



Inspiring Young Minds  
Through Knowledge Olympiads

CLASS

11

QUESTION PAPER SET

C



DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Name: .....

SOF Olympiad Roll No.: .....

Contact No.: .....

Total Questions: 50

Time: 1 hr.

  
myclassroom  
PRESENTS



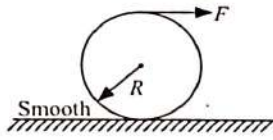
SOF NATIONAL SCIENCE  
OLYMPIAD 2022-23

### Guidelines for the Candidate

1. You will get additional ten minutes to fill up information about yourself on the OMR Sheet before the start of the exam.
  2. Write your **Name, School Code, Class, Roll No.** and **Mobile Number** clearly on the **OMR Sheet** and do not forget to sign it. We will share your marks / result and other information related to SOF exams on your mobile number.
  3. The Question Paper comprises three sections:  
Section - 1 : **Physics & Chemistry** (25 Questions)  
Section - 2 : **Achievers Section** (5 Questions)  
Section - 3 : **Mathematics** (20 Questions) or **Biology** (20 Questions)
  4. **Section-1 and 2 are compulsory for all.** In Section-3 opt for Mathematics OR Biology and mark the same on the OMR Sheet.  
Each question in Achievers Section carries 3 marks, whereas all other questions carry one mark each.
  5. All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
  6. There is only ONE correct answer. Choose only ONE option for an answer.
  7. To mark your choice of answers by darkening the circles on the OMR Sheet, use **HB Pencil** or **Blue / Black ball point pen** only. E.g.  
Q.16: In the water cycle, condensation is the process of  
A. Water vapour cooling down and turning into a liquid  
B. Ice warming up and turning into a liquid  
C. Liquid cooling down and turning into ice  
D. Liquid warming up and turning into water vapour  
As the correct answer is option A, you must darken the circle corresponding to option A on the OMR Sheet.
16. ● ○ ○ ○ ○
8. Rough work should be done in the blank space provided in the booklet.
  9. Return the OMR Sheet to the invigilator at the end of the exam.
  10. Please fill in your personal details in the space provided on this page before attempting the paper.

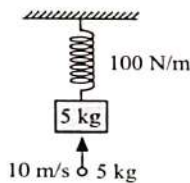
**SECTION-1**  
**PHYSICS**

1. A force  $F$  is applied at the top of a circular periphery object as shown in the given figure.



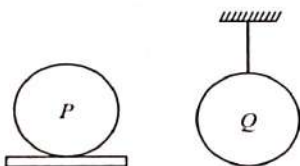
If the object is performing pure rolling motion, then it may be a

- A. Disc  
B. Hollow cylinder  
C. Solid cylinder  
D. Solid sphere
2. A block of mass 5 kg is hanging from a massless spring of spring constant 100 N/m as shown in the given figure. It is in equilibrium under the influence of gravitational force. A particle of same mass moving upwards with velocity 10 m/s hits the block and sticks to it. For the subsequent motion, select the correct statement.



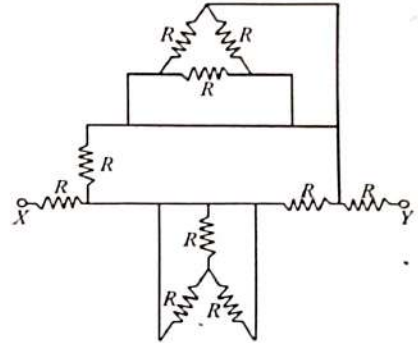
- A. Velocity of the combined mass must be maximum at natural length of the spring.  
B. Velocity of the combined mass must be maximum at the new equilibrium position.  
C. Velocity of the combined mass must be maximum at the instant particle hits the block.  
D. Velocity of the combined mass must be maximum at a point lying between old equilibrium position and natural length.

3. Consider two identical metal spheres, one which lies on a thermally insulating plate, while the other hangs from an insulatory thread as shown in the given figure. If equal amount of heat is supplied to both the spheres, then



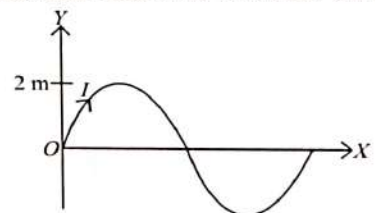
- A. Temperature of  $P$  will be greater than  $Q$   
B. Temperature of  $Q$  will be greater than  $P$   
C. Their temperatures will be equal  
D. Cannot be predicted.

4. Equivalent resistance between points  $X$  and  $Y$  is



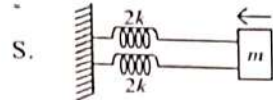
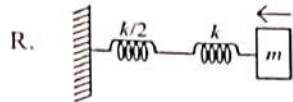
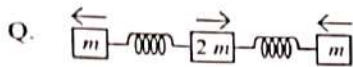
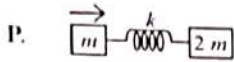
- A.  $3R$   
B.  $4R$   
C.  $\frac{5R}{2}$   
D.  $\frac{7R}{2}$

5. Let a current carrying wire is in the form of a sine curve as shown in the given figure, which carries a current  $I$ . If the equation of this curve is  $Y = 2 \sin\left(\frac{\pi x}{L}\right)$  and a uniform magnetic field  $B$  exists in the space, then select the incorrect statement.



- A. Force on the wire is  $BIL$ , if field is along  $Z$ -axis.  
B. Force on the wire is  $2BIL$ , if field is along  $Y$ -axis.  
C. Force on the wire is zero, if field is along  $X$ -axis.  
D. Force on the wire is  $BIL$ , if field is in the  $XY$  plane making an angle  $30^\circ$  with  $X$ -axis.
6. In column I, various configurations given of masses are connected to spring, as shown in the given figures. Column II shows corresponding time periods of oscillations. Match column I with column II and select the correct option from the given codes.

**Column I**



**Column II**

I.  $2\pi\sqrt{\frac{2m}{3k}}$

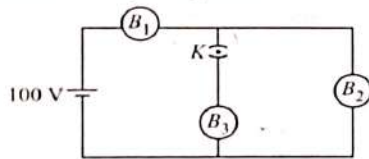
II.  $2\pi\sqrt{\frac{m}{4k}}$

III.  $2\pi\sqrt{\frac{m}{2k}}$

IV.  $2\pi\sqrt{\frac{3m}{k}}$

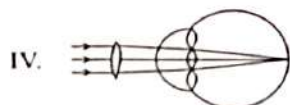
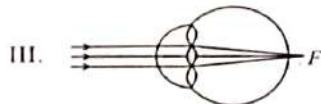
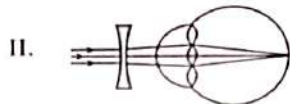
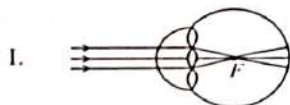
- A. P - II, Q - III, R - IV, S - I  
 B. P - II, Q - III, R - I, S - IV  
 C. P - I, Q - II, R - III, S - IV  
 D. P - I, Q - III, R - IV, S - II

7.  $B_1$ ,  $B_2$  and  $B_3$  are the three identical bulbs which are connected to a battery of steady emf 100 V with key  $K$  is closed as shown in the given figure. How the brightness of the bulbs  $B_1$  and  $B_2$  gets affected when the key is opened?



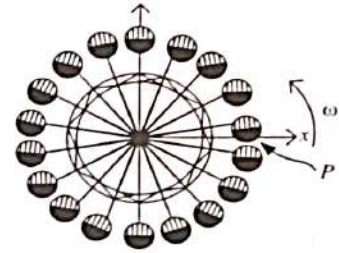
- A. Brightness of the bulb  $B_1$  increases and that of  $B_2$  decreases.  
 B. Brightness of the bulbs  $B_1$  and  $B_2$  increases.  
 C. Brightness of the bulb  $B_1$  decreases and  $B_2$  increases.  
 D. Brightness of the bulbs  $B_1$  and  $B_2$  decreases.

8. Find out the incorrect description from the given diagrams.



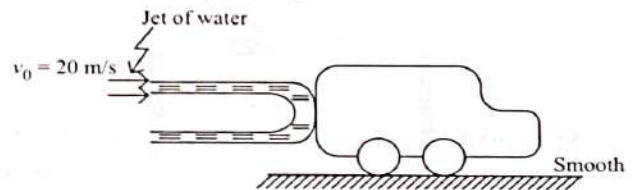
- A. I represents far-sightedness  
 B. II represents correction for short-sightedness  
 C. III represents far-sightedness  
 D. IV represents correction for far-sightedness

9. In an amusement park, the arrangement of a Ferris wheel is as shown in the given figure. The wheel is turning in anticlockwise manner. Contrary to the illustration, not all seats are aligned horizontally, that is parallel to the  $x$ -axis. The orientation of the normal to the seat, as it passes the point  $P$ , is



- A. Along the unit vector  $\hat{i}$   
 B. Along the unit vector  $\hat{j}$   
 C. In the I/III quadrants  
 D. In the II/IV quadrants.

10. A car of mass 20 kg is initially kept at rest on a smooth horizontal surface. Now, a jet of water is directed onto the car through a connected tube as shown in the given figure.

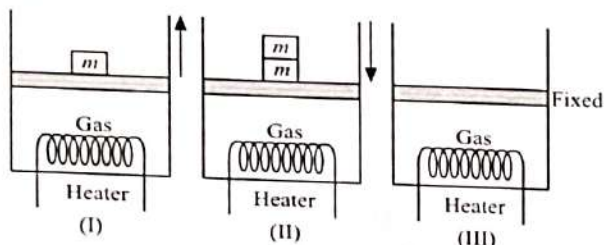


Speed of the water jet is 20 m/s and its cross-sectional area is  $10^{-4} \text{ m}^2$ . If the car is released and allowed to move at  $t = 0 \text{ s}$ , then consider following statements.

- I. Force on the car at  $t = 0$  is 80 N.  
 II. Speed of the car at  $t = 10 \text{ s}$  is  $\frac{4}{3} \text{ m/s}$ .  
 III. Power supplied to the car when it is moving with velocity  $\frac{40}{3} \text{ m/s}$  is 3200 W.  
 IV. Acceleration of the car at  $t = 10 \text{ s}$  is  $\frac{4}{9} \text{ m/s}^2$ .

- Which of the given statements are correct?  
 A. I, II and III only  
 B. I, II and IV only  
 C. II, III and IV only  
 D. All are correct.

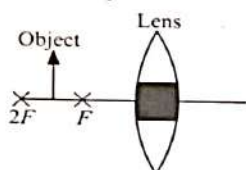
11. A sample of a gas is heated through three different processes (I), (II) and (III) as shown in the given figure. In each process heat supplied is the same. In (I) piston moves up by some amount. In (II) piston moves down and in (III) piston does not move. If calculated specific heat of the gas corresponding to each of the process is  $C_I$ ,  $C_{II}$  and  $C_{III}$  respectively, then



- A.  $C_I > C_{II} > C_{III}$   
 B.  $C_{II} > C_I > C_{III}$   
 C.  $C_{III} > C_{II} > C_I$   
 D.  $C_I > C_{III} > C_{II}$

12. Read the given statements and select the correct option.

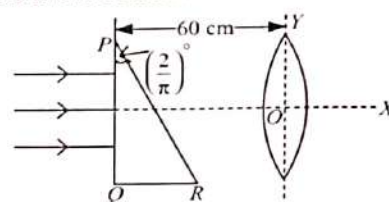
**Statement 1 :** In the given situation, if middle portion of the lens having focus at  $F$  is painted black, then complete image of the object will be formed, but it will be of lower intensity.



**Statement 2 :** More the reflected or refracted ray intersect, more would be the intensity of the corresponding image.

- A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.  
 B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.  
 C. Statement 1 is true but statement 2 is false.  
 D. Both statements 1 and 2 are false.

13. A parallel beam of light is incident on a right angled thin prism as shown in the given figure. Refractive index of the material of the prism is 1.5 and focal length of the lens is 40 cm, then which of the following statements is/are correct?



- I.  $y$ -coordinate of converging point of the beam is  $-\frac{2}{9}$  cm.  
 II. Distance of converging point of the beam along  $x$ -axis from  $PQ$  is 100 cm.  
 III. Distance of converging point of the beam along  $x$ -axis from  $PQ$  is 40 cm.  
 IV.  $y$ -coordinate of converging point of the beam is  $-\frac{2}{3}$  cm.  
 A. I only  
 B. II only  
 C. I and II only  
 D. III and IV only

## CHEMISTRY

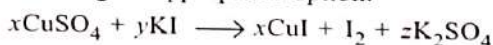
14. Which electronic configuration will show the lowest first ionization potential?

- A.  $1s^2 2s^2 2p^1$   
 B.  $1s^2 2s^2 2p^5$   
 C.  $1s^2 2s^2 2p^3$   
 D.  $1s^2 2s^2$

15. The bond order and the magnetic characteristic of  $C_2$  are

- A. 2, diamagnetic  
 B. 3, paramagnetic  
 C. 2.5, paramagnetic  
 D. 2.5, diamagnetic.

16. Study the given reaction and fill in the blanks by selecting an appropriate option.



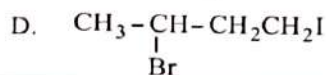
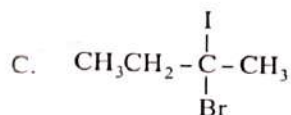
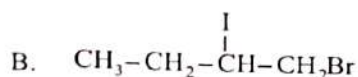
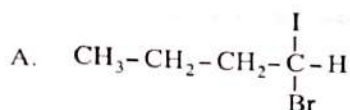
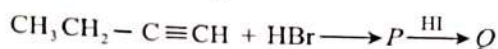
In this reaction, (i) has been oxidised and (ii) has been reduced. The value of  $x$  is (iii),  $y$  is (iv) and  $z$  is (v).

- |    | (i)             | (ii)            | (iii) | (iv) | (v) |
|----|-----------------|-----------------|-------|------|-----|
| A. | $\text{I}_2$    | $\text{CuSO}_4$ | 2     | 2    | 4   |
| B. | $\text{CuI}$    | $\text{KI}$     | 4     | 2    | 2   |
| C. | $\text{KI}$     | $\text{CuSO}_4$ | 2     | 4    | 2   |
| D. | $\text{CuSO}_4$ | $\text{KI}$     | 2     | 1    | 2   |

17. At 25°C, the solubility product of  $\text{Hg}_2\text{Cl}_2$  in water is  $3.2 \times 10^{-17} \text{ mol}^3 \text{ dm}^{-9}$ . What is the solubility of  $\text{Hg}_2\text{Cl}_2$  in water at 25°C?

- A.  $1.2 \times 10^{-12} \text{ M}$   
 B.  $3.0 \times 10^{-6} \text{ M}$   
 C.  $2 \times 10^{-6} \text{ M}$   
 D.  $1.2 \times 10^{-16} \text{ M}$

18. Predict the major product  $Q$  obtained in the following reaction of but-1-yne.



19. Among the following, the correct statements are

- I. In diamond, each carbon atom is bonded to three other carbon atoms forming a rigid three-dimensional structure.  
 II. Graphite structure is formed by the hexagonal arrays being placed in layers one above the another.  
 III. The chemical properties of diamond and graphite are different, but the physical properties remain the same.  
 IV. Diamonds can be synthesised by subjecting pure carbon to very high pressure and temperature.

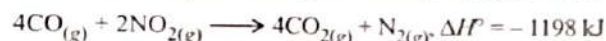
- A. I and III only  
 B. II and IV only  
 C. I and II only  
 D. III and IV only.

20. A compound contains 4.06% hydrogen, 24.25% carbon and 38.38% fluorine. The empirical formula of this compound is

(At. masses, C = 12, H = 1, F = 19)

- A.  $\text{CH}_2\text{F}_3$   
 B.  $\text{CH}_3\text{F}_2$   
 C.  $\text{CH}_2\text{F}$   
 D.  $\text{CHF}_2$

21. Calculate the amount of heat evolved when 12 g of CO reacts with  $\text{NO}_2$  according to the following reaction.



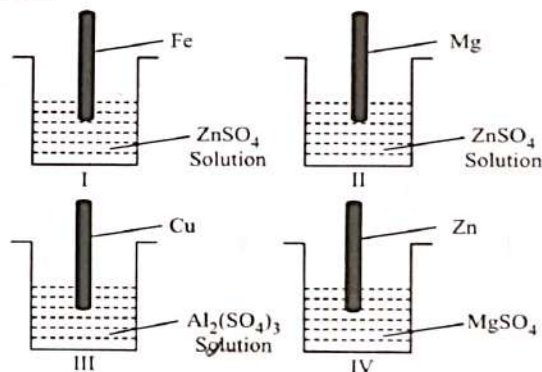
- A. 105 kJ  
 B. 128 kJ  
 C. 50 kJ  
 D. 30 kJ

22. Match column I with column II and select the correct option from the given codes.

Column I	Column II
(i) Metalloid	(P) Fluorine
(ii) Smallest atomic radius	(Q) Caesium
(iii) Highest electronegativity	(R) Helium
(iv) Highly electropositive	(S) Silicon

A. (i) - (S), (ii) - (P), (iii) - (R), (iv) - (Q)  
 B. (i) - (Q), (ii) - (S), (iii) - (P), (iv) - (R)  
 C. (i) - (S), (ii) - (R), (iii) - (P), (iv) - (Q)  
 D. (i) - (Q), (ii) - (R), (iii) - (S), (iv) - (P)

23. In which of the following beakers, reaction will not occur?



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

24.  $X$  is produced when plaster of Paris is mixed with water.  $Y$  is a gas obtained by heating baking soda.  $Z$  is used as an oxidising agent in many chemical industries and is obtained from dry slaked lime. Identify  $X$ ,  $Y$  and  $Z$  respectively.

- A.  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ ,  $\text{H}_2$ ,  $\text{NaOH}$   
 B.  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{CaOCl}_2$   
 C.  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ ,  $\text{H}_2$ ,  $\text{CaCl}_2$   
 D.  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{Na}_2\text{CO}_3$

25. Select the incorrect statements from the following.
- Dumas method and Carius method are used for the quantitative analysis of halogens.
  - On treating sodium fusion extract with sodium nitroprusside, appearance of yellow colour indicates the presence of sulphur.
  - Kjeldahl's method is not applicable to compounds

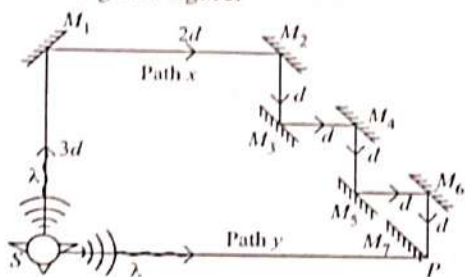
containing nitrogen in nitro group, azo group and nitrogen present in the ring.

- IV. In Lassaigne's test for phosphorus, a red coloured precipitate indicates the formation of phosphorus.
- I and II only
  - I, II and IV only
  - II, III and IV only
  - III and IV only

## SECTION-2

### ACHIEVERS SECTION

26. Consider seven mirrors  $M_1, M_2 \dots M_7$  arranged as shown in the given figure.



Here, the sound source  $S$  emits monochromatic sinusoidal sound waves of wavelength  $\lambda$ .

The sound waves emitted from the source travels along two paths  $x$  and  $y$  and meet at point  $P$ . The waves along path  $x$  suffers reflections from seven mirrors. Now, consider following statements.

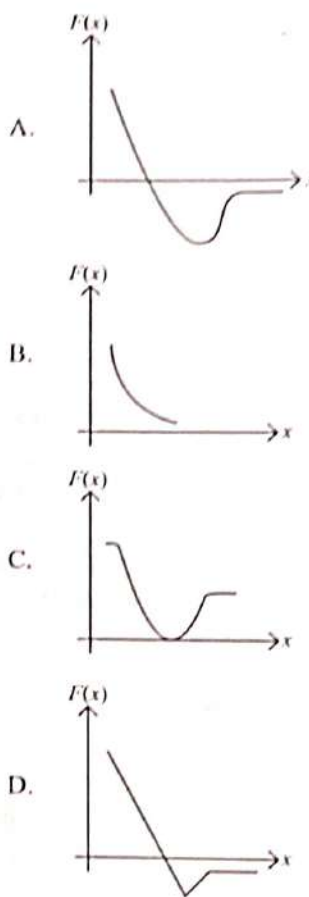
- For point  $P$  to be minima,  $d_{\min} = \frac{\lambda}{12}$
- For point  $P$  to be maxima,  $d_{\max} = \frac{\lambda}{6}$
- For point  $P$  to be maxima,  $d_{\max} = \frac{\lambda}{10}$
- For point  $P$  to be minima,  $d_{\min} = \frac{\lambda}{5}$

Which of the given statements are correct?

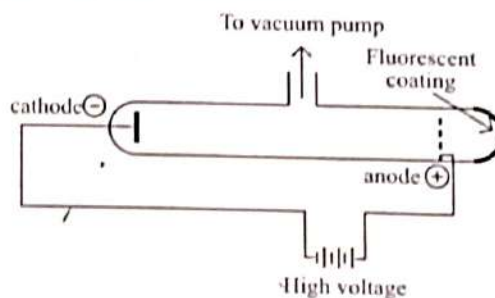
- II and III only
  - I and II only
  - III and IV only
  - II and IV only
27. Due to interatomic forces between atoms, the associated potential energy function is expressed as

$$U(x) = \frac{\alpha}{x^{12}} - \frac{\beta}{x^6}, \text{ here } \alpha \text{ and } \beta \text{ are positive constants,}$$

and  $x$  is the distance between the atoms. The graph of force between the atoms can be best expressed as



28. Study the given figure showing a cathode ray discharge tube with perforated anode.



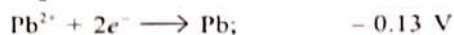
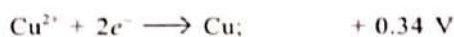
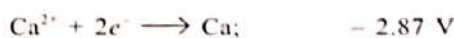
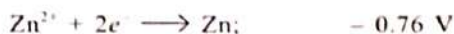
Now, select the incorrect statement(s).

- I. The given experimental set up was used for the discovery of protons and neutrons.
  - II. In the absence of electrical or magnetic field, cathode rays travel in straight lines.
  - III. When sufficiently high voltage is applied across the electrodes, current starts flowing through a stream of particles moving in the tube from anode to cathode.
  - IV. The characteristics of cathode rays depend upon the material of electrodes and the nature of the gas present in the cathode ray tube.
- A. I only
  - B. I, II and IV only
  - C. I, III and IV only
  - D. II, III and IV only

**Direction (Q. No. 29 and 30) :** Read the given passage and answer the questions that follow.

Redox reactions play a significant role in chemistry as well as biology. The values of standard reduction potential ( $E^\circ$ ) of two half cell reactions decide the direction in which

the reaction will proceed. Few half-cell reactions along with their  $E^\circ$  values are shown below.



29. Among the following, identify the correct statement.
  - A. Cu is a better reducing agent than Ca.
  - B.  $\text{Br}_2$  can easily reduce  $\text{Zn}^{2+}$  to Zn.
  - C. Ca can reduce  $\text{Al}^{3+}$  to Al.
  - D. Pb is a strong reducing agent than Al.
30. The correct order of reducing power of the given metals/ions is
  - A.  $\text{Br}^- > \text{Zn} > \text{Pb} > \text{Cu} > \text{Ca} > \text{Al}$
  - B.  $\text{Ca} > \text{Al} > \text{Zn} > \text{Pb} > \text{Cu} > \text{Br}^-$
  - C.  $\text{Al} > \text{Ca} > \text{Pb} > \text{Zn} > \text{Br}^- > \text{Cu}$
  - D.  $\text{Ca} > \text{Zn} > \text{Al} > \text{Pb} > \text{Br}^- > \text{Cu}$

### SECTION-3

### MATHEMATICS

31. If  $n$  is any integer, then find the value of  $(1-i)^n \left(1-\frac{1}{i}\right)^n$ .

- A.  $1+i$
- B.  $2^n$
- C.  $1-i$
- D. 0

32. A trader has 612 soap X and 342 soap Y. He packs them in boxes and each box contains exactly one type of soap. If every box contains the same number of soaps, then find the number of soaps in each box such that the number of boxes are the least.

- A. 15
- B. 14
- C. 18
- D. None of these

33. The eccentricity of the conic  $16x^2 + 25y^2 = 400$  is

- A.  $2/5$
- B.  $3/5$
- C.  $1/5$
- D.  $6/5$

34. The x-coordinate of a point P is twice its y-coordinate. If P is equidistant from Q(2, -5) and R(-3, 6), then find the coordinates of P.

- A. (10, 5)
- B. (16, 8)
- C. (5, 4)
- D. (7, 3)

35. How many numbers are there between 99 and 1000 such that at least one of the digits is repeated?

- A. 648
- B. 180
- C. 248
- D. 252

36. Calculate the mean of the given data.

Percentage of marks	0-20	20-40	40-60	60-80	80-100
Number of students	2	12	13	15	8

- A. 50
- B. 55
- C. 52
- D. 56

37. Solve the following inequality:

$$-\frac{2}{3} < -\frac{x}{3} + 1 \leq \frac{2}{3}, x \in \mathbf{R}$$

- A.  $x \in [1, 2)$
- B.  $x \in (2, 5)$
- C.  $x \in [1, 5)$
- D.  $x \in [0, 3)$

38. The tops of two towers of height 48 m and 60 m are connected by a string. If the string is making an angle of  $60^\circ$  with horizontal, then find the length of the string.

- A. 16 m
- B.  $4\sqrt{3}$  m
- C.  $8\sqrt{3}$  m
- D. None of these

39. What is the perpendicular distance of the point  $P(6, 7, 8)$  from  $xy$ -plane?

- A. 8 units
- B. 7 units
- C. 6 units
- D. 5 units

40. Alok was asked to find  $\frac{6}{7}$  of a number but instead he multiplied it by  $\frac{7}{6}$ . As a result he got an answer, which was more than the correct answer by 299. What was the number?

- A. 860
- B. 915
- C. 760
- D. 966

41. The sum of first 6 terms of a G.P. is 28 times the sum of its first 3 terms. Find the common ratio of the G.P., if  $r \neq 1$ .

- A. 4
- B. 5
- C. 2
- D. 3

42. If  $E$  and  $F$  are two events such that  $P(E) = \frac{1}{4}$ ,  $P(F) = \frac{1}{2}$  and  $P(E \text{ and } F) = \frac{1}{8}$ , then find  $P(E \text{ but not } F)$ .

- A.  $\frac{1}{8}$
- B.  $\frac{1}{4}$

- C.  $\frac{1}{2}$
- D.  $\frac{1}{3}$

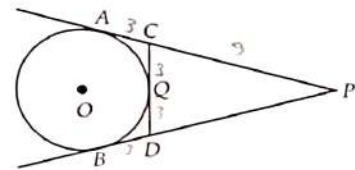
43. A two digit number is such that the product of the digits is 24. When 18 is added to the number, the digits interchange their places. Find the number.

- A. 64
- B. 46
- C. 83
- D. 38

44. If  $f(x) = \lambda x^2 + \mu x + 12$ ,  $f'(4) = 15$  and  $f'(2) = 11$ , then find the values of  $\lambda$  and  $\mu$ .

- A.  $\lambda = 2, \mu = 3$
- B.  $\lambda = 1, \mu = 7$
- C.  $\lambda = 2, \mu = 5$
- D.  $\lambda = 1, \mu = 5$

45. In the given figure,  $PA$  and  $PB$  are tangents to the circle from an external point  $P$ .  $CD$  is another tangent touching the circle at  $Q$ . If  $PA = 12$  cm,  $QC = QD = 3$  cm, then find  $PC + PD$ .



- A. 20 cm
- B. 12 cm
- C. 15 cm
- D. 18 cm

46. If  $A = \{3, 5, 7, 9, 11\}$ ,  $B = \{7, 9, 11, 13\}$ ,  $C = \{11, 13, 15\}$  and  $D = \{15, 17\}$ , then  $(A \cup D) \cap (B \cup C)$  is equal to

- A.  $\{5, 7, 9, 11, 15\}$
- B.  $\{7, 9, 11, 15\}$
- C.  $\{7, 9, 11, 13, 15\}$
- D.  $\{7, 9, 11\}$

47. Find the domain and range respectively of the function  $f(x) = x^2 - 25$ .

- A.  $R, R$
- B.  $R - \{5\}, R - \{5\}$
- C.  $R - \{5\}, R - \{10\}$
- D. None of these



48. A line cutting off intercept  $-3$  from the  $Y$ -axis and the tangent at an angle to the  $X$ -axis is  $\frac{3}{5}$ , its equation is
- A.  $5y - 3x + 15 = 0$   
 B.  $3y - 5x + 15 = 0$   
 C.  $5y - 3x - 15 = 0$   
 D. None of these

49. A toy is in the shape of a cone of base radius  $3.5$  cm mounted on a hemisphere of base diameter  $7$  cm. If the total height of the toy is  $15.5$  cm, then find the

total surface area of the toy. (Use  $\pi = \frac{22}{7}$ )

- A.  $198.5 \text{ cm}^2$   
 B.  $220 \text{ cm}^2$   
 C.  $214.5 \text{ cm}^2$   
 D. None of these

50. The value of  ${}^{11}\text{C}_2 + {}^{11}\text{C}_4 + {}^{11}\text{C}_6 + {}^{11}\text{C}_8$  is equal to
- A.  $2^{10} - 1$   
 B.  $2^{10} - 11$   
 C.  $2^{10} + 12$   
 D.  $2^{10} - 12$

OR

### BIOLOGY

31. When yellow round heterozygous pea plants are self fertilised, the frequency of occurrence of  $RrYY$  genotype among the offsprings is
- A.  $9/16$   
 B.  $3/16$   
 C.  $2/16$   
 D.  $1/16$

32. A plant is provided with ideal conditions for photosynthesis and supplied with isotope  ${}^{14}\text{CO}_2$ . When the products of the process are analysed carefully, which of the following would be the nature of products?
- A. Both glucose and oxygen are normal.  
 B. Both glucose and oxygen are labelled.  
 C. Only glucose is labelled but oxygen is normal.  
 D. Only oxygen is labelled but glucose is normal.

33. Select the incorrect statement regarding pollination.
- A. Cross pollination is carried out by agents such as wind, water or animals.  
 B. In cross pollination, pollen is transferred from one flower to another flower of different plant.  
 C. Autogamy is the key to reproduction in unisexual flowers.  
 D. Pollination leads to fertilisation in flowering plants.

34. Which of the following statements is correct regarding the function of the enzymes of pancreatic juice?
- A. Trypsin digests proteins and lipase digests carbohydrates.  
 B. Trypsin digests emulsified fats and lipase digests proteins.

- C. Trypsin and lipase digest fats.  
 D. Trypsin digests proteins and lipase emulsifies fats.

35. Match column I (storage products) with column II (organisms) and select the correct option from the given codes.

Column I	Column II
(i) Glycogen	p. <i>Sargassum</i>
(ii) Pyrenoids	q. <i>Nostoc</i>
(iii) Laminarin and mannitol	r. <i>Polysiphonia</i>
(iv) Floridean starch	s. <i>Spirogyra</i>
	t. <i>Agaricus</i>

- A. (i)-t, (ii)-s, (iii)-p, (iv)-r  
 B. (i)-r, (ii)-s, (iii)-p, (iv)-t  
 C. (i)-q, (ii)-p, (iii)-s, (iv)-r  
 D. (i)-s, (ii)-r, (iii)-t, (iv)-q

36. Which of the following flowers represent zygomorphic symmetry?

- A. *Canna*, Mustard, Chilly, *Datura*  
 B. Mustard, *Canna*, Pea, *Datura*  
 C. Pea, Bean, *Cassia*, Gulmohar  
 D. Pea, Bean, *Canna*, Chilly

37. Select the option which is not correct regarding enzyme action.

- A. Substrate binds with enzyme at its active site.  
 B. Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.  
 C. A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.  
 D. Malonate is a competitive inhibitor of succinic dehydrogenase.

38. In which one of the following reactions of glycolysis, oxidation takes place?

- A. Glucose 6-phosphate to fructose 6-phosphate
- B. Fructose 6-phosphate to fructose 1,6-bisphosphate
- C. 1,3-bisphosphoglycerate to 3-phosphoglyceric acid
- D. 3-phosphoglycerinaldehyde to 1,3-bisphosphoglycerate

39. Phytohormone *X* is responsible for 'bakanae disease' of rice seedlings and function *Y* is not carried out by this phytohormone.

Select the option that correctly identifies *X* and *Y*.

- A. *X*: Gibberellic acid;  
*Y*: Induction of bud dormancy
- B. *X*: Abscisic acid;  
*Y*: Delaying senescence of fruits
- C. *X*: Ethylene;  
*Y*: Increases the length of grapes stalks
- D. *X*: Florigen;  
*Y*: Increases the length of sugarcane stem

40. Select the correct statement.

- A. During mitosis endoplasmic reticulum and nucleolus disappear completely at early prophase.
- B. Chromosomes are arranged along the equator during prophase of mitosis.
- C. Chromosome is made up of two sister chromatids at anaphase of mitosis.
- D. Small disc shaped structures at the surface of the centromeres that appear during metaphase are kinetochores.

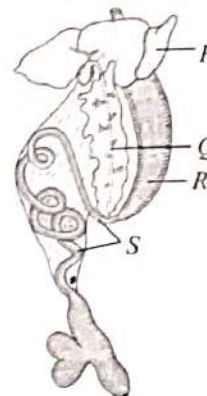
41. *Anabaena*, *Nostoc* and *Aulosira* exemplify

- A. Blue-green algae that contain chlorophyll *a* and cyanophycean starch as reserve food
- B. Blue-green algae that are flagellated and contain glycogen as reserve food
- C. Bacteria that are heterotrophic in nature and possess bacteriochlorophyll
- D. Bacteria having 1-2 layered cell wall and contain glycogen as reserve food material.

42. Choose the incorrect match of animal and its excretory organ.

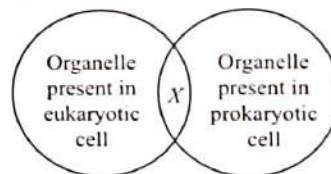
Animal	Excretory organ
A. <i>Nereis</i>	- Nephridia
B. Cockroach	- Malpighian tubules
C. <i>Ascaris</i>	- Renette cells
D. <i>Wuchereria</i>	- Flame cells

43. Refer to the given figure of alimentary canal of a frog. Identify the labelled parts *P-S* and select the incorrect statement regarding it.



- A. Gland *P* is the largest gland of the body and secretes a liquid that lacks any digestive enzyme.
- B. Gland *Q* secretes insulin hormone that converts glucose into glycogen.
- C. Part *R* of alimentary canal contains gastric glands and its secretion contains enterokinase enzyme.
- D. Part *S* is the longest part of alimentary canal having large number of villi.

44. Refer to the given Venn diagram and select the correct statement regarding *X*.



- A. *X* could be a membrane less organelle that helps in protein synthesis.
- B. *X* could be an organelle that produces energy rich molecule ATP.
- C. *X* could be an organelle that provides rigidity and shape to a plant cell.
- D. Both A and C

45. During complete ventricular systole,

- A. Oxygenated blood is pumped into the pulmonary artery and deoxygenated blood is pumped into the artery
- B. Oxygenated blood is pumped into the aorta and deoxygenated blood is pumped into the pulmonary vein
- C. Oxygenated blood is pumped into the pulmonary vein and deoxygenated blood is pumped into the pulmonary artery
- D. Oxygenated blood is pumped into the aorta and deoxygenated blood is pumped into the pulmonary artery.

46. Read the given passage and select the option that correctly fills the blanks.

ADH is secreted by (i) and is released into the blood by (ii) of pituitary gland. It (iii) the reabsorption of water in the (iv) and (v).

- A. (i)-Hypothalamus, (ii)-Posterior lobe, (iii)- Increases, (iv)-DCT, (v)-Collecting duct  
B. (i)-Hypothalamus, (ii)-Anterior lobe, (iii)- Decreases, (iv)-DCT, (v)-Collecting duct  
C. (i)-Anterior pituitary, (ii)-Posterior lobe, (iii)- Increases, (iv)-Loop of Henle, (v)-DCT  
D. (i)-Posterior pituitary, (ii)-Anterior lobe, (iii)- Decreases, (iv)-PCT, (v)-DCT

47. Opening and closing of stomatal aperture is dependent upon

- A. Turgor pressure  
B. Oxygen concentration  
C. Temperature  
D. Both A and C.

48. Read the given statements and select the option that correctly identifies them as true (T) and false (F) ones.

- (i) Totipotent cells can be differentiated into any type of cells depending upon the requirement.

- (ii) Fresh water sponges reproduce asexually by formation of gemmules.

- (iii) *Begonia* reproduces asexually by same means as banana.

- (iv) Grafting is performed between two plants that are not related to each other.

	(i)	(ii)	(iii)	(iv)
A.	T	F	T	F
B.	T	T	F	F
C.	T	F	F	T
D.	F	T	F	T

49. In a cross involving two contrasting characters, out of two alleles only one expresses itself in the hybrid and prevents the expression of the other allele. This is known as the

- A. Law of dominance  
B. Law of independent assortment  
C. Law of segregation  
D. Dihybrid cross.

50. Food web helps in

- A. Providing alternative pathways of food availability  
B. Checking overpopulation  
C. Ecosystem development  
D. All of these.

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