Indian Association of Physics Teachers

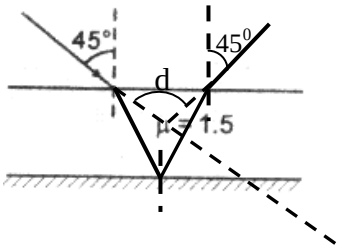
NATIONAL STANDARD EXAMINATION IN JUNIOR SCIENCE 2013-2014

Solution for question paper version 514

Total time: 120 minutes **Marks: 240**

Only one out of four options is correct

1) Solution: (a) The ray traces the path as indicated in the figure below. The angle of emergence is also 45^0. The net deviation (angle d) is given by 90^0 (see figure)



2) Solution: d)

3) Answer (B)
4) Solution: b)
5) Solution: d)
6) Solution: b)
7) Solution: (d)

Using conservation of energy we have $100 = mgh$. Where h is vertical height from where the object was released. Therefore h=10m. The angle of inclination is $\sin\theta = \frac{h}{l} = \frac{10}{20} = 0.5$. Thus $\theta=30^0$.

8) Solution: c)

9) Answer (C)

10) Solution (a) :

At any point inside the liquid, pressure is same in all direction given by ρgh. The force is therefore ρgh(ΔA) in a direction normal to inclined plane.

11) Solution: b)

12) Answer (D)

13) Solution (b): Light travels slower in water while sound travels faster in water. This makes light bend towards normal and sound bend away from normal. Statement (i) is correct. Statement (ii) is also correct while it does not explain the above phenomenon. Thus option (b) is most appropriate.

14) Solution: b)
15) Answer (B)
16) Solution: a)
17) Solution: b)
18) Solution: a)
19) Solution: (C)

The acceleration due to gravity is given by $g = \frac{GM}{R^2}$

$$\frac{g - g_0}{g_0} = \frac{\frac{GM}{(2R)^2} - \frac{GM}{R^2}}{\frac{GM}{R^2}} = -0.75$$

20) Solution: a)

21) Answer (C)

22) Solution: (a) Initially particle is accelerating. The velocity of particle (which is slope of the curve) should increase continuously. When particle decelerates, slope should decrease. This represented only by option (a)

23) Solution: c)

24) Answer (D)

25) Sol: (c)

Solution: 100W bulb has lower resistance compared to 50W bulb since $P = V^2/R$. The 100W bulb will glow brighter when connected in parallel.

While connected in series, same current flows through both the bulbs. The power dissipated by each bulb is given by $I^2 R$ and since 50 W bulb has a higher resistance it will glow brighter.

26) Solution: b)

27) Answer (C)

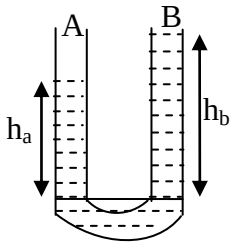
28) Solution: c)
29) Solution: (d)

Solution: Acceleration is the rate of change of velocity and if the velocity is constant acceleration by definition is zero and cannot vary. All other situations are possible.

30) Solution: b)

31) Answer (c)
32) Solution: d)

33) Solution: (a)
The pressure along the horizontal solid line must be same. Thus
$h_p \rho_p g = h_q \rho_q g$
26.6X1.6=50.0Xh_b. Thus h_b = 0.85gcm^{-3}.



34) Solution: d)

35) Answer (C)

36) Solution: d)

37) Solution: (b)
The acceleration is provided by gravity of earth and hence always vertically downward.

38) Solution: b)

39) Answer (c)
40) Solution: b)

41) Solution (d)
The heat absorbed by Al; Q=Cm(Δt). That is 96=0.8XmX6. Thus m= 20g.

42) Solution: c)

43) Answer (B)

44) Solution: c)

45) Solution (b): The photoelectric equation is given by
$E_K = hf - \phi$. Thus $\boldsymbol{E_K}$ is plotted against ***f***. The slope will be equal to ***h***.

46) Solution: b)

47) Answer (D)

48) Solution: a)
49) Solution: (c)

50) Solution: b)

51) Answer (C)

52) Solution: b)

53) Solution: (c)
Light travel at an enormously high speed and hence lighting is seen almost instantaneously while sound takes 6 second. Thus ***h***=350X6=2100m or 2.1 km.

54) Solution: c)

55) Answer (B)
56) Solution: a)
57) Solution (b):
When two bodies attract, one of the body may be charged or neutral. But when they repel then surely both of them are having same charge. Thus repulsion is a sure test of charge and not attraction.

58) Solution: d)

59) Answer (C)

60) Solution: c)

61) Solution: a) Mean Stellar time period is 4 m lesser than mean Solar time period. As a result star rises 4 m earlier than the previous day. In two months it will rise (4X30=120m) earlier. That is it will rise at 7-2 = 5:00pm
62) Solution: c)

63) Answer (D)

64) Solution: c)
65) Solution: (a)
The work done by Normal force and gravitational force (weight) is zero. Work done by external force is W=20X10=200J. The work done by friction is $W^{/}$=-6X10=-60J. The net workdone is W=200-60=140J. This workdone results in change in Kinetic energy.
140J=K_f - K_i =K_f-0. Thus K_f = 140J

66) Solution: c)

67) Answer (A)

68) Solution: a)
69) Solution (c)
According to conservation of momentum; 2X4 + 3X(-1)=(3+2)v
Thus final velocity is 1ms^{-1}. The initial kinetic energy is

$$K_i = \frac{1}{2}m_1 v_1^2 + \frac{1}{2}m_2 v_2^2 = \frac{1}{2}2X4^2 + \frac{1}{2}3X1^2 = 17.5J$$

The final kinetic energy is $K_f = \frac{1}{2}Mv^2 = \frac{1}{2}X5X1^2 = 2.5J$. The change in kinetic energy is converted to other forms including sound. If we assume that only sound energy is given out then it is given by 17.5-2.5=15J.

70) Solution d)

71) Answer (A)

72) Solution: a)

73) Solution (d) : The current is the rate of change of charge. Thus

$$I = \frac{2X10^{16}X1.6X10^{-19} - 2X10^{16}X(-1.6X10^{-19})}{2} = 3.2mA$$

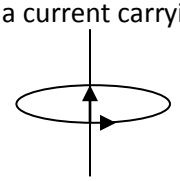
74) Solution: b)

75) Answer (A)

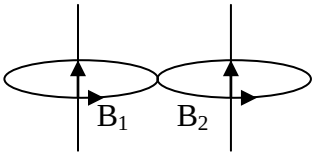
76) Solution: c)

77) Solution: (b)

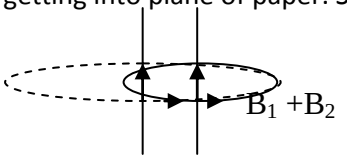
The magnetic field around the a current carrying conductor is given in the figure.



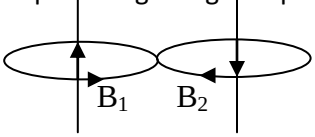
(1) In this case B_1 is getting into plane of paper while B_2 is coming out. Thus net magnetic field is $B=B_1-B_2=0$ (R).



(2) In this case B_1 and B_2 is getting into plane of paper. Since P is closer to I_2. Thus net magnetic field is B_2+B_1 (P)



(3) In this case B_1 and B_2 are equal and getting into plane of paper. Thus net field is B_1+B_2 (S)



(4) In this case B_1 is getting into plane of paper while B_2 is coming out. $B_2>B_1$. Thus net magnetic field is B_2-B_1 and coming out (Q).

78) Solution d)

79) Solution: a)
80) Solution: d)