

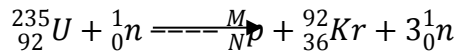
## S.4 PHYSICS 2020

### PHYSICS

### PAPER 1

#### SECTION A: (40marks)

- A body is said to be moving with uniform acceleration when the rate of change of
  - Distance is constant
  - Displacement is constant
  - Velocity is constant
  - Velocity is not constant
- Which of the following devices can be used to compare densities of liquids
  - Barometer
  - Siphon
  - Communicating tube
  - Manometer
- An energy saving bulb is marked 240V, 15W. What is the quantity of charge that passes through the bulb in 120 seconds?
  - 7.5 C
  - 15 C
  - 30 C
  - 192 C
- The results of rubbing an ebonite rod with fur and separating them is
  - No charge on both the rod and fur
  - Equal amounts of positive charge on both
  - A positive charge on the rod and equal negative charge on fur
  - A negative charge on the rod and an equal positive charge on fur.
- The final velocity attained by a car moving at  $10\text{ms}^{-1}$  and later accelerating at  $1\text{ms}^{-2}$  in 15seconds is
  - $150\text{ms}^{-1}$
  - $25\text{ms}^{-1}$
  - $15\text{ms}^{-1}$
  - $5\text{ms}^{-1}$
- When Uranium 235 is bombarded with a neutron, it splits according to the equation



M and N on P represent  M  N

- A. 56                      141
- B. 141                    56
- C. 199                    36
- D. 107                    128

7. A transformer has 200 turns in the primary coil. The voltage applied to the primary coil is 240V a.c. How many turns are on the secondary coil if the output voltage is 48V a.c

- A. 500                      B. 4000                      C. 400                      D. 300

8. A battery of e.m.f 6v and negligible internal resistance is connected in series to two resistors as shown in fig 1. Calculate the P.d across the 2Ω resistor.

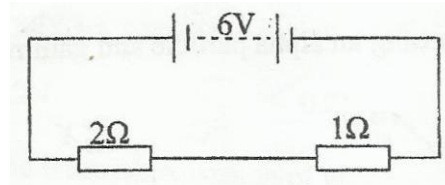



fig 1

- A. 2V                      B. 2.5V                      C. 3V                      D. 4V

9. To convert a galvanometer to an ammeter, the galvanometer is connected in

- A. Series with shunt
- B. Parallel with the shunt
- C. Parallel with the multiplier
- D. Series with the multiplier

10.

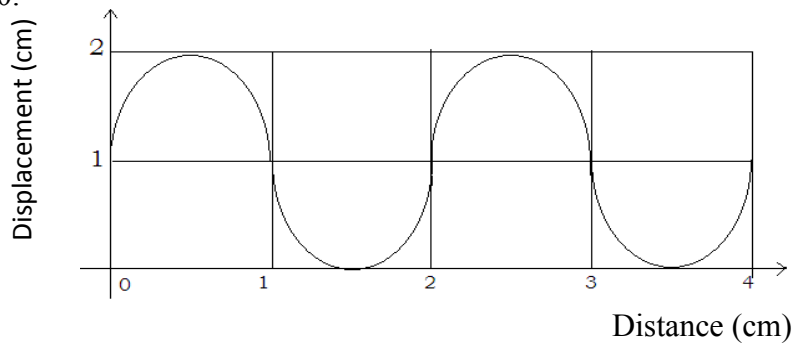


fig 2

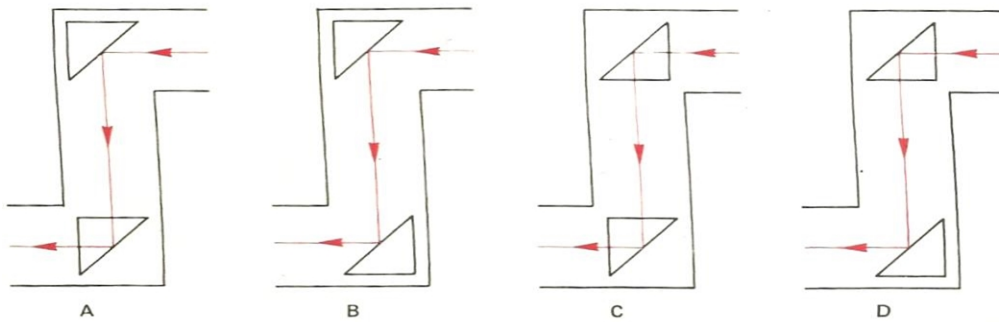
Figure 2 shows a transverse wave. What is the wave length?

- A. 4cm
- B. 3cm
- C. 2cm
- D. 1cm

11. A constant force of 5N acts on a body and moves it through a distance of 20m in 10seconds. Calculate its power in watts

- A. 10
- B. 2.5
- C. 40
- D. 100

12. Which one of the diagrams below best represents the paths of a ray of light through a periscope?



13. In a ferromagnetic material , a group of atomic magnets is the

- A. magnadur
- B. dipoles
- C. ferrites
- D. domains

14. The rate of evaporation of a liquid can be increased by increasing its;

- (i) Volume
- (ii) Temperature
- (iii) Surface area

- A. (i) only
- B. (i) and (ii) only
- C. (ii) and (iii) only
- D. (i) and (iii) only

15. In an elastic collision

- A. Bodies move with common velocity
- B. Kinetic energy is not conserved
- C. Kinetic energy is conserved
- D. Bodies stick together

16. When you look at yourself in a mirror you see an image of yourself. The image is

- A. A virtual image behind the mirror
- B. An inverted virtual image
- C. A real image behind the mirror
- D. Caused by rays behind the mirror

17. How much heat energy is needed to warm 20g of water from 25°C to 35°C

- A. 4200J
- B. 840J
- C. 420J
- D. 8400J

18. Which of the following gives a defect and its cause in a simple cell

Defect	Cause
A. Local action	Presence of zinc amalgam
B. Polarization	Hydrogen in gaseous form
C. Local action	Adding oxidizing agent
D. Polarization	Use of dilute electrolyte

19. The frequency of the third harmonic in an open pipe is 660Hz. Find the length of the air column if the speed of sound in air is 330ms<sup>-1</sup>

- A. 0.75m
- B. 0.85m
- C. 1.2m
- D. 1.0m

20. Which of the following is a vector quantity

- A. Speed
- B. distance
- C. Momentum
- D. Perimeter

21. An object 2cm tall is placed 5cm in front of a convex lens. A real image is produced 20cm from the lens. Calculate the magnification of the lens

- A. 4.0
- B. 2.0
- C. 5.0
- D. 0.5

22. In game supermarket a student loaded a trolley and finds it difficult to start and stop. The property of the loaded trolley which accounts for both these observations is its

- A. friction
- B. Energy
- C. weight
- D. Inertia

23. The law of electrostatics states that

- A. Charged occur in pairs
- B. Charges repel each other
- C. Like charges repel each other
- D. Like charges attract each other

24. A trolley of mass 4kg moving at  $3\text{ms}^{-1}$  collides with a stationary trolley of mass 2kg and remains attached to it. Calculate their common velocity

- A.  $4\text{ms}^{-1}$       B.  $2\text{ms}^{-1}$       C.  $3\text{ms}^{-1}$       D.  $5\text{ms}^{-1}$

25. In a school experiment a stream of electrons passes through a horizontal slit and strikes an inclined screen so that a trace is seen as shown in fig 3

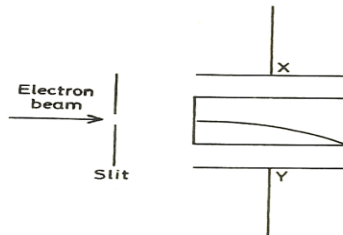


fig 3

Which of the following is the best explanation of the parabolic paths

- A. Plate x has a negative potential relative to plate Y  
B. Plate X has a positive potential relative to plate Y  
C. The electrons are showing down and losing energy  
D. The electrons are falling under the influence of gravity

26. Water waves travels a distance of 72cm in 6seconds. If the separation of successive crest is 3.0cm, find the frequency of the waves

- A. 0.25Hz      C. 24Hz  
B. 4.00Hz      D. 36.00Hz

27. In a lighting system of a house, the bulbs and sockets are in parallel, in order to

- (i) Void short circuiting  
(ii) Operate at the same voltage  
(iii) Use the same current

- A. (ii) only  
B. (i) and (ii) only  
C. (ii) and (iii) only  
D. (i), (ii) and (iii)

28. A d.c motor converts

- A. Electrical energy to mechanical energy
- B. Electrical energy to electrical energy
- C. Kinetic energy to potential energy
- D. Potential energy to kinetic energy

29. A uniform beam of negligible weight balanced when pivoted at  $p$  with forces of  $Y$  and  $5.0\text{N}$  acting on it as shown in fig 4

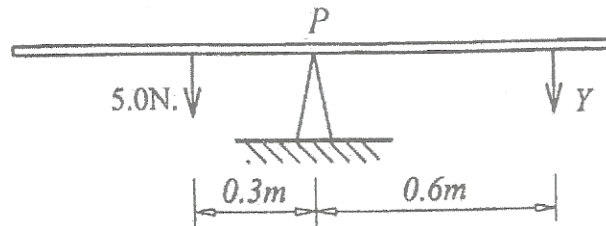


Fig 4

Find the value of  $Y$

- A. 0.4N
- B. 2.5N
- C. 5.0N
- D. 10.0N

30. An immersion heater rated  $4.2\text{Kw}$  is placed in  $5\text{kg}$  of water. The temperature rise per minute will be

- A.  $5^{\circ}\text{C}$
- B.  $0.12^{\circ}\text{C}$
- C.  $12^{\circ}\text{C}$
- D.  $12^{\circ}\text{C}$

31. Which of the following is correct?

- (i) Green light shone on green surface is all absorbed
- (ii) Green light added equally to red lights appears yellow
- (iii) Green light passes through a red filter

- A. (ii) only
- B. (i) and (ii) only
- C. (ii) and (iii) only
- D. (i), (ii) and (iii)

32. Electromagnets are used in all the following appliance except

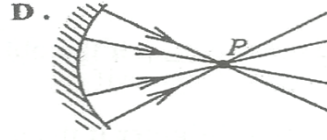
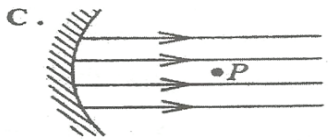
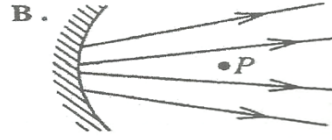
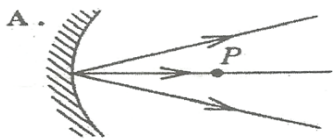
- A. Telephone
- B. Loud speaker
- C. Electric bell

D. Thermostat

33. Concrete is obtained by mixing

- A. Cement ,sisal, wood and paper
- B. Cement , gravel, and water
- C. Sand ,gravel ,metal rods and water
- D. Gravel, sand ,sisal and water

34. A point source of light is placed at the principal focus, P of a concave mirror, which one of the following beams of light is produced after reflection from the mirror?



35. When an atom loses an electron it becomes

- A. A negative ion
- B. A neutron
- C. A positive ion
- D. A proton

36. When a positively charged rod is brought near the cap of a positively charged gold leaf electroscope

- A. Electrons flow from the cap towards the gold leaf
- B. The divergence of the leaf does not change
- C. The divergence of the leaf decreases
- D. The divergence of the leaf increases

37. A girder which is under tension is referred to as

- A. Tie
- B. beam
- C. strut
- D. Pillar

38. A person who has a mass of 50kg runs up some stairs in 9s. The stairs are 8m high. It is power output in watts is

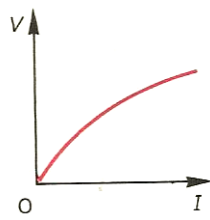
A.  $\frac{50 \times 8}{9}$

C.  $\frac{50 \times 10 \times 8}{9}$

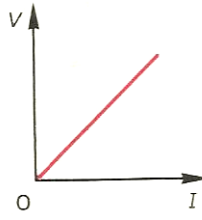
B.  $\frac{50 \times 9}{8}$

D.  $\frac{50 \times 10 \times 9}{8}$

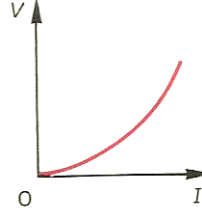
39. The graphs show the potential difference across a component plotted against the current in the component. Which of the graphs would be obtained for a coil of copper wire?



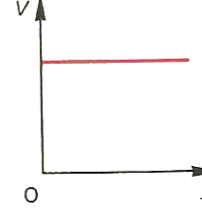
A



B



C



D

40. A mass of 0.4kg of oil in a container is warmed from 20°C to 24°C by 2260J of energy. The specific heat capacity of the oil in J kg<sup>-1</sup> K<sup>-1</sup>

A.  $0.4 \times 44 \times 3360$

C.  $\frac{0.4 \times 3360}{4}$

B.  $\frac{0.4 \times 4}{3360}$

D.  $\frac{3360}{0.4 \times 4}$

### SECTION B

41. (a) Define the term internal resistance as used in electricity (01mark)

.....

.....

.....

(b)

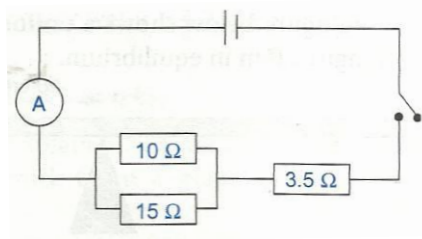




fig 5

In the circuit shown in fig 5, the e.m.f of the battery is 2.1V and has an internal resistance of  $0.5\Omega$ . Determine the ammeter reading when the switch is closed. (01mark)

.....

.....

.....

.....

.....

42. (a) State the principle of moment. (01mark)

.....

.....

.....

(b)

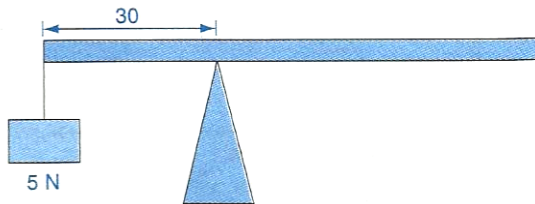


Fig.6

The uniform bar in fig 6 is not in equilibrium, when a 2N weight is hung at the center, the bar balances. Given the length of the bar to be 1.0m, determine the weight of the bar.

(03marks)

.....

.....

.....

43. (a) Define the term radioactivity as used in modern physics.

(01marks)

.....

.....

.....

.....

.....

(b)

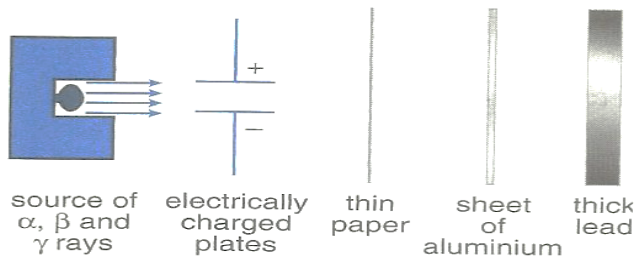


fig 7

Figure 7 shows the source of  $\alpha$  - *particle*,  $\beta$  - *particle* and  $\gamma$ - rays. Copy and complete the figure to show how the particles and rays are deflected and at which material each of them is stopped.

44. (a) Briefly explain what is meant by the term Eddy current as used in a transformer. (02marks)

.....

.....

.....

.....

.....

(b) A transformer with 400 turns in the secondary circuit and 20 turns in the primary circuit lens a p.d of 2400v in the primary circuit. What is the p.d in the secondary circuit?

.....

.....

.....

.....

45. (a) What is meant by the following terms

(i) Wavelength of a longitudinal wave. (01mark)

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

(ii) Frequency of a wave (01mark)

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

(b) Sketch a displacement time graph of a wave of amplitude 0.5cm and frequency 4Hz overtime interval of 1.25 seconds (02marks)

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

46. (a) What is meant by the term critical angle as used in light? (01mark)

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

(b) A pin is placed close to one face of rectangular block of glass and is viewed normally through the opposite face. If the block is 27cm long, how far will the pin appear to be from the front face of the block, given that the material of the block has refractive index of 1.5. (03marks)

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

.....  
.....

47. (a) A fixed mass of a gas was put in a container whose one end was closed, the temperature and volume of the gas was changed at constant pressure .State the laws that relates the volume and the temperature of the gas. (01mark)

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

(b) How much heat is required to raise the temperature of 500g ofcopper form 15<sup>o</sup>C to 115<sup>o</sup>C (specific heat capacity of copper=0.39Jg<sup>-1</sup>k<sup>-1</sup>) (03marks)

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

48. (a) State the laws of magnetism (01mark)

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

(b) During an experiment a student in S.4 was provided with two bar magnets, X and Y .One is magnetized and the other is not. Explain how you would identify the magnetized bar magnet. (03marks)

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

49.

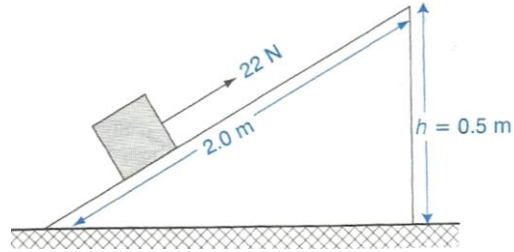


fig 8

Figure 8 shows a load of 50N being raised by pulling it along an inclined plane of length 2.0m .Determine

(i) The work done on the load. (02marks)

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

(ii) The efficiency of the system. (02marks)

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

50. (a) Why is an ammeter constructed such that it has a low internal resistance? (01mark)

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

.....  
.....

(b) A millimeter has internal resistance of  $4\Omega$  and a full scale deflection of  $15\text{mA}$ . calculate the value of the resistor that must be connected to the millimeter so that it gives maximum current. (03marks )

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

## PHYSICS Paper 2

1.(a)(i) Describe a simple experiment to determine the size of an oil molecule.(5 marks)

(ii) State any **two** assumptions made in (a) (i) above. (2 marks)

(b) A large vessel containing water has a fine powder dusted on to its surface. A single drop of oil of density  $0.8\text{gcm}^{-3}$  is dropped on to the surface where it spreads out into a circular film of radius  $10\text{cm}$ . If the mass of 100 identical drops is  $0.04\text{g}$ , calculate the

(i) Mass and volume of one drop of oil. (2 marks)

(ii) Area of the circular film of oil and hence its thickness.(2 marks)

(c) Explain what is meant by the term **surface tension**.(2 marks)

(d) State the factors that affect surface tension of water. (3 marks)

2. (a) Define the term **Pressure** and state its SI unit. (2 marks)

(b) Describe a simple experiment to demonstrate the existence of atmospheric pressure. (6 marks)

(c) A hole of area  $2.0\text{cm}^2$  at the bottom of a tank  $2.0\text{m}$  deep is closed with a cork. Determine the force on the cork when the tank is filled with water. (4 marks)

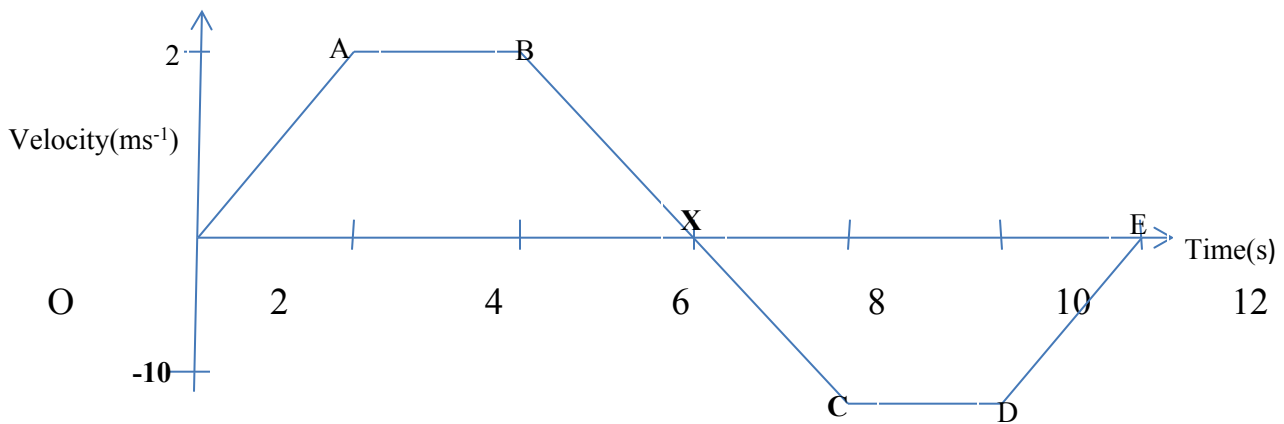
(d) State:

(i) **Two** applications of atmospheric pressure. (2 marks)

(ii) The principle of transmission of pressure in fluids. (2 marks)

3. (a) Define the term **displacement** and state its SI unit. (2 marks)

(b) The figure below shows the motion of a body.



(i) Describe the motion of the body. (5 marks)

(ii) Find the total distance covered by the body. (3 marks)

(c) A ball is dropped from the top of a building and takes  $2.0\text{s}$  to reach the ground.

Calculate:

(i) The velocity with which it strikes the ground.  
(3 marks)

(ii) The height of the building.  
(3 marks)

4. (a) Define the term “**electromotive force**” and state its unit.  
(2 marks)

(b) Explain the specification on an electric kettle “**240V, 1000W**”.  
(2 marks)

(c)(i) Use a diagram to show how three identical cells, each of e.m.f 1.5V and internal resistance  $0.1\Omega$ , can be arranged to give maximum e.m.f.  
(2 marks)

(ii) Calculate the current flowing in the circuit of the arrangement in (c)(i), if two resistors of resistances  $4\Omega$  and  $5\Omega$  are included in parallel, in the circuit.  
(6 marks)

(d)(i) Name **one** rechargeable source of e.m.f.  
(1 marks)

(ii) Outline **three** precautions to prolong the life of the source of e.m.f named in (d)(i) above. (3marks)

5. (a) With the aid of a labelled diagram, describe how X-rays are produced in an X-ray tube. (6 marks)

(b) State three differences between cathode rays and X-rays.  
(3 marks)

(c) State **one**:

(i) Industrial use and

(ii) Medical use of X-rays. (2 marks)

(d)(i) Define the terms “**half-life**” and “**Isotopes**” as applied to radioisotopes. (2 marks)



(ii) The mass of a radioisotope of half-life 9 days decays to  $\frac{1}{x}$  of the original mass in 36 days. Find the value of x.

(3 marks)

6. (a) With the aid of a diagram explain why a copper coin in a glass of water appears raised. (4 marks)

(b) An erect object 5 cm high is placed 25 cm away from a convex lens. If the real image formed by the lens is 2.5 cm high, by graphical method determine the focal length of the lens. (4 marks)

(c) A long glass tube is partially immersed in water and a vibrating tuning fork of frequency 80 Hz is held above it. Determine the length of the air column when resonance first occurs, on raising the tube gradually from the water. (Neglect the end correction). (4 marks)

(d) What are the conditions for the formation of a standing wave? (4 marks)

7. (a) Explain the following observations:

(i) If a mercury thermometer with a thick glass bulb is dipped into hot water, the mercury level first drops slightly and then rises quickly in the bore.

(2 mks)

(ii) If boiling water is poured into a thick glass vessel, the vessel may crack. (2 mks)

(iii) Water plastic pipes burst in cold weather when water freezes.

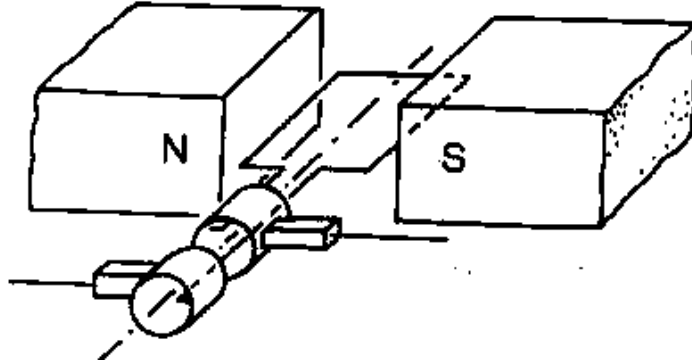
(2 mks)

(b) 2.5 kg of water is placed in a copper calorimeter of mass 0.4 kg. If a copper block of mass 3 kg at 20°C is immersed in the water and stirred the water attains a steady temperature of 43°C. Calculate the initial temperature of the water. (4 marks)

(c)(i) List the possible sources of error in the experiment in (b) above. (3 marks)

(ii) Suggest how each of the errors you have listed in (c)(i) can be minimized. (3 marks)

8. The diagram shows a simple generator consisting of a rectangle coil which is suspended in a magnetic field between the two poles of a permanent magnet.



- (a) Name and describe how the named type of electricity is generated. (5 marks)
- (b)(i) Sketch the shape of the voltage-time graph produced by the **spinning coil** in (a) above. (2 marks)
- (ii) State two ways by which the generated voltage can be increased. (2 marks)
- (c)(i) Describe the mode of operation of a step up transformer. (2 marks)
- (ii) State **two** causes of energy losses in a transformer and how they can be minimized. (2 marks)
- (d) A transformer with 1200 turns on the primary coil and 500 turns on the secondary coil is designed to step down voltage from 240V. If the current in the primary and secondary coil is 3A and 5A respectively, calculate the efficiency of the transformer. (3 marks)

## PHYSICS

### PAPER 1

#### SECTION A (40 MARKS)

*Answer **all** questions in this section*

- 1 A Pendulum bob moves 50 complete oscillations in 2 minutes, calculate the period of the swing in seconds.

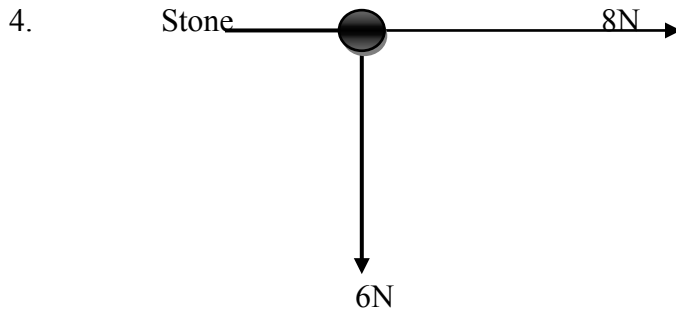
- A 0.02      B .2.4      C. 2.5      D. 0.42

2. The following types of waves travel at the speed of light except

- A. radiowaves
- B. radarwaves
- C. waterwaves
- D. infraredwaves

3. In a simple cell electrons flow from

- A. the copper plate
- B. the zinc plate
- C. dilutesulphuric acid
- D. potassium dichromate



**Fig 1**

Fig 1 shows the forces acting on a stone of mass 2.5kg. calculate the acceleration produced on the stone.

- A.  $40\text{ms}^{-2}$     C.  $5.6\text{ms}^{-2}$
- B.  $2.5\text{ms}^{-2}$     D.  $4.0\text{ms}^{-2}$

5. When a body is thrown vertically upwards

- (i) its initial velocity is greater than zero
- (ii) its velocity at maximum height is zero
- (iii) its acceleration upwards is positive
- (iv) it moves with uniform velocity

- A. (i) and (ii)      B. (i) and (iii)      C. (ii) and (iii)      D. (iii) and (iv)

6. Which of the following statements is correct about soft ferromagnetic materials

- (i) they don't lose their magnetism easily
- (ii) they are easily and strongly magnetized

(iii) they are used to make permanent magnets

- A. (i) and (ii) only                      B. (ii) and (iii) only  
 C. (ii) only                                  D. (iii) only

7. When a substance is boiling, its saturated vapour pressure is

- A. maximum                      C. above the atmospheric pressure  
 B. minimum                      D. equal to the atmospheric pressure

8. When an uncharged conductor is brought near the cap of a positively charged electroscope, the gold leaf

- A. gains a positive charge  
 B. increases the divergence  
 C. decreases in divergence  
 D. remains uncharged

9.

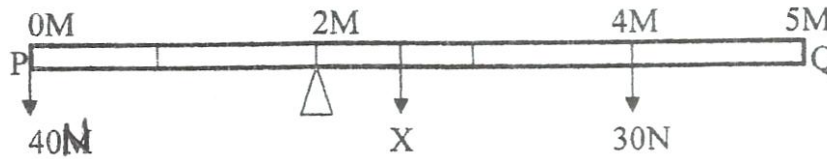


Fig 2

Fig 2 shows a uniform pole **PQ** of length 5m pivoted 2m from end **P**. A force of 40N suspended at **P**. and 30N suspended one metre from end **Q** make it balance horizontally.

Find the weight **x** of the pole.

- A. 90N                      B. 40N                      C. 60N                      D. 70N

10. Two resistors of  $7\Omega$  and  $3\Omega$  are connected as shown in fig 3.

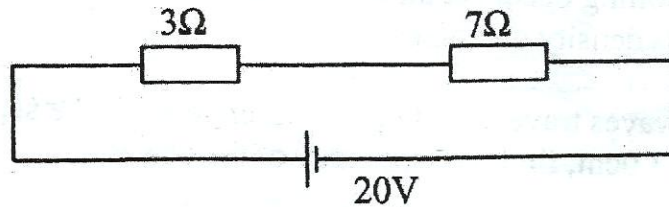


Fig.3

The current through the 7Ω resistor is

- A. 0.5A
- B. 2.0A
- C. 2.8A
- D. 9.5A

11. When the amplitude of vibration of the cone of a loud speaker increases, the sound produced becomes

- A. High pitched
- B. Low pitched
- C. Louder
- D. Softer

12. Which one of the following colours is used for the live wire in three core cables?

- A. Brown
- B. Black
- C. Yellow
- D. Blue

13. The diagrams show different arrangements of two strong magnets. Which pair of magnets will pull each other

- A. 

N	S
---	---

S	N
---	---
- B. 

N	S
---	---

N	S
---	---
- C. 

S	N
---	---

N	S
---	---
- D. 

S
N

S
N

14. Which of the following is not a vector quantity

- A. Magnetic flux
- B. Momentum
- C. Pressure
- D. Weight

15. An image 5cm high is formed by a converging lens. If the magnification is 0.4, find the height of the object

- A. 2.0cm
- B. 4.6cm
- C. 5.4cm
- D. 12.5cm

16. Calculate the amount of heat required to raise the temperature of 0.2kg of lead by 60°C (Specific heat capacity of lead = 130 Jkg<sup>-1</sup> K<sup>-1</sup>)

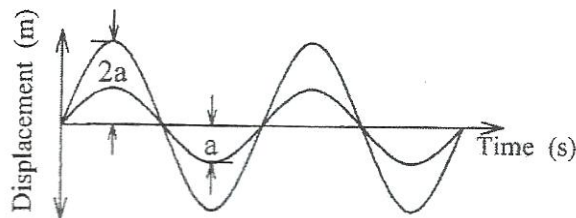
- A. 156J
- B. 1140J
- C. 1560J
- D. 340J

17. Which of the following are properties of cathode rays

- i. they are electrically neutral
- ii. they travel in a straight line
- iii. they are deflected by magnetic fields

- A. (i) and (ii) only
- B. (i) and (iii) only
- C. (ii) and (iii) only
- D. (i), (ii) and (iii)

18. Fig 4 shows two waves representing two musical notes



**Fig 4**

Which of the following statements is true?

- A. The two waves produce sound of different pitch
- B. The two waves produce sound of different wave length
- C. The two waves produce sound of the same loudness

- D. The two waves produce sound of different loudness
19. A converging mirror produces a virtual, magnified and erect image when
- A. The object is between the pole and the principal focus
  - B. The object is between the principal focus and the centre of curvature
  - C. The object is beyond the centre of curvature
  - D. The object is at infinity

20. The inner walls of a vacuum flask are highly polished to,
- A. Reduce heat loss by convection
  - B. Prevent heat loss by radiation
  - C. Reduce heat loss by evaporation
  - D. Reduce heat loss by conduction

21. Fig 5 shows levels of water in a measuring cylinder before and after immersing a solid X of mass 40g.

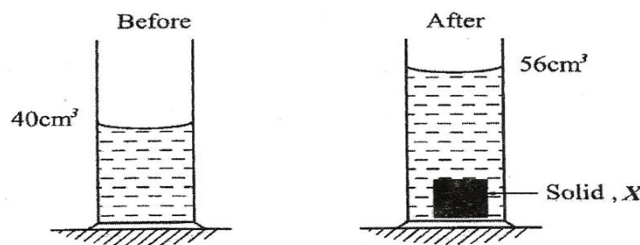


Fig 5

The density of solid X in  $\text{gcm}^{-3}$  is

- A. 1.0
- B. 1.4
- C. 2.4
- D. 2.5

22. The volume of a gas is  $150\text{cm}^3$  at  $27^\circ\text{C}$  and  $770\text{mmHg}$  pressure. Calculate the volume of the gas at s.t.p ( $0^\circ\text{C}$  and  $760\text{mmHg}$ )

A.  $\frac{760 \times 770 \times 300}{150 \times 273}$

B.  $\frac{770 \times 760 \times 273}{150 \times 300}$

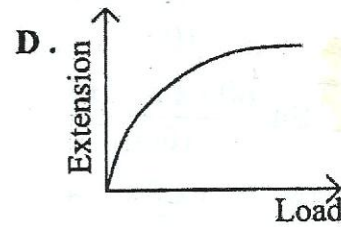
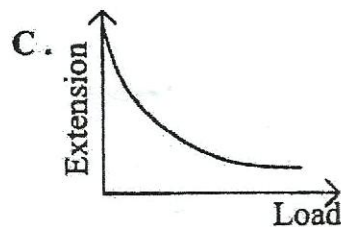
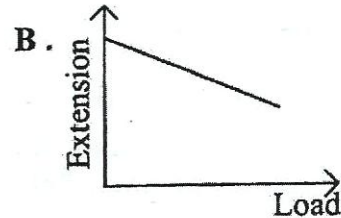
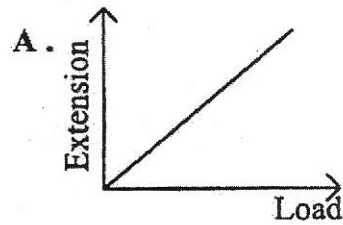
C.  $\frac{150 \times 770 \times 273}{760 \times 300}$

C.  $\frac{760 \times 770 \times 150}{300 \times 273}$

23. Electromagnets are used in all the following appliances except

- A. telephone
- B. loud speaker
- C. electric bell
- D. thermostat

24. Which one of the following graphs represents the variation of extension of a spring with load.



25. A d.c motor converts

- A. electrical energy to mechanical energy
- B. mechanical energy to electrical energy
- C. Kinetic energy to potential energy
- D. potential energy to kinetic. Energy

26. Find the cost of running six 100W lamps and three 75W lamps for 8 hours if the cost of one unit of electric power is shs 214

A. Shs  $\frac{825 \times 8 \times 214}{1000}$

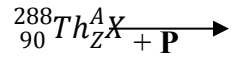
B. Shs  $\frac{600 \times 8 \times 214}{1000}$



C. Shs  $\frac{225 \times 8 \times 214}{1000}$

D. Shs  $\frac{175 \times 8 \times 9}{1000}$

27. The equation below represents a radioactive decay in which a particle **P** is emitted



If A= 284 and Z=88. Identify particle **P**

A. Beta Particle

B. Alpha Particle

C. Gamma rays

D. Neutron

28. A source produces waves which travel a distance of 140cm in 0.08seconds. If the distance between successive crests is 20m find the frequency of the source.

A. 87.50Hz

B. 0.875Hz

C. 0.0875Hz

D. 8750Hz

29. Isotopes of an element

(i) have same physical properties

(ii) have equal number of protons

(iii) have different number of neutrons

A. (i) only

B. (i) and (ii) only

C. (ii) and (iii) only

D. (i) and (iii) only

30. A body accelerates uniformly from rest and acquires a velocity of  $60\text{ms}^{-1}$  after half a minute. Find the distance covered by the body.

- A. 15m                      B.30m                      C.1800m                      D.900m

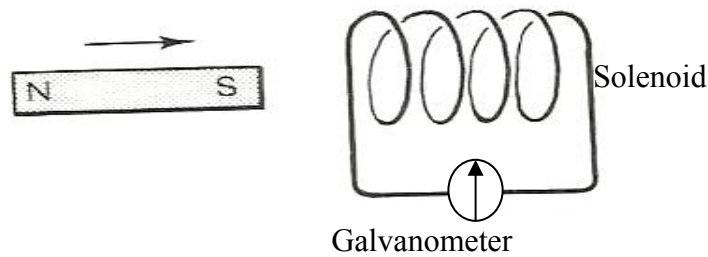
31. Which one of the following parts of the eye acts like the film in a lens camera

- A. pupil                      B. iris                      C. cornea                      D. retina

32. Which of the following takes place as water waves travel from shallow end to the deep end of a ripple tank?

	Speed	Frequency	Wavelength
<b>A</b>	Increases	Remains the same	Remains the same
<b>B</b>	Decreases	Remains the same	Decreases
<b>C</b>	Increases	Remains the same	Increases
<b>D</b>	Increases	Increases	Increase

33.



**Fig 6**

Figure 6 shows an arrangement where is plugged into a solenoid then withdrawn.Which of the following is the correct observation?

- A. The galvanometer doesn't deflect  
 B. The galvanometer deflects in one direction  
 C. The galvanometer deflects in one direction then in the opposite direction  
 D. The galvanometer continuously oscillates in either direction

34. The lead-acid cell is called a secondary cell because

- A. Its output voltage is 2volts
- B. It can be recharged
- C. It has two lead electrodes
- D. It can't be recharged

35. A Material which undergoes a large amount of extension before it breaks is called

- A. ductile
- B. brittle
- C. plastic
- D. elastic

36. The amount of heat absorbed by a body of mass 2kg at a constant temperature is called

- A. latent heat
- B. heat capacity
- C. specific heat capacity
- D. specific latent heat

37. Four cells each of emf 1.5V and internal resistance 1.0  $\Omega$  are connected in series with a resistor of 8.0  $\Omega$ . Calculate the value of the current that flows.

- A. 2.0 A
- B. 1.5 A
- C. 1.0 A
- D. 0.5 A

38. What is the appearance of a blue curtain with red flowers in green light?

	Appearance of curtain	Appearance of flower
<b>A</b>	Blue	Red
<b>B</b>	Black	Green
<b>C</b>	Black	Black
<b>D</b>	Red	Black

39. The advantage of mercury over alcohol as a thermometric liquid are;

- (i) mercury is opaque
- (ii) mercury doesn't wet glass
- (iii) mercury is a good conductor of heat

- A. (i) and (iii) only
- B. (i),(ii) and (iii)
- C. (i) and (ii) only
- D. (i) only

40. The power of a lens is 25Dioptrefind the focal length of this lens in cm.

- A. 0.25
- B. 0.04
- C. 2.5
- D. 4.0

**SECTION B**

*Answer all the questions in this section*

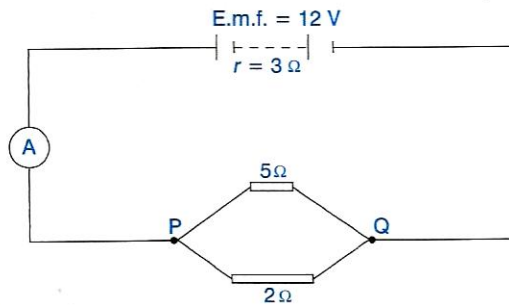
41. (a) Define the term potential difference and state its **SI** unit. (01mark)

.....

.....

.....

(b)



**Fig.7**

Figure 7 shows a battery of e.m.f 12V and total internal resistance of 3Ω. It is placed in series with two resistors and an ammeter of 1Ω resistance .Determine the reading of the ammeter. (03marks)

.....  
.....

42. (a) State **one** factor which affects the speed of sound in air. (01mark)

.....  
.....

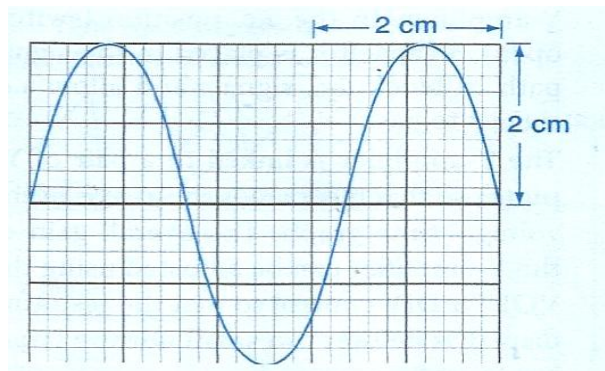
(b) A loud speaker placed between two walls but nearer to wall **A** than wall **B** is sending out constant sound waves. Determine how far the loud speaker is from wall **B** if it's 100m from wall **A** and the time between the two echoes received is 0.2 seconds .(Speed of sound in air =  $340\text{ms}^{-1}$ ) (03marks)

.....  
.....

43. (a) Define the term cathode rays. (01marks)

.....  
.....

(b) The wave form shown in figure 8 was produced on C.R.O when a certain oscillating source was connected to the Y-plated of the C.R.O



**Fig.8**

The Y-gain reads  $0.5\text{Vcm}^{-1}$  while the time based reads  $10\text{mscm}^{-1}$ .

Determine:

- (i) the peak voltage of the wave form. (01mark)

.....  
.....

- (ii) The frequency of the wave. (02marks)

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

- (a) State Hooke's law.

(01mark)

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

- (b) An unstretched spring has a length of 5.0 cm. A force of 1.0N caused its length to increase to 7.8cm. Find the length of the spring when its subjected to the force of 4.0N. (03marks)

.....  
.....

44. (a) State Faraday's law of electromagnetic induction. (01mark)

.....  
.....

- (b) A 12V, 48W lamp operates normally when it is connected to a transformer with 300turns in the secondary and 150turns in the primary circuit. Calculate the primary voltage. (03marks)

.....  
.....

45. (a) Define the term focal length of a lens. (01mark)

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

- (b) The critical angle of a certain glass material is  $42.7^\circ$ . Determine the refractive index of the material. (03marks)

.....  
.....

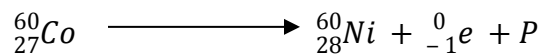
46. (a) Define the term half life. (01mark)

.....  
.....

- (b) A radioactive nuclide has a half life period of 4 hours. Calculate the mass that would remain after 24hours if the original mass is 9.6g. (02marks)

.....  
.....

- (c) A radioactive nuclide  ${}_{27}^{60}\text{Co}$  decays by the following equation



Identify the radiation **P**. (01mark)

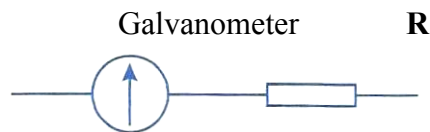
.....  
.....

47. (a) Define the term **velocity ratio** of a machine. (01mark)

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

(b) A pulley system having three pulleys in the fixed block and two in the movable block is used to raise a load of 600N. If the system has an efficiency of 80% , what effort is required to raise the load. (03marks)

.....



**Fig 9**

Figure 9 shows a galvanometer adapted for use as voltmeter. If the galvanometer has a resistance of  $100\Omega$  and gives a full scale deflection of  $1\text{mA}$

(a) Name resistor **R** connected to the galvanometer. (1mark)

.....

(b) What is the value of the resistor **R** that must be connected in series with the meter so that it can be used as a voltmeter and reads up to  $1\text{V}$ . (03mark)



.....  
.....

48. (a) Define heat capacity. (1mark)

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

(b)

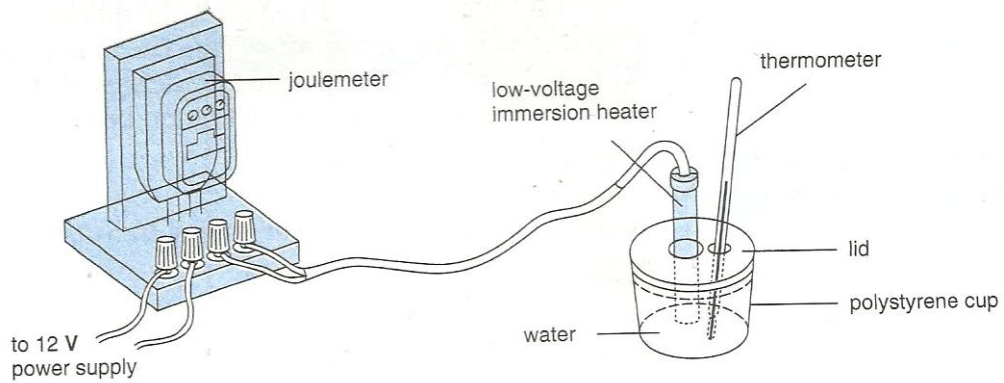


Fig 10

Fig 10 shows an electrical apparatus set up to measure specific heat capacity of a liquid .Given that:

Energy transferred = 12209J

Mass of liquid = 0.8kg

Original temperature = 26.8<sup>0</sup>C

Final temperature = 33.0<sup>0</sup>C

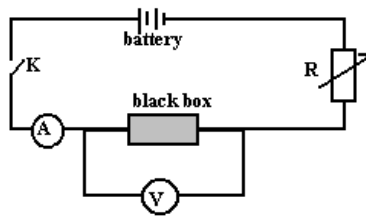
Find the specific heat capacity of the liquid.

.....  
.....

## PHYSICS

### PAPER 2

1. (a) State what is meant by the terms:
- (i) Electromotive force of a cell.  
(1)
  - (ii) A volt.  
(1)
- (b) (i) State Ohm's law  
(1)
- (ii) Derive an expression for effective resistance of three conductors of resistance  $R_1$ ,  $R_2$  and  $R_3$  connected in parallel.  
(4)
- (c) The results obtained by an S4 candidate in a physics practical for the circuit shown below are as follows:



I(A)	0.0	1.0	2.0	3.0	4.0	5.0
V(V)	0.0	0.2	0.6	1.5	3.0	6.0

(i) Plot a graph of I against V.

(4)

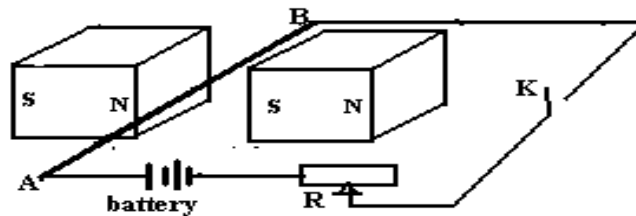
(ii) Use the graph to describe the type of device connected in the black box.

(2)

(iii) Use the graph to find resistance of the device when operating voltage is 2.0V. (3)

(3)

2. (a) A wire AB is placed in the space between poles of a magnet as shown in the diagram below.



(i) State what is observed on the wire AB when the switch is closed.

(1)

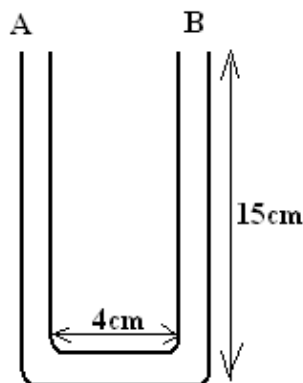
(ii) State what is observed on the wire AB when the poles of the magnet are reversed and the switch is closed?

(1)

(iii) What is the difference in the observations above when current is increased? (1)

- (b) Draw a labeled diagram of a moving coil galvanometer and describe how it works. (6)
- (c) Name three things that can be done to make the galvanometer sensitive. (3)
- (d) A galvanometer has a coil of resistance  $20\Omega$  and gives a full scale deflection when a current of  $0.05\text{A}$  passes through it. Describe how the galvanometer is modified to measure current up to  $2\text{A}$ . (4)

3. (a) (i) Define pressure. (1)
- (ii) Explain why knives cut better when they are sharpened. (3)
- (b)



The open U-tube shown above has uniform cross-section of  $2\text{cm}^2$ .  $40\text{cm}^3$  of water is put in the U-tube and then oil of density  $0.8\text{gcm}^{-3}$  is added on side B until it fills side B.

Find the difference in levels of water in the U-tube.

(4)

(c) (i) State Archimedes principle.

(1)

(ii) Describe an experiment to verify Archimedes principle.

(5)

(d) Explain why a ship made of steel floats in water yet steel is denser than water.

(2)

4. (a) State the laws of friction.

(2)

(b) (i) Distinguish between limiting static friction and dynamic friction.

(2)

(ii) Describe an experiment to show that limiting static friction is greater than dynamic friction.

(4)

(c) Distinguish between the following:

(i) A brittle and a ductile material.

(2)

(ii) Tensile stress and tensile strain.

(2)

(iii) Plastic and elastic deformation.

(2)

- (d) Sketch the strain against stress graph for a copper wire that was stressed to breaking point and label features on the graph.

(2)

5. (a) (i) Define the terms **radioactive decay** and **half life**.

(2)

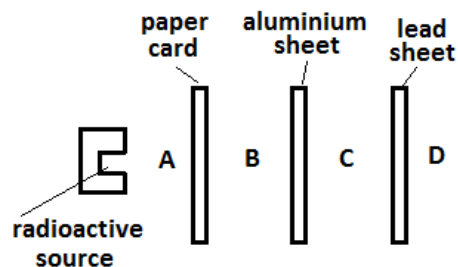
- (ii) Distinguish between nuclear fusion and nuclear fission.

(2)

- (b) Name the three types of radioactive emission.

(3)

- (c) A radioactive source below produces all three types of radiation.



Name the radiations in regions A, B, C and D.

(4)

- (ii) Given that the activity of the source above decreases from 4800 counts per second to 300 counts per second in 40 minutes, calculate half life of the material. (3)

- (iii) Find how much of 20g of the material will remain after 2 hours?

(3)

6. (a) Use the kinetic theory of matter to distinguish between saturated and unsaturated vapours.  
(3)
- (b) Describe an experiment using the method of mixtures to determine the specific latent heat of ice.  
(5)
- (c) In the freezing compartment of a refrigerator 5kg of water at 25°C is turned to ice at 0°C. Calculate
- (i) The total energy lost by water.  
(4)
- (ii) Explain why the freezer of the refrigerator should be placed at the top rather than the bottom of the refrigerator.  
(2)
- (iii) Give two measures taken to ensure efficiency of the refrigerator. (2)
7. (a) (i) Define interference of waves.  
(1)
- (ii) Describe an experiment to show interference of waves.  
(4)
- (b) (i) What is meant by resonance?  
(1)
- (ii) When using a tuning fork of frequency 680Hz, the shortest length of a resonance tube that produces resonance is 0.12m and the next resonance length is 0.37m. Calculate the velocity of sound in air.  
(3)

- (c) (i) Give three differences between radio waves and sound waves.  
(3)
- (ii) Describe how total internal reflection is used in broadcasting.  
(4)
8. (a) With the aid of ray diagrams,
- (i) Describe principal focus of a diverging lens.  
(3)
- (ii) Describe spherical aberration of a converging lens.  
(3)
- (b) (i) Describe how you would determine the focal length of a converging mirror, if you were provided with a light bulb and a screen with a small hole in it. (4)
- (ii) Explain why the method in b(i) above is unsuitable for measuring the focal length of a diverging lens.  
(2)
- (c) (i) By means of a scale drawing show how a converging lens of focal length 6cm forms an image half as tall as the object of height 6cm.  
(3)
- (ii) What is the object distance?  
(1)

**PHYSICS**

**PAPER 1**

**Section A**

1. When cells have worked for some time they may start leaking. This is due to:



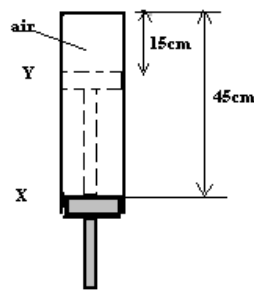
- A. polarization B. depolarization C. local action D. dampness of air
2. When a neutral conductor is brought near the cap of a negatively charged electroscope divergence of the leaf:
- A. Increases. B. Decreases. C. Remains the same. D. Increases then decreases.
3. Which of the following are good conductors of heat and electricity?
- (i) copper (ii) mercury (iii) carbon (iv) air
- A. (i), (ii) and (iii). B. (i) and (ii) only C. (i) only D. (iii) and (iv) only
4. The advantage of alcohol over mercury in a thermometer is.
- A. It is a better conductor. B. It does not wet glass.
- C. It is opaque. D. It has a lower freezing point.
5. The temperature at which molecules of a gas stop moving is called.
- A. Thermodynamic temperature. B. Celsius temperature.
- C. Freezing point. D. Absolute zero temperature.
6. Addition of salt to water.
- (i) Lowers melting point. (ii) Raises melting point
- (iii) Lowers boiling point (iv) Raises boiling point
- A. (i) and (iii). B. (i) and (iv) C. (ii) D. (ii) and (iv)
7. Which of the following is correct about a shiny surface?
- (i) They are good radiators of heat (ii) They are poor radiators of heat
- (iii) They are good absorbers of heat (iv) They are poor absorbers of heat
- A. (i) and (iii). B. (i) and (iv) C. (ii) D. (ii) and (iv)
8. When a cell is made to give a lot of current it becomes warm. This is due to.

- A. internal resistance                      B. local action.
- C. absorption of external heat. D. conversion of chemical energy to electricity.
9. Which of following are true statements about evaporation?
- (i) It takes place inside the liquid.                      (ii) It takes place at the surface of the liquid
- (iii) It takes place at and above  $100^{\circ}\text{C}$  only                      (iv) It takes place at any temperature.
- A. (i) only.      B. (i) and (iii)    C. (i) and (iv)    D. (ii) and (iv)
10. When a needle is carefully placed on water it floats. Which of the following will make the needle sink.
- (i) Addition of detergent.                      (ii) Heating the water.                      (iii) Cooling the water.
- A. (i) only.      B. (i) and (ii)    C. (i) and (iii)    D. (iii) only
11. Surface tension is a demonstration of:
- A. Adhesive forces.    B. Cohesive forces.
- C. Collision among molecules. D. Random motion of molecules.
12.  $10\text{cm}^3$  of A liquid of density  $0.7\text{gcm}^{-3}$  is mixed with  $15\text{cm}^3$  of liquid of density  $1.3\text{gcm}^{-3}$ . Assuming no change in the total volume, density of the mixture is.
- A.  $0.80\text{gcm}^{-3}$                       B.  $0.94\text{gcm}^{-3}$                       C.  $1.00\text{gcm}^{-3}$                       D.  $1.06\text{gcm}^{-3}$
13. The reason for using cooking oil instead of water to fry doughnuts is.
- (i) It has higher specific heat capacity than water.
- (ii) It has higher boiling point than water.
- (iii) It is a better solvent than water.
- A. (i) only      B. (ii) only      C. (i) and (ii).                      D. (i) and (iii)
14. Which of the following sets includes only vector quantities?
- A. weight, acceleration, momentum.    B. energy, potential, momentum.
- C. mass, velocity, force.                      D. heat capacity, power, time.

15. Brownian motion shows that:
- (i) Matter is made of particles
  - (ii) Particles in matter are constantly moving
  - (iii) There are forces among particles.

A. (i) and (ii)            B. (i) and (iii)    C. (ii) and (iii)    D. (i), (ii) and (iii)

16. In the diagram below the piston is moved from point X to point Y at a constant temperature.



The pressure of the air inside the cylinder will be

A. Tripled      B. Doubled.      C. Reduced by a half.      D. Unchanged.

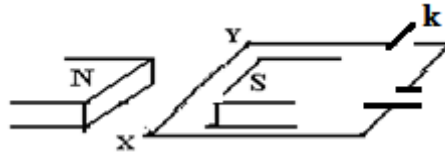
17. When a stone is projected vertically up, it has,
- (i) zero potential energy when it is moving
  - (ii) zero kinetic energy when at the highest position
  - (iii) maximum potential energy when it is at rest on the ground.
  - (iv) maximum potential energy at the highest point of its flight.

A. (i) and (ii)            B. (i) and (iii)            C. (ii) and (iii)    D. (ii) and (iv)

18. A man of mass 60 kg is travelling downwards in a lift which breaks loose and falls freely until it hits the ground. The force exerted by the man on the floor of the lift during the free fall is:

- A. 0N                      B. 6N                      C. 60N                      D. 600N

19. In the diagram below XY is at right angles to the magnetic field.

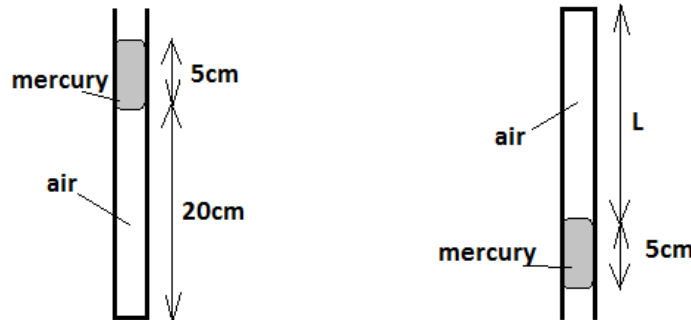


In what direction will XY move when switch k is closed?

- A. Upwards.                      B. Downwards. C. Towards N.                      D. Towards S.
20. Which of the following reactions show(s) the process of fusion?
- (i)  ${}_{92}^{239}\text{U} \rightarrow {}_{58}^{144}\text{Ce} + {}_{36}^{91}\text{Kb} + {}_0^1\text{n}$
- (ii)  ${}_{92}^{238}\text{U} + {}_0^1\text{n} \rightarrow {}_{93}^{239}\text{Np} + {}_{-1}^0\text{e}$
- (iii)  ${}_1^2\text{H} + {}_1^3\text{H} \rightarrow {}_2^4\text{He} + {}_0^1\text{n}$
- A. (i), (ii) and (iii)      B. (ii) and (iii) only      C. (iii) only                      D. (i) only
21. Which of the following is true about viscous drag in fluids?
- (i) It increases with speed.                      (ii) It increases with surface area
- (iii) It is independent of speed.                      (iv) It is independent of surface area.
- A. (i) and (ii)                      B. (i) and (iv)                      C. (ii) and (iii) D. (iii) and (iv)
22. In a simple cell the source of electrons which constitute the electric current is
- A. The zinc plate.                      B. The copper plate.
- C. Dilute sulfuric acid. D. The connecting wire.
23. Which of the following is used to change heat energy to electrical energy?
- A. Electric motor.      B. Heater.      C. Dynamo      D. Thermo-couple.
24. When brass spoon is to be silver-plated, the most suitable setup is:

	Electrolyte	Positive electrode	Negative electrode
A	Distilled water	Spoon	Silver
B	Distilled water	Silver	Spoon
C	Silver nitrate	Spoon	Silver
D	Silver nitrate	Silver	Spoon

25. Air is trapped in a vertical uniform tube by a 5cm thread of mercury as shown below forming a column of length 20cm. Take atmospheric pressure to be 75cm of mercury. The length of the air column when the tube is inverted is.



A.  $L = \frac{(5 + 75) \times 20}{75 - 5}$

B.  $L = \frac{5 \times 20}{75}$

C.  $L = \frac{75 \times 20}{5}$

D.  $L = \frac{(5 + 75) \times 20}{75}$

26. Which of the following can be produced by passing current through a metal wire?

- (i) Infra-red radiation.      (ii) Light.      (iii) magnetic field.

A. (i) (ii) and (iii)      B. (ii) and (iii) only

C. (i) and (ii) only      D. (i) and (iii) only

27. When the simple cell is connected in series with a bulb, the light becomes dim after a short time due to

(i) polarization (ii) local action (iii) increase in temperature

A. (i) B. (ii) C. (iii) D. (i) and (iii)

28. Which of the following can occur when a ray of red light travels from water to glass?

(i) Change in direction, (ii) decrease in velocity (iii) total internal reflection

A. (i) and (ii) B. (i), (ii) and (iii) C. (ii) and (iii) D. (ii) only

29. What happens to divergence of the leaf when a person slowly brings the hand near the cap a positively charged gold leaf electroscope?

A. Divergence increases. B. Divergence reduces.

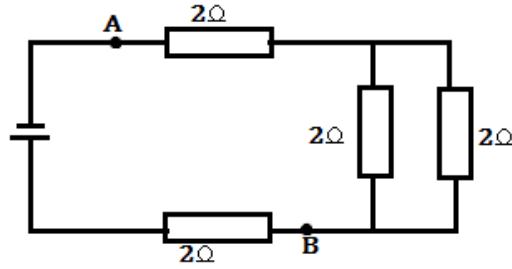
C. Divergence remains the same. D. There is increase then decrease

divergence.

30. Waves of frequency  $f$  and wave length  $\lambda$  are produced in a string. How will the frequency and wave length change when the tension in the string is increased?

	$f$ .	$\lambda$
A	Increase	Constant
B	Constant	Increase
C	Increase	Increase
D	Constant	Constant

31. What is the effective resistance between point A and B in the diagram below?

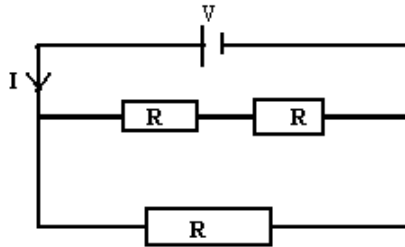


- A.  $2\Omega$     B.  $3\Omega$     C.  $5\Omega$     D.  $6\Omega$

32. The image formed by the optical system of the human eye is.

- A. Inverted and real.                      B. Erect and real.  
C. The same size as the object.    D. Erect and virtual.

33. The diagram below shows a battery of e.m.f.  $V$  and negligible internal resistance connected in circuit with identical resistors  $R$ .




Which expression gives the value of  $I$ ?

- A.  $I = \frac{2V}{3R}$     B.  $I = \frac{3V}{2R}$     C.  $I = \frac{V}{2R}$     D.  $I = \frac{3V}{R}$

34. Lunar eclipse is when the

- A. Sun is between the moon and the earth.    B. Moon is between the earth and the sun.  
C. Earth is between the moon and the sun.    D. Moon is out of line with the earth and sun.

35. When a gold leaf electroscope is charged positively by induction using a charged rod, electrons flow:

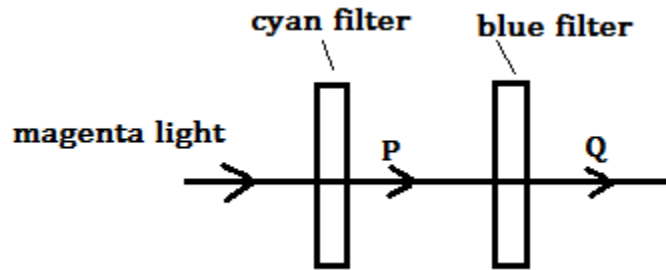
- A. from the charged rod to the electroscope.    B. from the electroscope to the charged rod.  
 C. from the electroscope to the earth.                      D. from the earth to the electroscope.

36. An object is placed 6cm from a spherical mirror. The image is formed 10cm behind the mirror. Which of the following is true about the mirror and the image?

- (i) Concave    (ii) Convex    (iii) Real image    (iv) Virtual image

- A. (i), (iii)                      B. (i), (iv)                      C. (ii), (iii)                      D. (ii) and (iv)

37. In the diagram below, magenta light is incident on two filters arranged one after the other.



Name the colours observed in the regions P and Q.

	P	Q
A	Magenta	Blue
B	White	Blue
C	Blue	Blue
D	Cyan	Blue

38. Which of the following statements is correct?

(i) Surfaces which appear white reflect all colours

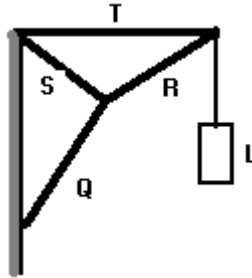
(ii) Red bodies absorb all colours and reflect red.



(iii) Black bodies appear black because they reflect all colours

- A. (i)            B. (i) and (ii)            C. (i), (ii) and (iii)            D. (ii) and (iii)

39. The structure below shows wooden beams supporting a load L. Identify the ties.



- A. T only            B. S only            C. T and S            D. Q and R

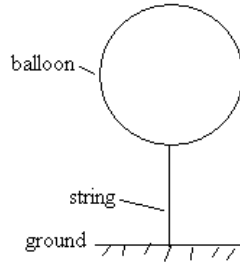
40. A nuclide of atomic number 84 decays to a nuclide of atomic number 83 by emission of one or more radiations. Identify the radiation/s.

- A. Alpha, beta and gamma.            B. Alpha and gamma only.  
C. Beta and gamma only.            D. Alpha only.

### Section B

41. The diagram here shows a balloon of volume  $16\text{m}^3$ , whose material has mass  $0.5\text{kg}$ . The balloon contains a gas of density  $0.5\text{kgm}^{-3}$ . Density of air is  $1.25\text{kgm}^{-3}$ . The balloon is tied to the ground using a string.

- (i) Indicate on the diagram the forces acting on the balloon. (1 ½ marks)



(ii) Find upthrust on the balloon  
(2marks)

.....

.....

(iii) Find tension in the string. (2 ½ marks)

.....

.....

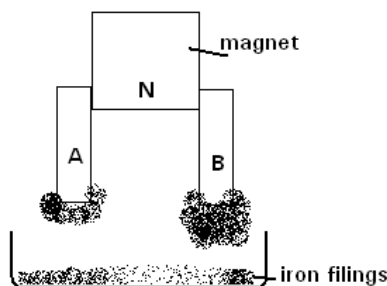
.....

42. (a) What is magnetic induction?  
(1mark)

.....

.....

(b) The diagram here shows pieces of metal A and B attached on the pole of a magnet and placed near a dish containing iron filings.



(i) Explain what is observed in each case when the magnet is detached.  
(2mark)

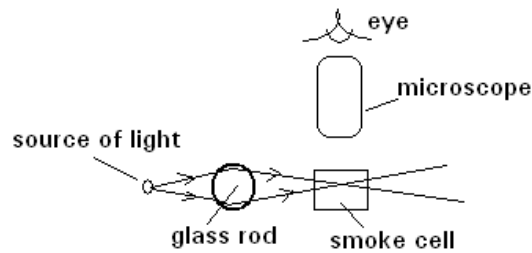
A.....

B.....

(ii) State magnetic properties of A  
(1marks)

.....  
.....

43. (a) The diagram below shows an arrangement used to observe Brownian motion.



(i) What is the function of the glass rod?  
(1mark)

.....

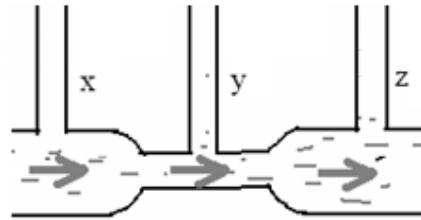
(ii) State what is observed.  
(1mark)

.....  
.....

(iii) Explain the observation above.  
(2mark)

.....  
.....

44. The diagram shows a horizontal tube through which water flows in the direction indicated.



Indicate on the diagram levels of water in the tubes X, Y and Z.

(1mark)

Explain why the levels are as you have indicated.

(2marks)

.....

.....

.....

45. (a) Name the components of fully charged lead acid battery.

(3marks)

.....

.....

.....

(b) Give the advantages of the NiFe cell over the lead acid cell.

(2marks)

.....

.....

.....

.....

46. (a) Define diffraction of waves.  
(1mark)

.....

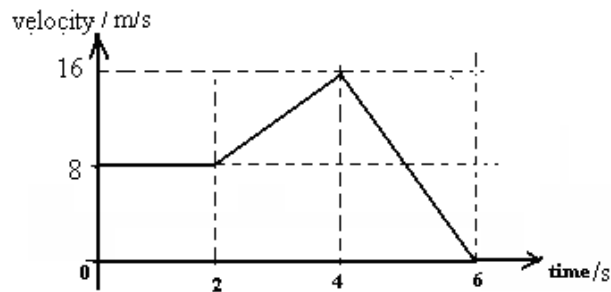
.....

- (b) The diagrams below show water waves incident on a narrow gap, A and a wide gap, B.



In both cases sketch the shape of waves passing through the gaps.  
(2marks)

47. The graph shows the motion of a body between two places.



- (a) Describe motion of the body.  
(3marks)

.....

.....

.....

- (b) Find distance traveled by the body in the last 2 seconds.  
(2marks)

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

48. (a) What is a vapour?  
(1mark)

.....  
.....

(b) Define saturated vapour pressure (SVP).  
(1mark)

.....  
.....

(c) Explain why it is possible to boil water at a temperature higher than 100°C.  
(3mark)

.....  
.....

49. (a) Describe what happens in the 3<sup>rd</sup> stroke of a four stroke petrol engine.  
(2marks)

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

(c) Describe the energy transformations that take place in the four stroke petrol engine.

(  
1mark)

.....  
.....

50. (a) What is a magnetic relay?  
(1mark)

.....  
.....

(b) Describe the working of a magnetic relay.  
(3marks)

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

**PHYSICS**

Paper 1

***SECTION A: (40 MARKS)***

1. The reason why black layers are used in a solar heating system is because they are.  
A. Bad emitters of heat.                      B. Bad absorbers of heat

- C. Good absorbers of heat      D. Good reflectors of heat.
2. The following do not affect the frequency of a vibrating string except?  
A. Tension and length of the string   
B. Length and mass of the string  
C. Mass per length of the string and temperature  
D. Tension and velocity of sound produced
3. Which of the following is emitted by thermionic emission?   
A. Protons      B. Neutrons      C. Electrons      D. Nucleons
4. A ray of light travelling from a less dense medium to a more dense medium is refracted.  
A. Towards the normal      B. Along the boundary   
C. Away from the normal      D. Parallel to the incident ray
5. In a dry cell, the electrolyte is?  
A. Carbon rod      B. Zinc plate   
C. Manganese (iv) oxide      D. Ammonium chloride paste
6. Which of the following is the lowest possible temperature on a Kelvin scale?  
A. Ice point      B. Steam point   
C. Absolute zero      D. Dew point
7. Which of the following quantities increases when the mass of a body is increased?  
A. Velocity      B. Displacement      C. Acceleration      D. Momentum
8. A body of mass 3kg is thrown upwards with a velocity of  $12\text{ms}^{-1}$ . Calculate the maximum height reached,  
A. 0.5 m      B. 7.2m      C. 5.0m      D. 10.0m
9. Why does a charged electroscope lose its charge when a flame is brought near its cap?  
A. Point action takes place at the cap   
B. The flame blows the charges off the cap  
C. Charges of the opposite sign from the flame are attracted to the cap.



- D. The flame ionizes nearby air molecules and those of opposite sign are attracted on the cap.
10. The separation between successive compressions of a sound wave is 3.0cm. if the wave travels a distance of 48 cm in 8 seconds, find the frequency of the wave.

A. 0.5Hz    B. 2.0Hz    C. 18.0Hz    D. 128.0Hz

11. An air craft is able to experience a lift in air because,
- (i) It can adjust the shape of the wings to create less pressure above the wings.
  - (ii) It can adjust the shape of the wings to create less pressure below the wings.
  - (iii) It can adjust the shape of its wings to reduce its apparent weight in air.

A. (i) only    B. (ii) only    C. (i) and (iii) only    D. (ii) and (iii) only

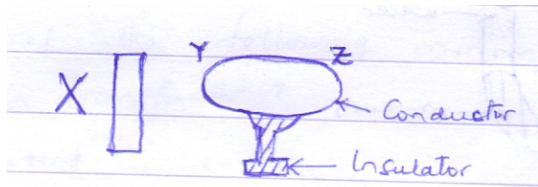
12. Which of the following pairs of colors combine to form white light?

A. Green + yellow  
B. Red + magenta  
C. Blue + yellow  
D. Blue + cyan

13. Which off the nuclei  ${}_{92}^{235}P$ ,  ${}_{92}^{238}Q$ ,  ${}_{84}^{218}R$  and  ${}_{83}^{218}S$  are isotopes?

A. P and R    B. Q and S    C. R and S    D. P and Q

14. In the figure 1 below X is a charged body.



What are the possible signs of charge at Y, Z and X

- | Y           | Z        | X        | <input type="checkbox"/> |
|-------------|----------|----------|--------------------------|
| A. Negative | Positive | Positive |                          |
| B. Negative | Positive | Negative |                          |
| C. Positive | Positive | Positive |                          |
| D. Negative | Negative | Negative |                          |

15. A body moving on a horizontal surface experiences frictional force of 10N. If the normal reaction on the body is 25N, find the mass of the body.

- A. 0.5 kg    B. 1.5 kg    C. 2.5 kg    D. 2.0 kg

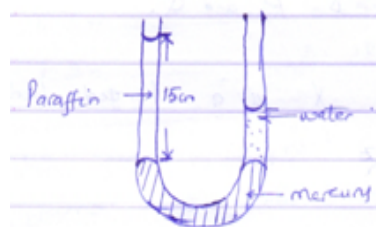
16. Which of the following statements is correct about diffusion?

- A. It takes place at the same rate in all states of matter.  
 B. It is faster in gases than in liquids  
 C. It is faster in liquids than in gases  
 D. It does not depend on temperature.

17. A ray of light travelling from air to water is refracted at an angle of  $30^\circ$ . Find the angle of incidence if the critical angle of water is  $48.6^\circ$ .

- A.  $22.1^\circ$     B.  $40.6^\circ$     C.  $41.8^\circ$     D.  $60.0^\circ$

18. In figure 2 below, a U-tube is containing mercury, a column of water of density  $1000\text{kgm}^{-3}$  and a column of paraffin of density  $800\text{kgm}^{-3}$  and a column of paraffin of density  $800\text{kgm}^{-3}$ , find the length of the water column if the length of paraffin column is 15cm.



- A. 12.00cm      B. 1.25 cm      C. 18.75 cm      D. 0.80 cm
19. When current is passed through a wire placed perpendicular to a magnetic field, the wire
- A. Becomes magnetized      B. Becomes demagnetized
- C. Produces a neutral point below it      D. Experiences a force
20. A heater rated 100 W melts 17.9g of ice every minute, find the specific latent heat of fusion of ice.
- A.  $\frac{1000 \times 1 \times 100}{17.9}$       B.  $\frac{100 \times 60 \times 1000}{17.9}$       C.  $\frac{100 \times 1000}{17.9 \times 60}$
- D.  $\frac{17.9 \times 1000}{100 \times 1}$
21. A transformer having a primary coil of 400 turns and a secondary coil of 200 turns is connected to a 240V a.c mains supply. Find the secondary voltage.
- A. 480 V      B. 333V      C. 120 V      D. 33.3V
22. The mass of a sample of a radioactive substance is 8 days, find the mass remaining after 32 days.
- A. 25g      B. 50g      C. 100g      D. 200g
23. A boy of mass 20kg develops a power of 20W after climbing steps for 80s. If each step is 20cm high, how many steps did he climb?
- A. 400 steps      B. 100 steps      C. 40 steps      D. 4 steps
24. Which of the following minimizes leakages of the magnetic flux is a transformer?
- (i) Laminating the iron core  
 (ii) Winding air on the soft core  
 (iii) Reducing air between the coils
- A. (i) and (ii) only      B. (ii) and (iii) only
- C. (i) and (iii) only      D. (i) only
25.  ${}^x_{234}\text{Th} \rightarrow {}_{91}^{234}\text{Pa} + {}_{-1}^0\text{e} + \text{energy}$

The equation above represents the decay of a radio isotope by beta emission.

Find the value of x

- A. 90      B. 92      C. 143      D. 144

26. Which of the following happens during the power stroke of a petrol engine.

- A. The inlet valve opens  
B. The piston moves up  
C. Expanding gas pushes the piston down  
D. Burnt gas is pushed out from the cylinder.

27. Which of the following is true about longitudinal waves?

- (i) Distance between two consecutive rarefactions is the wave length  
(ii) Particles move away from the centre of a rarefaction to a compression.  
(iii) The crests and troughs are points of maximum displacement from the initial position.

- A. (i) Only                      B. (ii) only  
C. (i) and (ii) only          D. (ii) and (iii) only

28. The cost of running a lamp rated 7.2v, 3.0A for 5 hours is shs 2.16. find the cost per unit of electricity.

- A. Shs 20              B. Shs 500      C. Shs 0.05      D. Shs. 0.02

29. A mass of 600g produces an extension of 15cm in a spring. Find the extension produced by a force of 12.0N.

- A. 4.8cm    B. 7.5 cm    C. 10.8cm    D. 30.0cm

30. The volume of a fixed mass of gas at a temperature of 57<sup>0</sup>C is 750 cm<sup>3</sup> find the volume of the gas when its temperature is 9<sup>0</sup>C at constant pressure.

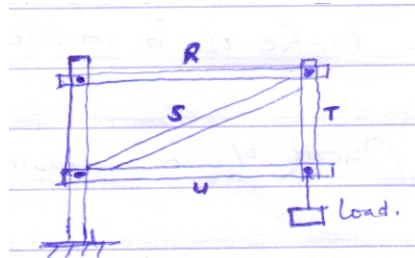
- A. 118.4cm<sup>3</sup>    B. 124. 1cm<sup>3</sup>    C. 640.9cm<sup>3</sup>    D. 877.7 cm<sup>0</sup>

31. The stability of a body may be increased by?

- (i) Raising its centre of gravity  
(ii) Lowering its centre of gravity  
(iii) Making its base narrow  
(iv) Making its base wide.

- A. (i) and (iv) only                      B. (ii) and (iv) only  
 C. (i) and (iii) only                      D. (ii) and (iii) only
32. Which of the following is responsible for the formation of a mirage?  
 A. Diffraction of light                      B. Absorption of light  
 C. Dispersion of light                      D. Total internal reflection

33. Figure 3 shows a structure supporting a load



Which of the girders R, S, T, U is under compression?

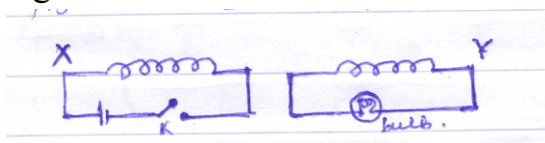
- A. U and R    B. T and R    C. S and U    D. S and T
34. A trolley of mass 2kg moves with an acceleration of  $2.5\text{ms}^{-2}$  when pulled by an elastic cord. If the tension in the cord is 6N, find the frictional force.  
 A. 1 N    B. 3N    C. 2N    D. 5N



35. An object of height 1 cm is placed 4cm from a convex lens and forms image five times the height of the object. Find the distance of the image from the lens.  
 A. 0.80 cm    B. 1.25cm    C. 4.00cm    D. 20.00cm
36. A car starts from rest and accelerates uniformly at  $8\text{ms}^{-2}$  for a distance of 100m. Find the time it takes to cover this distance.  
 A. 25.0 seconds    B. 12.5 seconds    C. 5.0 seconds    D. 3.5 seconds



37. Figure 4 shows two coils X and Y close to each other.



When switch K is closed, the bulb lights momentarily because

- (i) An emf is induced in coil Y
- (ii) An emf is induced in coil X
- (iii) The magnetic field between X and Y changes

- A. (i) only      B. (ii) only      C. (iii) only
- D. (i) and (iii) only

38. Which of the following radiations is emitted from white hot bodies?

- A. X-rays      B. Ultraviolet      C. Infrared      D. Gamma

39. The time between which a girl claps her hands and hears the each of the clap is 5 seconds. Find the distance between the girl and the reflector. (speed of sound in air is  $330\text{ms}^{-1}$ )

- A. 1650m      B. 825m      C. 66m      D. 325m

40. Which of the following can be used to regulate the temperature of an appliance.

- A. Thermocouple      B. Thermometer
- C. Thermostat      D. Thermopile

**SECTION B: (40 MARKS)**

*Answer all questions in this section. All working must be shown clearly in the spaces provided.*

41. a) Define the term gravitational potential energy. (01 mk)

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

b) A body of mass 800 kg moves with a velocity of  $72\text{km h}^{-1}$ . calculates its kinetic energy. (03 mks)

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

42. a) State two characteristics of images formed by plane mirrors. (02 mks)

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

b) Draw a ray diagram showing the formation of the image of object by a plane mirror. (02 mks)

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

43. a) (i) What is surface tension? (01 mk)

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

(ii) State one factor which affects surface tension. (01 mk)

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

b) A drop of oil of volume  $1.1 \times 10^{-5} \text{cm}^3$  forms a patch of radius 10cm on the surface of water. Calculate the thickness of the molecules. (02 mks)

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

44. a) Define the term momentum. (01 mk)

.....  
.....  
b) A body of mass 1000kg travelling at a speed of  $20\text{ms}^{-1}$  in the direction due east collides head on with another one of mass 1500kg travelling at  $15\text{ms}^{-1}$  in the direction due west. If the two bodies stick together, find their common velocity after collision. (03 mks)

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

45. a) A machine is used to raise a load of 300N through a distance of 20m. if the work done against friction is 1500J, calculate;-

a) work in put: (02 mks)

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

b) efficiency of the system (02 mks)

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

46. a) What is a closed pipe? (01 mk)

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

b) The frequency of the first harmonic made by a closed pipe is 349.2Hz Calculate the length of the air column if the speed on sound in the pipe is  $350\text{ms}^{-1}$ . (03 mks)

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



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

47.a)(i) What is a notch? (01 mk)

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

(ii) State two ways of reducing notch effect? (02 mks)

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

b)What is the difference between a tie and a strut? (01 mk)

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

48.a)(i) Differentiate between nuclear fusion and nuclear fission. (01 mk)

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

(ii) State two conditions for nuclear fusion to take place. (01 mk)

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

b) Radium  ${}_{86}^{226}\text{Ra}$  disintegrates into radon (Rn) by emission of an alpha particle. Write the equation for the reaction. (02 mks)

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

49. a) (i) What is a magnetic field? (01 mk)

.....  
.....

.....  
(ii) Draw the magnetic field pattern between two magnets whose north poles are facing each other. (02 mks)  
.....  
.....  
.....  
.....

b) What is meant by the term magnetic saturation? (01 mk)  
.....  
.....

50. a) Define specific latent heat of fusion. (01 mk)  
.....  
.....

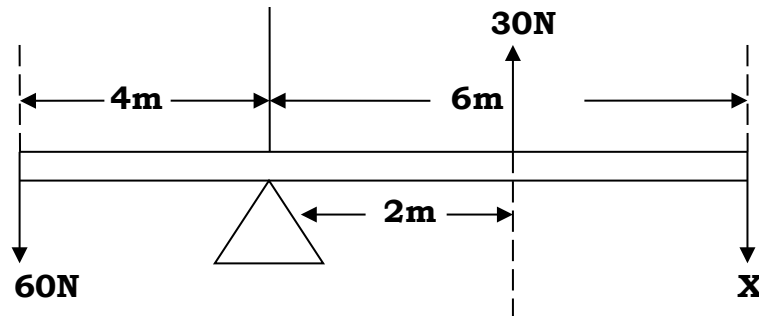
b) 20g of ice at  $-15^{\circ}\text{C}$  is placed inside 85g of water at  $40^{\circ}\text{C}$  contained in a calorimeter of mass 50g and specific heat capacity  $400\text{Kkg}^{-1}\text{ k}^{-1}$ . Calculate the final temperature of the water. (shc of ice =  $2100\text{Jkg}^{-1}\text{ k}^{-1}$ , shc of water =  $4200\text{ Jkg}^{-1}\text{k}^{-1}$ , latent heat of fusion of ice =  $3.34 \times 10^5\text{ Jkg}^{-1}$ ) (03 mks)  
.....  
.....  
.....  
.....

**PHYSICS.**

1. When a pinhole camera is moved nearer an object, the size of the image  
A. Remains the same B. becomes smaller  
C. Becomes longer D. becomes diminished
  
2. The gradient of velocity – time graph represents the  
A. speed of the body  
B. Velocity of the body  
C. Acceleration of the body

- D. The distance covered by the body.
3. An object thrown from an aeroplane reaches a constant velocity known as terminal velocity because the
- A. Weight of the body at a given places does not vary.
  - B. Sum of the upthrust and viscous force will be equal to the weight of the body.
  - C. sum of the upthrust and the viscous force on the body is constant.
  - D. Upthrust experienced by the body is constant.
4. A metal rod gains a positive charge when rubbed with fabric. The fabric acquire.
- A. No charge
  - B. A negative charge equal to that on the rod
  - C. A positive charge equal to that on the rod
  - D. A positive charge greater than that on the rod
5. A ductile material is that which
- A. Is fragile
  - B. Is not fragile
  - C. Can be moulded into any shape
  - D. Easily breaks under compression
6. An object is placed 6cm from a plane mirror. If the object is moved further by 2cm, find the distance between the object and its image.
- A. 16cm
  - B. 8cm
  - C. 12cm
  - D. 6cm
7. When a car is suddenly brought to rest, a passenger jerks forward because of
- A. Inertia
  - B. friction
  - C. Gravity
  - D. momentum
8. A solid **C** sinks deeper in liquid **N** than in liquid **M** because the
- A. Upthrust on the solid is greater in liquid **N** than in **M**.
  - B. Density of liquid **M** is greater than that of **N**.
  - C. Density of liquid **N** is greater than that of **M**.
  - D. Surface tension of liquid **N** is less than that of **M**.
9. A concave mirror can be used as a shaving mirror because when an object is placed between the principal focus and the pole, the image formed is
- A. Magnified, virtual and erect.
  - B. Magnified, real and inverted
  - C. Diminished, real and inverted
  - D. Diminished, virtual and erect.

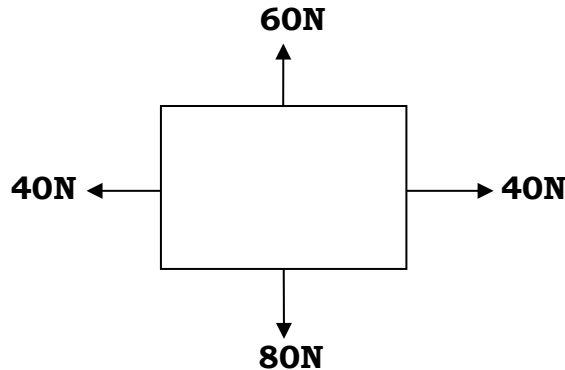
10. When an inflated balloon is released in air with its neck opened, it will.
- A. Rise
  - B. Drop to the ground instantly.
  - C. Move to the opposite direction to the escaping air.
  - D. Remain in one position.
11. If this system in figure 3 is in equilibrium. Find the value of **X**



- A. 30N
  - B. 60N
  - C. 50N
  - D. 90N
12. The S.I units for the fundamental measurements are
- A. Mass, length and time
  - B. Time, density and pressure
  - C. Mass, frequency and pressure
  - D. Second metre and kilogram.
13. The image formed in a plane mirror is
- i) The same distance behind as the object in front
  - ii) Totally inverted
  - iii) Magnified and virtual
- A. (i) and (ii) only
  - B. (i) and (iii) only
  - C. (ii) and (iii)
  - D. (i), (ii) and (iii)
14. The energy which a body has reason of its motion is
- A. Potential energy
  - B. Kinetic energy
  - C. Chemical energy
  - D. Internal energy
15. When momentum of a body changes,
- A. Its mass remains constant
  - B. Its velocity remains constant
  - C. Direction of movement remains constant
  - D. Force acting on it changes

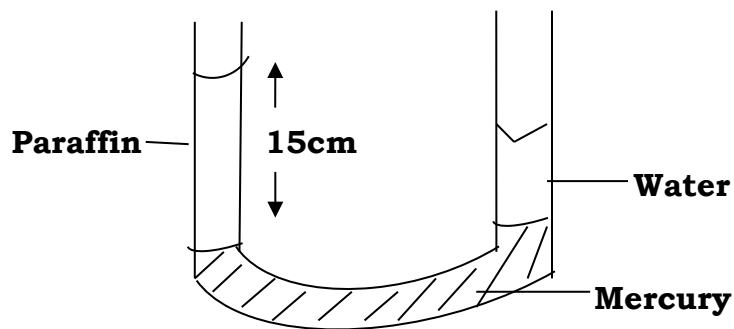
16. A body of weight 6N falls vertically to the ground throw wind blowing eastwards with a force of 8N. Find the resultant force on the body.
- A. 20N B. 8.0N  
C. 10N D. 14.0N
17. Trailers have many tyres because distribution of weight over
- A. Small area gives less pressure  
B. A long area gives great pressure  
C. A large area gives less pressure  
D. On area does not affect pressure
18. Jjumba a S.2 student used a soft tissue to dry the water on his table. The process used is called.
- A. Chromatography B. Diffusion  
C. Osmosis D. Capillarity.
19. A force of **5N** changes the momentum of a body from  $50\text{kgms}^{-1}$  to  $250\text{kgms}^{-1}$ . Find the time taken.
- A.  $1.7 \times 10^{-2}$  seconds B.  $4.0 \times 10^1$  seconds  
C.  $2.5 \times 10^2$  seconds D.  $6.0 \times 10^1$  seconds
20. A drop of oil of volume  $2 \times 10^{-3} \text{ mm}^3$  spreads on water to form an area of  $1.5 \times 10^{-2} \text{ mm}^2$ . Find the size of the oil molecule.
- A.  $\frac{2 \times 10^{-3} \text{ mm}}{1.5 \times 10^{-2}}$  B.  $\frac{1.5 \times 10^{-2} \text{ mm}}{2 \times 10^{-3}}$   
C.  $2 \times 10^{-3} \times 1.5 \times 10^{-3} \text{ mm}$  D.  $2.5 \times 10^{-3} + 1.5 \times 10^{-3} \text{ mm}$
21. When reflection occurs in a plane mirror,
- A. The image is real, erect and magnified  
B. The angle of reflection is equal to the angle of incidence.  
C. The incident ray and the reflected ray lie different planes  
D. The object and image are the same distance from the mirror.
22. A notch on a material spreads more rapidly when the material is
- A. In tension B. in compression  
C. Prestressed D. reinforced
23. An object of mass 2kg dropped from the top of a building hits the ground with kinetic energy of 900J. The height of the building is.
- A. 30m B. 45m  
C. 90m D. 180m

24. A body becomes negatively charged when  
A. Gains electrons  
B. loses electrons  
C. Gains protons  
D. loses protons
25. The eclipse of the sun takes place when the shadow of the  
A. Earth falls on the moon  
B. sun falls on the moon  
C. Moon falls on the moon  
D. moon falls on the earth
26. A ticker timer is connected to a main – supply of frequency 50Hz.  
Find the time it takes to print five consecutive dots.  
A. 0.08s  
B. 250s  
C. 10s  
D. 0.10s
27. A girl is standing in front of two plane mirrors inclined at angle of  $30^\circ$  to each other. How many images of the girl can be seen?  
A. 11  
B. 12  
C. 9  
D. 6
28. The figure below shows forces of **80N**, **40N**, **60N**, and **40N** acting on a body.



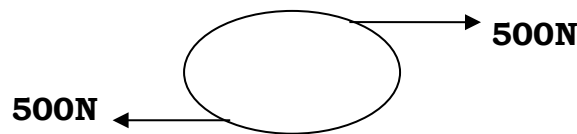
- In which direction does the body move?
- A. To the left  
B. to the right  
C. Downwards  
D. upwards
29. It is easier to use a claw hammer to remove a nail from a piece of wood if the handle is longer because the  
A. Effort applied becomes bigger  
B. Turning effect becomes bigger  
C. Anticlockwise moments will balance clockwise moments  
D. Fulcrum is between the effort and the load.

30. A smoke cell is used to demonstrate a phenomenon called
- A. Diffusion  
B. capillarity  
C. Brownian motion  
D. surface tension
31. Which one of the following quantities increases when mass of a body is increased?
- A. Velocity  
B. Displacement  
C. Acceleration  
D. Momentum
32. The figure below shows a U-tube containing mercury, a column of water of density  $1000\text{kgm}^{-3}$  and a column of paraffin of density  $800\text{kgm}^{-3}$ . Find the length of water column if the length of the paraffin column is 15cm.



- A. 12.00cm  
B. 18.75cm  
C. 1.25cm  
D. 0.80cm
33. Which of the following increases the stability of a body?
- i) Raising its centre of gravity  
ii) Lowering its centre of gravity  
iii) Making its base narrow  
iv) Making its base wide

- A. (i) and (iv) only  
B. (ii) and (iv) only  
C. (i) and (iii) only  
D. (ii) and (iii) only
34. Which one of the following is a derived unit?  
A. Kilogram  
B. Newton  
C. Second  
D. Metre
35. A point along the principal axis of a concave mirror where rays parallel and close to the axis converge after reflection is  
A. a pole  
B. centre of curvature  
C. focal length  
D. Principal focus.
36. The shaft in engine is subjected to two parallel but opposite forces of 500N each as shown in the figure below.



- The rotation is best stopped by applying
- A. Two forces of 500N acting at right angles to each other.  
B. Two parallel but opposite forces of 500N  
C. A single force of 1000N  
D. A single force of 250N
37. A diver dives to a depth of 20m below the surface of water of density  $1000\text{kgm}^{-3}$ , the increase in pressure he experiences in  $\text{Nm}^{-2}$  is  
A.  $5.0 \times 10^2$   
B.  $1.0 \times 10^4$   
C.  $2.0 \times 10^4$   
D.  $2.0 \times 10^5$
38. At what position along the principal axis of a concave mirror should the object be placed to form an image of the size as the object?  
A. Beyond centre of curvature  
B. At the focal point  
C. At the centre of curvature  
D. Between the focal point and the pole.

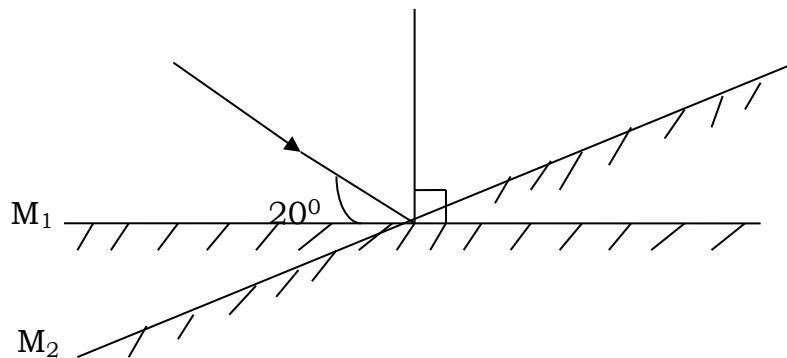


39. The fundamental law of electrostatics states that
- A. charges occur in pairs
  - B. Charges repel each other
  - C. Like charges repel each other
  - D. Like charges attract each other
40. A pin is placed in front of a concave mirror at a distance less than the focal length what type of image is formed?
- A. Real, inverted, diminished
  - B. Virtual, erect, magnified
  - C. Real, erect, diminished
  - D. Virtual, inverted, magnified

**SECTION B.**

41. a) State the laws of reflection of light.  
(02mks)

b)



- An incident ray makes an angle of  $20^\circ$  with the plane mirror in position  $M_1$  as shown in the diagram above. What will be the angle of reflection if the mirror is rotated through  $6^\circ$  to position  $M_2$  while the incident ray remains the same?  
(02mks)

42. a) What is meant by uniform velocity?  
(01mk)

b) A car travelling with uniform velocity of  $25\text{ms}^{-1}$  for **5** seconds  
brakes and then comes to rest under a uniform deceleration  
in **8** seconds.

i) Sketch a velocity – time graph of the motion.  
(06mks)

ii) Find total distance travelled.  
(02mks)

43. a) What is reflection of light?  
(01mk)

b) (i) Mariam stands in front of two plane mirrors inclined at  
 $60^\circ$  to each other. How many Mariam's images can be  
seen through the mirrors?  
(02mks)

ii) State two properties of the image formed in a plane mirror.  
(01mk)

44. a) Define momentum.  
(01mk)

b) A car **X** of mass 1000kg traveling at a speed of  $20\text{ms}^{-1}$  in the direction due East collides head on with another **Y** of mass 1500kg, travelling at  $15\text{ms}^{-1}$  in a direction due West. If the two cars stick together, find their common velocity after collision. (03mks)

45. a) i) What is magnification as applied to light? (01mk)

b) ii) An object of height 4cm is placed 8cm in front of a pinhole camera of length 10cm. What is the size of the image formed on the screen? (02mks)

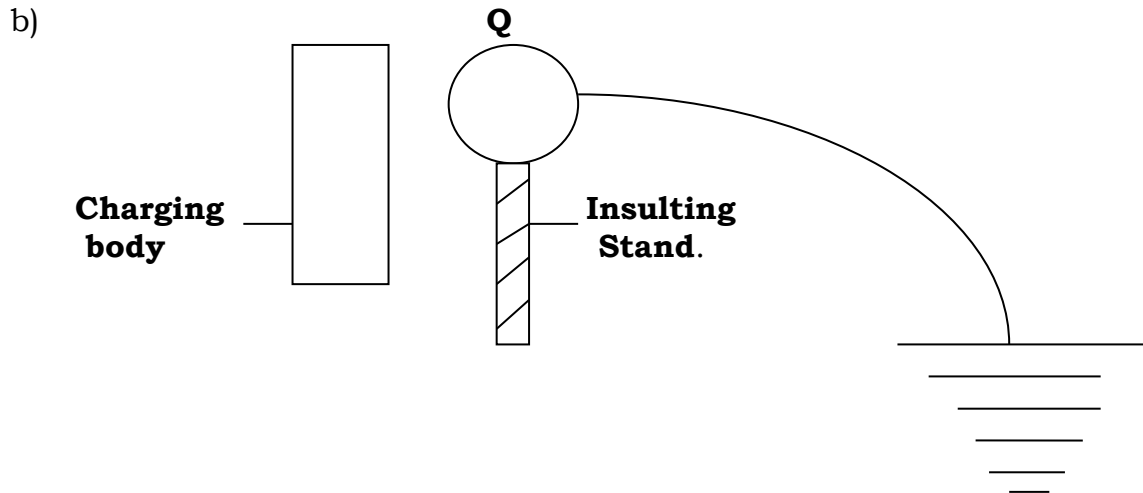
iii) Why is a pinhole camera painted black inside? (01mk)

46. a) Define the following  
i) Conductors (01mk)

ii) Insulators (01mk)

b) Give two examples of each in 46 (a) above. (02mks)

47. a) What is meant by electrostatic induction? (01mk)



### Earthing.

The apparatus above were set up by a senior two student to charge a metal sphere **Q** positively.

i) What should be the charge on the charging body?

(01mk)

ii) Indicate on the earth wire the direction of flow of negative charges.

(01mk)

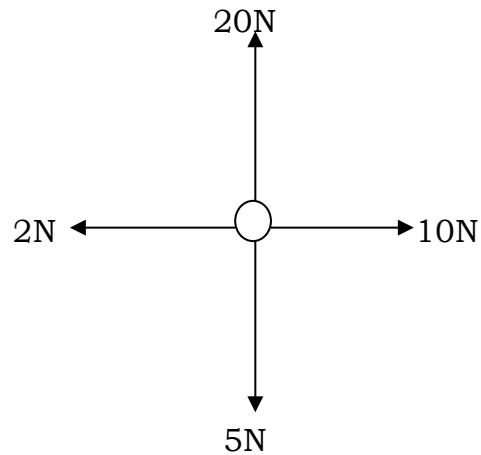
iii) Why should the eathw ire be disconnected when the charging body is still in position?

(01mk)

48. a) Distinguish between scalar and vector quantities.

(02mks)

- b) Four forces of **20N**, **5N**, **10N** and **2N** act on a body as shown in the diagram below.



Find the magnitude of the resultant force.

(02mks)

49. a) Define;

i) Moment of force

(01mk)

ii) Centre of gravity

(01mk)

- b) State the conditions for a body to be in mechanical equilibrium.

(02mks)

50. a) Distinguish between a real and virtual image.

(02mks)

b) With the aid of a diagram, show how a solar eclipse is formed.  
(02mks)

## PHYSICS

### Paper 2

1.(a) State Hooke's law of elasticity. (1 mark)

(b) Describe an experiment to demonstrate Hooke's law. (5 marks)

(c) A spring of natural length  $8.0 \times 10^{-2}$  m extends by  $2.5 \times 10^{-2}$  mm when a weight of 10 N is suspended on it.

(i) Find the spring constant. (2 marks)

(ii) Determine the extension when a weight of 15 N is suspended on the spring.  
(1 mark)

(d) (i) Define moment of a force. (1 mark)

(ii) The diagram in Fig.1 shows a uniform bar AB of length 1.2 m and weight 10 N under the action of some forces.

Find the minimum force,  $F$ , needed to keep the bar in a horizontal position.

(3 marks)

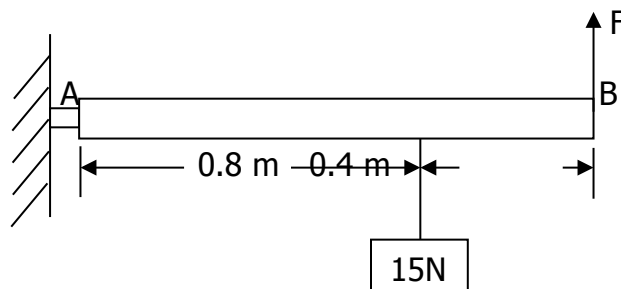


Fig. 1

(e) (i) Define capillarity. (1 mark)

(ii) Explain how capillary rise occurs in a narrow tube. (2 marks)

2. (a) (i) State the laws of refraction of light. (2marks)

(ii) Give two applications of total internal reflection. (2 marks)

(b) Describe an experiment to determine the refractive index of the material of a rectangular glass block. (6 marks)

(c) A ray of light incident on glass from air is refracted through  $32^\circ$ . If the refractive index of glass is 1.50, find the angle of incidence. (3 marks)

(d) With the aid of a diagram, explain why a swimming pool appears shallower than its actual depth. (3 marks)

3. (a) A drop of oil of volume  $6.0 \times 10^{-3} \text{ cm}^3$  forms a patch of diameter 3.5 cm on a water surface.

(i) Calculate the diameter of a molecule of the oil. (3 marks)

(ii) State the **two** assumptions made. (1 mark)

(b) (i) State Archimede's principle. (1 mark)

(ii) A block of metal of mass 0.25 kg floats in mercury whose density is  $1.36 \times 10^4 \text{ kgm}^{-3}$ . Find the volume of the metal block which lies below the surface of the mercury. (3 marks)

(c) (i) Explain why a metallic tin with an air-tight lid floats on the surface of water. (3 marks)

(ii) Give **one** example where the principle in (c) (i) is used. (1 mark)

(d) In a Brownian motion experiment, smoke was introduced into an illuminated glass cell and observed under a microscope.

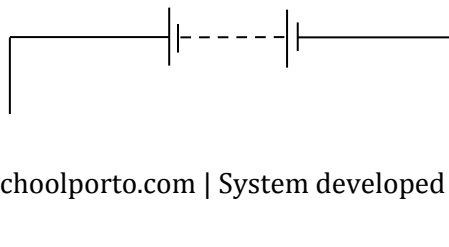
Explain what is observed. (3 marks)

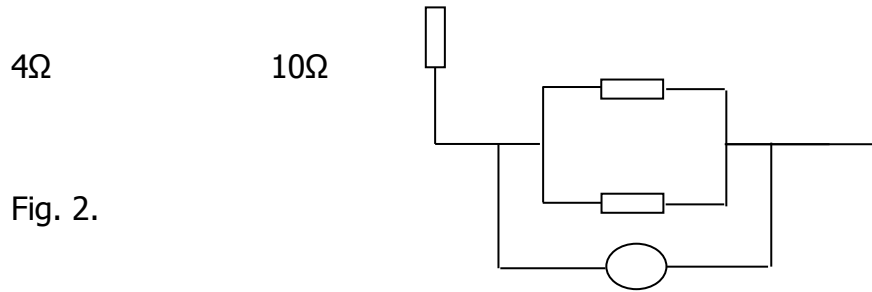
4. (a) Describe an experiment to charge a gold leaf electroscope negatively by induction. (4 marks)

(b) A positively charged sewing needle is fixed in a cork and placed in a dark room. A candle flame is placed in front of the sharp end of the pin. Explain why the flame is blown away. (4 marks)

(c) A battery of e.m.f. 12V is connected to resistors of resistances  $4 \Omega$ ,  $10 \Omega$  and  $15 \Omega$  as shown in Fig. 2.

12V





Determine the voltmeter reading. (5 marks)

(d) (i) State Ohm's law. (1 mark)

(ii) A light industry uses 20 kW of electrical energy to run its machines. How much does the industry pay for operating the machines for 8 hours if one unit of electrical energy costs 650 shillings? (2 marks)

5. (a) State any **two** differences between sound waves and light waves. (2 marks)

(b) (i) Describe a simple experiment to determine the velocity of sound in air. (4 marks)

(ii) Explain why the speed of sound is higher in solids than in air. (3 marks)

(c) Two people P and Q stand in a straight line at distances of 330 m and 660 m respectively from a high wall. Find the time interval taken for P to hear the first and second sounds when Q makes a loud sound. (3 marks)

(d) (i) What is a stationary wave? (3 marks)

(ii) Name **one** musical instrument which produces stationary waves. (1 mark)

6. (a) (i) Draw a labeled diagram of a cathode ray oscilloscope. (4 marks)

(ii) State the function of each part. (4 marks)

(iii) Explain how the bright spot is formed on the screen. (3 marks)

(b) A radioactive substance produces alpha particles, beta particles and gamma rays simultaneously which are directed midway between two parallel horizontal electrical plates which are oppositely charged.

(i) Draw a diagram to show the path of the radiations between the plates.



(3 marks)

(ii) What happens when the radioactive substance is completely covered with an ordinary sheet of paper? (1 mark)

(c) Give any **one** precaution taken by people who handle radioactive substances. (1 mark)

7. (a) (i) Give any **two** characteristics which a liquid used in a liquid-in-glass thermometer should have. (2 marks)

(ii) Describe how the lower fixed point on a mercury-in-glass thermometer can be determined. (4 marks)

(b) Explain this observation: A piece of thick glass removed from hot water and dipped into cold water will crack. (5 marks)

(c) (i) Define specific heat capacity. (1 mark)

(ii) A piece of copper of mass  $4 \times 10^{-2}$  kg at  $200^{\circ}\text{C}$  is quickly transferred into a copper calorimeter of mass  $6 \times 10^{-2}$  kg containing  $5 \times 10^{-2}$  kg of water at  $25^{\circ}\text{C}$ . Determine the final temperature of the mixture. (4 marks)

8. (a) (i) Define the term **line of force** as applied to magnetic fields. (1 mark)

(ii) Sketch the magnetic field between two south poles of a magnet placed close to each other. (2 marks)

(b) Explain, using the domain theory of magnetism, how magnetization is lost by heating a steel magnet. (3 marks)

(c) State **two** factors that affect the strength of an electromagnet. (1 mark)

(d) (i) With the aid of a labeled diagram, describe how a transformer works. (6 marks)

(ii) A transformer with 400 turns in the secondary circuit and 20 turns in the primary circuit has a p.d. of 240 V in the primary circuit. What is the p.d. in the secondary circuit? (3 marks)

**Together we can 2020**