

# PHYSICS

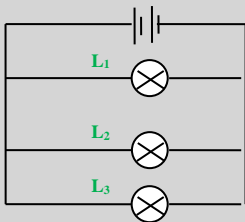
1987

## PAPER 1

1. An object is placed between the focal point and centre of curvature of a concave mirror. Which of the following fully describes the image formed?

- A. Real, inverted, diminished
- B. Real, inverted, magnified
- C. Real, erect, diminished
- D. Virtual, erect, magnified.

2.



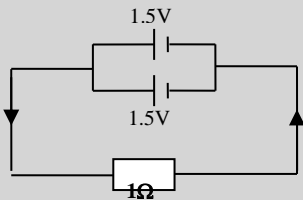
Three identical lamps  $L_1$ ,  $L_2$  and  $L_3$  just glow when connected as shown in Fig.1 What will happen if a piece of copper wire is connected across  $L_2$ ?

- A.  $L_2$  and  $L_1$  will go out.
- B.  $L_2$  and  $L_3$  will be brighter.
- C. There will be no effect on the lamps.
- D.  $L_1$  will be brighter than  $L_3$ .

3. When a force of 30N is applied to a stationary trolley, the trolley moves through a distance of 10 m in 20s in the direction of the force. The average power developed by the trolley is

- A. 6.67 W
- B. 60 W.
- C. 15 W.
- D. 7.5 W.

4.



Two cells each of emf 1.5 V and each having internal resistance of  $2\Omega$  are connected as shown in Fig. 2. Find the current,  $I$ , flowing in the circuit.

- A. 3.00 A.      B. 1.50 A      C. 0.75 A      D. 0.60 A

5.

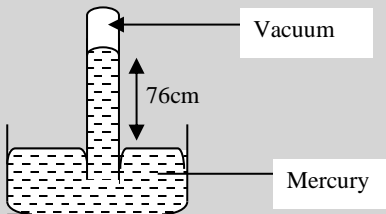


Fig. 3 shows a simple barometer. The height of the mercury column is 76 cm. When the tube is tilted the height of the mercury column will

- A. be slightly higher than 76 cm.  
B. be slightly lower than 76 cm.  
C. not change.

D. oscillate about 76 cm.

6. After 18 hours  $1/16^{\text{th}}$  of the original mass of radioactive isotope remained. What is the half life of the isotope?

A. 1.125 h

B. 3.6 h

C. 4.5 h

D. 9 h.

7. In an oil-film experiment to estimate the size of a molecule,  $0.005 \text{ cm}^3$  of oleic acid was dropped on lycopodium powder on a water surface. The mean diameter of the acid patch was 5 cm. The thickness of a molecule of oleic acid is

A.  $\frac{0.005}{25\pi}$

B.  $\frac{0.005 \times 4}{25\pi}$

C.  $\frac{\pi(2.5)^2}{0.005}$

D.  $\frac{0.005 \times 3}{4\pi(2.5)^3}$

8. When a body is brought near a negatively charged electroscope a decrease in divergence is observed.

This may mean that the body is

- (i) positively charged.                      (ii) negatively charged  
(iii) not charged at all.

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

**9.—11 missing !!**

12. A bullet is fired upwards from the ground. It reaches its maximum height in 4 s, find the total distance it covers by the time it hits the ground.

- A. 40 m.  
B. 80 m.  
C. 160 m.  
D. 280 m.

13. A sound wave of frequency 250 Hz is produced 300 m away from a high wall. If an echo is received after 2 s the wavelength of the sound wave is

- A. 2.4 m  
B. 1.2 m  
C. 0.83 m.  
D. 0.6 m.

14. When liquid naphthalene is cooled, a time comes when its temperature remains constant for some time. This is because as naphthalene freezes

- A. it stops losing heat to the surroundings.
- B. the heat lost to the surroundings is replaced by latent heat of fusion.
- C. an insulating layer forms around it.
- D. it loses as much heat as it gains from the surrounding.

15. Which of the following statements about boiling and evaporation is correct?

- A. Boiling takes place at all temperatures while evaporation is correct?
- B. Evaporation takes place throughout a liquid while boiling takes place at the bottom of the container.
- C. Boiling takes place throughout a liquid while evaporation takes place at the surface.
- D. Evaporation only takes place at a much lower temperature than boiling does.

16. Which of the following is the correct sequence of energy conversions in an x-ray tube?

- A. Electrical energy heat energy kinetic energy electromagnetic heat energy
- B. Heat energy electrical energy kinetic energy

electromagnetic and heat energy

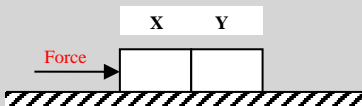
C. Electrical energy heat energy electromagnetic

heat energy kinetic energy

D. Electrical energy heat energy kinetic energy

electromagnetic energy

17.



Two wooden blocks X and Y are placed in contact on a smooth table as shown in Fig 5. The mass of X is twice that of Y. If constant force acts on X then

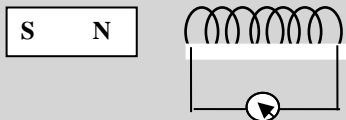
A. the acceleration of X will be twice that of Y.

B. X and Y will have the same acceleration.

C. the acceleration of X will be half that of Y.

D. both X and Y will move with uniform velocity.

18.



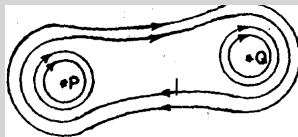
When a magnet is moved relative to the coil as shown in Fig. 6 above, the magnitude of the induced current is not increased by

- A. moving the magnet faster.
- B. using a coil with more turns.
- C. using a more sensitive galvanometer.
- D. using a stronger magnet.

19. A mass of 0.20 kg produces an extension of 6 cm in a spiral spring. The force required to produce an extension of 1 cm is

- A.  $(0.20 \times 6 \times 10) \text{ N}$
- B.  $\frac{0.20 \times 10}{6} \text{ N}$
- C.  $\frac{6 \times 10}{0.20} \text{ N}$
- D.  $\frac{6 \times 0.20}{10} \text{ N}$

20. Fig. 7 shows the magnetic field pattern around two wires P and Q carrying a current perpendicular to the plane of the paper. Which of the following statements is true?



- A. Current in P is flowing into the page while that in



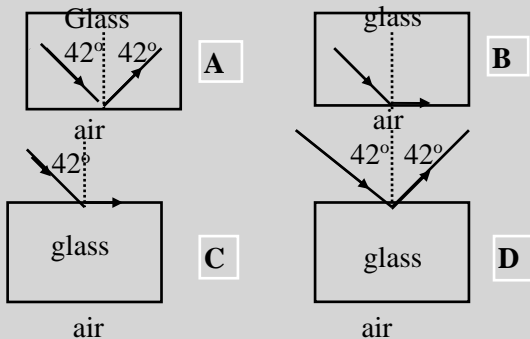
Q is flowing out of the page.

B. Both currents in P and Q are flowing into the page.

C. Both currents in P and Q are flowing out of page.

D. Current in Q is flowing into the page and that in P is flowing out of page.

21.



The critical angle of glass is  $42^\circ$ . Which of the diagram describe the path of light at critical angle?

22. Which of the following statements are true about x-ray?

(i) x-rays cause photoelectric emission.

(ii) x-rays are deflected by an electric field.

(iii) x-rays ionize matter.

(iv) x-rays are not deflected by a magnetic field.

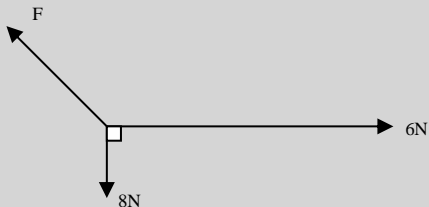
A. (i), (ii) and (iii).

B. (i) and (iii).

C. (ii) and (iv)

D. (i), (iii) and (iv).

23.



Three forces act on a body as shown in Fig. 8. If the forces are in equilibrium. Calculate  $F$ .

A. 20 N.

B. 14 N.

C. 10 N

D. 3.7 N.

24. A machine lifts a load of 5000 N through a distance of 10 m in 5 s.

The average power of the machine is

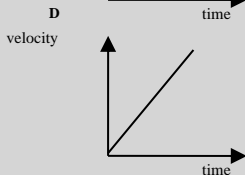
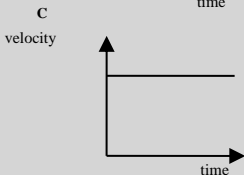
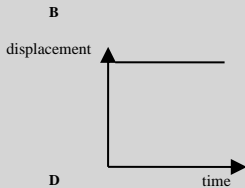
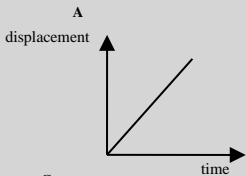
A. 0.1 kW.

B. 10 kW.

C. 50 kW.

D. 250 kW.

25. Which of the following graphs describe uniformly accelerated motion?

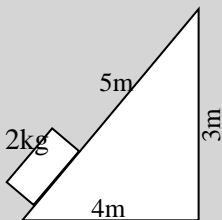


26. Parallel rays can be obtained practically from a point source of light if the source is placed at

- A. the principal focus of a concave reflector.
- B. the centre of curvature of a concave reflector.
- C. the principal focus of a convex reflector.
- D. the centre of curvature of a convex reflector.

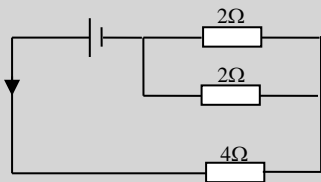
27. A brick mass 2 kg is lifted to a height of 3 m along a smooth, inclined plane 5m long, as shown in Fig. 9. The work done is

- A. 10 J.
- B. 60 J.
- C. 6 J.
- D. 100 J.



28. Thermionic emission may occur when
- A. fast moving electrons hit a metal.
  - B. a metal is given heat energy.
  - C. metal receives light energy.
  - D. a substance undergoes radioactive decay.

29.

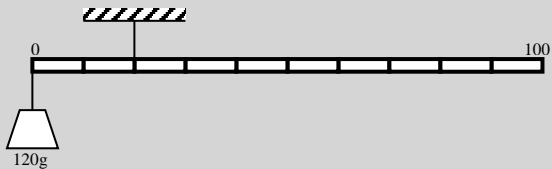


- The total resistance in the above circuit is
- A.  $0.8\ \Omega$
  - B.  $5.0\ \Omega$
  - C.  $8.0\ \Omega$
  - D.  $1.25\ \Omega$

30. Arrange the following radiations in order of decreasing frequency.

- A Gamma rays, x-rays, light radiowaves.
- B. radiowaves, light, x-rays gamma rays.
- C. Xrays, light, gamma, rays, radiowaves.
- D. radiowaves, light, gamma rays, x-rays.

31.

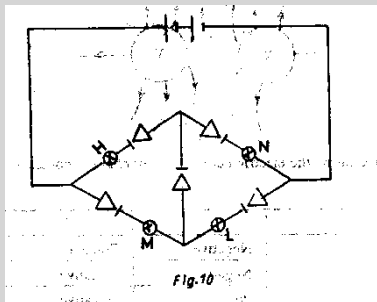


A uniform metre rule is suspended with a string at the 20 cm mark and is kept horizontal by a mass of 120 g hung from one end as shown in the above figure.

Find the mass of the metre rule

- A. 80 g.
- B 30 g
- C. 24 g
- D.120 g

32.The circuit in Fig. 10 shows diodes and bulbs connected to a.d.c supply.



Which of the following pairs of bulbs will light up?

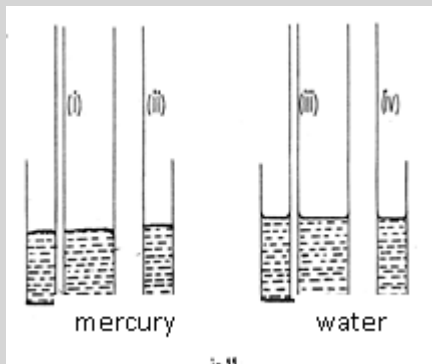
- A. M and N
- B. N and H
- C. M and L
- D. H and L

33. Which of the following statements about eclipses is NOT correct?

- A. During the eclipse of the sun, the shadow of the moon falls on the earth.
- B. During the eclipse of the moon, the earth is between the sun and the moon.
- C. During the eclipse of the sun, the moon is between the sun and the earth.

D. During the eclipse of the moon, the shadow of the moon falls on the earth.

34.



The diagram above in Fig. 11 show two capillary tubes standing in a trough of mercury and two capillary tubes standing in a trough water.

Arrange the tubes in order of increasing height of the liquid column.

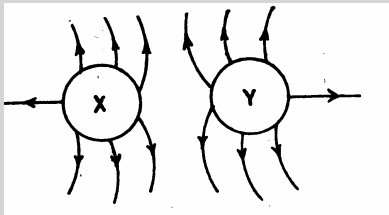
A. (i), (ii), (iv) (iii).

B. (ii), (i), (iv), (iii)

C. (ii), (iv), (i), (iii)

D. (iii), (iv) , (i), (ii)

35.



The diagram above shows the electric field pattern of charged bodies X and Y. Identify the charges on the bodies.

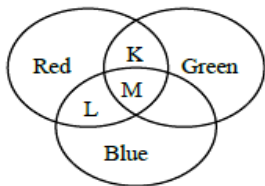
	X	Y
A	Negative	Positive
B	Negative	Negative
C	Positive	Negative
D	Positive	Positive

36. Find the efficiency of a machine which requires an effort of 200 N to raise a load of 18000 N, if its velocity ratio is 300.

- A. 30%
- B. 60%
- C. 67%
- D. 90%



37. Name the colours of the overlapping patches K, L, M and N of primary colours.



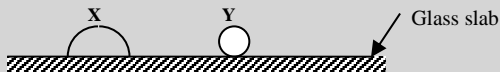
	K	L	M	N
A	Magenta	Cyan	White	Yellow
B	Yellow	Magenta	White	Cyan
C	Yellow	Cyan	White	Magenta
D	Cyan	Yellow	White	Magenta

38. A driver uses a convex mirror as his driving mirror because it

- (i) forms an upright image.
- (ii) gives a bigger magnification
- (iii) gives a wider field of view.

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

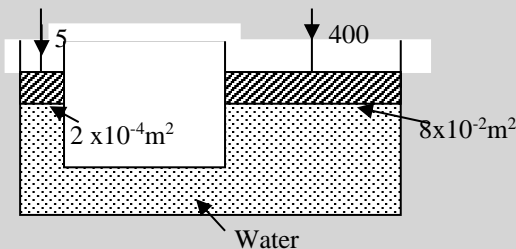
39. The diagram below shows drops of liquids X and Y carefully put on a clean flat glass.



Which of the following statements does NOT explain why the drops take different shapes?

- A. The force of attraction between molecules of X is less than that between molecules of Y.
- B. The force of attraction between molecules of Y and glass is less than that between molecules of Y.
- C. The force of attraction between molecules of X is less than that between molecules of X and glass.
- D. The force of attraction between molecules of Y and glass is greater than that between molecules of Y.

40. Forces of 50 N and 4000 N are applied to pistons A and B respectively, as shown in the figure below.



The area of cross-section of A and B are  $2 \times 10^{-4} \text{ m}^2$  and  $8 \times 10^{-2} \text{ m}^2$  respectively. Which of the following is not true?

- A. Both pistons A and B remain at the same level.
- B. The upthrust on piston B is equal to 20,000 N.
- C. The pressure exerted on the water by piston B is  $5 \times 10^4 \text{ Nm}^{-2}$
- D. Piston B is going to move upwards.

## SECTION B

1.  $10^3 \text{ kg}$  of water falls through a height of 15 m every second to operate an electrical generator.

(a) The power input for the generator is

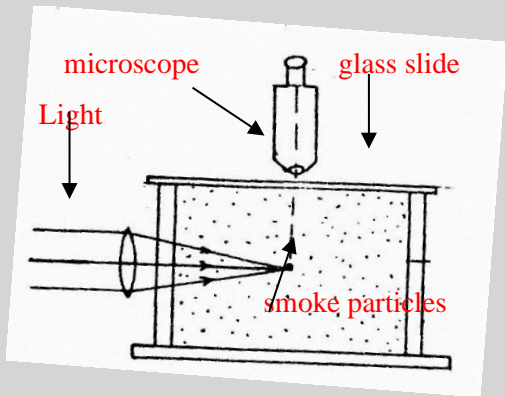
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(b) Give any two possible reasons why the efficiency of the generator is less than 100 percent.

.....

.....

2.



The diagram above shows the arrangement for the Brownian motion experiment.

(a) Describe what would be seen through the microscope.

(b) What would be observed if the temperature of the smoke cell was increased?

3. (a) What is the difference between atomic number and mass number?

(b) The half-life of iodine is 8 days. Find the mass

which will have decayed in 32 days if the initial mass is 1.6 kg.

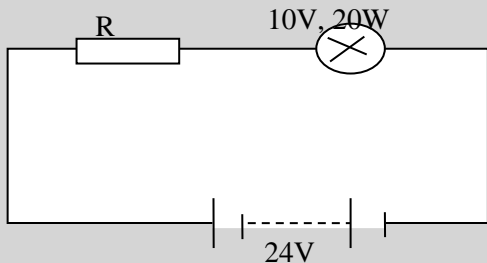
4 (a) Draw a labelled ray diagram to show the formation of an image in a pinhole camera.

(b) State the effect on the image in a pinhole camera of

(i) enlarging the pinhole

(ii) decreasing the distance between the pinhole and the film

5. A battery of emf 24 V is connected in series with a resistor R and a lamp rated 10 V 20 W as shown above.



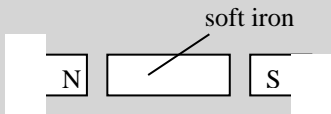
If the bulb is operating normally find

(i) the p.d. across the resistor

.....  
(ii) the value of R

.....  
 (iii) the power dissipated in the resistor  
 .....

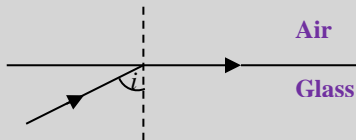
6. Sketch the magnetic field pattern between the N and S poles in the figure below.



7 (a) Define

(i) critical angle

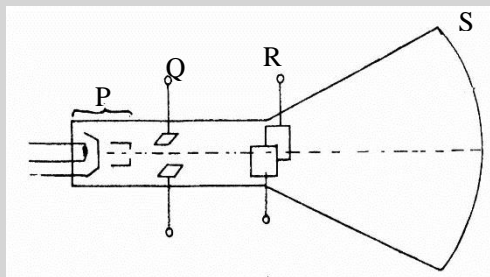
.....  
 (ii) total internal reflection.  
 .....  
 .....



(b) A ray of light traveling from glass to air is refracted as shown in the diagram above.

If the refractive index of glass is 1.5 calculate the value of angle  $i$ .

8



The diagram shows the main parts of a cathode ray oscilloscope (CRO).

(a) Name the parts labeled

P.....

Q.....

R.....

S.....

(b) State two uses of a CRO

(i).....

(ii).....

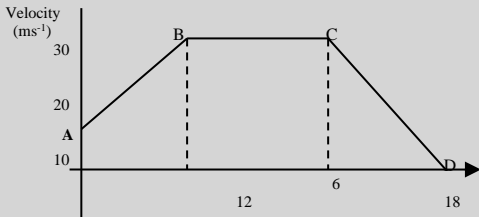
9 (a) Name three constituents of concrete materials

.....  
.....  
(b) State any two characteristics of concrete which make it a desirable building material.

.....  
.....  
(c) State any three ways in which concrete may be reinforced.

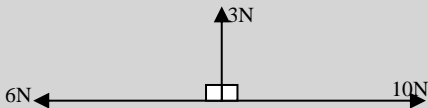
**1987**  
**PAPER 2**

1 (a) The diagram represents a velocity time graph of a body in motion.



- (i) Describe the motion of the body.  
(ii) Calculate the total distance traveled.
- (b)





Forces of 3N, 6N and 10N act on a body of mass of 2kg, initially at M. Find the magnitude of the acceleration with which the body moves.

2. (a) (i) Define pressure and state its unit.  
(ii) Describe an experiment to show that the pressure in a liquid increases with depth.  
(iii) Find the length of the mercury column in a simple barometer when the barometer is raised from sea level to height of 2.5 km given that the average density of air is  $1.32\text{kg m}^{-3}$  and the density of mercury is  $13600\text{kg m}^{-3}$ . Atmospheric pressure at sea level is 76cm of mercury.
- (b) A spring balance reads 2.42N when a metal cube of side 3.0 cm is suspended in air from the spring balance.
- (i) Find the density of the metal.  
(ii) What will the spring balance read when the metal is completely submerged in a liquid of density  $1200\text{kg m}^{-3}$ ?

3. (a) (i) Draw a labeled diagram to show the essential parts of a d.c motor.
- (ii) Describe briefly how a d.c motor works.
- (b) An electric motor of efficiency 90% operates a water pump. The pump raises 0.9 kg of water through 10m every second.
- (i) What is meant by the term efficiency?
- (ii) State the energy changes which take place.
- (iii) Find the electrical power supplied to the motor.

4. (a) Use the kinetic theory of matter to explain the following.

- (i) the valve of bicycle tyre warms up on pumping.
- (ii) water in porous clay pot keeps at a lower temperature than that of the surroundings.
- (b) An empty bottle is covered when air inside is at  $15^{\circ}\text{C}$  and standard atmospheric pressure. Calculate the temperature to which the air must be heated for the air to exceed 1.3 times standard atmospheric pressure. State the assumptions you have made.

5. (a) Describe the composition of the  ${}_{11}^{23}\text{Na}$  atom.

(b) A radioactive nuclide  ${}_{88}^{226}\text{X}$  emits an alpha particle and turns into another nuclide Y.

(i) Write a balanced equation to represent this

unclear charge.

(ii) How would the nuclide X be affected if a beta particle was emitted instead of an alpha particle?

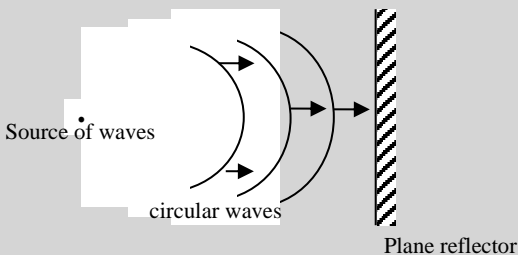
(iii) Compare the nature and properties of an alpha particle with of a beta particle.

(c) Describe briefly how X-rays are produced.

(Diagram of an X-ray tube is not required).

6. (a) List three differences and three similarities between sound waves and light waves.

(b)



The above diagram shows circular waves propagating towards a plane reflector.

(i) Draw a diagram to show how the waves will be reflected.

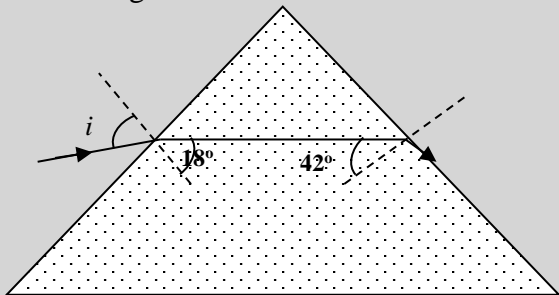
(ii) Calculate the frequency of the waves if their velocity and wavelength are  $5.0\text{m s}^{-1}$  and  $0.5\text{m}$

respectively.

(c) A man standing midway between two cliffs makes a loud sound. He hears the first echo after 3s. Calculate the distance between the two cliffs if the velocity of sound in air is  $330\text{ms}^{-1}$ .

7. (a) Describe a simple method of measuring the refractive index of glass in the form of a glass block.

(b) (i) Explain, with the aid of a diagram, the term critical angle.



(ii) Light of the same wavelength is incident at an angle  $i$ , on a glass prism. The light is refracted and follows the path shown in the figure below.

Find the angle of incidence  $i$

8. (a) Give the advantages of alternating current over direct current in power transmission.

(b) Describe, with the aid of a diagram, the

construction and action of a transformer.

(c) A transformer is designed to operate at 240 V mains supply and deliver 9V. The current drawn from the mains supply is 1.0A, if the efficiency of the transformer is 90%, calculate

- (i) the maximum out put current.
- (ii) the power loss.
- (d) State the possible causes of the power loss in (c) (ii) above.