SAMPLE QUESTION PAPER-2

SCIENCE

Time allowed : 3 hours | Maximum Marks : 80

GENERAL INSTRUCTIONS:

*(i) This question paper consists of 39 questions in 3 sections. **Section A is Biology, Section B is Chemistry and Section C is Physics.***

*(ii) **All questions are compulsory.** However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.*

SECTION - A

1. Rahul is learning about the human excretory system in his biology class. He is curious about how urine travels through the body after it is formed. Can you help Rahul identify the correct path of urine? **1**

(*a*) Kidney → urinary bladder → urethra → ureter
(*b*) Urinary bladder → ureter → kidney → urethra
(*c*) Kidney → ureter → urethra → urinary bladder
(*d*) Kidney → ureter → urinary bladder → urethra

2. Consider the following statements regarding genetic traits:

1. Dominant traits are only expressed in heterozygous individuals.
2. Recessive traits can reappear in subsequent generations.
3. Traits are inherited through alleles.
4. All offspring have identical traits as their parents.

Which of the above statements is/are correct? **1**

(*a*) 1 and 2 (*b*) 2 and 3 (*c*) 1 and 3 (*d*) 1 and 4

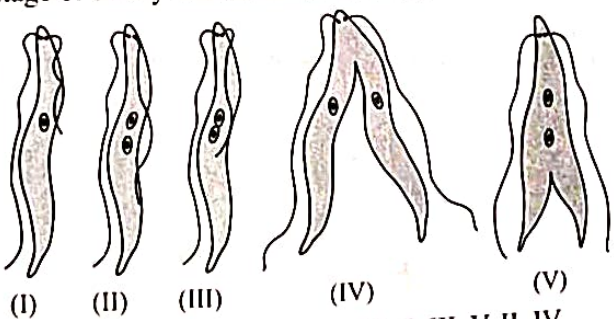
3. Which of the following plants can be developed by leaf propagation? **1**

(*i*) Potato (*ii*) Mint (*iii*) *Bryophyllum* (*iv*) Rose

The correct plants for leaf propagation is/are:

(*a*) (*i*) only (*b*) (*ii*) and (*iii*) (*c*) (*iii*) only (*d*) (*iv*) only

4. Choose the correct order of the stage of binary fission in *Leishmania*. **1**



(*a*) I, II, III, IV, V (*b*) I, III, II, V, IV (*c*) I, III, V, II, IV (*d*) I, II, III, V, IV

12. Sexual reproduction is a fundamental biological process in many organisms. How does sexual reproduction contribute to genetic variation? 2

13. A certain organism has the remarkable ability to break itself into multiple pieces, each capable of developing into a new individual. What is the specific term used to describe this method of reproduction? Is this form of reproduction classified as sexual or asexual? Provide an explanation. How does this process relate to the concept of regeneration, and what distinguishes it from the regeneration processes in other organisms? 3

14. (*i*) How does adrenaline prepare the body for the 'fight or flight' response and its effects on different organs?
(*ii*) Give reasons for the following:
(*a*) Plants can move their leaves without muscles.
(*b*) Chemical coordination in animals involves hormones. 3

15. All human chromosomes are not paired. Most human chromosomes have a maternal and a paternal copy, and we have 22 such pairs. But one pair called the sex chromosomes, is odd in not always being a perfect pair. Women have a perfect pair of sex chromosomes. But men have a mismatched pair in which one is normal sized while the other is a short one.
(*a*) In humans, how many chromosomes are present in a zygote and in each gamete? 1
(*b*) A few reptiles rely entirely on environmental cues for sex determination. Comment. 2
(*c*) "The sex of a child is a matter of chance and none of the parents are considered to be responsible for it." Justify it through a flow chart only. 1

OR

(*c*) Why do all the gametes formed in human females have an X chromosome? 1

16. (A) (*i*) Draw an ecological pyramid representing different trophic levels in a food chain. Explain with the help of examples for each level.
(*ii*) Explain the role of decomposers in an ecosystem. Mention some examples. 5

OR

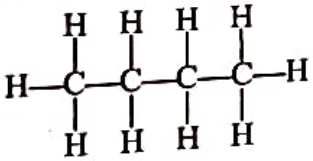
(B) (*a*) Define ozone depletion and explain its significance.
(*b*) Describe the main causes and sources of ozone depletion.
(*c*) How can we contribute to protecting the depletion of the ozone layer at an individual level? 5

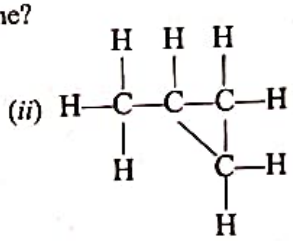
SECTION - B

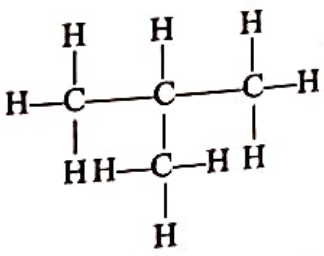
17. Riya, working in a chemical industry, was assigned to prepare bleaching powder for water disinfection. She knows it is prepared by reacting chlorine gas with a specific calcium compound. Which compound should she use?
(*a*) Calcium carbonate (*b*) Calcium hydroxide (*c*) Calcium chloride (*d*) Calcium sulphate 1

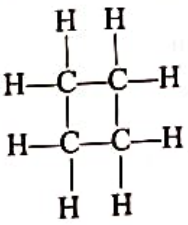
18. Which of the following metal does **NOT** corrode easily and does not require any special treatment for prevention?
(*a*) Iron (*b*) Copper (*c*) Zinc (*d*) Gold 1

19. Which of the following are correct structural isomers of butane?

(*i*)


(*ii*)


(*iii*)


(*iv*)


(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*) (*c*) (*i*) and (*ii*) (*d*) (*iii*) and (*iv*)

32. **Assertion (A):** A virtual image can be photographed.

Reason (R): Only real objects are photographed. 1

33. Sunlight enters the water at an angle of 30 degrees from the normal. If the water has a refractive index of 1.33, then find the angle of refraction of the sunlight inside water. 2

34. (A) (*i*) Mention the condition under which charges can move in a conductor.

(*ii*) Name the device which is used to maintain this condition in an electric circuit. 2

OR

(B) Distinguish between potential and potential difference in a circuit. 2

35. (*a*) Draw the magnetic field lines around a straight current-carrying conductor.

(*b*) Explain how the direction of the magnetic field produced by a current-carrying conductor can be determined using the right-hand thumb rule. 3

36. A circuit contains three resistors, one of 2 ohm and the other two of 4 ohm each. The 4 ohm resistors are connected in parallel and the combination is connected in series with the 2 ohm resistor. Calculate the current flowing through the circuit if a voltage of 10V is applied. 3

37. You are standing in a parking lot, and you notice a convex mirror installed on a wall near the entrance. The mirror is used to help drivers see around a blind corner. The object in front of the mirror is a parked car. 3

(*i*) (*a*) Explain the purpose of convex mirror in this scenario and how it helps driver see around a blind corner.

(*b*) Explain how the image of the parked car is formed by the convex mirror. Mention the characteristics of the image, such as its orientation and size.

(*ii*) If the convex mirror was replaced with a concave mirror of the same focal length, how would the image formation be different? Provide a brief explanation.

38. Electrical resistivity refers to the inherent property of a material that quantifies its opposition to the flow of electric current. It is defined as the electrical resistance exhibited by a specimen of the material with unit length and unit cross-sectional area. This parameter provides insight into how effectively or ineffectively a conductor allows the passage of electrical current. Below, you will find a table displaying the resistivity values for four distinct materials.

Resistivities at 20°C	
Material	**Resistivity**
Aluminium	2.82×10^{-8}
Copper	1.72×10^{-8}
Gold	2.44×10^{-8}
Nichrome	150×10^{-8}

(*a*) Among the given materials, which is the best conductor of electricity? 1

(*b*) Write the SI unit of resistivity. 1

(*c*) What are two reasons for the prevalent use of nichrome wire in various electrical heating devices? 2

OR

(*c*) Identify the element suitable for use in electrical transmission lines and provide a justification for your choice. 2

39. (A) Explain the structure and functioning of Human eye. How are we able to see nearby as well as distant objects? 5

OR

(B) When do we consider a person to be myopic or hypermetropic? Explain using diagrams how the defects associated with myopic and hypermetropia eye can be corrected? 5

Apple juice	3.5
Black Coffee	5.0
Black tea	5.5
Acid rain	5.6
Milk	6.5
Distilled water	7.0
Human saliva	7.5
Sea water	8.0
Soap	9.0–10.0
Milk of magnesia	10.5
Ammonia	11.5
Bleach	12.5

(*a*) Compare the pH values of stomach acid and black coffee and discuss which one is more acidic. 1

(*b*) Which substance from the table would you use to neutralize stomach acidity and why? 1

(*c*) (*i*) Identify a substance from the table that can be used as a weak acid for a home cleaning solution and explain why. 1

(*ii*) If a sample of rainwater has a pH of 5.6, is it considered acidic, neutral, or basic? Explain your answer. 1

OR

(*c*) Explain why black tea (pH 5.5) is suitable for consumption even though it is slightly acidic, compared to stronger acids like stomach acid (pH 2.0). 2

29. (A) Write the name and symbol of two most reactive metals. Explain the structure of one of the reactive metals with halogen. Explain two physical properties of the compound formed. 5

OR

(B) (*i*) Write the electron-dot structures for sodium, oxygen and magnesium.

(*ii*) Show the formation of Na_2O and MgO by the transfer of electrons.

(*iii*) What are the ions present in these compounds? 5

SECTION - C

30. Sneha was learning about solenoids and wrote down the following: 1

I. A solenoid is a coil of many circular turns of wire, usually wrapped in the shape of a cylinder.

II. Magnetic field inside a solenoid is non-uniform and changes direction at regular intervals.

III. A soft iron core placed inside a solenoid gets magnetized and behaves like an electromagnet.

Which of the above statements are correct?

(*a*) I and II (*b*) I and III (*c*) II and III (*d*) I, II and III

31. In the context of the human eye, what is the term for the black opening that exists between the clear fluid (aqueous humor) and the lens? 1

(*a*) Ciliary muscles (*b*) Iris (*c*) Cornea (*d*) Pupil

The following two questions consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions by selecting the appropriate option given below:

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

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

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

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

20. Which of the following reactions is a redox reaction? 1

(*a*) $2Mg + O_2 \rightarrow 2MgO$ (*b*) $NaOH + HCl \rightarrow NaCl + H_2O$

(*c*) $CaCO_3 \rightarrow CaO + CO_2$ (*d*) None of the above

21. While camping, you discover a plant with yellow roots. Testing its juice with lemon (acid) and soap (base), any color change could suggest it's a natural acid-base indicator. Which indicator might it resemble? 1

(*a*) Methyl orange (*b*) Phenolphthalein (*c*) Turmeric (*d*) Universal indicator

22. When ammonia (NH_3) reacts with oxygen (O_2) to produce nitrogen monoxide (NO) and water (H_2O), the balanced chemical equation is: 1

(*a*) $4NH_3 + \frac{3}{2}O_2 \rightarrow 4NO + 6H_2O$ (*b*) $2NH_3 + \frac{5}{2}O_2 \rightarrow 2NO + 3H_2O$

(*c*) $NH_3 + O_2 \rightarrow NO + H_2O$ (*d*) $3NH_3 + 4O_2 \rightarrow 3NO + 6H_2O$

23. Which of the following metals can be extracted by the electrolytic reduction process? 1

(*a*) Copper (*b*) Zinc (*c*) Aluminium (*d*) Iron

The following two questions consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions by selecting the appropriate option given below:

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

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

24. **Assertion (A):** Metals like Na, K, Ca and Mg are never found in their free state in nature.

Reason (R): These metals are very reactive elements, so they combine with other non-metals to complete its octet. 1

25. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with a brisk effervescence. Name this gas. Describe the method of testing this gas. 2

26. (A) Balance the following:

(*a*) $Mg(OH)_2 + HCl \rightarrow MgCl_2 + H_2O$

(*b*) $Na_2CrO_4(aq) + Zn(NO_3)_2(aq) \rightarrow ZnCrO_4(s) + NaNO_3(aq)$

(*c*) $NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$ 3

OR

(B) Explain why?

(*a*) Sitting by a campfire, exhaling in the cold air, you can see your breath forming a mist in the cold air. Now, in the context of this situation, can you explain why respiration is often referred to as an exothermic reaction?

(*b*) Imagine you are in a chemistry class, and your teacher conducts an experiment involving the decomposition of $CaCO_3$ into CaO and CO_2 on heating. Based on this experiment, can you explain why decomposition reactions are often classified as endothermic reactions?

(*c*) When the blue salt of copper sulphate is heated, it becomes colorless. Explain. 3

27. What do you understand by esterification and saponification reactions of organic compounds? Explain this with the help of the chemical equation for each. 3

28. The pH values of many common liquids are given in the table below.

Substance	pH
Battery acid	< 1.0
Stomach acid	2.0
Lemon juice	2.4
Cola	2.5

5. What is heredity? 1

(*a*) Transmission of physical characters from one generation to the next.

(*b*) Transmission of sexual and morphological characters from one generation to the next.

(*c*) Transmission of anatomical characters from one generation to the next.

(*d*) Transmission of genetic characters from parents to offspring or one generation to the next.

6. As the cricket match progresses, some players begin to experience muscle cramps. The coach gathers the team to discuss the possible causes. What is the likely reason for these cramps? 1

(*a*) The conversion of pyruvate to ethanol (*b*) The conversion of pyruvate to glucose

(*c*) The conversion of glucose to pyruvate (*d*) The conversion of pyruvate to lactic acid

7. A big tree falls in a forest, but its roots are still in contact with the soil. The branches of this fallen tree grow straight up (vertically). This happens in response to: 1

(*a*) Water and light (*b*) Water and minerals (*c*) Gravity and water (*d*) Light and gravity

The following two questions consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions by selecting the appropriate option given below:

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

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

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

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

8. **Assertion (A):** Contraception always helps in preventing unwanted pregnancies and sexually transmitted infections (STIs).
Reason (R): Condoms are an example of a barrier method of contraception that prevents the transmission of STIs to some extent. 1

9. **Assertion (A):** Excretion is the process of eliminating waste products from the body.
Reason (R): Excretion helps in maintaining the body's internal environment by removing harmful metabolic by products. 1

10. A picture of the lady is given below. She might be having some problems. Can you depict the problem and what kind of diet is advised to treat the disease? 2

11. (A) Alveoli are crucial structures in the respiratory system for gas exchange. How are the alveoli designed to maximize the exchange of gases? 2

OR

(B) (*a*) The images given below depict different components of the transportation system in animals. State its function. 2

P

Q

(*b*) Identify 'X' from the figure shown and compare its function with a similar structure in plants.