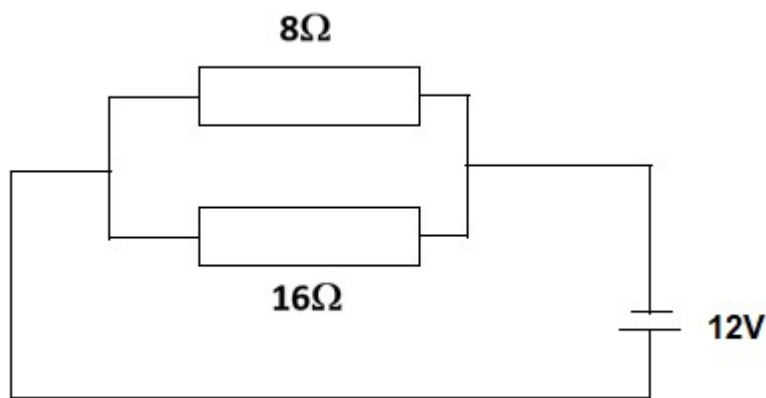
- A. 160 kgms^{-1}
- B. 0 kgms^{-1}
- C. 0.8 kgms^{-1}
- D. 0.16 kgms^{-1}

- 18 A student constructs a 5000 turn solenoid which is 25 cm in length. She then passes a current of 40 A through it.

What is the strength of the magnetic field produced inside this solenoid?

- A. 0.01 T
- B. 0.1 T
- C. 1 T
- D. 10 T

- 19 An electrical circuit (shown below) is constructed with a 8.0Ω resistor connected in parallel to a 16.0Ω resistor. This circuit is powered by 12V.



What is the total current flowing through the circuit?

- A. 0.5 A
 - B. 2.3 A
 - C. 4.2 A
 - D. 10.5 A
- 20 In the laboratory, white light can be split into its component colours ROYGBIV.

What is this effect known as?

- A. Dispersion
- B. Resonance
- C. Superposition
- D. Total Internal Reflection

2020

**YEAR 11
YEARLY EXAMINATION**

Student Name:

Teacher's Name:

Physics

Section II Answer Booklet

53 marks

Attempt Questions 21–30

Allow about 1 hour 30 minutes for this part

Instructions

- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Show all relevant working in question 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.
- Write your Student ID above

Please turn over

Question 21 (4 marks)

On a warm day, an ambulance is moving at a speed of 30 ms^{-1} . It is emitting a siren which has a frequency of 1750 Hz . The speed of sound was measured to be 340 ms^{-1} . A diagram of this event is shown below.



- (a) What frequency would be detected by a probe positioned in Location A, in front of the ambulance? 2

.....

.....

.....

.....

.....

- (b) When this was repeated on a cold day, with the speed of sound measured to be 330 ms^{-1} 2
Would the pitch be higher or lower at Location A when compared to the experiment conducted on a warm day? Justify your answer.

.....

.....

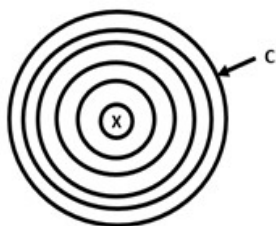
.....

.....

.....

Question 22 (7 marks)

Investigate the magnetic field below.



- (a) Explain how you would determine the direction of the field at point c. **2**

.....

.....

.....

.....

.....

- (b) The distance to point C from the current carrying wire is 50 mm and the current flowing through the wire is 12 A. **2**

Determine the strength of the magnetic field at point C in field A.

.....

.....

.....

.....

.....

- (c) Explain how and why ferromagnetic materials can become strongly magnetised. **3**

.....

.....

.....

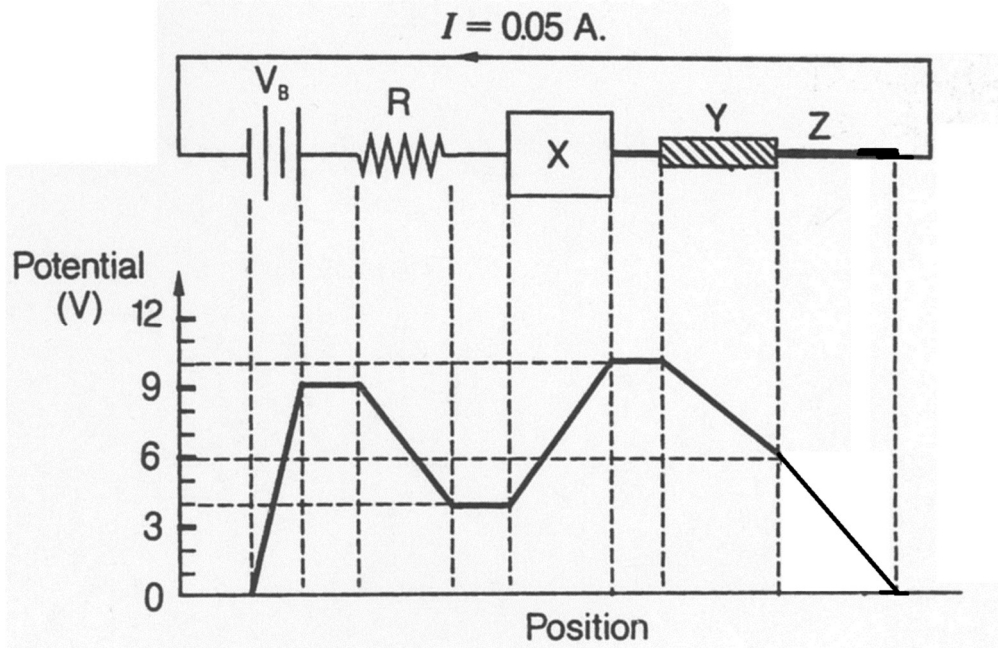
.....

.....

.....

Question 23 (11 marks)

A graph of electric potential as a function of position is shown below. It relates to the circuit in which there is a current of 0.05A.



Using the graph above, determine:

- a) The potential difference of the battery V_B . 2

.....

.....

.....

.....

- b) The value of the resistor, R . 2

.....

.....

.....

.....

- c) The identity of the device at X . Justify your answer. 1

.....

.....

.....

.....

Question 23 continues over page...

Question 23 cont'd

d) (i) The resistance of the wire Y and the resistance of the wire Z. 2

.....
.....
.....
.....

(ii) Both wires Y and Z are made of copper and are of equal length. Explain how they can have different resistances. 1

.....
.....
.....
.....

e) The ratio of $\frac{\text{length of wire Y}}{\text{length of wire Z}}$, given that Y is three times the cross-sectional area of Z. 3

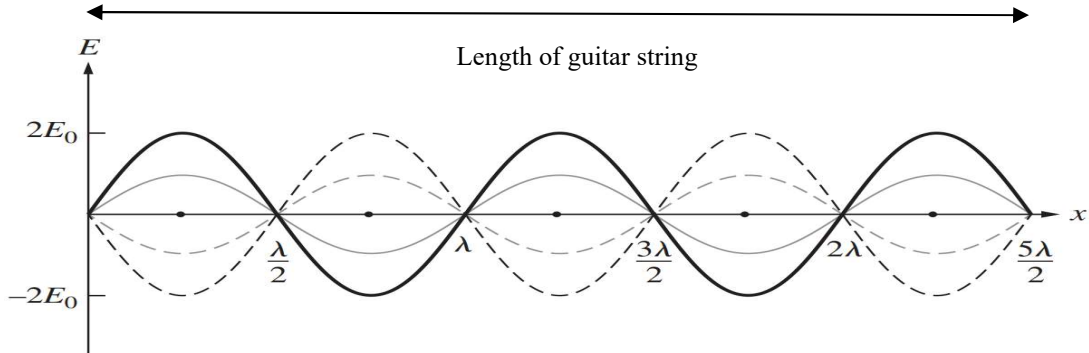
.....
.....
.....
.....



Question 24 (4 marks)

When played, musical instruments create standing waves.

- (a) A guitar is strummed to create standing waves which can be described as the first harmonic, second harmonic, 3rd harmonic and so on.



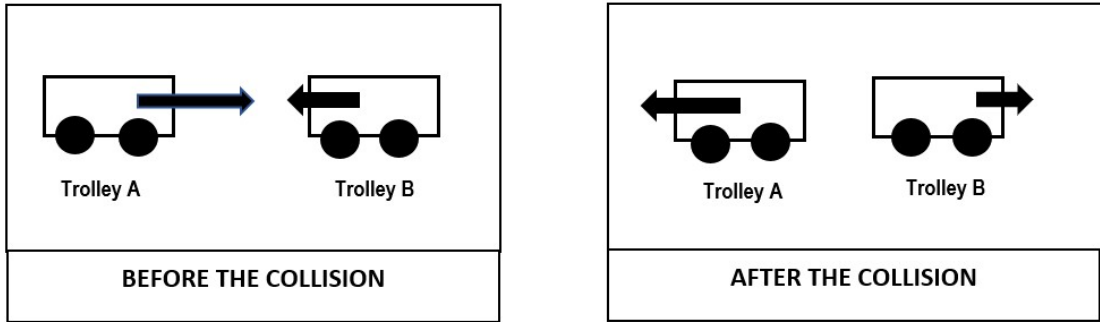
Clearly draw the waveform created for the same string that would produce the third harmonic. 2

- (b) A closed pipe sets up a third harmonic when a 512 Hz tuning fork is placed over it. 2

How long is this pipe?

Question 26 (5 marks)

The diagrams and the data table below display the results of two identical physics trolleys which have collided in a laboratory. The velocities of the trolleys are measured by students before and after they collide.



	Trolley A	Trolley B		Trolley A	Trolley B
Before Collision	$u = 20 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	$u = 10 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	After Collision	$V = 15 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	$V = 5 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$

Use the diagrams and the data table above to analyse the collision and answer the following questions.

- (a) Determine whether kinetic energy is conserved in the collision. If it is not, explain where the energy has gone. 3

.....

.....

.....

.....

.....

.....

.....

- (b) Clearly explain the difference between elastic and inelastic collisions. 2

.....

.....

.....

.....

.....

Question 28 (4 marks)

Pure ice is melted in a laboratory and the latent heat and phase changes are recorded until steam forms.

4

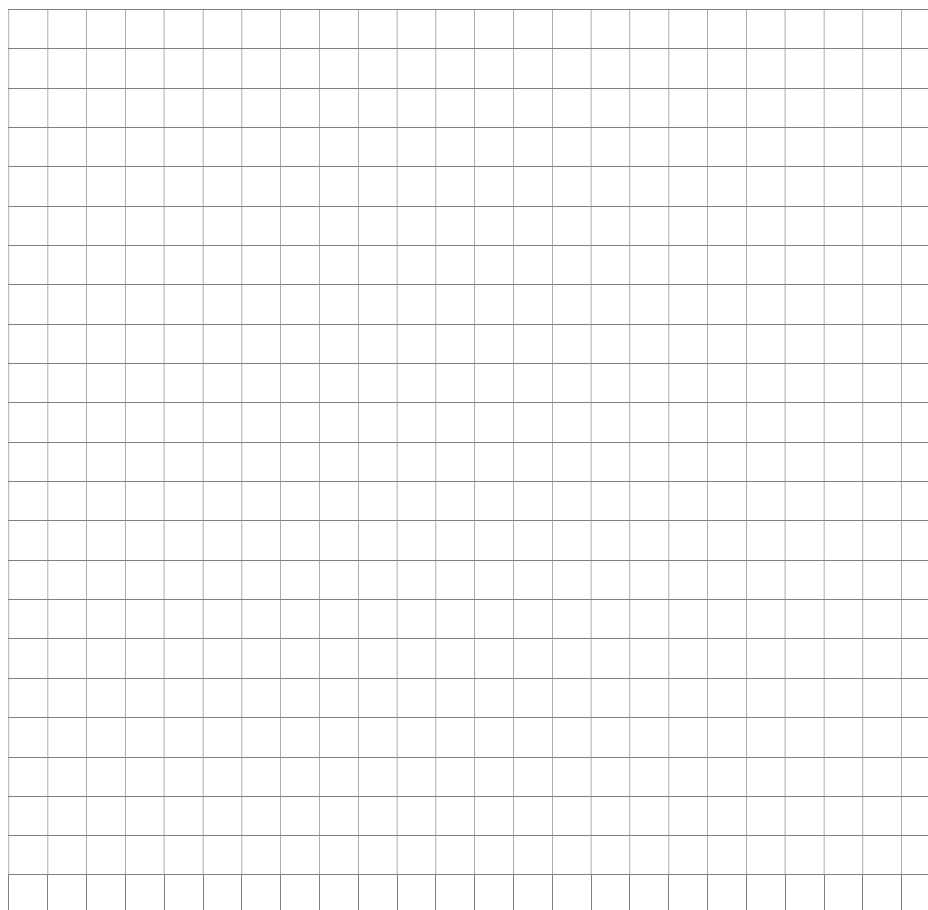
The stages of this experiment are arranged in this table.

Stage	Description of stage
A to B	Ice being heated
B to C	Phase change (melting)
C to D	Water being heated
D to E	Phase change (vaporisation)
E to F	Gas being heated

- a) Plot a graph of stages A to F, using your knowledge of latent heat and the energy required to achieve melting and vaporisation.

Latent Heat and Phase Changes

Temp



Time

Question 30 (4 marks)

Drawing diagrams allow us to investigate physics phenomena more easily.

- (a) In the space below, draw a concave mirror, clearly showing both the location of the light rays and the the focal length of the mirror. **2**



- (b) A $+2C$ electric charge is placed near a $-4C$ electric charge as modeled below. Draw their corresponding electric fields. **2**



End of paper

NAME _____

TEACHER _____

2020 Physics Year 11 Yearly Examination
Section I – Multiple Choice Answer Sheet

20 marks

Attempt Questions 1–20

Allow about 30 minutes for this section

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

- | | | | | |
|-----------|-------------------------|-------------------------|-------------------------|-------------------------|
| 1 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 2 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 3 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 4 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 5 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 6 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 7 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 8 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 9 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 10 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 11 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 12 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 13 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 14 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 15 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 16 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 17 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 18 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 19 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
| 20 | A <input type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |

Question 21 (4 marks)

On a warm day, an ambulance is moving at a speed of 30 ms^{-1} . It is emitting a siren which has a frequency of 1750 Hz . The speed of sound was measured to be 340 ms^{-1} . A diagram of this event is shown below.



- (a) What frequency would be detected by a probe positioned in Location A, in front of the ambulance? 2

equation + working - ① $f' = f \frac{(v_{\text{wave}} + v_{\text{observer}})}{(v_{\text{wave}} - v_{\text{source}})}$

correct answer - ① $f' = 1750 \times \frac{340}{340 - 30} = 1919 \text{ Hz}$

- (b) When this was repeated on a cold day, with the speed of sound measured to be 330 ms^{-1} 2
Would the pitch be higher or lower at Location A when compared to the experiment conducted on a warm day? Justify your answer.

Calculation of answer - ①

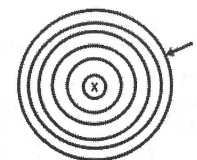
$$f' = 1750 \left(\frac{330}{330 - 30} \right) = 1925 \text{ Hz}$$

comment on increase of pitch due to increase of frequency - ①

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

Question 22 (7 marks)

Investigate the magnetic field below.



- (a) Explain how you would determine the direction of the field at point c. 2

Right hand rule
- Thumb as direction of current - ①
- Direction of field as clockwise - ①

- (b) The distance to point C from the current carrying wire is 50 mm and the current flowing through the wire is 12 A . 2

Determine the strength of the magnetic field at point C in field A.

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

working - ①

$$= \frac{12 \cdot 4\pi \times 10^{-7}}{2\pi (0.05)}$$

correct answer - ①

$$= 0.00048 \text{ T}$$

$$= 4.8 \times 10^{-5} \text{ T}$$

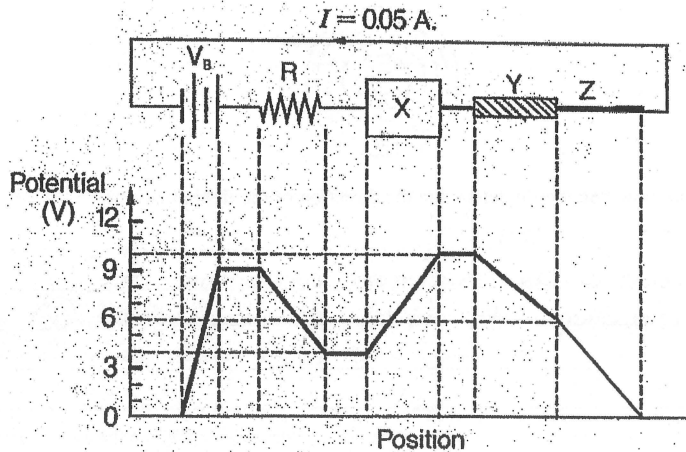
units

- (c) Explain how and why ferromagnetic materials can become strongly magnetised. 3

- ferromagnetic material (description of magnetic domains) - ①
- introduction of external magnetic field. - ①
- alignment of individual magnetic domains which no longer cancel out individual mag. field. - ①

Question 23 (11 marks)

A graph of electric potential as a function of position is shown below. It relates to the circuit in which there is a current of 0.05A.



Using the graph above, determine:

- a) The potential difference of the battery V_B . 2

Must show unit

$$V_B = \text{difference in potential between the +ve and -ve terminals}$$

$$= 9 - 0 \text{ V}$$

$$= \underline{\underline{9 \text{ V}}}$$

- b) The value of the resistor, R. 2

$$V = 9 - 4 = 5 \text{ V} \quad I = 0.05 \text{ A} \quad R = ?$$

$$R = V/I = 5 / 0.05 \text{ } \Omega$$

$$= \underline{\underline{100 \text{ } \Omega}}$$

- c) The identity of the device at X. Justify your answer. 1

X increases the potential. Could be

- a battery or a cell
- solar power source
- transformer
- power supply.

Any one of these

Question 23 continues over page...

Question 23 cont'd

- d) (i) The resistance of the wire Y and the resistance of the wire Z. 2

LP

$Y: V_Y = 4 \text{ V}$ $Z: V_Z = 6 \text{ V}$

$R_Y = V_Y / I = 4 / 0.05 \text{ } \Omega$ $R_Z = V_Z / I = 6 / 0.05$

$= 80 \text{ } \Omega$ $= 120 \text{ } \Omega$

NB: no (1) marks

Show units

Show full working

- (ii) Both wires Y and Z are made of copper and are of equal length. Explain how they can have different resistances. 1

$$R = \frac{\rho L}{A}$$

Cause of different resistances: different cross-sectional areas of wires.

Reason: other factors causing different resistance (temperature, length, type of material (ρ)) are controlled. Cross-sectional area affects flow of charge

- e) The ratio of $\frac{\text{length of wire Y}}{\text{length of wire Z}}$ given that Y is three times the cross-sectional area of Z. 3

$$R_Y = 80 \text{ } \Omega = \rho \cdot \frac{L_Y}{A_Y}$$

$$R_Z = 120 \text{ } \Omega = \rho \cdot \frac{L_Z}{A_Z}$$

$$\frac{R_Y}{R_Z} = \frac{80}{120} = \frac{L_Y/L_Z \cdot A_Z}{A_Y}$$

$$A_Y = 3 A_Z$$

$$\frac{L_Y}{L_Z} \cdot \frac{A_Z}{3 A_Z} = \frac{80}{120}$$

$$\frac{L_Y}{L_Z} = 3 \times \frac{80}{120}$$

$$L_Y : L_Z = 2 : 1$$

The ratio could also be derived as follows:

$$R = \frac{\rho L}{A}$$

Y: $R_Y = \rho \frac{L_Y}{A_Y}$

Z: $R_Z = \rho \frac{L_Z}{A_Z}$

$$L_Z = \frac{R_Z \cdot A_Z}{\rho}$$

$$= \frac{120 \cdot A_Z}{\rho}$$

$$\frac{L_Y}{L_Z} = \frac{80 \times 3 A_Z}{120 \times A_Z} \Rightarrow \frac{L_Y}{L_Z} = \frac{2}{1}$$

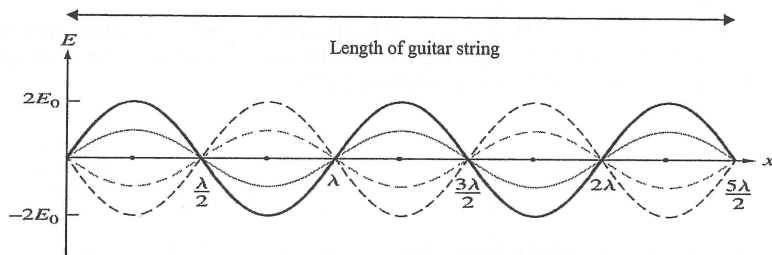
$$L_Y : L_Z = 2 : 1$$

Question 24 (4 marks)

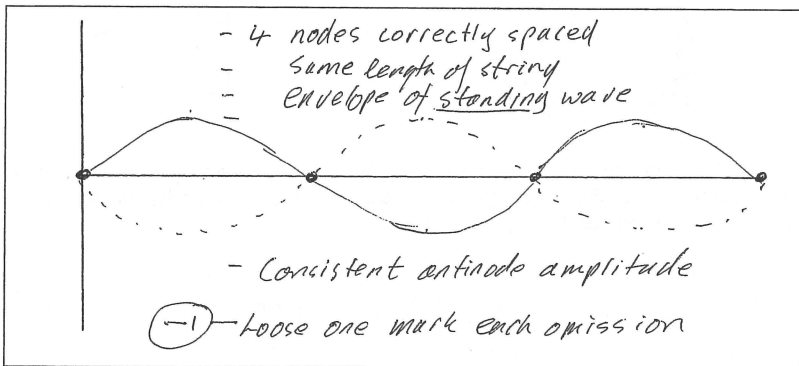
JC

When played, musical instruments create standing waves.

- (a) A guitar is strummed to create standing waves which can be described as the first harmonic, second harmonic, 3rd harmonic and so on.



Clearly draw the waveform created for the same string that would produce the third harmonic. 2

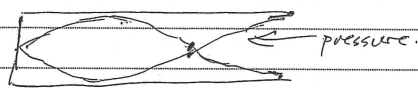


- (b) A closed pipe sets up a third harmonic when a 512 Hz tuning fork is placed over it. 2

How long is this pipe?

'Closed Pipe' is defined as one open end, one closed end as per your text book.

$\lambda = 0.6641$
 $0.8301 \frac{1}{4}$
 $0.9962 \frac{1}{2}$



$L = n \left(\frac{\lambda_n}{4} \right)$ n odd.

① - $L = \frac{3}{4} \lambda_{n3} = \frac{3}{4} \frac{v}{f}$

② - Correct sub/answer/clear working (CE possible) / lenit.

$L = \frac{3}{4} \times \left(\frac{340}{512} \right) = 0.498 \text{ m}$

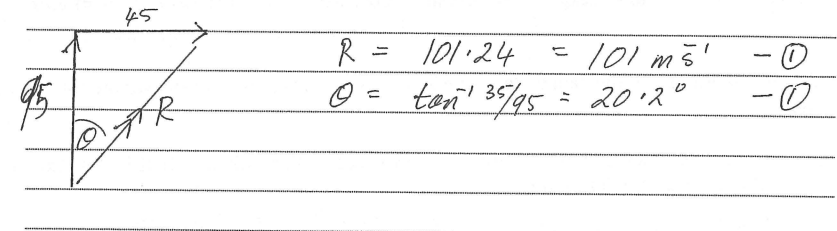
Question 25 (6 marks)

An aircraft flies with a constant velocity of 95 ms⁻¹ North.

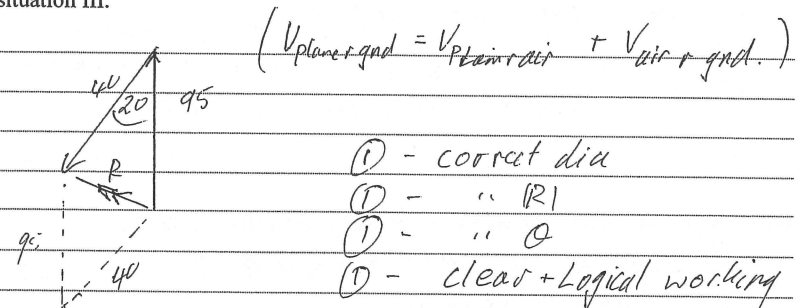
During the flight, a stationary observer on the ground records three situations which outline wind speeds and their corresponding directions as displayed below.

SITUATION I CROSS WIND 35ms ⁻¹ East 	SITUATION II HEAD WIND 55ms ⁻¹ South 	SITUATION III ANGLED CROSS WIND 40ms ⁻¹ South 20° West
--	---	---

- (a) Calculate the velocity of the airplane, relative to the ground, in Situation I. 2



- (b) Calculate the resultant velocity of the airplane with regard to the ground observer in situation III. 4

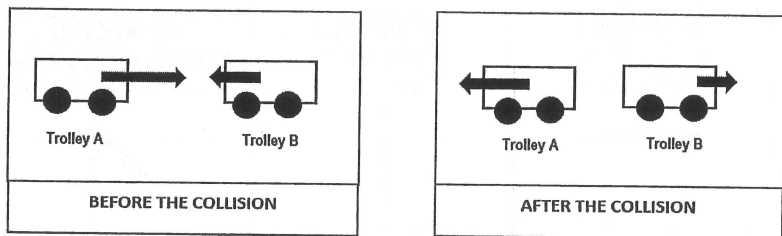


$R = \sqrt{40^2 + 95^2 - 2 \times 40 \times 95 \cos 20} = 59.0198$
 $\theta = \sin^{-1} \left(\frac{40}{59.0198} \sin 20 \right) = 13.4031^\circ$

59 m/s N 13° W or 347 T

Question 26 (5 marks)

The diagrams and the data table below display the results of two identical physics trolleys which have collided in a laboratory. The velocities of the trolleys are measured by students before and after they collide.



	Trolley A	Trolley B		Trolley A	Trolley B
Before Collision	$u = 20 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	$u = 10 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	After Collision	$V = 15 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$	$V = 5 \text{ ms}^{-1}$ $m = 1.25 \text{ kg}$

Use the diagrams and the data table above to analyse the collision and answer the following questions.

- (a) Determine whether kinetic energy is conserved in the collision. If it is not, explain where the energy has gone. 3

Determine Total KE before = $\frac{1}{2} m (20^2 + 10^2) = \frac{1}{2} m (500) (= 312.5 \text{ J})$
 " " " after = $\frac{1}{2} m (15^2 + 5^2) = \frac{1}{2} m (250) (= 156.25 \text{ J})$

- ① - Correct determination of KE before & KE after.
- ① - Not conservative BASED ON numerical comparison
- ① - Energy lost to heat/sound/deformation

- (b) Clearly explain the difference between elastic and inelastic collisions. 2

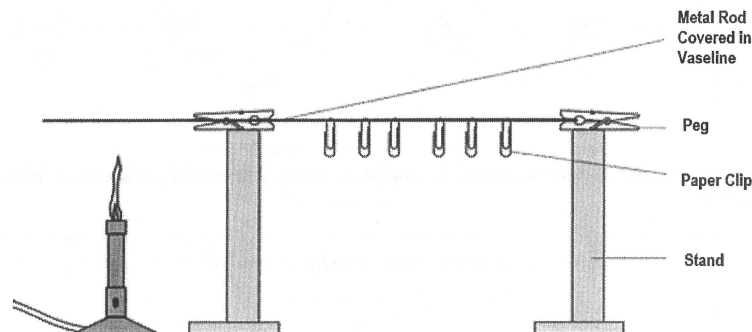
- ① - Elastic NO ΔKE before & after
- ① - KE after < KE before

Note: MOMENTUM NOT required
 * Incorrect/contradictions lose mark (including incorrect statement of momentum if included in ans.)

Question 27 (4 marks)

The experimental diagram below displays paper clips placed on a metal rod at measured intervals, held by vaseline. A bunsen burner is then applied to the rod and the time is recorded.

Once the experiment has ended, the metal rod is replaced by a glass rod and the experiment is set up again using the same paper clip and vaseline design. The time is recorded again and the results are collected for both the metal and glass rods.



Use your knowledge of thermodynamics to explain what can best be investigated in this experiment. Predict in detail what you would expect to happen and why. In your answer, compare the expected metal and glass rod results. 4

- ① What is being investigated = conduction (or similar)
- ① Prediction - paper clips drop off
- ① - metal faster than glass
- ① Why? Decent explanation (not just "thermal conductivity of metal")

Question 28 (6 marks)

RS

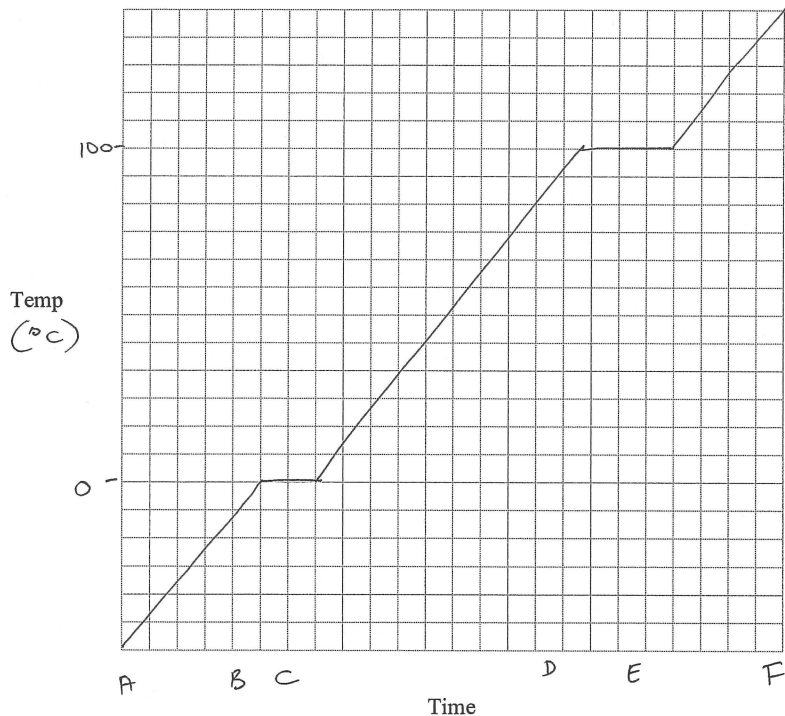
Pure ice is melted in a laboratory and the latent heat and phase changes are recorded until steam forms. 4

The stages of this experiment are arranged in this table.

Stage	Description of stage
A to B	Ice being heated
B to C	Phase change (melting)
C to D	Water being heated
D to E	Phase change (vaporisation)
E to F	Gas being heated

- a) Plot a graph of stages A to F, using your knowledge of latent heat and the energy required to achieve melting and vaporisation.

Latent Heat and Phase Changes



Must have :-
 - both axes
 - correct line
 - flats match 0°C & 100°C
 - 1 for each error
 ① for some relevant attempt

Question 28 continues over page...

Question 29 (4 marks)

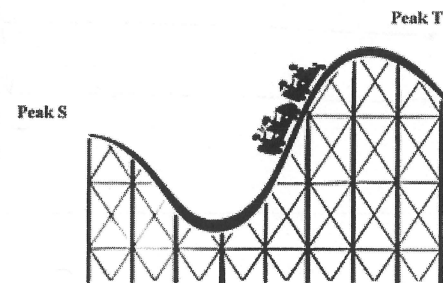
RS

Students tabulate physics data relating to a roller coaster ride at a local amusement park. The connected cars have a mass of 750 kg. 4

Energy changes occur as the connected cars travel from Peak T down towards Dip U, then up towards Peak S.

Students' Physics Data for Ride

Location on Ride	Total Height (m)	Maximum Velocity Achieved (ms ⁻¹)
Peak S	20.8	0.1 (Top of Peak S)
Dip U	10.2	10 (Start of Dip U)
Peak T	45.2	0.1 (Top of Peak T)



Using the table and diagram above, discuss the various forms of energy and how they change as the connected car travels from Peak T to Dip U, then to the top of Peak S. Support your answer with calculations.

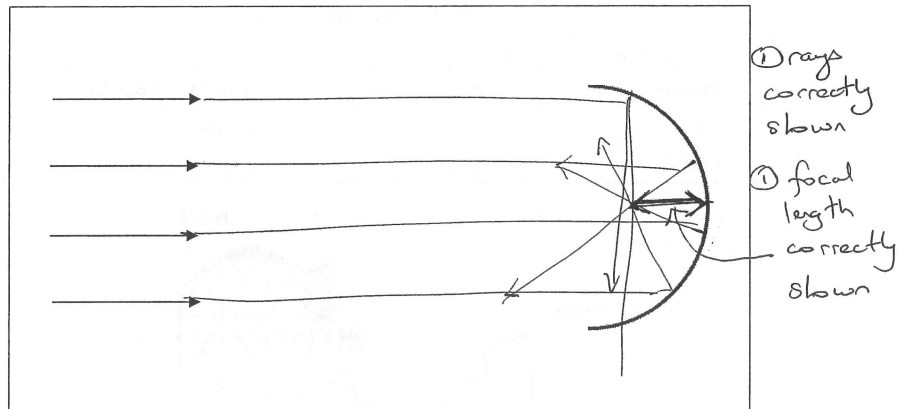
- ① $T = GPE + Ek$ calculation
 ① $U = \dots$ + GPE \rightarrow Ek concept
 ① $S = \dots$ + Ek \rightarrow GPE concept
 + some energy Δ to other forms due to total E
 ① at S being $<$ at T.

Question 30 (4 marks)

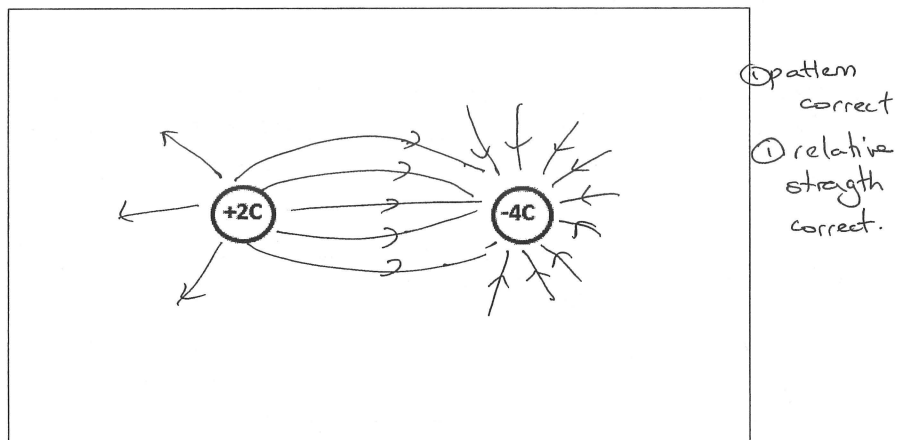
RB

Drawing diagrams allow us to investigate physics phenomena more easily.

- (a) In the space below, draw a concave mirror, clearly showing both the location of the light rays and the the focal length of the mirror. 2



- (b) A $+2C$ electric charge is placed near a $-4C$ electric charge as modeled below. Draw their corresponding electric fields. 2



End of paper