Please check the examination details below before entering your candidate information

Candidate Name	Class	Section

BLOOM Science Olympiad (BSO)

Question Paper 2023-24

Class 10

Total Questions 50+5 (Tie Breaking Section)

Total Time Allotted : 60 minutes

Total Marks 60

Instructions

1. There are **50 Multiple Choice Questions** in this booklet having 4 options out of which **ONLY ONE** is correct.
2. There are two sections in the Question Paper; Section 1 having 40 Questions carrying 1 Mark each & Section 2 having 10 Higher Difficulty Order Questions carrying 2 Marks each.
3. All questions are compulsory. There is **NO negative** marking for incorrect answers.
4. Total time allotted to complete the paper is 60 minutes.
5. Please fill in your details in the space provided on this page before attempting the paper.

OMR Sheet Instructions

1. Before starting the paper, fill in all the details in the OMR Sheet.
2. Additional 10 minutes will be provided to fill up the OMR sheet, before the start of the exam.
3. Use HB Pencil to darken the circle of the correct Option in OMR sheet. The correct way to darken the circle in OMR sheet is shown below.

   ● ○ ○ ○
4. Use black or blue ball point pen/HB pencil to fill the information in the OMR sheet. Partially filled OMR sheet will not be checked.
5. Return the OMR sheet to the invigilator after the exam.

CODE#1

SC10

BLOOM CAP
Founded by | arihant

Section A (1 Mark)

1. The correct sequence of air passage during inhalation is

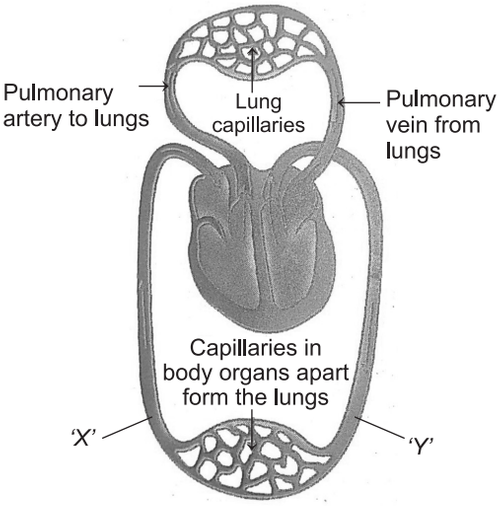
(a) Nostrils → larynx → pharynx → trachea → lungs

(b) Larynx → nostrils → pharynx → Lungs

(c) Nassal passage → trachea → pharynx → larynx → alveoli

(d) Nostrils → pharynx → larynx → trachea → alveoli

2. Examine the following diagram.



Correctly label the letters '*X*' and '*Y*' in the following figure.

(a) *X* → Blood, *Y* → Artery

(b) *X* → Artery, *Y* → Vein

(c) *X* → Vein, *Y* → Artery

(d) *X* → Capillary, *Y* → Artery

3. Sodium metal is a strong reducing agent. It is because

(a) it has small size.

(b) it is hard.

(c) it has higher place in reactivity series.

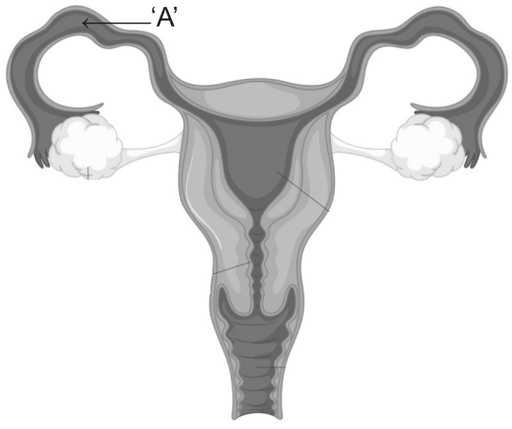
(d) it is brittle.

4. Which of the following is the sexually transmitted disease caused by bacteria?

(a) Gonorrhoea (b) AIDS

(c) Diarrhoea (d) Malaria

5. Examine the following diagram.



Identify the most appropriate function of the part represented by letter '*A*'.

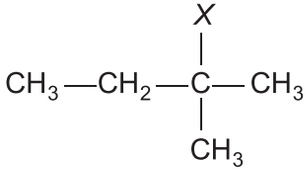
(a) Egg transport and fertilisation.

(b) Embryo pathway

(c) Development support

(d) Formation of gametes

6. A compound has following structure.



The IUPAC name of the above compound is 4, 4-dimethyl hex-2-ene. *X* for this compound is

(a) —CH_2 = CH_2

(b) —CH = CH—CH_3

(c) —CH_2 —CH_2 —CH = CH_2

(d) —CH_2 —CH_2 —CH_3

7. The number of chromosomes in sex cells of a human being is most likely to be

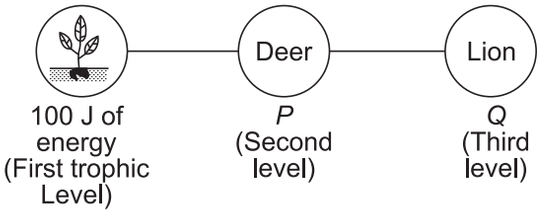
(a) 46

(b) 23

(c) 21

(d) 42

8. According to the 10 per cent law, analyse the energy flow and choose the correct option from the following.

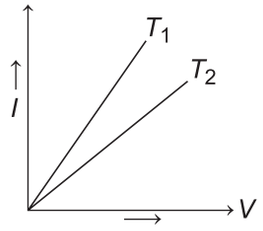


(a) *P*-10 J; *Q*-1 J (b) *P*-1 J; *Q*-10 J
(c) *P*-100 J; *Q*-100 J (d) *P*-10 J ; *Q* - 10 J

9. Which one among the following is the major greenhouse gas destroying the ozone layer in atmosphere ?

(a) CFCs (b) CO (c) CO_2 (d) Smog

10. *V-I* graph for a metallic wire at two different temperature T_1 and T_2 is as shown in the figure. Which of two is higher?

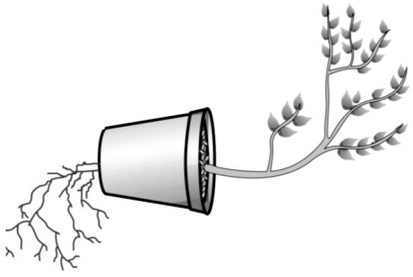


(a) T_1 is higher
(b) T_2 is higher
(c) T_1 and T_2 both are higher
(d) None of the above

11. The metabolism of carbohydrate, protein and fat is regulated by which endocrine hormone?

(a) Adrenaline
(b) Thyroxine
(c) Insulin
(d) Testosterone

12. Examine the following diagram carefully.



Identify the following phenomenon depicted by the roots of the plant.

(a) Tropism (b) Phototropism
(c) Geotropism (d) Light response

13. Actions like blood pressure, salivation and vomitting are controlled by

(a) medulla (b) cerebellum
(c) cerebrum (d) pons

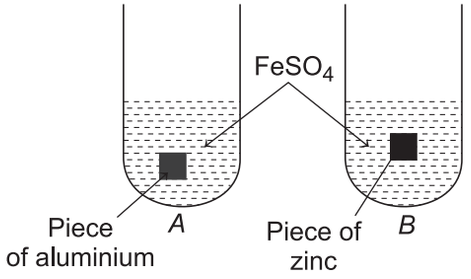
14. Presence of moisture can be easily detected by $CuSO_4$. Anhydrous copper sulphate changes colour in it's hydrous form. The colour change is

(a) from white to yellow (b) from blue to white
(c) from white to blue (d) from black to blue

15. A student has been given a project to prepare an astronomical telescope. Which two types of lenses does she have to buy?

(a) Concave lenses of different focal lengths
(b) Convex lenses of same focal lengths
(c) Convex lenses of different focal lengths
(d) Concave lenses of same focal lengths

16. Look at the given diagram carefully.



$FeSO_4$ solution is taken in two test tubes. Colour of the solutions in *A* and *B* after Al and Zn metals are added in *A* and *B* respectively are

(a) blue and white
(b) blue and colourless
(c) green and blue
(d) colourless and colourless

17. A metal *X* reacts vigorously with water. It is super reactive in air as well. It forms important compounds which are used in baking as well as in washing products. *X* is

(a) Ca (b) Mg (c) Al (d) Na

18. Which among the following, most appropriately describes the function of the umbilical cord?

(a) It supplies oxygenated blood from mother to the embryo
(b) It feeds the embryo with digested substances
(c) It removes waste from the embryo to the mother's blood
(d) It conveys nutrients and wastes to and from the embryo, respectively

19. A salt *X* is taken in a beaker. To this beaker, dil. HCl is added slowly. The colour of the solution turns from black to bluish-green. Here, *X* is

(a) CuO (b) Cu_2O
(c) Cu_2S (d) CuCl

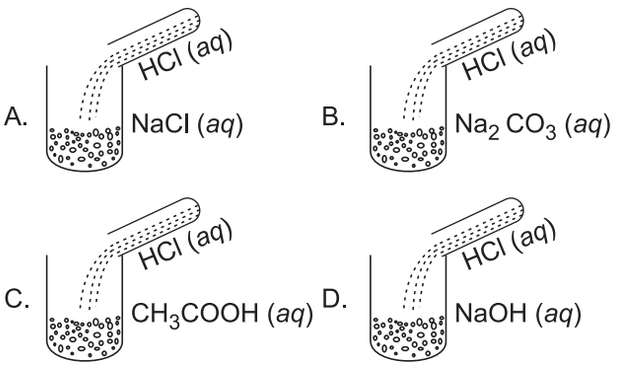
20. Ionic compounds are formed from a metal and a non-metal element. They have

(a) a sharing of electrons equally between the atoms.
(b) low melting point
(c) soluble in water
(d) softness

21. A cross between two separate traits, shape and colour of seeds results in the phenotype of

(a) 3 : 1 (b) 9 : 3 : 3 : 1
(c) 9 : 3 : 1 (d) 1 : 2 : 1

22. Observe the following experimental setup carefully.



From the above given figures, which test tube gives effervescence?

(a) A and B (b) Only B
(c) Only C (d) C and D

23. When magnesium (Mg), a metal, reacts with oxygen (O_2) a non-metal, a compound is formed. Which of the following statements about this reaction is true?

(a) Magnesium and oxygen both gain electrons during the reaction.
(b) Magnesium and oxygen both lose electrons during the reaction.
(c) Magnesium loses electrons and oxygen gains electrons.
(d) Magnesium gains electrons and oxygen loses electrons.

24. While playing outside, you were bit by an ant, and the affected area got inflamed. Your mother asked you to apply some calamine lotion on the affected area of your skin. This is done because

(a) ant bite has acetic acid which is neutralised by sodium carbonate of calamine lotion.
(b) ant bite has formic acid which is neutralised by sodium carbonate of calamine lotion.
(c) ant bite has sodium hydroxide in it which is neutralised by acetic acid of calamine lotion.
(d) ant bite has formic acid which is neutralised by zinc carbonate of calamine lotion.

25. Classify each reaction.

I. $Zn + 2AgNO_3 \longrightarrow Zn(NO_3)_2 + 2Ag$

II. $Ca(OH)_2 \xrightarrow{\Delta} CaO + H_2O$

III. $Cu(NO_3)_2 + 2Na_2S \longrightarrow CuS_2 + 2NaNO_3$

IV. $H_2SO_3 + 2KOH \longrightarrow K_2SO_3 + 2H_2O$

(a) Decomposition, redox, precipitation, neutralisation
(b) Displacement, precipitation, neutralisation decomposition
(c) Redox, decomposition, precipitation, neutralisation
(d) Precipitation, displacement, neutralisation, redox

26. Metals higher in the reactivity series are not extracted from their oxides by carbon reduction because

(a) reduction is expensive.
(b) carbon form alloys with metals.
(c) carbon has more affinity with oxygen.
(d) carbon is weaker reducing agent than these metals.

27. What is the increasing order of the extent of angle changes undergoes by the colour of the spectrum during splitting of white light?

(a) Red > Blue > Yellow
(b) Yellow < Blue < Red
(c) Blue < Yellow < Red
(d) Red < Yellow < Blue

28. An induced emf is produced when a magnet is plunged into a coil. The magnetic field of induced emf does not depend on the

(a) number of turns in the coil
(b) speed with which the magnet is moved
(c) strength of the magnet
(d) resistivity of the material of the coil

29. In a household electric supply the earth pin of a plug is made thicker because

(a) maximum current flows into it
(b) it can help in proper electrical connection
(c) its provide greater efficiency
(d) None of the above

30. In a food chain, the percent of energy available for the transfer at different trophic levels is in the form of

(a) heat energy (b) chemical energy
(c) mechanical energy (d) light energy

31. When a ray of light travelling in air is incident on the glass surface at angle of incidence 60°. Find the angle of refraction in glass, if refractive index of glass is $\frac{3}{2}$.

(a) 35° (b) 60°
(c) 45° (d) 90°

32. How can we explain the reddish appearance of sun at sunrise or sunset?

(a) Scattering of blue light is more than the scattering of red light.
(b) Scattering of red light is more than the scattering of blue light.
(c) Intensity of the sun reduces during sunrise and sunset.
(d) Due to the view angle, it appears blue.

33. A 60 W electric lamp gives off energy in the form of light at a rate of 7.5 J/s. What percentage of energy does the lamp transform into light energy?

(a) 12.2% (b) 12.3% (c) 12.5% (d) 12.8%

34. What will be the power consumed by a 25 Ω wire if it is put across a mains of 250 volts?

(a) 2.5 kW (b) 5 kW
(c) 25 kW (d) 25 W

35. Rohan mixed a salt *X* with water. A reaction took place with release of heat. When a gas CO_2 is mixed into this solution, a milky white product *Y* is formed. *Y* on heating strongly gives *C* and *D*. Here, *X*, *C* and *D* are

(a) CaO, O_2, H_2O (b) CaO, CaO, CO_2
(c) $CaO, Ca(OH)_2, CO_2$ (d) $CaCO_3, CaO, CO_2$

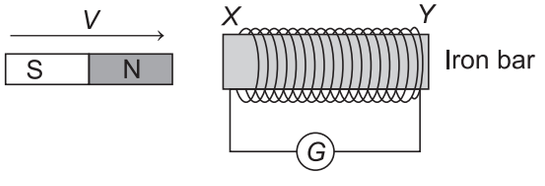
36. An AC generator is connected to an electric appliance. In 10 revolutions of the armature the current in the appliance changes direction.

(a) 10 times (b) 20 times
(c) 30 times (d) 40 times

37. A magnet having pole strength *m* is cut along its length into two equal parts. The strength of the pole of each of the magnets is

(a) $\frac{m}{2}$ (b) $2m$ (c) m (d) $4m$

38. A permanent magnet is moving with velocity *v* towards a solenoid as shown in the diagram. Find out the induced magnetic pole at *Y* of the solenoid. Also, find the direction of induced current into the galvanometer?



	Polarity at *Y*	Direction of the current
(a)	N-pole	from the left
(b)	N-pole	from the right
(c)	S-pole	from the left
(d)	S-pole	from the right

39. For water, $\mu = \frac{4}{3}$ and the velocity of light in vacuum is 3×10^8 m/s, the time taken for light to travel a distance of 450 m in water will be

(a) 2 μs (b) 1.5 μs (c) 1 μs (d) 3 μs

40. An object, 5 cm is in size, is placed at 12 cm in front of a concave mirror of radius of curvature 20 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image?

(a) 50 cm (b) – 60 cm (c) – 30 cm (d) 45 cm

Section B (2 Marks)

41. Given below are two statements, one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A) During intense physical activity, humans may experience oxygen debt.

Reason (R) Lack of oxygen lead to building of lactic acid in muscles.

Choose the correct answer from the options given below.

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true, but R is not the correct explanation of A

(c) A is true, but R is false

(d) A is false, but R is true

42. Given below are two statements.

Statement I The responses of nervous system can be classified as voluntary and involuntary action.

Statement II A feedback mechanism regulates the action of the hormones.

Choose the correct answer from the options given below.

(a) Both statement I and statement II are correct

(b) Both statement I and statement II are incorrect

(c) Statement I is correct, but statement II is incorrect

(d) Statement I is incorrect, but statement II is correct

43. Match the following pairs in Column I and Column II.

	Column I		Column II
A.	Leech	1.	Parasitic nutrition
B.	Mushroom	2.	Holozoic nutrition
C.	Amoeba	3.	Autotrophic nutrition
D.	Green plants	4.	Saprophytic nutrition

Choose the correct answer from the options given below.

	A	B	C	D
(a)	1	4	2	3
(b)	1	2	4	3
(c)	3	4	2	1
(d)	1	3	4	2

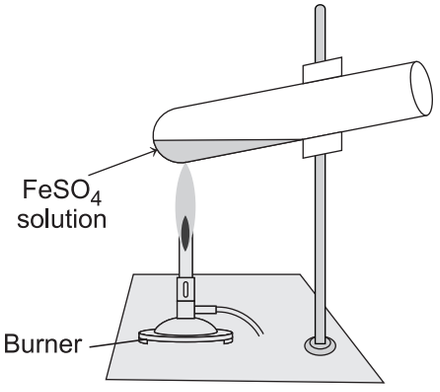
44. Match the following Column I with Column II.

	Column I (Metals)		Column II (Extraction)
A.	Pt	1.	Calcination
B.	Ca	2.	Roasting
C.	Zn	3.	Refining
D.	Pb	4.	Electrolysis

Choose the correct answer from the options given below.

	A	B	C	D
(a)	1	3	2	4
(b)	4	1	3	2
(c)	3	4	2	1
(d)	3	4	1	2

45. A solution of $FeSO_4$ is kept in a test tube. It is heated as shown in the picture.



Choose the correct statement(s) for the change taking place in the test tube.

I. Colour of solution changes from light green to white.

II. On prolonged heating, a gas with pungent smell is evolved.

III. $FeSO_4$ gets decomposed easily.

IV. Zinc will replace Fe from $FeSO_4$ solution when it is added to it.

Choose the correct answer from the options given below.

(a) I and III

(b) I and II

(c) I, II and III

(d) I, II and IV

46. Given below are two statements, one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A) Ionic compounds are conductor of electricity due to free electrons.

Reason (R) Ionic compounds do not conduct electricity in their solid form.

Choose the correct answer from the options given below:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Case Study

Read the cases given below and answer the question that follow.

When an electric current is passed through a high resistance wire like nichrome wire, then the wire becomes very hot and produces heat. This is called the heating effect of current. This effect is obtained by the transformation of electrical energy into heat energy. e.g. An electric fan becomes warm, if it is used continuously for longer time.

Assuming that all electric work done or electrical energy consumed is converted into heat energy, i.e., heat produced. So, heat produced is given by

$$H = I^2 \times R \times t$$

$\therefore$ The electrical energy consumed by a household appliance in a certain time (t) is given as,

$$\text{Energy (in kWh)} = \text{Power (in kW)} \times \text{Time (in h)}$$

$$= \frac{\text{Power (in W)} \times \text{time (in h)}}{1000}$$

$$= \frac{V(\text{volt}) \times I\,(\text{A}) \times t\,(\text{h})}{1000}$$

Now, cost of the electricity will be given as,

cost of electricity = energy consumed (in kWh) $\times$ rate in rupees per unit.

47. An electric fan runs from the 220 V mains. The current flowing through it is 0.5 A. At what rate is the electrical energy transformed by the fan?

(a) 90 W (b) 200 W

(c) 110 W (d) 240 W

48. An electric iron of resistance 20 Ω takes a current of 5A. Calculate the heat developed in 0.5 min.

(a) 1.5×10^4 J (b) 2.5×10^6 J

(c) 3×10^6 J (d) 2×10^5 J

49. 200 J of heat is produced in 10 s in a 5 Ω resistance. Find the potential difference across the resistor.

(a) 20 V (b) 15 V

(c) 10 V (d) 25 V

50. An electric refrigerator rated 500 W operates 6 hours/day. What is the cost of the energy to operate it for 30 days at ` 4.5 per kWh?

(a) ₹ 250 (b) ₹ 600

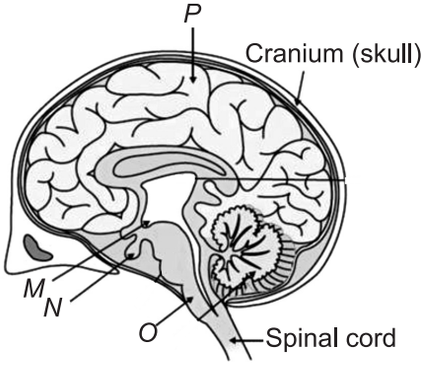
(c) ₹ 100 (d) ₹ 405

Tie-Breaking Section

Instructions

1. This section consists of 5 questions.
2. The score achieved in this section will not be included in the total marks.
3. If overall marks of two or more students are same, winner will be decided based on the score in this section.
4. Participation in this section is optional and students may choose to attempt it or not.

1. Examine the represented diagram carefully. Identify and correctly label the components depicted as *M*, *N*, *O* and *P*.



(a) *M*-Hypothalamus, *N*-Pituitary gland, *O*-Medulla, *P*-Cerebrum

(b) *M*-Pituitary gland, *N*-Hypothalamus, *O*-Cerebellum, *P*-Pons

(c) *M*-Medulla oblongata, *N*-Hypothalamus, *O*-Cerebrum, *P*-Cerebellum

(d) *M*-Pituitary gland, *N*-Medulla, *O*-Cerebrum, *P*-Hypothalamus

2. Read the following statements.

I. Movement of various types can be taken as an indication of life.

II. Respiration is prominently anaerobic.

III. Excretory products are removed by the nephrons in the kidney.

IV. Autotrophic nutrition involves intake of complex organic materials from the environment.

V. The circulatory system consists of the heart, blood and blood vessels.

Choose the incorrect statements from the options given below

(a) I, II and III (b) III and IV

(c) II and IV (d) III, IV and V

3. Consider the following observation and determine the nature of solutions *A, B* and *C*.

Solution *A* $\xrightarrow{\text{Excess HCl}}$ white ppt. (dissolves in excess of HCl)

Solution *B* $\xrightarrow{\text{Excess NaOH}}$ greenish blue ppt dissolves in excess of NaOH)

Solution *C* $\xrightarrow{\text{HCl,}}$ white ppt. (neither dissolves in HCl nor in NaOH)

	Solution *A*	**Solution *B***	**Solution *C***
(a)	Strong acid	Weak base	Salt
(b)	Weak base	Strong acid	Salt
(c)	Weak acid	Weak base	Salt
(d)	Weak acid	Strong base	Neutral substance

4. An organic compound *X* has molecular formula C_8H_{16}. When it is treated with HBr, a compound with molecular formula $C_8H_{17}Br$ is formed. The IUPAC name of this compound is 2-bromo-2,3,4- trimethylpentane. IUPAC name of *X* is

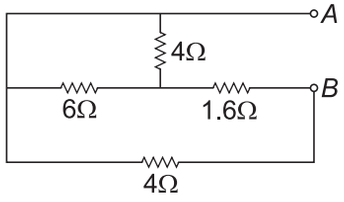
(a) 1, 2, 3-trimethylbut-1-ene

(b) 2, 4, 5-trimethylpent-3-ene

(c) 3, 4, 5 - trimethylpent -3-ene

(d) 2, 3, 4 - trimethylpent -2-ene

5. If four resistances are connected as shown in the figure between *A* and *B*, the effective resistance is



(a) 5 Ω (b) 4 Ω (c) 3 Ω (d) 2 Ω