PHYSICS

1. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm . Find the position of the image , its nature and size.

2. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained ? Find the size and the nature of the image.

3. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?

4. Light enters from air to glass having refractive index 1.50 . What is the speed of light in the glass? The speed of light in vacuum in $3 \times 10^8 ms^{-1}$.

5. You are given kerosene,turpentine and water. In which of these do the light travel faster?

6. The angle between an incident ray and the mirror is θ.The total angle turned by the ray of light is 80°.What is the value of θ?

7. What is the value of θ in the following ray dioagram?
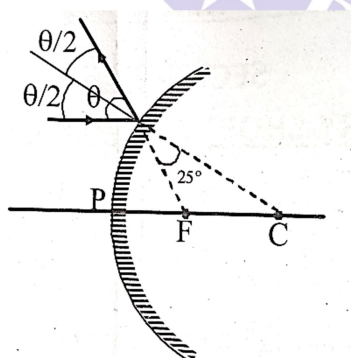
8. If the angle of incidence(i) for a light ray in air be 45° and the angle of refraction (r) in glass be 30°. Find the refractive index.

9. In a household five fans each of 100W are used for 4 hours and an electric press of 500W for 2 hours every day. Calculate the cost of using the fans and electric press for 60 days if the cost of 1 unit of electrical energy is Rs. 6.5.

10. As shown in the figure above A and B are two lamps. Lamp A is rated at 12 V, 24W. Lamp B is rated at 6.0 V. When lamp B operates at its rated voltage, the current in it is 3.0 A. The values of R1 and R2 are chosen so that both lamps operate at their rated voltages.
Based on the information given, answer the following.
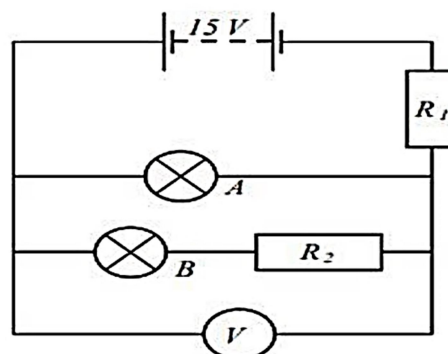
(i) Calculate the current in Lamp A.
(ii) State and give reason for the reading of the Voltmeter.
(iii) Calculate the resistance of R2.
(iv)Find the value of the resistance R1.

CHEMISTRY

11. Write the structures of (a) n-butane and iso-butane (b)n- pentane, isopentane and neopentane

12. Select the compounds that belong to the same homologous series:C_2H_6, C_2H_4,C_2H_2,C_3H_8, C_4H_8,C_5H_{12}

13. Write the next homologoue of the following compounds:
   (a) CH3OH   (b) HCOOH

14. Write the next two homologoue of the following compounds

(a) C_3H_6 (b) C_3H_4

15. Given the IUPAC names of thew following compounds.
    (a) C_4H_9Cl
    (b) $CH_3-CH_2-CH_2-CH_2-O-H$

16. Draw the electron dot structure of Ethane, Ethene, Ethyne

17. Explain substitution reaction withan example.

18. Write an industrial application of hydrogenation.

19. An element 'M' with electronic configuration 2, 8,3 combines separately with Cl^-, SO_4^{-2} anions. Write the chemical formulae of the compounds formed. Predict with the suitable reason the nature of the bond formed by element 'M' in general. How will the electrical conductivity of the compounds formed vary with respect to 'M'? OR A reddish-brown metal 'X', when heated in air, gives a black compound 'Y', which when heated in presence of H_2 gas gives 'X' back. 'X' is refined by the process of electrolysis; this refined form of 'X' is used in electrical wiring. Identify 'X' and 'Y'. Draw a well-labeled diagram to represent the process of refining 'X'.

20. Which of the following compounds give substitution reactions?
    CH^-, C_3H_8, C_4H_8, C_5H_{12}

BIOLOGY

21. How does the embryo get nourishment inside the mother's body?

22. What are the functions performed by the testes in human beings?

23. What are the different methods of contraception?

24. How are the modes for reproduction different in unicellular and multicellular organisms?

25. What could be the reasons for adopting contraceptive methods?

26. Biosphere is a global ecosystem composed of living organisms and abiotic factors from which they derive energy and nutrients. And ecosystem is defined as structural and functional unit of the biosphere
   comprising of living and non-living environment that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable, self-supporting system

Which trophic level is incorrectly defined? Explain with reason
a) Carnivores – secondary or tertiary consumers
b) Decomposers – microbial heterotrophs
c) Herbivores – primary consumers
d) Omnivores – molds, yeast and mushrooms

27. The diagram below shows a food web from the sea shore
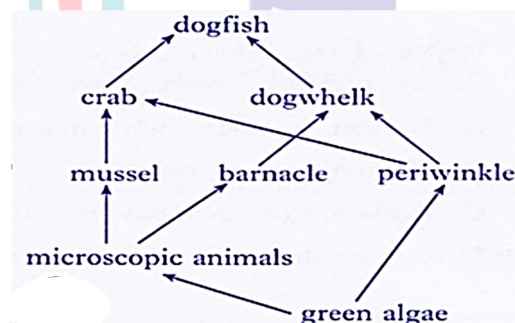
Give the example of
a) Producer
b) Primary consumer
c) Secondary consumer
d) Decomposer

28. The given figure represents: which type of the food chain Explain with reason

29. Consider the following statements concerning food chains:

(i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation

(ii) Removal of most of the carnivores resulted in an increased population of herbivores.

(iii)The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss

(iv) The length of the food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?

a) (i), (iv)
b) (i), (ii)
c) (ii), (iii)
d) (iii), (iv)

30. Which of the following group of organisms are not included in ecological food chain?
a) Carnivores
b) Saprophytes
c) Herbivores
d) Predators

MATHS

31. Divya deposited 1000 at compound interest at the rate of 10% per annum. The amounts at the end of first year, second year, third year, ... form an AP. Justify your answer.

32. Find the nth term and the 20th term of the list of numbers 5,1,-3,-7,……

33. Determine the AP whose 3rd term is 5 and the 7th term is 9.

34. Two APs have the same common difference. The difference between their 100th terms is 100, what is the difference between their 1000th terms?

35. 16 glass spheres each of radius 2 cm are packed in a cubiodal box of internal dimensions 16 cm x 8 cm x 8 cm and then the box is filled with water. Find the volume of the water filled in the box.

36. From solid cube of side 7 cm, a conical cavity of height 7 cm and radius 3 cm is hollowed out. Find the volume of the remaining solid.

37. A ladder has rungs 25 cm apart (shown in the adjoining figure). The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top. If the top and the bottom rungs are $2\frac{1}{2}$ m apart, what is the length of the wood required for the rungs?
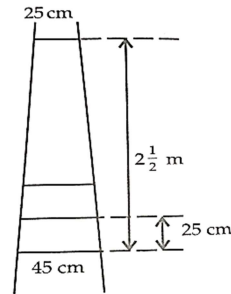
38. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder (as shown in the adjoining figure). If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.
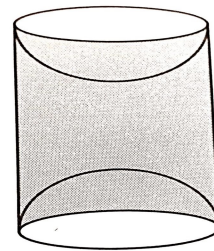
39. The sum of the radius of base and height of a right circular cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the volume of the cylinder

40. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm³ of iron has approximately 8g mass. (Use π = 3.14)