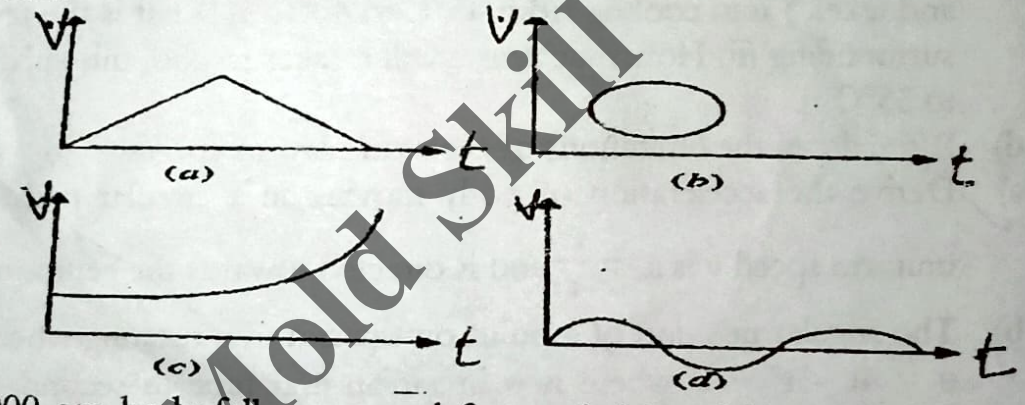
GRADE XI (SCIENCE)

Subject: Physics **SET A** **F.M. : 75**
Time : 3:00 hrs. **P.M : 30**

GROUP 'A'

MULTIPLE CHOICE QUESTIONS (1×11=11)

1. A student measured the diameter of a wire using a screw gauge with least count of 0.001 cm and listed the measurement. The correct measurement is:
   a) 5.3 cm b) 5.32 cm c) 5.320 cm d) 5.3200 cm
2. The angle between two vectors of magnitude 12 and 18 units when their resultant is 24 unit is:
   a) 63.50° b) 75.52° c) 82.30° d) 89.16°
3. The linear expansivities of a cubical crystal along three mutually perpendicular directions are α_1, α_2 and α_3. What is it's cubical expansivity?
   a) $\alpha_1 + \alpha_2 + \alpha_3$ b) $\alpha_1 + \alpha_2 - \alpha_3$ d) $\alpha_1 - \alpha_2 - \alpha_3$ d) $(\alpha_1 + \alpha_2)\alpha_3$
4. In the following fig., which curve does not represent the motion in one dimension?



5. If a 5000 gm body fall on ground from a height of 20m and if all it's energy is converted into heat, the heat produced will be.
   a) 200.33 cal b) 233.33 cal c) 250.33 cal d) 600 cal
6. The length of an elastic spring is 'a' meter when tension is 4N and 'b' meter when the tension is 5 N. What is the length in meter when the tension is 9N?
   a) 4a – 5b b) 5b – 4a c) 5b + 4a d) 9 (b – a)
7. A particle is moving along a circular path with uniform speed, the angle between instantaneous velocity and radial acceleration is:
   a) 0° b) 45° c) 90° d) 180°
8. In bringing an electron towards another electron, electrostatic potential energy of the system- a) Increases b) Decreases c) Remains same d) Zero
9. Two spheres A and B of exactly same mass are given equal positive and negative charges respectively. Their mass after charging
   a) Remains unaffected b) Mass of A > mass of B
   c) Mass of A < mass of B d) Nothing can be said

10. In a concave mirror experiment, an object is placed at a distance x_1 from the focus and the image is formed at a distance x_2 from the focus the focal length of the mirror would be: a) $\sqrt{x_1 x_2}$ b) $x_1 x_2$ c) $\sqrt{x_1 / x_2}$ d) $\frac{x_1 + x_2}{2}$

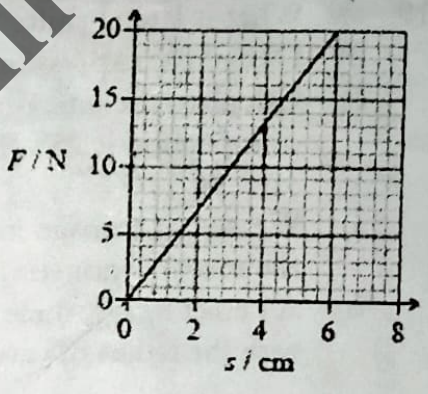
When light enters to the glass slab
a) Wave length decreases
b) Wave length increases
c) Velocity increases
d) Frequency decreases

GROUP B

SHORT ANSWER QUESTIONS: (8×5=40)

12. a) A man at the bank of the river aims to cross the river to reach exactly opposite point on the other side. How should he swim? [2]
b) A man wishes to swim across a river 300 m wide. If he can swim the rate of 4km/hr in still water and river flows at 1km/hr then in
i) What direction must he swim to reach a point exactly opposite to the starting point. [2]
ii) When will he reach a point exactly opposite to the starting point. [1]

13. a) Why are bridges declared unsafe after long use? [2]
b) On the basis of the Force and extension curve, answer the following questions:
i) In the given diagram, s represents elongation in cm and F represents a force in N. Calculate the force constant of the given material. [1]
ii) How much energy is stored at s = 0 and s = 6 ? [1] [1]
iii) If the length of the wire is 12 cm and area of cross section be 2×10^{-7} m², then find the value of young's modulus of given material. [1]



OR

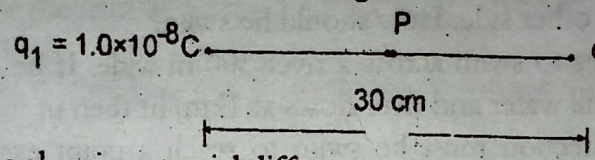
a) A body of unit mass is brought from infinity to a point at a distance 'r' from the centre of the earth. Derive the gravitational potential at that point r. [3]
b) A man can jump 1.5m on earth. Calculate the approximate height he might be able to jump on a planet whose density is one quarter of the earth and where radius is one third of the earth. [2]

14. a) Why invar is chosen to make pendulum clock. [2]
b) A steel ~~and when measured with zinc scale~~ rod when measured with zinc scale both being at 25°C appear to be 1m long. If the zinc scale is correct at 0°C, what is the actual length of the rod at 25°C? What will be the length rod at 0°C? [α for steel = 12×10^{-6}/°C, α for zinc = 26×10^{-6}/°C] [2]

15. a) Explain why water remains cool in the earthen pot in summer? [2]
b) The temp. of equal masses of three difference liquids A B and C are at 12°C, 19°C and 28°C respectively. When A and B are mixed the temperature of mixture is 16°C and when B and C mixed the temperature of mixture is 23°C. What should be the temperature of mixture when A and C are mixed. [3]

16. a) Define regelation. [1]
b) Two pieces of ice stick together when pressed to each other why? [2]
c) Find the result of mixing of 20 gm of water at 20°C with 10 gm of ice at –8°C. Given: [SP. heat capacity of water = 1 cal/gm°C, SP. heat capacity of ice = 0.5 cal/gm°C and Latent heat of fusion for ice = 80 cal/gm].

17. a) State gauss law in electrostatics. [1]
b) Derive an expression for electric field intensity due to plane charge conductor. [2]
c) What is the magnitude and direction of the electric field at point P mid-way between q_1 and q_2 as shown in figure.



18. a) Define electric potential difference. [1]
b) Derive an expression for electric potential difference due to a point charge. [2]
c) The difference of potential between two points in an electric field is 6 V. How much work is done required to move a charge of 300 μC from the point of lower potential to the point of higher potential? [2]

19. a) What is lateral shift? [1]
b) Derive the expression for lateral shift? [2]
c) Calculate the lateral shift through a glass slab of thickness 10 cm if the angle of reflection is 25°. [Refractive index of glass= 1.5] [2]

OR

a) We see our image in a still water in a bucket but when water disturbed then the image is not seen. Why? [2]
b) An erect image, three times the size of the object is obtained with concave mirror with the radius of curvature 36 cm. What is the position of the object? [3]

GROUP C

LONG ANSWER QUESTIONS: (3×8=24)

20. Any object thrown into space or, atmosphere so that it moves under the action of force due to gravity alone is called a projectile.
a) If a projectile is fired at the angle of projection θ with horizontal, then deduce the expression for -
i) Time of flight
iii) Maximum height [2]
b) Prove that the maximum horizontal range is four times the maximum height attained by the projectile. [2]
c) An airplane is flying with velocity of 90m/s at an angle of 23° above the horizontal, drops an object from it. Calculate the velocity of object after 3 second. [2]

21. Thermal conduction is the mode of heat transfer generally occurs in solids and the rate at which heat transfer is depends upon the coefficient of thermal conductivity of the material.
a) Define coefficient of thermal conductivity. [1]

b) Write down the SI unit and dimensional formula of coefficient of the conductivity.

c) Does the coefficient of thermal conductivity depends upon the area and thickness of the material? [1]

d) In a wedding party on a cold winter evening, you are requested to sit on chair. What would you like to choose a metal chair or, a wooden chair? Why? [2]

e) A rod 1.3m long consists of a 0.8m length of aluminum and 0.5m brass joined end to end. The free end of aluminum and brass maintained at 150°C and 20°C respectively. No heat is lost through the sides of the rod. At steady state, what is the temperature at a point where two metals are joined? [$K_{Aluminum}$ = 205 W/m-K, K_{Brass} = 110 W/m-K] [3]

OR

Newton's law of cooling describes the rate at which an exposed body changes temperature.

a) State Newton's law of cooling. [1]

b) Explain the method to determine specific heat capacity of liquid by the method of cooling. [3]

c) A substance takes 3min in cooling from 50°C to 45°C and takes 5 min cooling and takes 5 min cooling from 45°C to 40°C i) What is the temperature of the surrounding (ii) How much time will it takes to cool this substance from 40°C to 35°C. [3]

d) Write down the limitations of Newton's law of cooling. [1]

22. a) Derive the acceleration of body moving in a circular path of radius r with uniform speed v is $a_c = \frac{v^2}{r}$ and is directed towards the centre of circle. [3]

b) The angular position of a point on the rim of a rotating wheel is described by $\theta = 4t - 3t^2 + t^3$ where is θ in radian and time in second. What is average angular velocity for t = 2 s to 4 s? [2]

c) A mass of 1 kg is attached to the lower end of a string 1 m long whose upper end is fixed. The mass is made to rotate in a horizontal circle of radius 0.6 m. If the circular speed is constant, find the tension produced in the string and the period of the motion. [3]

Good Luck