

PRINCE ACADEMY

Series PHSC

Question Paper Code PAHE/2

ROLL NO.

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Candidate must write the Q.P. Code on the title page of the answer-book.

- Please check that this question paper contains 08 printed pages.
- Please check that this question paper contains 39 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the Series Number of the question in the answer-book before attempting it.
- 15-minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

SCIENCE (086)

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
(BIOLOGY)

- 01.** Choose the correct statement that describes arteries. 1
(a) They have thick elastic walls, blood flows under high pressure; collect blood from different organs and bring it back to the heart
(b) They have thin walls with valves inside, blood flows under low pressure and carries blood away from the heart to various organs of the body
(c) They have thick elastic walls, blood flows under low pressure; carry blood from the heart to various organs of the body
(d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.
- 02.** Choose the forms in which most plants absorb nitrogen 1
(i) Proteins
(ii) Nitrates and Nitrites
(iii) Inorganic Urea
(iv) Atmospheric Nitrogen
(a) (i) and (ii) (b) (ii) and (iii)
(c) (iii) and (iv) (d) (i) and (iv)
- 03.** A female is suffering from an irregular menstrual cycle. The doctor prescribed her some hormonal tablets. Which option shows that the hormone she lacks in her body is from the endocrine gland? 1
(a) Oestrogen (b) Testosterone
(c) Adrenalin (d) Thyroxin
- 04.** Which of the following statements are true? 1
(i) Sudden action in response to something in the environment is called reflex action
(ii) Sensory neurons carry signals from the spinal cord to muscles
(iii) Motor neurons carry signals from receptors to the spinal cord
(iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called the reflex arc
(a) (i) and (ii) (b) (i) and (iii)
(c) (i) and (iv) (d) (i), (ii) and (iii)
- 05.** Which of the following statements is incorrect? 1
(a) For every hormone, there is a gene.
(b) For every protein, there is a gene.
(c) For the production of every enzyme, there is a gene.
(d) For every molecule of fat, there is a gene.
- 06.** The maleness of a child is determined by 1
(a) the X chromosome in the zygote.
(b) the Y chromosome in the zygote.
(c) the cytoplasm of the germ cell, which determines the sex.
(d) sex is determined by chance.
- 07.** In an ecosystem, the 10% of energy available for transfer from one trophic level to the next is in the form of: 1
(a) heat energy (b) light energy
(c) chemical energy (d) mechanical energy

The following 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.

- 08. Assertion (A) :** Each human trait is influenced by both paternal and maternal DNA. 1
Reason (R) : As compared to the father, the mother contributes more amount of genetic material to the child.
- 09. Assertion (A) :** Green plants trap only 1% of the energy of sunlight that falls on their leaves. 1
Reason (R) : All green plants are the producers in a food chain.
- 10.** What are the methods used by plants to get rid of excretory products? 2
- 11. Attempt either option A or B** 2
(A) Name the correct nutrients for the following enzymes
 (a) Trypsin
 (b) Amylase
 (c) Pepsin
 (d) Lipase

OR

- (B)** Give reason for the following:
 (a) Fine hair and mucus are present in the nasal passage.
 (b) Rings of cartilage are present in the throat.
- 12.** Plastic cups were used to serve tea in trains in early days- these could be returned to the vendors, cleaned and reused. Later, Kulhads were used instead of plastic cups. Now, paper cups are used for serving tea. 2
 What are the reasons for the shift from Plastic to Kulhads and then finally to paper cups?
- 13.** What happens at synapse between two neurons? Why does the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron take place but not in the reverse direction? Draw a labelled diagram of neuron. 3
- 14.** It is possible that a trait gets inherited, but not expressed? 3
 Give an example to justify your answer.
- 15.** The maintenance functions of every living organism on the earth keeps going on even when they are not doing anything particular. The processes which together perform the job of maintenance of life are known as life processes. These processes are nutrition, respiration, transportation and excretion. 4
Attempt either subpart (a) and (b)
- (a) What is transpiration? How is it useful to plants?

OR

- (b) Mention the pathway of urine strating from the organ of its formation.
 Name any two substances which are reabsorbed from the initial filtrate in the tubular part of the nephron.
- (c) List two types of nutrition.
 (d) We eat food. What happens to this food during aerobic respiration in our body?
- 16. Attempt either option A or B.** 5
(A) (i) What is vegetative propagation? Is this process sexual or asexual? 2
 Justify your answer.
 (ii) List three advantages of practising the process/technique by the farmers. 2
 (iii) Select two plants from the following which are obtained by this technique: 1
 Banana, Papaya, Jasmine, Mustard
- OR**
- (B)** (i) List two functions each of the following parts of the human female reproductive system: (a) oviduct (b) uterus (c) ovary 3
 (ii) Draw a labelled diagram of bisexual flower. 2

SECTION - B
(CHEMISTRY)

17. What is the correct order of reactivity? 1
(a) Na > Mg > Al > Cu (b) Mg > Na > Al > Cu
(c) Na > Mg > Cu > Al (d) Cu > Al > Mg > Na
18. What is the common name of calcium oxide? 1
(a) Chalk (b) Slaked lime
(c) Quicklime (d) Marble
19. Which non-metal is used in the manufacturing of fertilizers? 1
(a) Chlorine (b) Oxygen
(c) Nitrogen (d) Sulphur
20. What does the litmus test determine? 1
(a) The temperature of a substance (b) Whether a substance is acidic or basic
(c) The pH of a substance (d) The solubility of a substance
21. Which of the following is a property of carbon monoxide? 1
(a) It is used as a refrigerant (b) It supports combustion
(c) It is highly flammable (d) It is colorless, odorless, and poisonous
22. What is the IUPAC name for CH₃-CH₂-CH=CH₂? 1
(a) 1-Butene (b) 2-Butene
(c) 2-Butyne (d) Butane
23. What is the functional group of aldehydes? 1
(a) -COOH (b) -OH
(c) -CHO (d) -NH₂

Following questions consist of two statements - Assertion (A) and Reason (R). Answer these questions 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 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.
24. **Assertion (A) :** Calcium carbonate when heated gives calcium oxide and water. 1
Reason (R) : On heating calcium carbonate, decomposition reaction takes place.
25. Translate the following statements into chemical equations and then balance them. 2
(a) Hydrogen gas combines with nitrogen to form ammonia.
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
26. (i) Write the electron-dot structures for sodium, oxygen and magnesium. 3
(ii) Show the formation of Na₂O and MgO by the transfer of electrons.
- 27A. Oil and fat containing food items are flushed with nitrogen. Why? 3
- 27B. Explain the following terms with one example of each (a) Corrosion, (b) Rancidity.
28. **Read the given passage and answer the questions.** 4
Homologous series is a series of compounds with similar chemical properties and the same functional group different from the successive member by-CH₂. Carbon chains of varying lengths have been observed in organic compounds having the same general formula. Such organic compounds that vary from one another by a repeating unit and have the same general formula form a series of compounds. Alkanes with general formula C_nH_{2n+2}, alkenes with general formula C_nH_{2n}, and alkynes with general formula C_nH_{2n-2}. From the most basic homologous series in organic chemistry.
(i) Which of these statements is incorrect about the members of a homologous series?
(a) They have the same functional group
(b) They have the same general formula
(c) They have the same chemical properties
(d) They have the same physical properties

- (ii) What is the molecular formula of the fifth member of the homologous series of a carbon compounds represented by the general formula $C_nH_{2n+1}^{-OH}$?
- (iii) Write the name and formula of fourth member of aldehyde group?
- (iv) Which of the following belong to the same homologous series?

- (1) CH_4 (2) C_2H_6
 (3) C_3H_8 (4) C_4H_8

- (a) 1 and 2 only
 (b) 1, 2 and 3 only
 (c) 1, 3 and 4 only
 (d) All of these

29A. Give suitable reason for the following statements -

5

- (i) Rain water conducts electricity but distilled water does not.
 (ii) We feel burning sensation in the stomach when we over eat.
 (iii) A tarnished copper vessel regains its shine when rubbed with lemon.
 (iv) The crystals of washing soda change to white powder on exposure to air.
 (v) An aqueous solution of sodium chloride is neutral but an aqueous solution of sodium carbonate is basic

OR

- 29B.** (i) Write the chemical formula of hydrated copper sulphate and anhydrous copper sulphate. Give an activity to illustrate how these two are inter convertible? 3
 (ii) Write chemical names and formula of plaster of paris and gypsum. 2

SECTION - C

(PHYSICS)

- 30.** Arnav was making notes and he wrote down the following statements from his understanding of reflection from curved surfaces. 1

I. Concave mirrors can produce both real and virtual images depending on the position of the object.

II. Convex mirrors always produce real, inverted images regardless of the object's position.

III. In both concave and convex mirrors, the image location can be determined using

the mirror formula $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ where f is the focal length, v is the image distance, and u is the object distance.

Choose from the following the correct option that lists the correct statements about reflection from curved surfaces.

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

- 31.** Choose the correct option from the below which explains the reason for us to perceive the day sky as blue. 1

a) As sunlight passes through the atmosphere, shorter wavelengths, such as blue, are scattered more than other colors.

b) The sky appears blue because all colors are scattered equally, but blue light is stronger and more visible to the human eye.

c) The blue color of the sky is due to longer wavelengths like red and orange scattering more than shorter wavelengths, making blue stand out more.

d) The atmosphere contains blue-colored particles that give the sky its blue appearance.

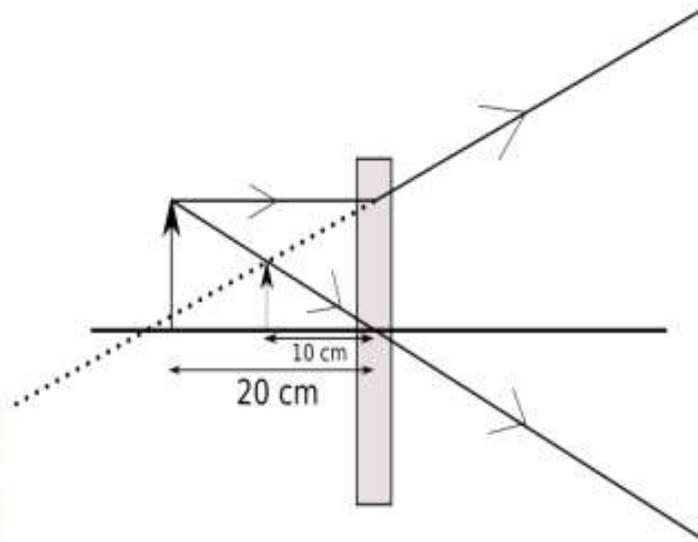
The following question consists of two statements-Assertion(A) and Reason(R). Answer this question by selecting the appropriate option given below:

- (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.

32. **Assertion (A)** : The magnetic field lines around a current carrying straight wire do not intersect each other. 1

Reason (R) : The magnitude of the magnetic field produced at a given point increases as the current through the wire increases.

33.

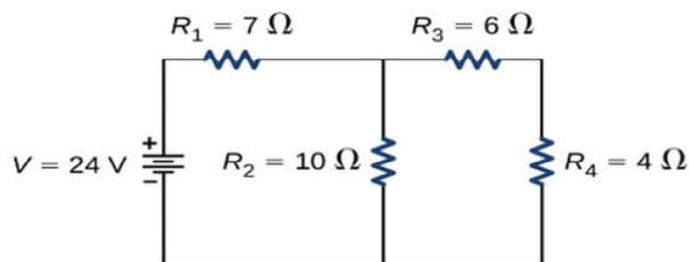


The above image shows the formation of an image with an optical instrument. 2

- (i) Identify the optical instrument (shown schematically as a rectangle) in the image. $\frac{1}{2}$
- (ii) What type of image is formed in this case? $\frac{1}{2}$
- (iii) Based on the measurements given in the image, calculate the focal length of the instrument. 1

34.

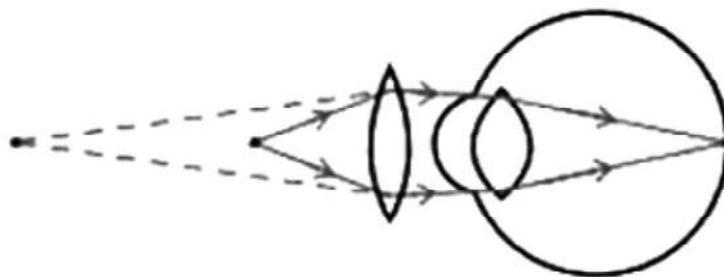
1+1 = 2



- (i) Calculate the total resistance of the circuit.
- (ii) Find the total current in the circuit.

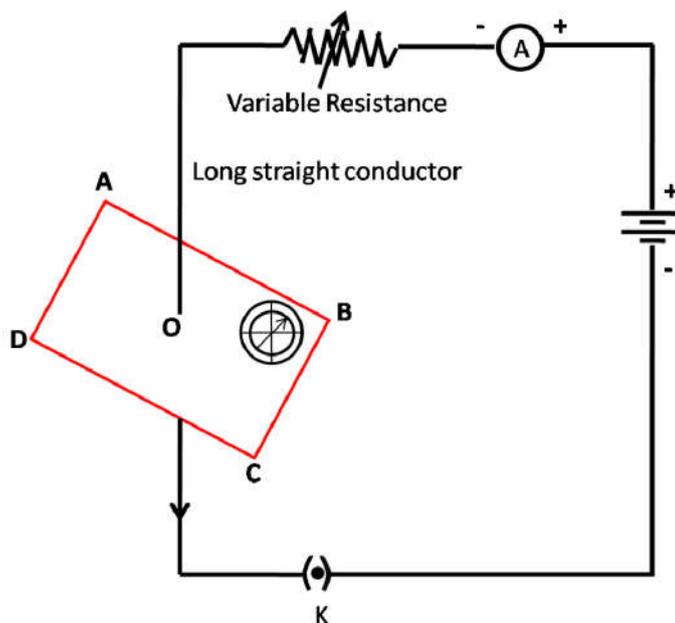
35.

1+2 = 3



The above image shows a corrective measure for a particular defect of vision.

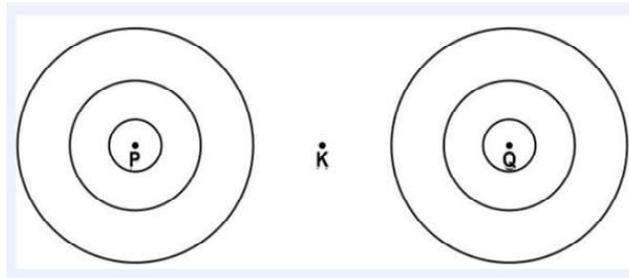
- (i) Identify the defect of vision and state what kind of lens is used to correct this deficiency.
 - (ii) Draw and label a ray diagram that shows the defect of vision in the above case before correction.
36. (i) Define 1 volt. How is a voltmeter connected in the circuit to measure the potential difference between two points? 1+2 = 3
- (ii) A copper wire has a diameter 0.5mm and resistivity of $1.6 \times 10^{-8} \Omega m$. What will be the length of this wire to make its resistance 10Ω ? How much does the resistance change if the diameter is doubled?
37. (i) Draw the pattern of magnetic field lines over a horizontal plane ABCD in the following picture. 1+2 = 3



- (ii) Define a solenoid. With the help of a suitable diagram show the pattern of magnetic field lines around a current-carrying solenoid. State the region where the field is uniform.

OR

P and Q represent two straight wires carrying equal current (I) in a direction perpendicular to the plane of the screen outwards. K is the midpoint of the line joining P and Q. The image shows the magnetic field lines around the wire. But the direction of the magnetic field is not marked.



- (a) Draw the above image and mark the direction of the magnetic field.
- (b) If the current in the wires is increased, how will the strength of the magnetic field around P and Q change? Draw the magnetic field lines around P and Q to represent this change.
- (c) If B is the magnetic field at point K due to the current in wire P, what will be the magnetic field due to P and Q at the midpoint K? Give a reason for your answer.
- 38.** Many optical instruments consist of a number of lenses. They are combined to increase the magnification and sharpness of the image. 4
 The net power (P) of the lenses placed in contact is given by the algebraic sum of the powers of the individual lenses $P_1, P_2, P_3 \dots$ as $P = P_1 + P_2 + P_3 \dots$. This is also termed as the simple additive property of the power of lens, widely used to design lens systems of cameras, microscopes and telescopes. These lens systems can have a combination of convex lenses and also concave lenses.
- (a) What is the nature (convergent/divergent) of the combination of a convex lens of power +4D and a concave lens of power -2D?
- (b) Calculate the focal length of a lens of power -2.5 D.
- Attempt either subpart (c) or (d)**
- (c) Draw a ray diagram to show the nature and position of an image formed by a convex lens of power +0.1 D, when an object is placed at a distance of 20 cm from its optical centre.
- (d) Explain how raindrops in the atmosphere acts like many small prisms in rainbow formation.
- 39.** (i) Explain why in household circuits only the fuse is connected in series with all the rest of the appliances but all appliances are connected in parallel to each other. 5
- (ii) In a household circuit, an electric heater of power 1500 W and a fan of power 500 W are connected in parallel to a 220 V supply. A fuse rated for 10 A is connected to the circuit to protect it from excessive current.
- (a) Calculate the total current drawn by the heater and the fan.
- (b) Determine whether the 10 A fuse is appropriate for this circuit or if it will blow.

OR

Two resistors, $R_1 = 6\Omega$ and $R_2 = 12\Omega$, are connected in parallel to a 24V battery. The circuit operates for 5 minutes.

- (a) Calculate the total heat generated in both resistors.
- (b) If each resistor has a power rating of 100 W, determine whether it is safe to use these resistors in the circuit
- (c) Why are coils of electric toasters and electric Irons made of an alloy rather than a pure metal?

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