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# Physics

## 1983- 2004

### JAMB

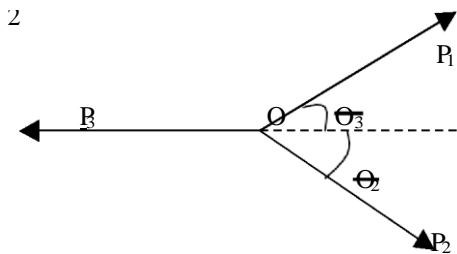
### Questions



# Physics 1983

1. In a resonance tube experiment, a tube of fixed length is closed at one end and several tuning forks of increasing frequency are used to obtain resonance at the open end. If the tuning fork with the lowest frequency which gave resonance had a frequency  $f_1$  and the next tuning fork to give resonance had a frequency  $f_2$ , find the ratio  $f_2/f_1$ .
- A. 8            B. 3  
 C. 2            D. 1/2  
 E. 1/3

1. Which of the following is NOT a vector quantity?
- A. Force                                      B. Altitude  
 C. Weight                                     D. Displacement  
 E. Acceleration.



**Fig. 1**

Consider the three forces acting at O and in equilibrium as shown in Fig. 1. Which of the following equations is/are CORRECT?

- I.  $P_1 \cos \theta_1 = P_3 \cos \theta_2$   
 II.  $P_3 = P_1 \cos \theta_1 + P_2 \cos \theta_2$   
 III.  $P_1 \sin \theta_1 = P_2 \sin \theta_2$
- A. I only            B. II only            C. III only  
 D. II and III only    E. I and III only

Which of the following statements about friction is NOT correct?

- A. The force of kinetic friction is less than the force of static friction.  
 B. The force of kinetic friction between two surfaces is independent of the areas in contact provided the normal reaction is unchanged.  
 C. The force of rolling friction between two surfaces is less than the force of sliding friction.  
 D. The angle of friction is the angle between the normal reaction and the force of friction.  
 E. Friction may be reduced by lubrication.

A brick at rest on a horizontal table is pulled by a horizontal cord, as shown in Fig. 2. The force of friction on the brick

- A. Increase if the pull increases but the brick does not move.  
 B. Is directly horizontal to the right  
 C. Decreases if an identical brick is placed on the first.  
 D. Is zero if the brick is pulled hard enough to make it slide.  
 E. Change if the brick is turned on its side.

6. The force with which an object is attracted to the earth is called its

- A. Acceleration    B. Mass  
 C. Gravity                                      D. Impulse  
 E. Weight

7. The refractive index of a liquid is 1.5. If the velocity of light in vacuum is  $3.0 \times 10^8 \text{ m s}^{-1}$ , the velocity of light in the liquid is

- A.  $1.5 \times 10^8 \text{ m s}^{-1}$   
 B.  $2.0 \times 10^8 \text{ m s}^{-1}$   
 C.  $3.0 \times 10^8 \text{ m s}^{-1}$   
 D.  $4.5 \times 10^8 \text{ m s}^{-1}$   
 E.  $9.0 \times 10^8 \text{ m s}^{-1}$

8. If the relative density of a metal is 19, what will be the mass of  $20 \text{ cm}^3$  of the metal when immersed in water?

- A. 380g                                      B. 400g  
 C. 360g                                      D. 39g  
 E. 180g

9. Which of the following statements about liquid pressure is NOT correct? The pressure

- A. At a point in a liquid is proportional to the depth.  
 B. At any point in a liquid is the same at the same level.  
 C. Is exerted equally in all directions at any point.



D. Of a liquid at any point on the wall of its

- container acts in a direction perpendicular to the wall.
- E At a particular depth depends on the shape of the vessel.
- 10 A ship traveling towards a cliff receives the echo of its whistle after 3.5 seconds. A short while later, it receives the echo after 2.5 seconds. If the speed of sound in air under the prevailing conditions is  $250\text{m s}^{-1}$ , how much closer is the ship to the cliff?
- A. 10 m B. 125 m  
C. 175 m D. 350 m  
E. 1,000 m

- 11 Which of the following is NOT correct?
- I. The pitch of a sound note depends on the frequency of vibrations.  
II. The intensity of a sound note is proportional to the amplitude of vibrations.  
III. Beats are produced by two sources of sound because one wave is travelling faster than the other.  
IV. When two sources of sound of frequencies 500 Hz and 502 Hz are sounded together, a beat frequency of 2 Hz is observed.  
V. The first harmonic of a note has double the frequency of the fundamental note.
- A. I and II B. II and III  
C. I and II D. III and IV  
E. IV and V.

- 12 Which of the following statements about defects of vision is/ are CORRECT
- I. For a long sighted person, close objects appear blurred.  
II. For a short sighted person, distant objects appear blurred.  
III. Short sight is corrected by using a pair of converging lenses.
- A. I only B. II only  
C. I and II only  
D. II and III only  
E. I, II and III.

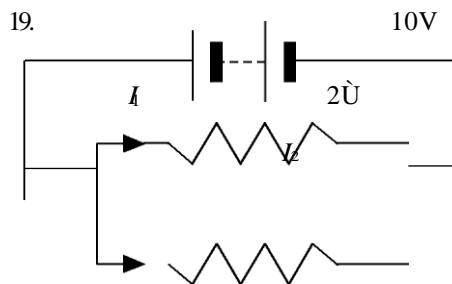
- 13 The range of wavelengths of the visible spectrum is  $400\text{nm} - 700\text{nm}$ . The wavelength of gamma rays is
- A. Longer than  $700\text{nm}$   
B. Shorter than  $700\text{nm}$  but longer than  $400\text{nm}$   
C.  $550\text{nm}$   
D. Shorter than  $400\text{nm}$   
E. Infinite

- 14 If the pressure on  $1000\text{cm}^3$  of an ideal gas is doubled while its Kelvin temperature is halved, then the new volume of the gas will become
- A.  $25\text{cm}^3$  B.  $50\text{cm}^3$   
C.  $100\text{cm}^3$  D.  $200\text{cm}^3$   
E.  $400\text{cm}^3$
- 15 A train has an initial velocity of  $44\text{m/s}$  and an acceleration of  $4\text{m/s}^2$ . Its velocity after 10 seconds is
- A.  $2\text{m/s}$  B.  $4\text{m/s}$   
C.  $8\text{m/s}$  D.  $12\text{m/s}$   
E.  $16\text{m/s}$ .

- 16 Which of the following conditions are necessary and sufficient for total internal reflection to take place at the boundary between two optical media?
- I Light is passing from optically denser medium to optically less dense medium.  
II Light is passing from optically less dense medium to optically denser medium.  
III Angle of incidence is greater.  
IV Angle of incidence is lesser.
- A. I and II only  
B. II and III only  
C. III and IV only  
D. I and III only  
E. II and IV only

- 17 A man of mass  $50\text{kg}$  ascends a flight of stairs  $5\text{m}$  high in 5 seconds. If acceleration due to gravity is  $10\text{m s}^{-2}$ , the power expended is
- A.  $100\text{W}$  B.  $300\text{W}$   
C.  $250\text{W}$  D.  $400\text{W}$   
E.  $500\text{W}$

- 18 Which of the following arrangements in the sequence shown can be used to obtain a pure spectrum of white light?
- A. Source, slit, converging lens, prism, converging lens, screen.  
B. Source, slit, diverging lens, screen.  
C. Source, converging lens, prism, diverging lens, screen.  
D. Source, slit, prism, diverging lens, screen



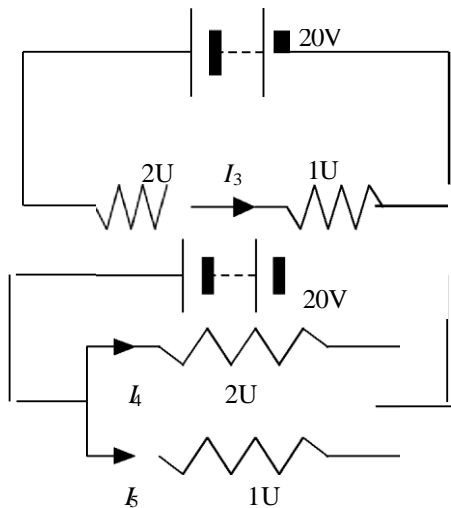


Fig. 3.

The diagrams in Fig.3 show three circuits. The internal resistances of the batteries are negligible. Which of the currents is the largest?

- A.  $I$                       B.  $I_2$   
 C.  $I_3$                       D.  $I_4$   
 E.  $I_5$

20. A millimeter with full scale deflection of 100mA has an internal resistance of 5 ohms. It would be converted to an ammeter with a full scale deflection of 1A by connecting a resistance of
- A. 5 / 99ohm in series with it  
 B. 5 / 99ohm in parallel with it  
 C. 99 / 5 ohm in parallel with it  
 D. 99 / 5 ohm in series with it  
 E. 2 ohms in series with it

21. It is usual to transmit electric power at high voltage and low current. Which of the following are possible advantages of the method.
- I Heat losses are reduced because the currents are small.  
 II Thin wires can be used because small currents are flowing.  
 III The power can flow faster because the voltage is high.
- A. I only  
 B. I and II only  
 C. II and III only  
 D. I and III only  
 E. I, II and III.

22. The linear expansivity of brass is  $2 \times 10^{-10} \text{C}^{-1}$ . If the volume of a piece of brass is  $100 \text{cm}^3$  at  $0^\circ\text{C}$ , what will be its volume at  $100^\circ\text{C}$ ?
- A.  $10.02 \text{cm}^3$                       B.  $10.04 \text{cm}^3$   
 C.  $10.06 \text{cm}^3$                       D.  $10.20 \text{cm}^3$   
 E.  $102.00 \text{cm}^3$

23. A 24V potential difference is applied across a

currents in each resistor is

- A. 1A                      B. 4 A  
 C. 16A                      D. 18 A  
 E. 36 A

24. In the circuit shown in Fig. 4, T is a resistor whose resistance falls as temperature increases.  $L_1$  and  $L_2$  are lamps. Assuming the cell has negligible internal resistance, as the temperature of T increases
- A.  $L_1$  becomes brighter,  $L_2$  becomes dimmer.  
 B.  $L_1$  and  $L_2$  becomes brighter.  
 C.  $L_1$  becomes dimmer,  $L_2$  becomes brighter.  
 D.  $L_1$  becomes brighter,  $L_2$  does not change.  
 E.  $L_2$  becomes dimmer,  $L_1$  does not change.

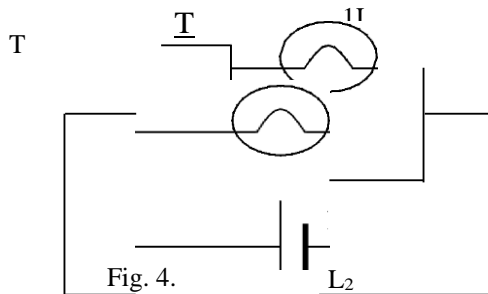


Fig. 4.

25. Which of the diagrams in Fig. 5 gives the correct resultant R of two vectors P and Q?

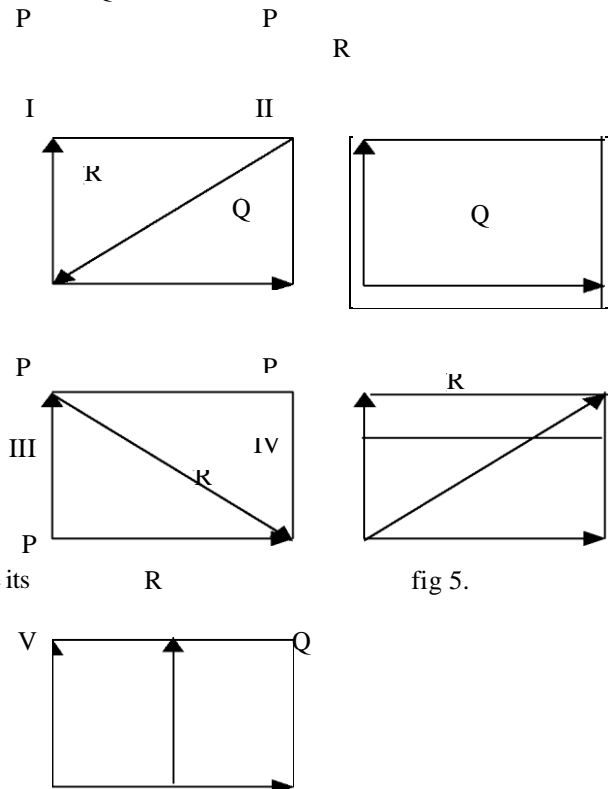


fig 5.

parallel combination of four 6-ohm resistors. The



- A. I                      B. II  
 C. III                    D. IV  
 E. V

26. The electrochemical equivalent of a metal is  $0.126 \times 10^{-6}$  kg/C. The mass of the metal that a current of 5A deposit from a suitable bath in 1 hour is

A.  $0.0378 \times 10^{-3}$  kg  
 B.  $0.227 \times 10^{-3}$  kg  
 C.  $0.378 \times 10^{-3}$  kg  
 D.  $0.595 \times 10^{-3}$  kg  
 E.  $2.268 \times 10^{-3}$  kg

27. Ripples on water are similar to light waves in that they both

A. Have the same wavelength  
 B. Are longitudinal  
 C. Cannot be reflected  
 D. Travel at the same speed  
 E. Can be refracted and diffracted.

28. A piece of wood is floating on water. The forces acting on the wood are

A. Upthrust and reaction.  
 B. Weight and reaction  
 C. Weight and upthrust  
 D. Upthrust and viscosity

29. Of the following derived units, the one that is not a unit of power is

A. Joule/second  
 B. Ampere/volt  
 C. Ampere<sup>2</sup>volt  
 D. Ohm<sup>2</sup>/volt  
 E. Volts<sup>2</sup>/ohm.

30. A force of 16N applied to a 4.0kg block that is at rest on a smooth horizontal surface. What is the velocity of the block at  $t = 5$  seconds?

- A. 4 m/s  
 B. 10 m/s  
 C. 20 m/s  
 D. 50 m/s  
 E. 80 m/s

II -

III

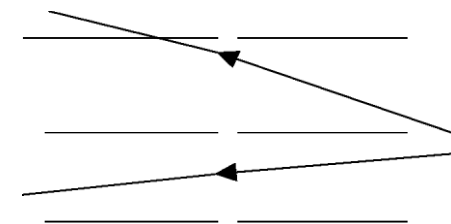
31. 1,000 identical drops of oil of density  $5000 \text{ kg/m}^3$  have a total mass of  $5 \times 10^{-4}$  kg. One of the drops forms a thin film of area  $0.5 \text{ m}^2$  on water. The thickness of the film is

A.  $2 \times 10^8 \text{ m}$       B.  $2 \times 10^9 \text{ m}$   
 C.  $2 \times 10^7 \text{ m}$       D.  $3 \times 10^9 \text{ m}$

E. Weight and viscosity. end.  
 Calculate the unstretched length of the spring assuming Hooke's law is obeyed.

- A. 9.33 cm      B. 10.00 cm  
 C. 10.66 cm    D. 12.00 cm  
 E. 15.00 cm

33. Each of the diagrams in Fig. 6 represents two current carrying conductors situated close to each other. In which two diagrams are the forces between the two wires attractive?



I

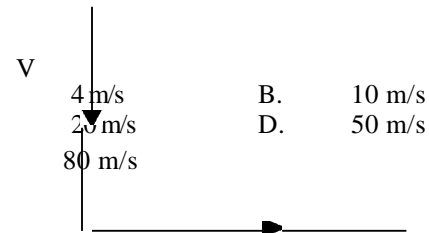
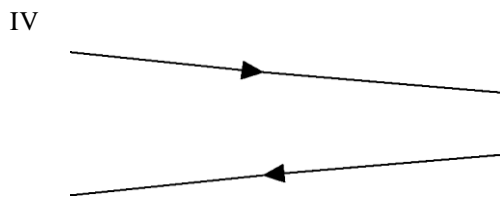


Fig .6

- A. I and V                      B. I and III  
 C. II and IVD.                D. II and V  
 E. III and IV

34. Which of the following statements is CORRECT?

- I The mass number is equal to the total number of protons and electrons in an atom.  
 II The atomic number is equal to the number of protons in an atom



E.  $2.8 \times 10^{-8} \text{m}$ .

32. The total length of a spring when a mass of 200g is hung from its end is 14cm, while its total length is 16cm when a mass of 30kg is hung from the same



- III The number of electrons in an atom is equal to the total number of protons and neutrons in the nucleus.
- A. I only                      B. II only  
 C. III only                    D. I and II only  
 E. II and III only.
- 35 A short response time is obtained in a liquid-in-glass thermometer when the
- A. Bulb is large and thick-walled.  
 B. Stem is long and thin.  
 C. Bulb is small and thick-walled.  
 D. Bulb is high density and the bore is large.  
 E. Bulb is thin-walled and the liquid is a good conductor of heat.
- 36 A machine has a velocity ratio of 5. It requires a 50kg weight to overcome a 200kg weight. The efficiency is
- A. 4%                          B. 5%  
 C. 40%                        D. 50%  
 E. 80%
37. If the normal atmospheric pressure in a laboratory supports a column of mercury 0.76m high and the relative density of mercury is 13.8, then the height of water column which atmospheric pressure will support in the same laboratory at the same time is
- A . 0 m    B . 10 m  
 C . 13 m  
 D . 14 m  
 E . 18 m
- 38 An electric current of 3A flowing through an electric heating element of resistance 20 embedded in 1,000g of an oil raises the temperature of the oil by 10°C in 10 seconds, then the specific heat capacity of the oil is
- A. 1.8 J/g    B. 0.6 J/g  
 C. 0.18 J/g °C    D. 1.8 J/g °C  
 E. 0.06 J/g °C
- 39 The difference of potential between the terminals of a cell is 2.2 volts. When a 4 ohm resistor is connected across the terminals of this cell, the potential difference is 2 volts. What is the internal resistance of the cell?
- A. 0.10 ohms                  B. 0.25 ohms  
 C. 0.40 ohms                  D. 2.50 ohms  
 E. 4.00 ohms.

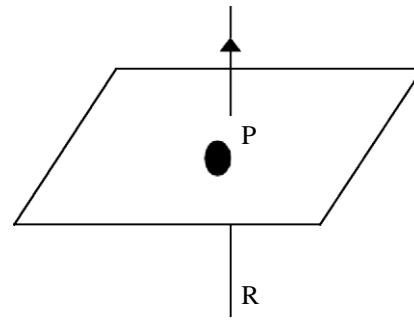
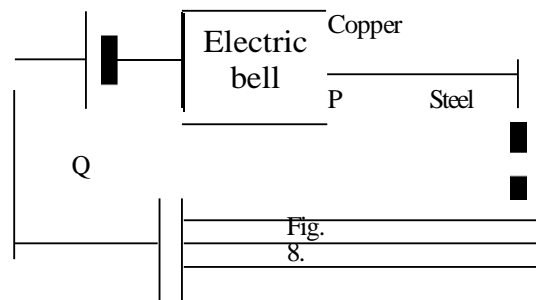


Fig. 7

In Fig. 7 above, QR is a vertical conductor and the current I flows from R to Q. P is a point on the horizontal plane and it is to the South of the wire. The direction of the magnetic field at P due to the current is

- A. Upward    B. North  
 C. South                  D. West  
 E. East

- 40
- 41 Which of the following best describes the energy changes which take place when a steam engine drives a generator which lights a lamp?
- A. Heat → Light → Sound  
 Kinetic
- B. Kinetic → Electricity → Light → Heat
- C. Heat → Kinetic → Electricity  
 → Heat and Light
- D. Electricity → Kinetic → Heat  
 → Light
- E. Heat → Sound → Kinetic  
 → Electricity.
- 42 Which of the following statements clearly describe the behaviour of the fire alarm shown in Fig. 8 below given that the linear expansivities of copper and steel are  $2.0 \times 10^{-5}/^{\circ}\text{C}$  and  $1.2 \times 10^{-5}/^{\circ}\text{C}$  respectively?



- I The bimetallic strip will not be able to close the circuit when there is fire
  - II The bimetallic strip will close the circuit when there is fire
  - III If the copper and steel are interchanged, the circuit will close when there is fire.
- A. I only                      B. II only  
 C. III only                    D. I and III  
 E. II and III

43. Four equal resistors  $R_1, R_2, R_3$  and  $R_4$  are connected in series as shown in Fig 9 below.  $V_1, V_2$  and  $V_3$  are voltmeters connected as indicated. Which of the following relations is **CORRECT**?

- A.  $V_1 = V_3 = \frac{V_2}{2}$   
 B.  $V_1 = 2V_2 = V_3$   
 C.  $V_1 = \frac{1}{2}V_2 = V_3$   
 D.  $V_1 - V_3 = V_2$   
 E.  $V_2 = 2V_3$

44. Which of the following may be used to determine relative humidity in a physics laboratory?

- I Manometer
- II Wet-and-dry bulb hygrometer
- III Hair hygrometer
- IV A hydrometer

- A. I only  
 B. II and III only  
 C. II only  
 D. III only  
 E. II, III and IV only

45.

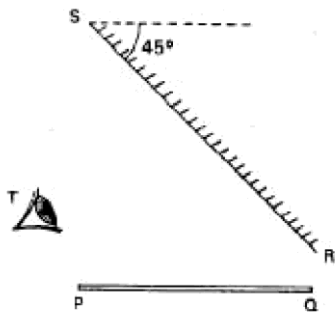


Fig. 10.

PQ is a thin rod on a horizontal table, RS is a plane mirror inclined at  $45^\circ$  to the horizontal as shown in Fig. 10 above. The image of PQ as seen in the mirror by the eye, T is

- A. Horizontal  
 B. Parallel to the mirror  
 C. At infinity

D. Vertical E Highly magnified.

46.

The speed of light in vacuum is  $3.0 \times 10^8 \text{ m s}^{-1}$ . If the refractive index of a transparent liquid is  $4/3$  then the speed of light in the liquid is

- A.  $0.44 \times 10^8 \text{ m s}^{-1}$   
 B.  $2.25 \times 10^8 \text{ m s}^{-1}$   
 C.  $3.0 \times 10^8 \text{ m s}^{-1}$   
 D.  $4.0 \times 10^8 \text{ m s}^{-1}$   
 E.  $4.33 \times 10^8 \text{ m s}^{-1}$

47.

If the force on a charge of 0.2 coulomb in an electric field is 4N, then the electric field intensity of the field is

- A. 08                              B. 0.8 N/C  
 C. 20.0 N/C D. 4.2 N/C  
 E 20.0 C/N

48.

The specific latent heat of vapourization of a substance is always

- A. Less than its specific latent heat of fusion.  
 B. Greater than its specific heat of fusion.  
 C. Equal to its specific latent heat of fusion  
 D. All of the above depending on the nature of the substance

49.

Longitudinal waves do not exhibit

- A. Refraction                  B. Reflection  
 C. Diffraction                D. Polarization  
 E Rarefaction

50.

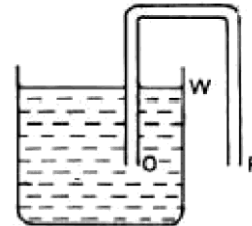


Fig. 11.

E. None of the above

Fig. 11 above shows an inverted U-tube with the open end, O of one limb below the level, W, of the water in a tank. In order that water should begin to flow from the tank it is necessary that

- A. The U-tube is completely filled with water and P should be higher than W.  
 B. P should be lower than O and W  
 C. P should be lower than W and O should reach to the bottom of the vessel.  
 D. The U-tube is completely filled with water and P should be lower than W.  
 E. The U-tube is completely filled with water and O should reach the bottom of the

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vessel.

# Physics 1984

1 The distance travelled by a particle starting from rest is plotted against the square of the time elapsed from the commencement of motion. The resulting graph is linear. The slope of this graph is a measure of

- A. Initial displacement
- B. Initial velocity

2.

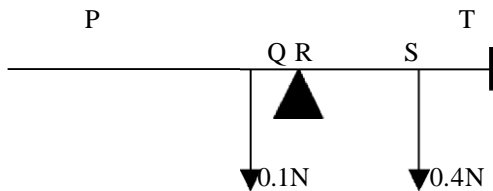


Fig. 1

- C. Acceleration
- D. Half the acceleration
- E. Half the initial velocity

In Fig. 1, PT is a uniform metre rule pivoted at R, the 70cm mark. Two forces 0.1N and 0.4N are applied at Q, the 60cm mark and S, the 85cm mark. If the metre rule is kept in equilibrium by the forces and its weight, then the weight of the metre rule is

- A. 0.25 N
- B. 0.30 N
- C. 0.35 N
- D. 0.50 N
- E. 0.56 N

3 For which of the underlisted quantities is the derived unit  $ML^2T^{-2}$  correct?

- I Moment of a force
- II Work
- III Acceleration

- A. I only
- B. II only
- C. III only
- D. I and II
- E. II and III

4 What volume of alcohol with a density of  $8.4 \times 10^2 \text{ kg m}^{-3}$  will have the same mass as  $4.2 \text{ m}^3$  of petrol whose density is  $7.2 \times 10^2 \text{ kg m}^{-3}$ ?

- A.  $1.4 \text{ m}^3$
- B.  $3.6 \text{ m}^3$
- C.  $4.9 \text{ m}^3$
- D.  $5.0 \text{ m}^3$
- E.  $5.8 \text{ m}^3$

5 For correcting long sight defects in the human eye we require a

- A. Converging lens
- B. Diverging lens

- C. Microscope
  - D. Periscope
  - E. Plain glass sheet.
- 6 For a concave mirror to form a real diminished image, the object must be placed

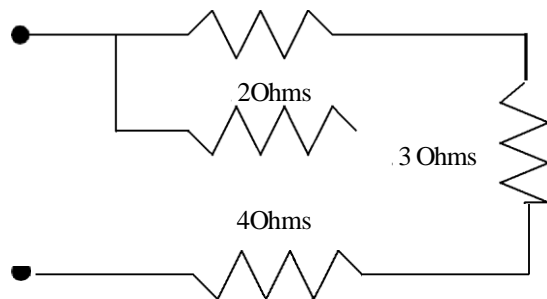
- A. Behind the mirror
- B. Between the mirror and its focus
- C. Between the focus and the center of curvature
- D. At the center of curvature
- E. At a distance greater than the radius of curvature.

7 The unit quantity of electricity is called

- A. The ampere
- B. The volt
- C. The coulomb
- D. The ammeter
- E. Electromotive force.

8 The resistance of a wire depends on

- A. The length of the wire
- B. The diameter of the wire
- C. The temperature of the wire



- D. The resistivity of the wire
- E. All of the above.

9 What is the resistance of the circuit shown in Fig. 2.

- A. 2 Ohms
- B.  $11 \text{ Ohms}$
- C.  $\frac{4 \text{ Ohms}}{5}$
- D.  $\frac{17 \text{ Ohms}}{4}$
- E. 8 Ohms

10. Two cells, each of e.m.f. 1.5V and an internal resistance 2 Ohms are connected in parallel. Calculate the current flowing when the cells are connected to a 1 Ohms resistor.

- A. 0.75 Ohms
- B. 1.5 Ohms



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- C. 0.5 Ohms
- D. 1.0 Ohms
- E. 0.6 Ohms

11. Which of the following components is NOT contained in a dry cell? A

- A. Carbon rod  
B. Paste of magnesium dioxide  
C. Paste of ammonium chloride  
D. Zinc case  
E. Copper rod.
- 12 Which of the following can be described as high tension transmission?  
A. High resistance and low voltage  
B. Low current and high voltage  
C. High current and low voltage  
D. High voltage and zero current  
E. High current and low resistance.
- 13 All the heat generated in a 5 ohms resistor by 2A flowing for 30 seconds is used to evaporate 5g of liquid at its boiling point. Which of the following is the correct value of the specific latent heat of the liquid?  
A. 120J                      B. 60 J g<sup>-1</sup>  
C. 120Jg<sup>-1</sup>                  D. 1 500 J  
E. 1 500 J g<sup>-1</sup>
- 14 When vibration occurs in an air column, the distance between a node and an antinodes is equal to  
A. One-quarter of the wavelength  
B. One-half of the wavelength  
C. The wavelength  
D. Twice the wavelength  
E. Four-times the wavelength.
- 15 Which of the following statements is (are) *NOT* correct?  
I Pressure changes do not affect the speed of sound in air  
II The velocity of sound increases with temperature  
III The quantity of a note depends only on its frequency.  
A. I only                      B. II only  
C. III only                    D. I and III only  
E. II and III only.
- 16 Of two identical tuning forks with natural frequency 256 Hz, one is loaded so that 4 beats per second are heard when they are sounded together. What is the frequency of the loaded tuning fork?  
A. 260Hz                      B. 252 Hz  
C. 248Hz                      D. 264 Hz  
E. 258 Hz
- 17 Dew point is the temperature at which water vapour in the atmosphere  
A. Turns into steam  
B. Solidifies into ice pellets  
C. First condenses into liquid form
- D. Is just sufficient to cause cooling



- E Has a relative of fifty percent.
- 18 The lower and upper fixed points marked on a mercury-in-glass thermometer are 210mm apart. The end of the mercury column in the tube is 49mm above the lower fixed point in a room. What is the temperature of the room in degrees Celsius?  
A. 55.3 °C B. 23.3 °C  
C. 49.0 °C D. 16.1 °C  
E. 76.7 °C
19. If a solid changes directly into a gas when heat is applied the process is called  
A. Vaporization  
B. Evaporation  
C. Sublimation  
D. Ionization  
E. Conversion.
- 20 A plane inclined at an angle of 30° to the horizontal has an efficiency of 60%. The force parallel to the plane required to push a load of 120N uniformly up the plane is  
A. 60N B. 100 N  
C. 120N D. 200 N  
E. 240 N
21. A body of mass 5kg initially at rest is acted upon by two mutually perpendicular forces 12N and 5N as shown in Fig. 3. If the particle moves in the direction QA, calculate the magnitude of the acceleration.  
A. 0.40m s<sup>-2</sup> B. 1.40m s<sup>-2</sup>  
C. 0.26m s<sup>-2</sup> D. 2.60m s<sup>-2</sup>  
E. 3.40m s<sup>-2</sup>

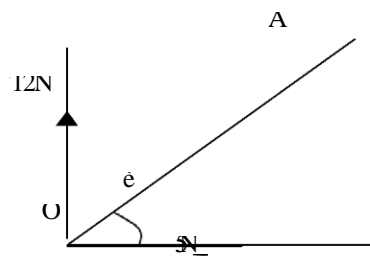


Fig. 3

22.

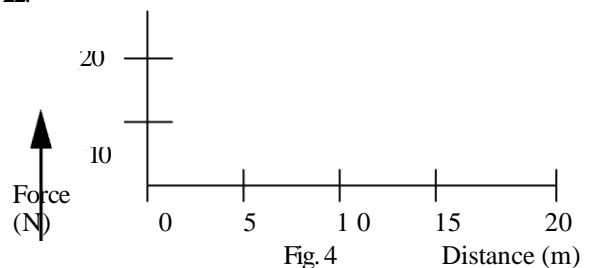
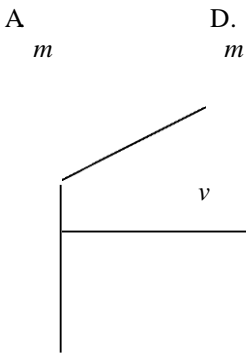


Fig. 4

Distance (m)

- body by the force during the first 10 metres of motion is  
 A. 100J                      B. 150 J  
 C. 200J                      D. 300 J  
 E. 600 J
23. A simple pendulum, 0.6m long, has a period of 1.5 s. what is the period of a similar pendulum 0.4m long in the same location?  
 A.  $1.4\sqrt{\frac{2}{3}}$  s                      B.  $1.5\sqrt{\frac{3}{2}}$   
 C. 2.25 s                      D. 1.00 s  
 E. 2.00 s
- A force varying linearly with the distance acts on a body as shown in Fig. 4. The work done on the body by the force during the first 10 metres of motion is  
 A. 100J                      B. 150 J  
 C. 200J                      D. 300 J  
 E. 600 J
23. A simple pendulum, 0.6m long, has a period of 1.5 s. what is the period of a similar pendulum 0.4m long in the same location?  
 A.  $1.4^{\frac{2}{3}}$  s                      B.  $1.5^{\frac{3}{2}}$   
 C. 2.25 s                      D. 1.00 s
24. A small steel needle is carefully floated on water in a beaker. When a few drops of kerosene are introduced into the water the needle sinks. Which of the following statements correctly explain(s) the observation?  
 I There is a tension on the water surface.  
 II Kerosene reduces the density of water so that the needle becomes denser than water.  
 III Kerosene reduces the surface tension of water.  
 A. I only                      B. II only  
 C. III only                      D. I and II  
 E. I and III
25. Which of the following statements describes an atom accurately?  
 I Atoms of all elements are identical  
 II An atom contains a nucleus and number of electrons.  
 III Due to the electrons in the atom, an atom is negatively charged.  
 IV Electrons in the atom move in circular orbits round the nucleus.  
 A. I and II                      B. II and III  
 C. III and IV                      D. II and IV  
 E. I, II and III
26. A particle moves in a circular orbit of radius 0.02m. If the speed of the particle is  $0.8\pi \text{ m s}^{-1}$ , calculate its frequency in cycles per second.  
 A. 20                      B. 7.0  
 C. 88                      D. 14.0  
 E. 17.6
27. Heat is supplied uniformly at the rate of 100W to  $1.0 \times 10^{-2} \text{ kg}$  of a liquid for 20 seconds. If the temperature of the liquid rises by  $5^{\circ}\text{C}$ , then the specific heat capacity of the liquid is  
 A.  $2.0 \times 10^2 \text{ J kg}^{-1} \text{ K}^{-1}$   
 B.  $2.0 \times 10^2 \text{ J kg}^{-1}$   
 C.  $4.0 \times 10^4 \text{ J kg}^{-1} \text{ K}^{-1}$   
 D.  $4.0 \times 10^4 \text{ J kg}^{-1}$   
 E.  $8.4 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$
28. A given mass of an ideal gas occupies a volume V at a temperature T and under a pressure P. If the pressure is increase to 2P and the temperature reduced to  $1/2T$ , then the percentage change in the volume of the gas is  
 A. 0 %                      B. 25 %  
 C. 75 %                      D. 300 %  
 E. 400 %
29. Which of the following properties of matter CANNOT be utilized for temperature measurement? The  
 A. Length of a liquid column  
 B. Volume of a gas at constant pressure.  
 C. Pressure of a gas at constant volume  
 D. Resistance of a metallic wire  
 E. Current produced in a photoelectric effect.
30. The image and object distances of a converging mirror are related by the equation  $1/f = 1/v + 1/u$  and the magnification of the image is  $m = v/u$ . Which of the graphs below represents the relation between m and v?  
 A.   
 D. 