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PHYSICS

PAPER 1 3117/1

Thursday **30 MAY 2019** 12:00 NOON–1:15 P.M.

Additional materials:
None

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INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

All answers are to be recorded in this booklet.

Calculators may be used.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer as many questions as you can. For each question, four possible answers, A, B, C and D are given.

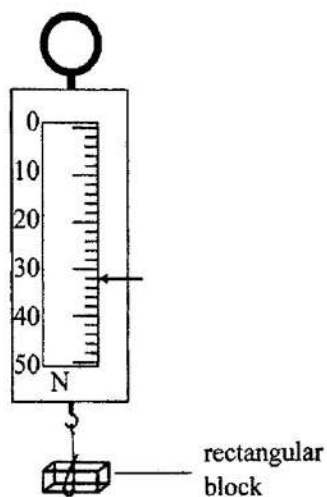
Circle the letter by the response which you consider to be correct.

Rough work paper should not be handed in.



This question paper consists of 26 printed pages and 2 blank pages.

1. The diagram shows a spring balance.

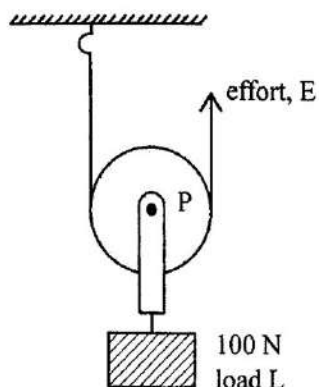


What is the reading on the balance?

- A. 28 N
 - B. 29 N
 - C. 31 N
 - D. 32 N
2. Which pair of quantities have the same unit?
- A. acceleration and velocity
 - B. energy and work done
 - C. mass and force
 - D. moment and momentum



3. The diagram shows a pulley system used on a construction site.



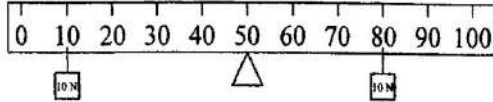
What effort is exerted by the construction worker assuming the pulley is weightless and there is zero friction?

- A. 25 N
 - B. 50 N
 - C. 100 N
 - D. 120 N
4. When only the pitch of a musical note is increased, which property of the sound wave has decreased?
- A. amplitude
 - B. frequency
 - C. speed
 - D. wavelength
5. An astronaut brought a rock from the Moon back to Earth. The gravitational field strength on the earth is 10 N/kg and the gravitational field strength on the moon is 1.6 N/kg.
- Which property of the rock would have changed?
- A. mass
 - B. weight
 - C. density
 - D. volume

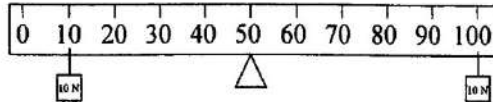


6. The diagram shows a metre ruler which was originally balanced at the 50 cm mark. Identical weights were then placed on either side of the pivot. In which diagram will the ruler balance?

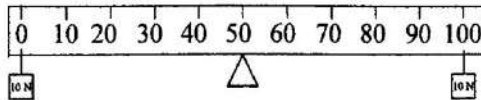
A



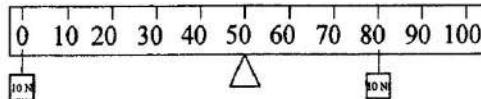
B



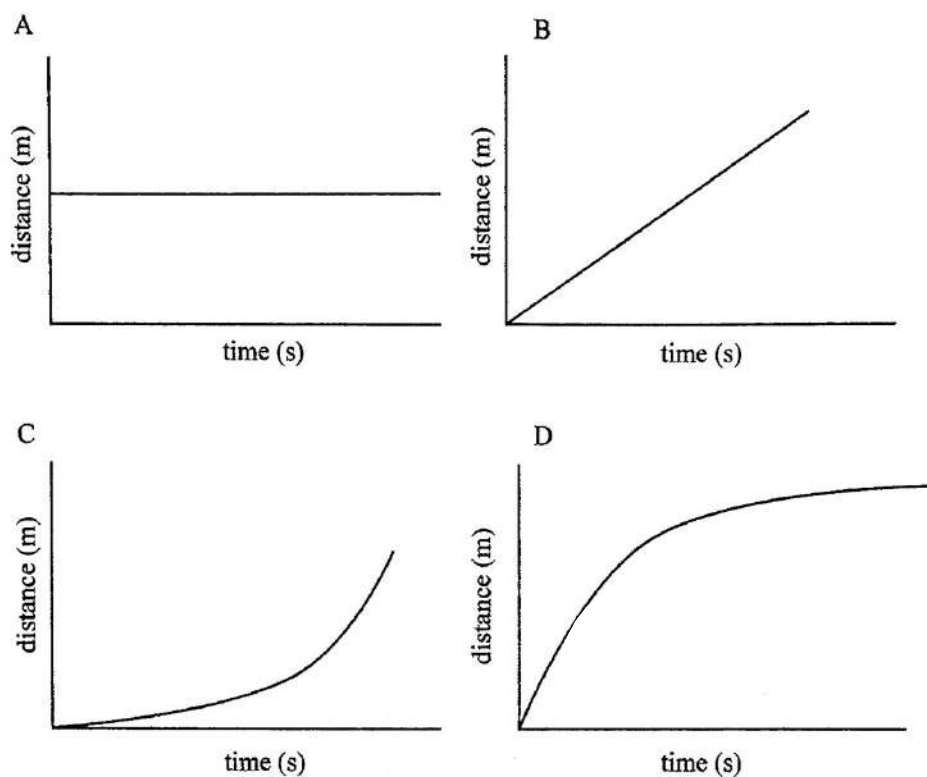
C



D



7. Which distance-time graph shows an object **moving** at constant speed?



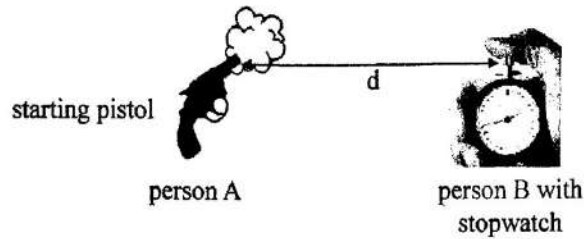
8. The volume of a fixed mass of gas is decreased, at constant temperature. What happens to the molecules of the gas?

- A. they gain kinetic energy
- B. their momentum increases
- C. they hit the sides of the container more often
- D. they move slower.

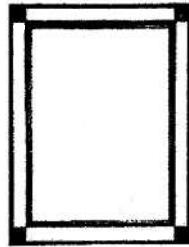


9. Person B watches as Person A fires a starter pistol. Person B hears the sound 2.5 seconds later. Calculate the distance, d , between Person A and Person B?

Sound travels at 340 m/s in air.



- A. 1700 m
B. 136 m
C. 342.5 m
D. 850 m
10. Which of the following is true about the image formed in a plane mirror?

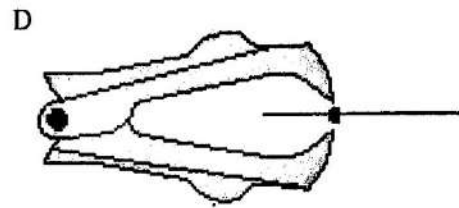
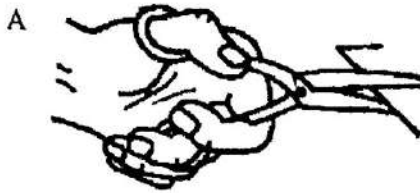


The image is

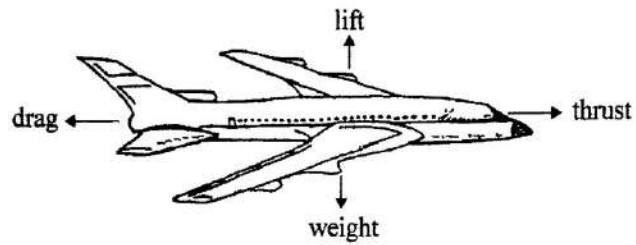
- A. inverted
B. real
C. smaller than the object
D. same distance behind mirror as object is in front of mirror



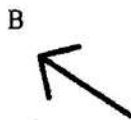
11. Which of the following diagrams is a second class lever?



12. Whilst flying horizontally at a constant speed, the pilot increases the lift and drag of the aircraft, by the same amount.



In which direction could the resultant force act on the aircraft?



13. The table below shows some common physical quantities and their units.

	Physical Quantity	Unit
A.	energy	N/m^2
B.	force	kg m/s^2
C.	momentum	$\text{kg m}^2/\text{s}^2$
D.	moment	kg m

Which physical quantity in the table is correctly matched with the units used for its measurement?

14. The motor shown has a power output of 60 W. It is used to lift a 10 N object vertically.

motor (direction of
rotation CCW)



What is the greatest height this motor could raise the load in one second?

- A. 1.0 m
 - B. 1.5 m
 - C. 3.0 m
 - D. 6.0 m
15. The cooling fins of a refrigerator are painted black.

Which method of heat transfer does this improve?

- A. conduction
- B. convection
- C. radiation
- D. all of the above



16. When pollen grains suspended in a liquid are observed under a microscope they are seen to be in continuous random motion. This is due to
- A. convection currents in the liquid
 - B. small air bubbles in the liquid
 - C. the acceleration of free fall
 - D. the molecules of the liquid colliding with the pollen grains

17. Which combination of colours may produce white light?

- A. blue, green and yellow
- B. blue, green and red
- C. blue, yellow and red
- D. green, red and yellow

18. When cooking rice, how does increased altitude and adding salt affect the boiling point of water?

	Addition of salt	Increased Altitude
A.	increase	increase
B.	decrease	decrease
C.	increase	decrease
D.	decrease	increase

19. What happens when water is heated from 0°C to 4°C ?

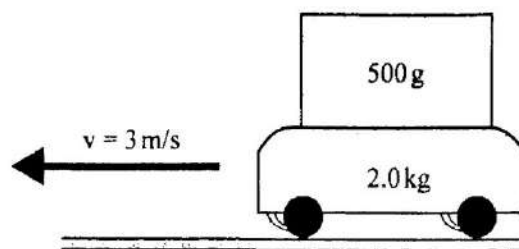
- A. density remains the same
- B. density decreases
- C. volume increases
- D. volume decreases

20. Which three radiations of the electromagnetic spectrum are commonly used for communications?

- A. gamma rays, x-rays and radio waves
- B. infrared, x-rays and radio waves
- C. infrared, ultraviolet and radio waves
- D. microwaves, radio waves and visible light



21. A trolley of mass 2.0 kg is loaded with sand of mass 500 g . The trolley moves at a constant speed of 3 m/s .



What is the momentum of the loaded trolley?

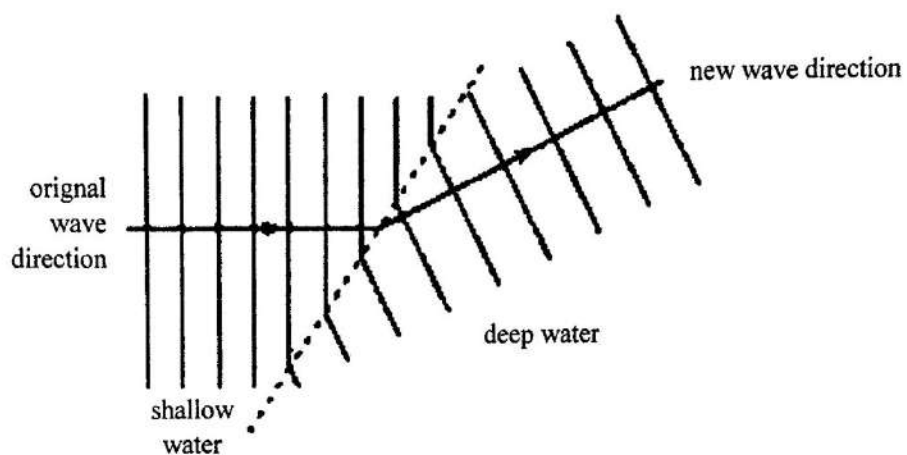
- A. 6.0 kg m/s
 - B. 7.5 kg m/s
 - C. 1500 kg m/s
 - D. 7500 kg m/s
22. Spherical mirrors have several applications in everyday life.

Which of the following correctly lists uses of concave mirrors?

	Use 1	Use 2	Use 3
A.	shaving mirrors	solar cookers	vehicle headlamps
B.	rearview mirror	shaving mirrors	supermarket surveillance
C.	street light reflectors	rearview mirrors	solar cookers
D.	supermarket surveillance	streetlight reflectors	vehicle headlamps



23. The diagram below shows the change in direction of water waves as they move from shallow to deep water.

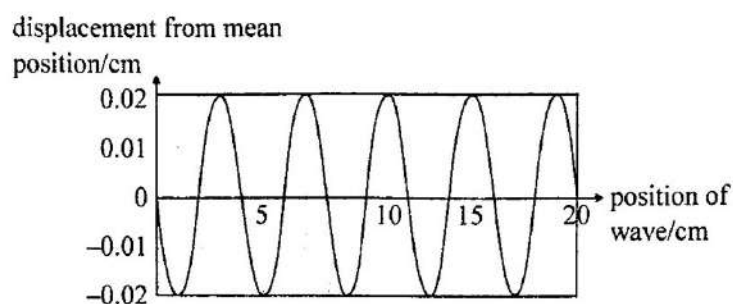


Which row correctly describes what happens when the waves enter deeper water?

	Name of Effect	Speed	Frequency
A.	reflection	remains same	increases
B.	reflection	increases	remains same
C.	refraction	remains same	increases
D.	refraction	increases	remains same



24. The diagram shows a transverse wave moving from right to left.



What is the amplitude and wavelength of the wave?

	Amplitude (mm)	Wavelength (cm)
A.	0.01	4
B.	0.02	4
C.	0.01	5
D.	0.04	5

25. Which of the following materials is magnetically hard?

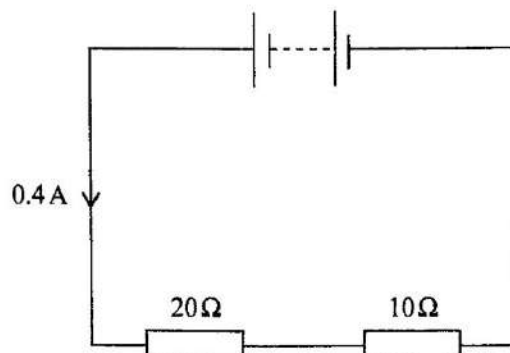
- A. Copper
- B. Iron
- C. Lead
- D. Steel

26. Which of the following can only be a longitudinal wave?

- A. can be reflected, refracted and diffracted
- B. transmits energy parallel to the direction of wave oscillation
- C. travels in a vacuum
- D. travels at the speed of light



27. The diagram below shows a series circuit.

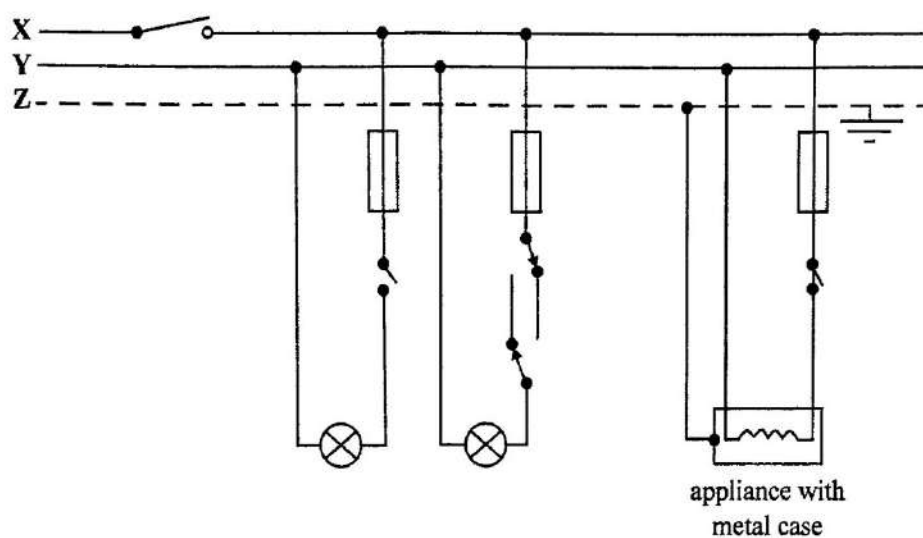


What is the power supplied to the circuit when a current of 0.4 A flows through the 10Ω and 20Ω resistors?

- A. 30 W
- B. 12 W
- C. 10 W
- D. 4.8 W



28. The figure below shows a simple schematic diagram of a house circuit.

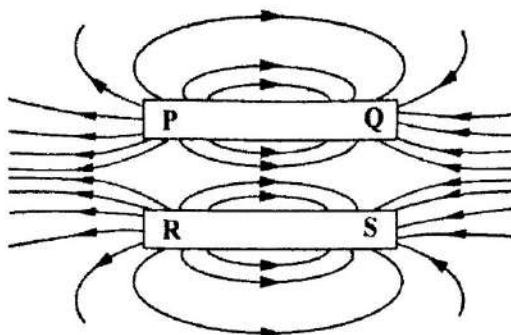


What are the names of the **letters X, Y and Z**?

	X	Y	Z
A.	earth	live	neutral
B.	live	neutral	earth
C.	neutral	earth	live
D.	live	earth	neutral



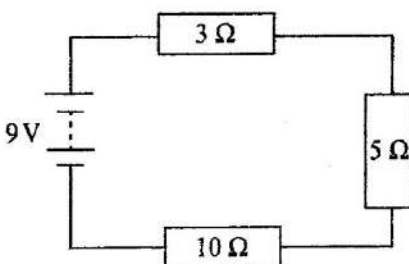
29. The figure below shows the magnetic field lines around two bar magnets in close proximity to each other.



Name the poles labelled P, Q, R and S.

	P	Q	R	S
A.	north	north	south	south
B.	north	south	north	south
C.	south	north	south	north
D.	south	south	south	south

30. The series circuit shown below has a supply voltage of 9V and three resistors of resistance 3Ω , 5Ω and 10Ω respectively.

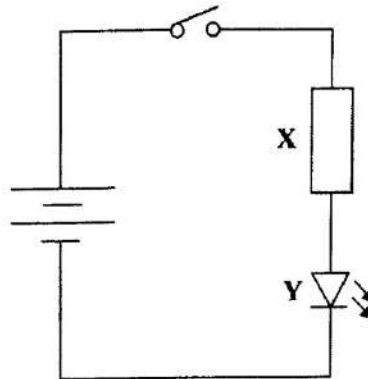


Calculate the current flowing in the circuit?

- A. 0.5A
 B. 0.9A
 C. 1.8A
 D. 3.0A



31. A simple circuit is shown below.



Name the circuit components labelled X and Y.

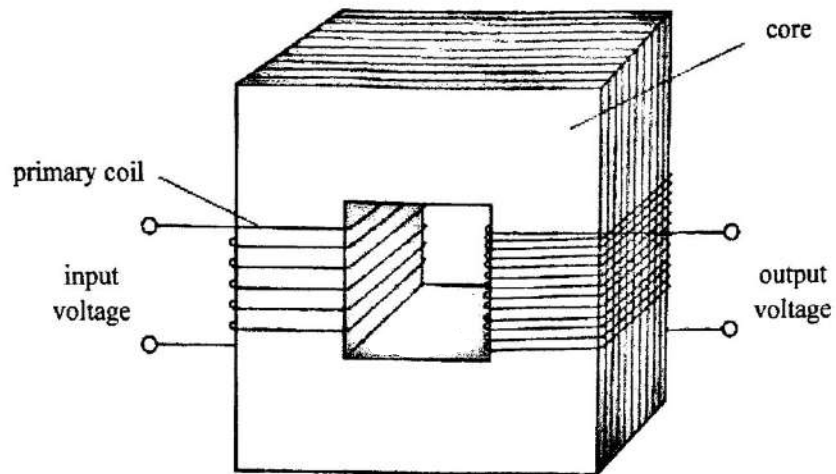
	X	Y
A.	fixed resistor	light emitting diode
B.	variable resistor	light emitting diode
C.	fixed resistor	light dependent resistor
D.	variable resistor	light dependent resistor

32. Thermistors are useful non-ohmic resistors, whose resistance depend on its temperature. In which of the following devices is a thermistor used?

- A. Automatic security lighting
- B. Burglar alarm circuits
- C. Digital cameras to control shutter speeds
- D. Fire alarm circuits



33. The diagram below shows a simple step up transformer.

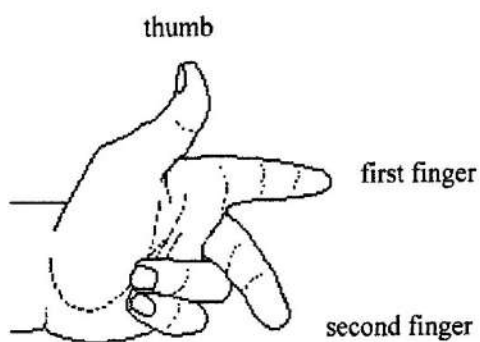


Given that the transformer is **ideal**, which row correctly shows its **output** voltage and current in relation to its input?

	Current	Voltage
A.	decreases	remains same
B.	decreases	increases
C.	increases	increases
D.	increases	decreases



34. Fleming's Left Hand Rule is used when applying the motor effect.



What does each of the labelled fingers shown above represent?

	Thumb	First Finger	Second Finger
A.	current	motion of wire	magnetic field
B.	current	magnetic field	motion of wire
C.	magnetic field	current	motion of wire
D.	motion of wire	magnetic field	current

35. Energy efficient LED lamps are increasingly being used globally.



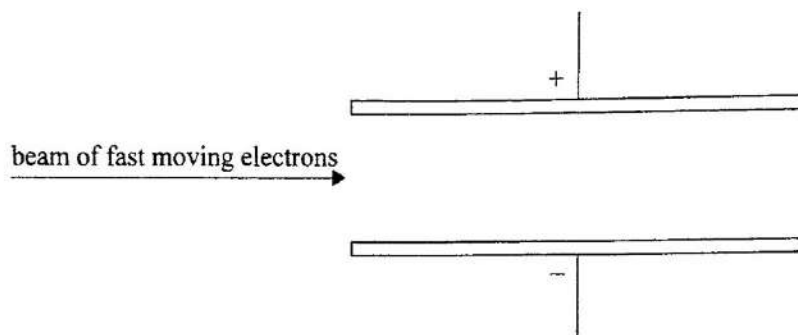
Calculate the cost of using a 0.015 kW LED lamp for 8 hours daily for 5 days, if one kWh costs \$0.10.

- A. \$0.06
- B. \$0.08
- C. \$0.12
- D. \$0.60



36. A beam of fast moving electrons passes through an electric field between oppositely charged parallel plates.

In which direction is the beam deflected?



- A. Into the page
 - B. Out of the page
 - C. Towards the negative plate
 - D. Towards the positive plate
37. Michelle uses a hair dryer of power rating 1400 W to dry her wet hair.

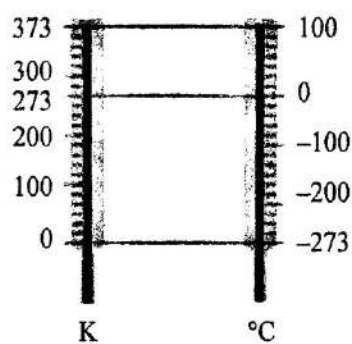


The dryer operates using the mains supply voltage of 120 V. Which rating of the fuse should be used?

- A. 3 A
- B. 5 A
- C. 7 A
- D. 13 A



38. The diagram shows temperature scales in °C and K.

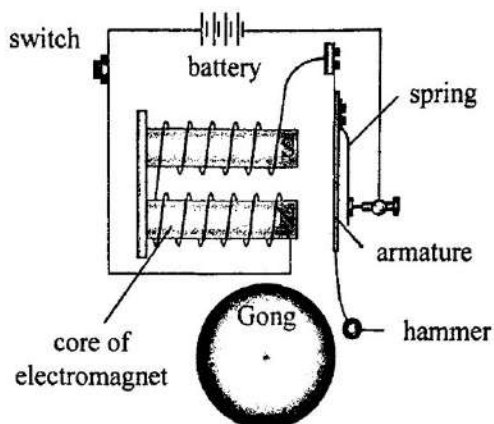


What temperature is 150 above absolute zero in °C and K?

	Temp (°C)	Temp (K)
A.	-123	150
B.	150	-123
C.	150	-423
D.	-423	150



39. The figure below shows the simplified circuit diagram of an electric bell. When the switch is closed, the circuit is complete and current flows.



Which row in the table correctly shows suitable materials used to make the core of the electromagnet and armature?

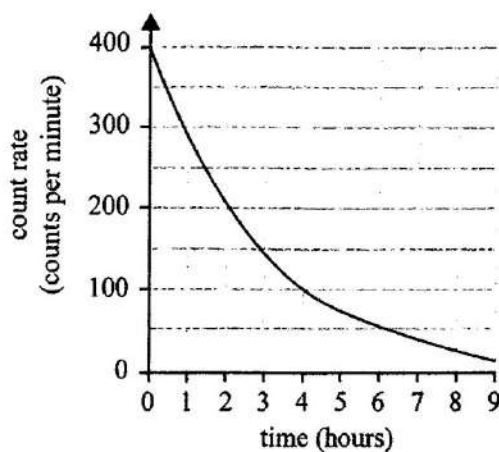
	Core of Electromagnet	Armature
A.	iron	plastic
B.	iron	iron
C.	steel	plastic
D.	steel	copper

40. Which of these waves has the shortest wavelength?

- A. infra-red
- B. radio
- C. ultra-violet
- D. x-rays

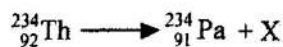


41. The graph below shows how the count rate of a certain radioactive isotope changes with time, as it decays.



What is the half-life of this radioactive isotope?

- A. 1 hour
 - B. 2 hours
 - C. 4 hours
 - D. 6 hours
42. The half-life of radioactive cobalt-56 is approximately 77 days. A sample contains 10 grams of cobalt-56. What will be the mass of cobalt-56 in the sample, after 154 days?
- A. 2.5 grams
 - B. 5.0 grams
 - C. 14 grams
 - D. 46 grams
43. Th-234 decays into Pa-234 as shown in the equation below.



What is the nature of X?

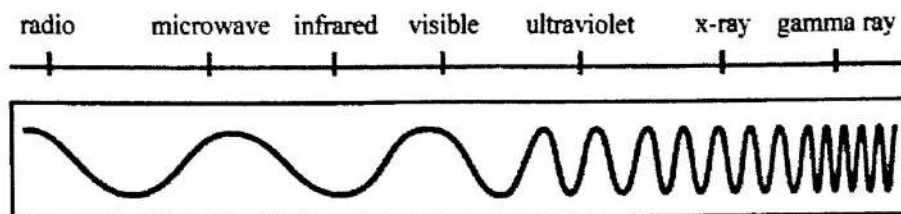
- A. a neutron
- B. an alpha particle
- C. a beta particle
- D. a gamma ray



44. Which of the following lists the types of radiation in the correct order of increasing penetrative ability?
- A. alpha, gamma, beta
 - B. beta, alpha, gamma
 - C. alpha, beta, gamma
 - D. gamma, beta, alpha
45. A polyethene rod acquired a negative charge after rubbing it with dry cloth. How did the rod acquire this negative charge?
- A. it gained electrons.
 - B. it lost electrons.
 - C. it gained protons.
 - D. it lost protons.
46. Which of the following can convert sound energy into electrical energy?
- A. battery
 - B. microphone
 - C. motor
 - D. speaker
47. Which physical quantity is a scalar quantity?
- A time
 - B weight
 - C momentum
 - D acceleration



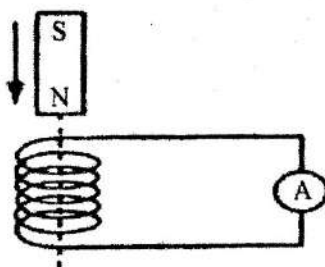
48. The diagram below is a representation of the electromagnetic spectrum.



Which row in the table below correctly depicts electromagnetic waves that are commonly used for cooking?

	EM waves used for cooking
A.	ultraviolet, microwaves
B.	gamma rays, infra-red
C.	infra-red, microwaves
D.	infra-red, ultraviolet

49. When a magnet is moved through a solenoid as shown in the diagram, voltage is induced. If the circuit is complete, current is also induced.



What change would **not** increase the size of the induced current?

- A. holding the magnet stationary in the solenoid
- B. increasing the number of coils in the solenoid
- C. moving the magnet faster
- D. using a stronger magnet



50. Which of the following properties of a radioactive isotope makes it suitable for use as a radioactive tracer in the human body?

	Half-life	Radiation emitted
A.	12 hours	alpha
B.	12 hours	beta
C.	2 years	alpha
D.	2 years	beta



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PHYSICS

PAPER 2 3117/2

Thursday **30 MAY 2019** 1:30 P.M.–3:00 P.M.

Additional materials:

None

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Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** questions in this paper in the spaces provided.

Calculators may be used on this paper.

Read each question carefully and make sure you know what you have been asked to do before starting your answer.

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part-question is given in brackets [].



This question paper consists of 15 printed pages and 1 blank page.

1. This question is about common physical quantities and their units.

- (a) Using the list of units provided, write a possible unit for each of the following physical quantities. A unit may be used once or not at all.

kg/m^3	N m/s	kg
kg m/s^2	m	m/s^2
kg m/s	Nm	m/s

Write down units for

- | | | |
|--------|--------------|-----------|
| (i) | velocity | _____ |
| (ii) | power | _____ |
| (iii) | momentum | _____ |
| (iv) | mass | _____ |
| (v) | acceleration | _____ |
| (vi) | amplitude | _____ |
| (vii) | density | _____ |
| (viii) | weight | _____ [8] |

- (b) Calculate the acceleration a car travelling at a velocity of 20 m/s and comes to a stop in 2.5 s.

[2]

TOTAL MARKS [10]



2.

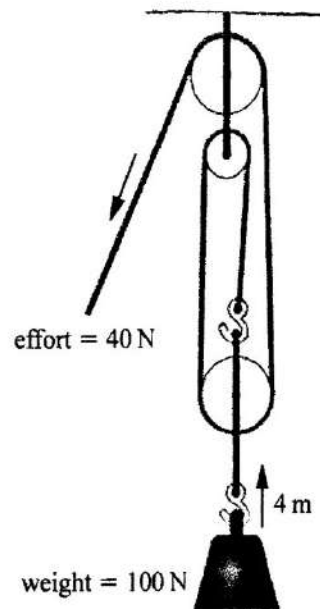


Fig. 2.1

An object of weight 100 N is being lifted using a simple machine.

- (a) Give the name of this simple machine.

_____ [1]

- (b) Calculate the mass of the object using $g = 9.8 \text{ m/s}^2$.

[2]

- (c) What is the gain in gravitational potential energy of the object if it is lifted 4 m?

[2]

- (d) State the velocity ratio of the machine.

_____ [1]



- (e) Calculate the distance moved by the effort.

[1]

- (f) Calculate the mechanical advantage of the machine.

[1]

- (g) Using your answers from (c) and (e) calculate the efficiency of the machine.

[2]

TOTAL MARKS [10]



3. This question is on electromagnetism.

Fig. 3.1 shows a simple electromagnetic relay.

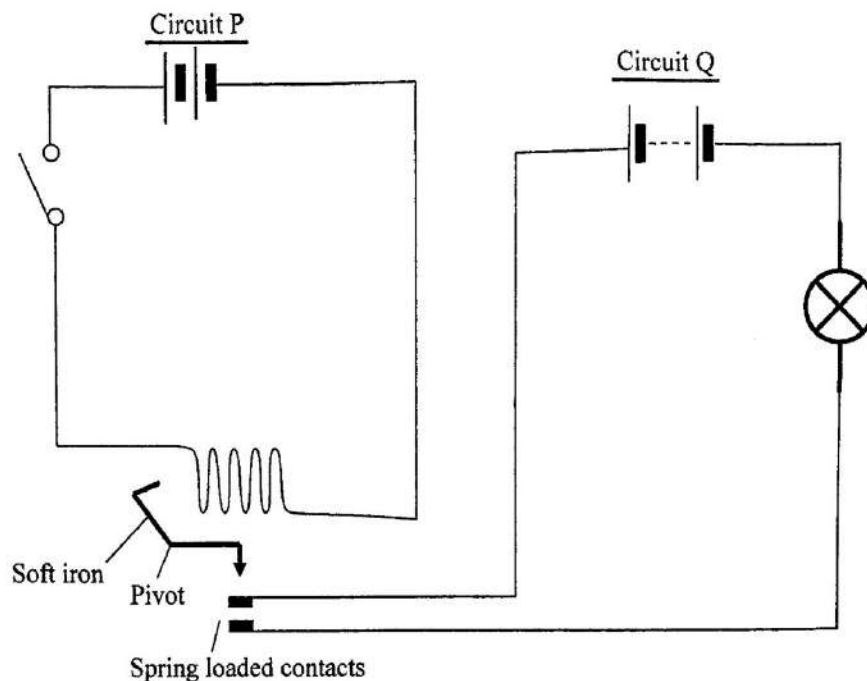


Fig. 3.1

- (a) On Fig 3.1 indicate
- (i) the direction of conventional current on circuit P, [1]
 - (ii) the magnetic field pattern around the solenoid, the current is flowing counter clockwise when viewed from left end of the solenoid, [2]
 - (iii) the polarity of the solenoid. [1]
- (b) State **TWO** factors that would increase the strength of the electromagnet shown in circuit P.

[2]



- (c) (i) What should happen to **Circuit Q** when the switch in **Circuit P** is closed? _____ [1]
- (ii) Why does this occur?

_____ [2]
- (iii) Give **one** use of this electromagnet relay.
_____ [1]

TOTAL MARKS [10]



4. (a) The table below shows some information about the electromagnetic spectrum.

low frequency		→ high frequency				
radio waves	A	infra-red	visible light	B	X-rays	gamma rays

- (i) Name the radiation at A.
 _____ [1]
- (ii) Name the radiation at B.
 _____ [1]
- (iii) State **one** use of X-rays.
 _____ [1]
- (iv) State **one** harmful effect of X-rays on living organisms.
 _____ [1]
- (b) State **two** properties that all electromagnetic waves have in common.

 _____ [2]
- (c) The diagram shows wave fronts in water waves approaching a barrier. The wavelength of the waves is 2.0 cm. The barrier has a gap that is 1.8 cm wide. Complete the diagram to show the diffracted wave fronts after passing through the gap. draw four wave fronts. [2]

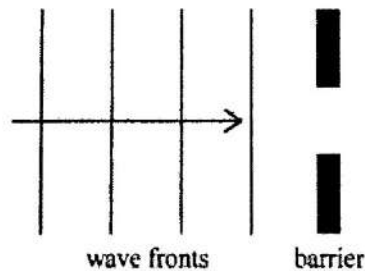


Fig. 4.1



- (d) Draw four water wave fronts of wavelength 1.2 cm after it has passed through the gap in part (c). [1]

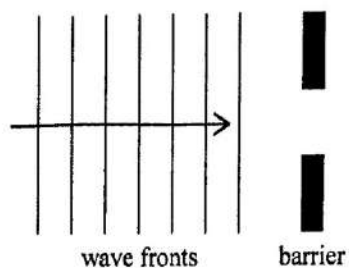


Fig. 4.2

- (e) Give one conclusion that can be drawn from your observations in parts (c) and (d)

[1]

TOTAL MARKS [10]



5. This question is about Hooke's Law.

- (a) Fig. 5.1 shows a spiral spring whose unstretched length is 0.1 m.

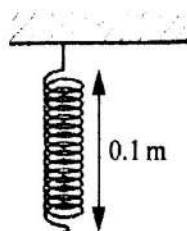


Fig. 5.1

A student then hangs objects of different masses from the spiral spring. Fig. 5. 2 shows the spring when a 1.5 N weight and an unknown weight, W , are respectively hung from it.

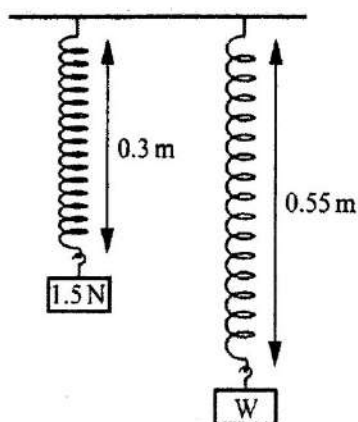


Fig. 5.2

- (i) By how much is the spring extended when the 1.5 N weight was hung from it?

_____ [1]

- (ii) Calculate the weight required per metre of extension.

[2]



- (iii) Calculate the weight which caused the spring's length to be 0.55 m.

[3]

- (b) In a further experiment, the student applied similar weights to two different spiral springs.

Fig. 5.3 is a force-extension comparative graph of the results obtained when the two springs were stretched.

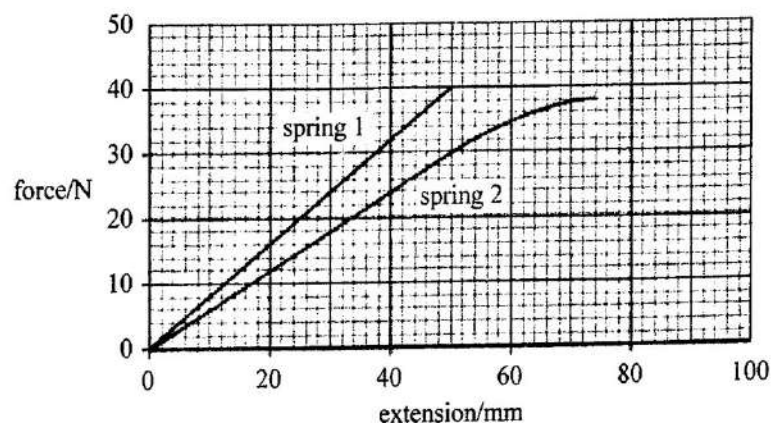


Fig. 5.3

- (i) Use the graphs to calculate the difference in extensions of the two springs when a load of 30 N is applied to each spring.

_____ [1]

- (ii) Which spring is easier to extend?

_____ [1]

- (iii) Which spring has a higher force per metre of extension?

_____ [1]

- (iv) In which spring is the elastic limit exceeded?

_____ [1]



TOTAL MARKS [10]

6. This question is about forces, weight and mass.

Fig. 6.1 is a graph which shows how weight changes with mass on two planets X and Y.

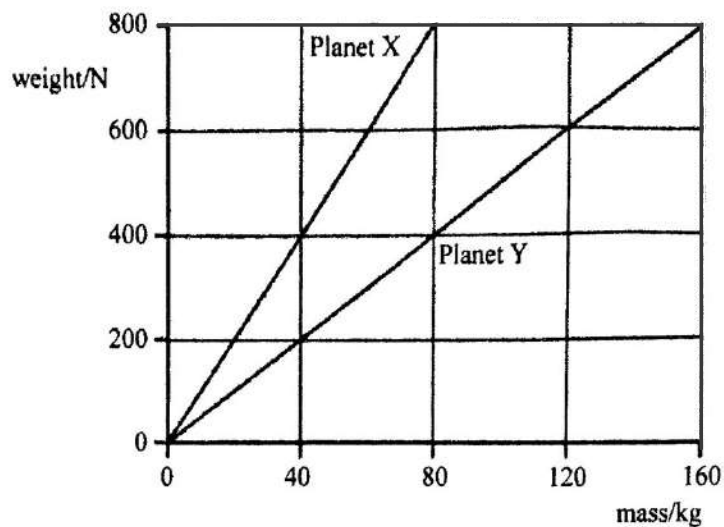


Fig. 6.1

- (a) (i) Find the gradient of the line for the graph plotted for planet X.

[2]

- (ii) What does this value represent?

[1]

- (iii) Name planet X, found in our solar system.

[1]

- (iv) An object, P which weighs 800 N on planet X, is taken to planet Y.

Determine the mass of object P on planet X and planet Y.

[2]



- (v) Give **one** reason for answers in (a) (iv).

_____ [1]

- (b) (i) An object of mass 100 grams travels with a uniform acceleration of 2.0 m/s^2 .
Calculate the net force acting on the object.

[2]

- (ii) The formula that was used to answer (b) (i), came from what law?

_____ [1]

TOTAL MARKS [10]



7. This question is about sound waves.

Sound waves emitted by whales can be used for hunting, navigation and communication. The frequency of these sound waves is within the hearing range of humans.

Fig. 7.1 shows such a wave emitted by a whale and reflected upon reaching its prey. It takes 1.2 seconds for the reflected sound (called an echo) to be received by the whale.

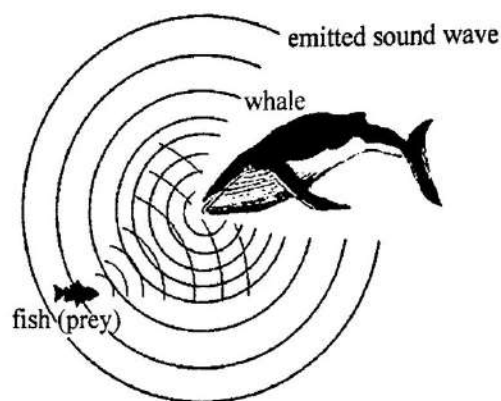


Fig. 7.1

- (a) State **ONE** property that remains the same and **ONE** property that changes after reflection of the sound wave.

Property that remains the same _____ [1]

Property that changes _____ [1]

- (b) State a possible frequency for the sound wave emitted by the whale.

Frequency _____ [1]

- (c) Bats can emit sound waves of frequencies above the hearing range of humans.

Give the name of this type of sound.

Name _____ [1]



(d) Given that the speed of sound waves in the ocean is 1500 m/s.

(i) how far away is the whale from the fish?

[3]

(ii) what is the total distance travelled by the sound wave in producing the echo.

[1]

(e) State **ONE** medical use and **ONE** industrial use of the phenomenon of reflection of sound waves.

Medical Use _____

[1]

Industrial Use _____

[1]

TOTAL MARKS [10]



8. (a) $^{238}_{92}\text{U}$, a radioactive isotope of uranium, decays by α -particle emission and has a half-life of 4.5×10^9 years. It decays into a radioactive isotope of thorium (Th). Thorium itself is radioactive, decaying by β -particle emission to protactinium (Pa), and has a half-life of 24 days.

(i) Define the term half-life.

_____ [2]

(ii) Given 100 grams of the two isotopes, which one will have the larger mass after 2 years.

Explain your answer.

_____ [2]

(b) Give one property of an alpha (α)- and one property of a beta (β)-particle.

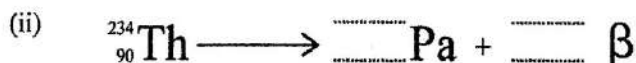
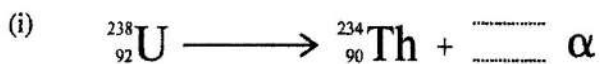
α - _____

β - _____ [2]

(c) Give one use of β -particles.

_____ [1]

(f) Copy and complete the radioactive decay equations below for uranium decaying to thorium and thorium decaying to protactinium.



[3]

TOTAL MARKS [10]



3117/3

BGCSE

School Number	Candidate Number
Surname and Initials	

PHYSICS

PAPER 3 3117/3

Thursday **6 JUNE 2019** 12:30 P.M.–2:00 P.M.

Additional materials:
Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials at the top of this page as well as at the top of all lined paper submitted.

Answer **ALL** the questions in **Section A** in the spaces provided on this question booklet.

Answer **TWO** questions from **Section B** on the lined paper/graph paper provided at the back of this question booklet.

Calculators may be used in this paper.

Show **ALL** working when answering numerical questions.

Answers to numerical problems should be given to a suitable number of significant figures/decimal places.

The intended marks for each question or part question are given in brackets [].



This question paper consists of 16 printed pages and 4 lined pages.

LIST OF FORMULAE

weight = mass $\times$ gravitational field strength

force = mass $\times$ acceleration

pressure = $\frac{\text{normal force}}{\text{area}}$

pressure due to a liquid = depth $\times$ gravity $\times$ density

average speed = $\frac{\text{distance travelled}}{\text{time taken}}$

average velocity = $\frac{\text{distance travelled in a given direction}}{\text{time taken}}$

acceleration = $\frac{\text{change in velocity}}{\text{time}}$

density = $\frac{\text{mass}}{\text{volume}}$

combined gas laws equation

Charles' law equation

kinetic energy = $\frac{1}{2}$ mass $\times$ velocity²

change in gravitational potential energy =
weight $\times$ change in height

power = $\frac{\text{energy}}{\text{time}}$

efficiency = $\frac{\text{work output}}{\text{work input}}$

efficiency = $\frac{\text{power output}}{\text{power input}}$

wave speed = frequency $\times$ wavelength

energy = mass $\times$ specific heat capacity $\times$ temperature change

capacitance = $\frac{\text{charge}}{\text{potential difference}}$

charge = current $\times$ time

potential difference = $\frac{\text{work done}}{\text{charge moved}}$

resistance = $\frac{\text{potential difference}}{\text{current}}$

total resistance in series, R_T

total resistance in parallel, R_T

power = potential difference $\times$ current

$\frac{\text{voltage across primary coil}}{\text{number of turns on primary coil}}$
= $\frac{\text{voltage across secondary coil}}{\text{number of turns on secondary coil}}$

refractive index of a medium, n

magnification, $m = \frac{\text{image distance}}{\text{object distance}}$

559130

$w = mg$

$F = ma$

$p = \frac{F}{A}$

$p = \rho gh$

$s = \frac{d}{t}$

$v = \frac{d}{t}$

$a = \frac{v - u}{t}$

$D = \frac{m}{v}$

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

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

$PE = wh$

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

$v = f\lambda$

$W = mc\Delta\theta$

$C = \frac{Q}{V}$

$Q = It$

$V = \frac{W}{Q}$

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

$R_T = R_1 + R_2$

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$

$P = VI$

$\frac{V_P}{n_P} = \frac{V_S}{n_S}$

$n = \frac{\sin i}{\sin r}; n = \frac{\text{real depth}}{\text{apparent depth}}$

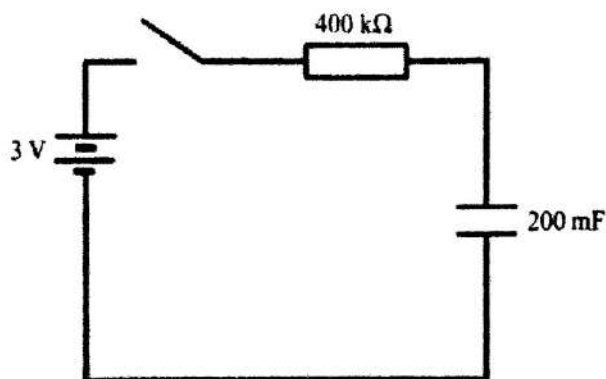
$m = \frac{v}{u}$

SECTION A
Answer ALL questions

1. (a) Define the term capacitance.

_____ [1]

- (b) A student set up a simple circuit to charge a capacitor.



Given that an uncharged capacitor with capacitance of 200 mF is connected in series with a 400 kΩ resistor, and a battery of 3 V, calculate the maximum current which flows.

[3]

- (c) Calculate the maximum charge that flows through the circuit.

[3]



- (d) State **THREE** factors that affect the capacitance of a capacitor.

[3]

TOTAL MARKS [10]



2. (a) Define acceleration.

[1]

- (b) A car starts from rest and accelerates constantly to a velocity of 10 m/s in 2 s , it then maintains that velocity for 5 s , and finally comes to rest with uniform deceleration in a further 3 s .

- (i) Sketch a velocity vs time graph to show the motion of the car during the 10 s journey.

[2]

- (ii) Using your graph, calculate the total distance travelled, in metres, by the car during the 10 s .

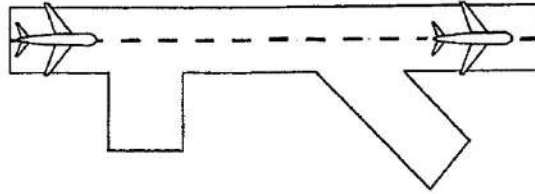
[2]

- (iii) Determine the acceleration of the car, during the final 3 s .

[2]



- (c) A plane starting at rest from one end of a runway undergoes a uniform acceleration of 5.2 m/s^2 for 16 s at take-off.



- (i) What is the speed of the plane at take-off?

[1]

- (ii) What distance did the plane travel just before take-off?

[2]

TOTAL MARKS [10]



3. This question is about lenses.

Fig. 3.1 shows an object placed 6 cm in front of a converging lens of focal length 12 cm.

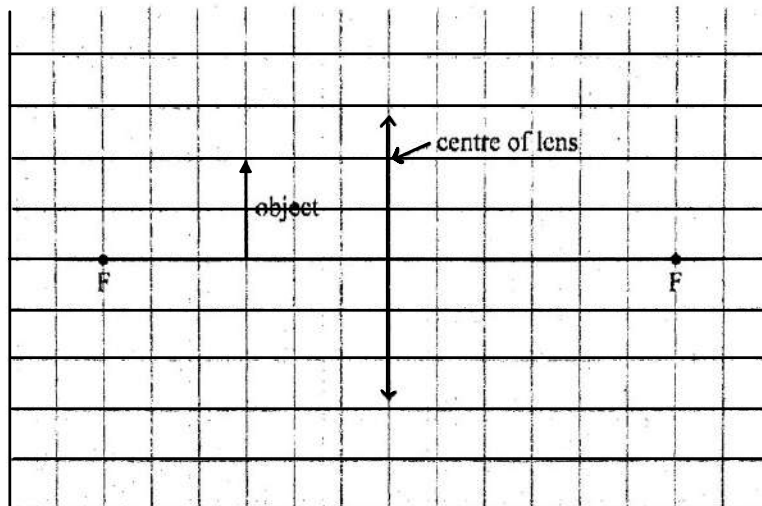


Fig. 3.1

- (a) (i) Complete a ray diagram to show the position of the image. [3]
- (ii) Calculate the magnification produced by the lenses. [2]
- (iii) State **ONE** property of the image formed, apart from magnification.

_____ [1]

- (b) The object is now moved so that it is 16 cm from the lens.

State **TWO** ways in which the nature of the image changes from that obtained when the object was 6 cm in front of the lens?

_____ [2]



- (c) The object is then placed 12 cm from a convex lens of focal length 4 cm. Determine the image position, using another method apart from the construction of a ray diagram. You can use the formula $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, where f is the focal length, v is the image distance and u are the object distance.

[2]

TOTAL MARKS [10]



4. This question is about forces and momentum.

In a high school Physics laboratory, two trolleys were used on a friction compensated ramp to determine the mass of Trolley 2.

Fig. 4.1 shows the diagram of the experimental set-up. The vibrating pin has a frequency of 50 Hz.

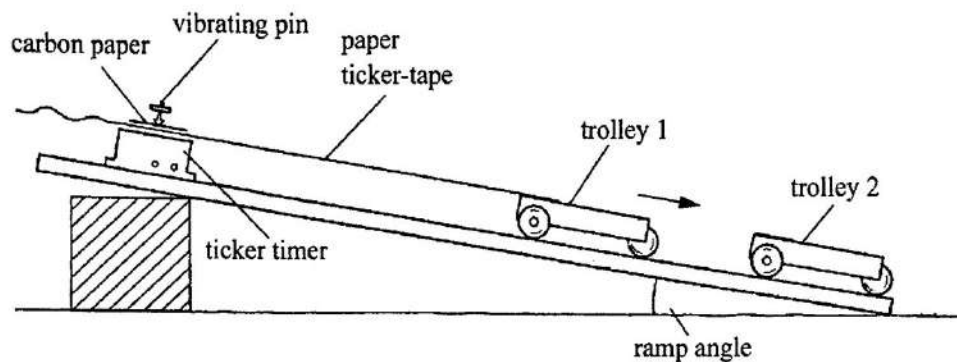


Fig. 4.1

After given a slight push, trolley 1, moving a constant speed, and of mass 1250 g, attached to a ticker-tape timer moves down the incline and collides with a stationary trolley of unknown mass and are coupled after collision moving with a constant velocity.

- (a) State the Principle of Conservation of Linear Momentum.

_____ [1]

- (b) Fig. 4.2 is the output of the ticker tape used in the experiment.

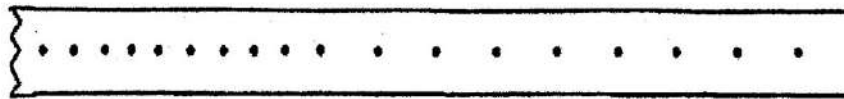


Fig. 4.2

- (i) Mark on the tape the point of collision. [1]
(ii) Calculate the speed of trolley 1 before collision.



- (iii) Calculate the speed of the coupled trolleys after collision.

[1]

- (iv) Determine the mass of **trolley 2**, using your results from (b) (i) and (b) (ii) and the Principle of Conservation of Linear Momentum.

[4]

- (c) What physical quantity represents the rate of change of momentum?

[1]

TOTAL MARKS [10]



SECTION B

5. This question is about electronics, including the cathode ray oscilloscope.

- (a) **Fig. 6.1** shows the trace produced by an alternating current on a cathode ray oscilloscope (CRO), when the Y gain is set at 3.0 V/cm and the time base at 20 ms/cm. Each division on the screen (not drawn to scale) represents a distance of 1 cm.

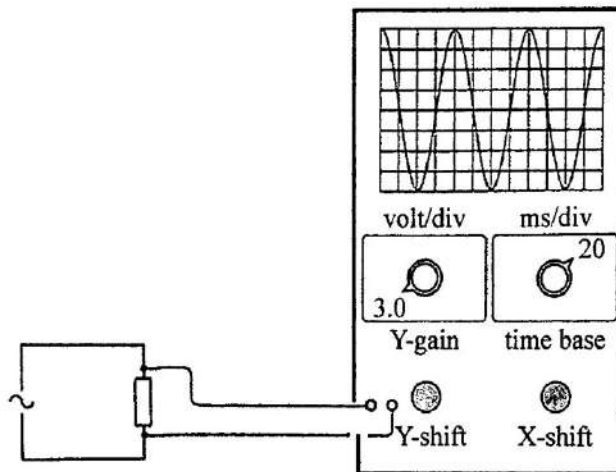


Fig. 6.1

Calculate the:

- (i) peak voltage of the alternating supply. [2]
- (ii) period of the alternating voltage in seconds. [2]
- (iii) frequency of the alternating waveform. [1]



- (b) A diode is now connected in series with the alternating power supply as shown in Fig. 6.2.

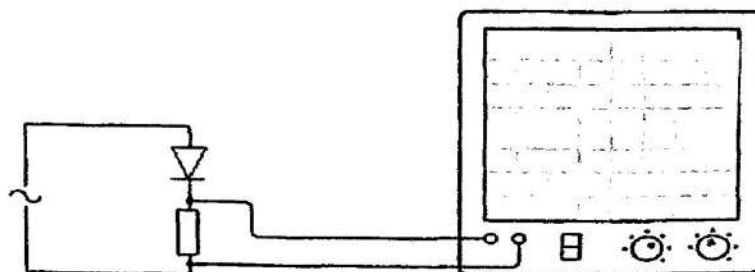


Fig. 6.2

- (i) Sketch the trace that would be observed on the screen of the CRO. [2]
 - (ii) Name the process occurring when the diode is used. [1]
- (c) In a further investigation, when the time-base is switched off an alternating voltage moves the spot on the screen from top to bottom and back once in 0.40 s. Its range of movement is 6.0 cm when the y-gain is set to 80 mV/cm.
- (i) What is the amplitude of the signal? [1]
 - (ii) What is the frequency of the signal? [1]
- (d) A student sets up a simple circuit to obtain the data needed to plot a current – voltage (I–V) graph for a diode.

The results obtained are recorded in Table 6.1

Current/A	0	0	0	0.08	0.27	0.60
Potential difference (V)	0	0.1	0.2	0.3	0.4	0.5

Table 6.1

- (i) Plot an I–V graph for the diode. [6]
- (ii) Give the potential difference at which the diode started to conduct an electric current. [1]
- (iii) Use data from the graph to calculate the resistance of the diode when the potential difference is 0.38 V. [3]

TOTAL MARKS [20]



6. This question is about radioactivity. Gold has one stable isotope and 36 radioactive isotopes.

- (a) One of the radioactive isotopes, Gold-198 decays by emitting a beta particle.
- (i) Define the term isotope. [2]
- (ii) Explain what happens in the nucleus when a beta particle is emitted. [2]
- (b) Fig. 7.1 shows a rolling mill which produces thin sheets of aluminium. The thickness of the aluminium is monitored using beta emitter, Gold-198, a Geiger Müller tube and a counter as shown below.

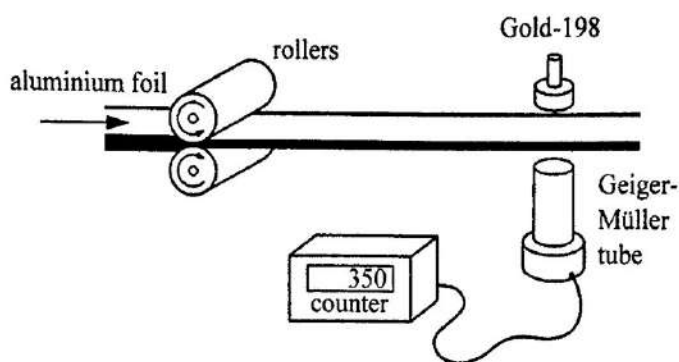


Fig. 7.1

- (i) What happens to the count rate when the thickness of the foil decreases? [1]
- (ii) Why would Gold-173, an alpha emitter not be suitable for monitoring the thickness of the aluminium sheets? [1]
- (c) An environment scientist records how the count rate of a sample of Gold-198 changes over a five-day period. The data below shows the results. Background radiation can be ignored.

Time (days)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Count $\times 10^5/\text{Second}$	6.00	5.20	4.60	4.05	3.55	3.15	2.80	2.48	2.15	1.88	1.65



- (i) Plot a graph of count rate of Gold-198 (y – axis) against time (x – axis). [5]

From the graph plotted, determine:

- (ii) The half-life of Gold-198. [2]
- (iii) The time when the count rate is 4.75×10^5 counts/second [1]
- (iv) The count rate at 3.8 days. [1]
- (v) Gold-198 is used in the treatment of some cancers and other diseases.
Give **TWO** reasons for the use of Gold-198 in nuclear medicine. [2]
- (d) Gold-195 has a half-life of 186 days. A sample of Gold-195 has a count rate of 8000 counts per minute. How long would it take the sample to fall to 125 counts per minute? [3]

TOTAL MARKS [20]



7. The diagram in Fig. 7.1 shows an apparatus that can be used to investigate the relationship between the volume of a gas and the pressure exerted on it.

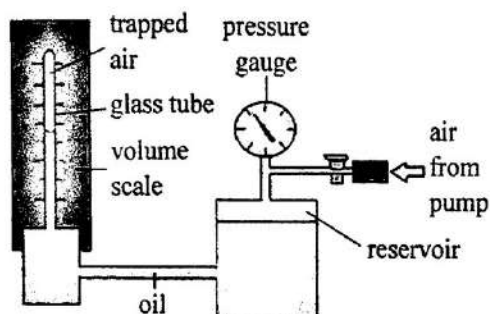


Fig. 7.1

- (a) Explain, in terms of its molecules,
- (i) how the trapped air exerts a pressure on the glass tube. [2]
 - (ii) why the pressure, of a fixed volume of gas, increases with temperature. [2]
- (b) Charles' law investigates the relationship between the volume of a gas and its absolute temperature, keeping mass and pressure constant.
- (i) Describe an experiment you would perform to investigate this relationship. A labelled diagram of the apparatus must be drawn and is worth 2 marks [4]
 - (ii) Sketch a graph of volume versus absolute temperature, which you would expect from this investigation. [2]
 - (iii) What does this graph show about the relationship between volume of a gas and temperature? [1]



- (c) A student carried out an investigation using the apparatus in Fig. 7.1 The volume and pressure of the gas are recorded. The table shows the results obtained.

Volume, cm ³	Pressure, N/m ²
117.5	12.0
87.2	16.0
70.7	20.0
58.8	24.0
44.2	32.0
35.3	40.0
29.1	48.0

- (i) Use the table above to draw a graph of volume against pressure [5]
- (ii) Use your graph to find the volume of the air when the pressure is 35 N/m². [1]
- (iii) A helium balloon, carrying weather equipment, is released from the ground where the atmospheric pressure 200 kPa and air temperature is 25 °C. The volume of the gas in the balloon is 5.0 m³. Using the combined gas equation, calculate the volume of the gas in the balloon at a height where the atmospheric temperature and pressure are 15 °C and 80 kPa respectively. [3]

TOTAL MARKS [20]



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.



School No.	Candidate No.	Level:	For Examiner's Use
Subject Number & Title:		Paper:	
Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	

A full-page view of a blank sheet of graph paper. The grid consists of small squares formed by thin black lines. There are approximately 20 columns and 20 rows of squares. A slightly thicker vertical line runs down the page, about one-fifth of the way from the left edge, creating a margin. Similarly, a slightly thicker horizontal line runs across the page, about one-fifth of the way from the top edge, also creating a margin. The rest of the page is filled with the standard grid pattern.

SCIENCE GRAPH PAPER

AB7

MINISTRY OF EDUCATION BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

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