INTSO EDUCATION

SCIENCE TALENT SEARCH OLYMPIAD (STSO) 2016-17

STAGE - 1

CLASS : X

TIME : 60 min.

Max. Marks : 50

Instructions:

- *Fill the OMR sheet completely and carefully.*
- *Each question carries one mark and has only one correct answer. No negative marks*
- *The question paper contains 50 questions to be answered in 60 minutes.*

PHYSICS

1. The filament of bulb is made of [ ]
   1) Silver 2) Gold 3) Tungsten 4) Copper

2. A light ray is incident on a plane mirror such that angle of incidence is equal to angle of deviation, then angle of reflection is equal to [ ]
   1) 30° 2) 60° 3) 120° 4) 90°

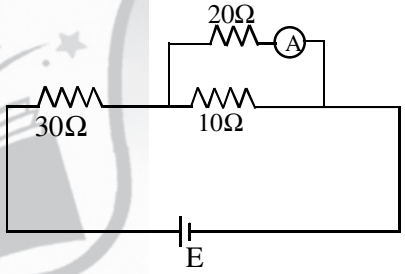
3. In the circuit given below, an ammeter (ideal) reads 5A. The emf of the cell (E) is equal to [ ]

   1) 550 V

   2) 1000 V

   3) 1100 V

   4) 900 V



4. An electric positive charge $5\mu c$ moves with a constant velocity 10^5 m/s towards east, in a uniform magneticfield of 10T acting vertically upward, force experienced by a charged particle [ ]
   1) 5N along South 2) 5N along North 3) 25 N along South 4) 25 N along North

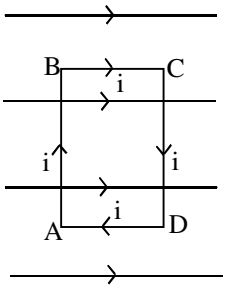
5. A rectangular coil (ABCD) kept in a uniform magnetic field as shown in figure. Then find the net force(F_R) and net torque (τ_R) on the coil. [ ]

   1) $F_R = 0,\ \tau_R \neq 0$

   2) $F_R = 0,\ \tau_R = 0$

   3) $F_R \neq 0,\ \tau_R \neq 0$

   4) $F_R \neq 0,\ \tau_R = 0$



6. The values of resistivity of insulators are of the order of _____ $\Omega - m$ [ ]
   1) 10^{12} to 10^{14} 2) 10^{14} to 10^{16} 3) 10^{16} to 10^{18} 4) 10^{18} to 10^{20}

7. A person cannot see the objects before 1 m and after 8 m infront of the eye. What are the power of the lenses required to correct this defect. [ ]
   1) + 1D, – 3D 2) –3D, + 0.125 D 3) – 1D, + 3D 4) + 3D, – 0.125 D

8. When a light wave travels from rarer to denser medium (i = angle of incidence in rarer medium, r = angle refraction in denser medium) [ ]

A) $i \geq r$ B) $i \leq r$

C) velocity of light increases D) velocity of light decreases

1) A, D are correct 2) B, C are correct 3) A, C are correct 4) B, D are correct

9. Refractive index of glass is $\frac{3}{2}$. Then the speed of light in glass is [ ]

1) 3×10^8 m/s 2) 2×10^7 m/s 3) 3×10^6 m/s 4) 2×10^8 m/s

10. When a light travels from denser to rarer medium, it [ ]

i) bends towards the normal ii) frequency remains unchanged

iii) wavelength decreases iv) velocity increases

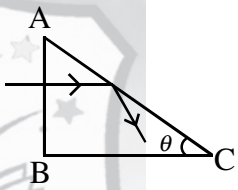
a) all are correct 2) i, ii, iii are correct 3) i, ii, iv are correct 4) only ii, iv are correct

11. A pin of length 2 cm lies along the principal axis of a converging lens, the centre being at a distance of 11 cm from the lens. The focal length of a lens is 6 cm. The size of the image

1) 1 cm 2) 4.33 cm 3) 3 cm 4) 3.33 cm [ ]

12. A light ray is incident normally on the face AB of a right - angled prism ABC ($\mu = 1.50$) as shown in figure. What is the largest angle 'θ' for which the light ray is totally reflected at the surface AC

1) $\sin^{-1}\left(\frac{2}{3}\right)$ 2) $\cos^{-1}\left(\frac{2}{3}\right)$ [ ]



3) $\tan^{-1}\left(\frac{2}{3}\right)$ 4) $\sin^{-1}\left(\frac{3}{2}\right)$

13. When we see an object, the image formed on the retina [ ]

1) virtual, erect 2) Real, inverted 3) Real, erect 4) virtual, inverted

14. A professor reads a greeting card recieved on his "50th" birthday with + 2.5 D glasses keeping the card 25 cm away. Five years later, he reads his fare well letter with the same glases but he has to keep the letter 50 cm away. What power of the lens should he now use [ ]

1) 4.5 D 2) 3.5 D 3) 3 D 4) 4 D

15. A proton and an electron entre a magnetic field at right angles to the field and move in circular paths of equal radii. These particles should have entered the field. [ ]

1) with same velocity 2) with same momentum

3) with same kinetic eenrgy 4) with same total energy

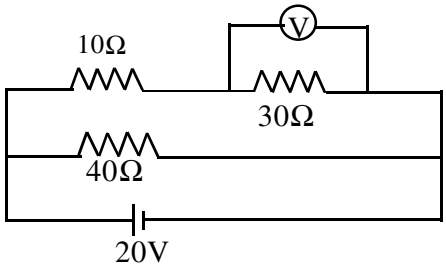
16. An ideal voltmeter is used to measure the potential drop across the 30 Ω resistor. The reading of volt meter is [ ]

1) 5V

2) 15V

3) 20V

4) 40V

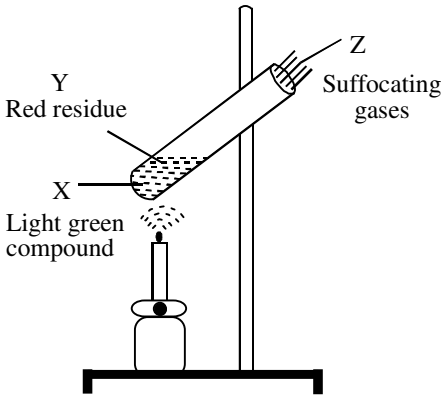


17. Which converts mechanical energy into electric energy [ ]

1) Electric motor 2) Battery 3) Switch 4) Generator

CHEMISTRY

18. Two gases, 'Z' having suffocating odour are obtained when a green solid 'X' is heated, along with a residue 'Y'. These gases are major air pollutants. When the vapours of the gases are collected and dissolved in water, the solution turns blue litmus red. The colour of the residue becomes red. What would be X, Y and Z ? [ ]



1) $Pb(NO_3)_2$ PbO_2 NO_2, N_2O_4

2) $Fe(OH)_3$ FeO H_2O, H_2O_2

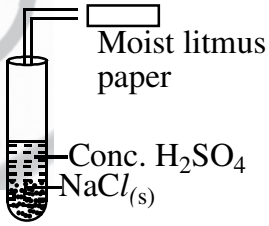
3) $FeSO_4$ Fe_2O_3 SO_2, SO_3

4) $PbSO_4$ Pb_2O_3 SO_2, SO_3

19. Consider the following statements about rancidity. [ ]
I) When fats/oil containing food items get reduced, they become rancid
II) It is prevented by the use of refrigerator or air tight containers or nitrogen or antioxidants
III) Benzene Hydrogen Sulphate (BHS) is added to protect the food from being rancid.
The incorrect statements from the above is/are
1) I and III 2) II and III 3) Only III 4) All of these

20. A solution reacts with marble chips to produce a gas which turns lime water milky.The solution contains [ ]
1) Na_2SO_4 2) $CaSO_4$ 3) H_2SO_4 4) K_2SO_4

21. By observing the diagram notice the reaction occured at bottom of the test tube [ ]



1) $HCl + H_2O \rightarrow H_3O^+ + Cl^-_{(aq)}$

2) $H^+ + H_2O \rightarrow H_3O^+$

3) $2NaCl_{(s)} + H_2SO_{4\,(l)} \rightarrow 2HCl_{(g)} \uparrow + Na_2SO_{4(s)}$

4) All

22. Energy of a photon with a wave length of 450 nm is [ ]
1) 4.4×10^{-12} ergs 2) 4.4×10^{-13} ergs 3) 4.4×10^{-19} ergs 4) 4.4×10^{-11} ergs

23. Consider the following table.

Element in neutral state	Atomic number	Number of protons	Number of neutrons	Number of electrons	Mass number
Hydrogen	1	1	0	1	1
Helium	2	2	2	2	4
Nitrogen	7	7	7	7	14
Carbon	6	6	6	6	12
Beryllium	4	4	5	4	9

What can be inferred from the table ? [ ]
1) Atomic number of an element is equal to its mass number
2) Mass number of an element is twice its atomic number
3) Mass number of an element is the sum of protons and neutrons in its atom
4) Atomic number of an element is the sum of protons and neutrons in its atom

24. Bohr's model of atom can't explain : [ ]
1) Spectrum of H 2) Spectrum of He^{+} 3) Spectrum of Li^{+2} 4) Spectrum of B

25. The correct sequence which shows decreasing order of the ionic radii of elements is [ ]
1) $Na^{+} > Mg^{2+} > Al^{3+} > O^{2-} > F^{-}$ 2) $Na^{+} > F^{-} > Mg^{2+} > Na^{+} > F^{-} > Al^{3+}$
3) $O^{2-} > F^{-} > Na^{+} > Mg^{2+} > Al^{+3}$ 4) $Al^{3+} > Mg^{2+} > Na^{+} > F^{-} > O^{2-}$

26. Which of the following is not a limitation of Mendeleef's periodic table? [ ]
1) Correction in atomic mass
2) Position of isotopes
3) Placing dissimilar elements together
4) Placing of heavier element before the lighter one

27. Which one of the following has an electrovalent linkage ? [ ]
1) CH_4 2) $MgCl_2$ 3) $SiCl_4$ 4) BF_3

28. Which of the following is a correct pair ? [ ]
1) $BeCl_2$,sp^2,linear 2) NH_3, sp^3 linear 3) CO_2, sp, linear 4) H_2O, sp^3, linear

29. Two elements 'X' and 'Y' have the following configuration .
$X = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$
$Y = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
The compound formed by the combination of 'X' and 'Y' will be [ ]
1) XY_2 2) X_5Y_2 3) X_2Y_5 4) XY_5

30. If the gangue is basic, the flux used is [ ]
1) CaO 2) MgO 3) SiO_2 4) CuO

31. Study the following extraction processes carefully [ ]

i) $2XS(s) + 3O_2(g) \xrightarrow{\Delta} 2XO(s) + 2SO_2(g)$, $2XO(s) \xrightarrow{\Delta} 2X(l) + O_2(g)$

ii) $YCO_3(s) \xrightarrow{\Delta} YO(s) + CO_2(g)$, $YO(s) + C(s) \xrightarrow{\Delta} Y(s) + CO(g)$

iii) $ZCl \rightarrow Z^{+} + Cl^{-}$

At cathode : $Z^{+} + e^{-} \rightarrow Z$

At anode : $2Cl^{-} \rightarrow Cl_2 + 2e^{-}$

What is the correct order of reactivity of X, Y and Z as inferred from the above reactions ?
1) X > Y > Z 2) Y > Z > X 3) Z > Y > X 4) Y = X > Z

32. 7 - Hydroxy heptan - 2- one is the IUPAC name of [ ]

1) $CH_3CH(CH)CH_2CH_2C(=O)-CH_3$

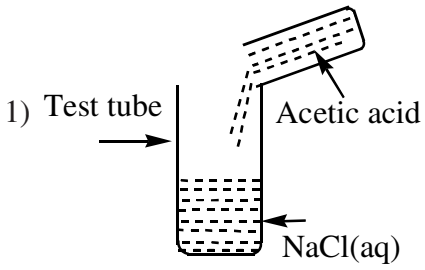
2) $CH_3-C(=O)-CH_2-C(=OH)-CH_2-CH_3$

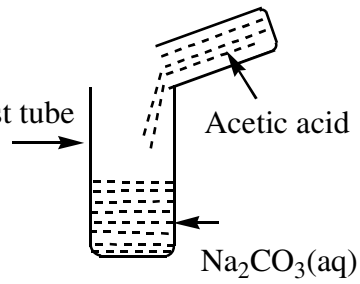
3) $HO-CH_2CH_2CH_2CH_2CH_2C(=O)-CH_3$

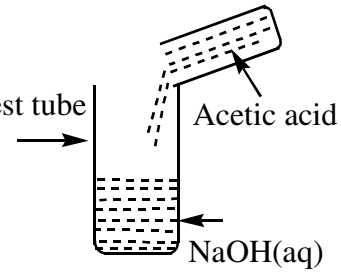
4) $CH_3-CH_2-C(=O)-CH_2CH_2CH_2OH$

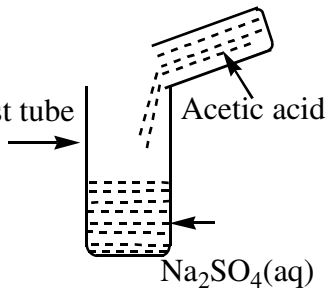
33. The alcoholic detecting instrument contains orange $Cr_2O_7^{2-}$. This will changes to bluish green Cr^{+3} by oxidising ethanol to ethanoic acid. Here the nature of $K_2Cr_2O_7$ is [ ]
1) Reducing agent 2) Oxidising agent 3) both 4) none

34. In which test-tube will efferescence occur? [ ]

1) 

2) 

3) 

4) 

BIOLOGY

35. Which one is the correct route through which pulse making impulse travels in the heart [ ]
1) SA node → Purkinje fibres → Bundle of His → AV node → Heart muscles
2) AV node → SA node → Purkinje fibres → Bundle of His → Heart muscles
3) AV node → Bundle of His → SA node purkinje fibres → Heart muscles
4) SA node → AV node → Bundle of His → Purkinje fibres → Heart muscles

36. The site of EMP pathway in eukaryotes and prokaryotes respectively is [ ]
1) Inner mitochondrial membrane, Cytoplasm 2) Cytoplasm, Cytoplasm
3) Cytoplasm, Mitochondrial matrix 4) Mitochondrial inner membrane,Cytoplasm

37. Which of the following papillae are without taste buds in universal tooth brush of humans
1) Circumvallate 2) Fungi form 3) Fusiform 4) Filiform [ ]

38. Lenticels and hydathodes are small pores with following common attributes [ ]
1) Their opening and closing are not regulated
2) They allow exchange of gases
3) They always remain closed
4) They are found on the same organ of plants

39. Read the following statements :
I. Stomata helps in exchange of gases in plants
II. Stomata open when guard cells have more k^+
III. Stomata closes when guard cells have more k^+
IV. Increased k^+ concentration results endosmosis in guard cells
V. Increased k^+ concentration results exosmosis in guard cells
Identify the correct statements regarding stomatal opening and closing [ ]
1) I, III, V 2) I, II, III 3) I, II, IV 4) V, IV, III

40. Raju took sugarcane and sucked its juice. Regarding this which of the following is correctly matched. [ ]

	Substance	Enzyme	Site of enzyme Production	Products formed
1)	Sucrose	Amylase	Pancreas	Maltose + dextrose
2)	Proteins	Peptidases	Intestinal glands	Glucose + Maltose
3)	Sucrose	Sucrase	Intestinal glands	Glucose + Fructose
4)	Starch	Sucrase	Duodenum	Frutose + Glucose

41. The pituitary harmone which shows effect on urination is [ ]
1) ADH 2) ACTH 3) GH 4) LH

42. S to Z are structures of the human respiratory system. Arrange them to show the order in which air from outside travels through the respiratory system to reach the gaseous exhange surface in the lungs. [ ]

S : Bronchioles U : Nostrils
W : Epiglottis Y : Trachea
T : Bronchi V : Pharynx
X : Larynx Z : Alveoli

1) $U \rightarrow V \rightarrow X \rightarrow Y \rightarrow W \rightarrow T \rightarrow S \rightarrow Z$ 2) $V \rightarrow X \rightarrow Y \rightarrow W \rightarrow T \rightarrow S \rightarrow Z \rightarrow U$
3) $U \rightarrow V \rightarrow W \rightarrow X \rightarrow Y \rightarrow T \rightarrow S \rightarrow Z$ 4) $X \rightarrow Y \rightarrow V \rightarrow U \rightarrow T \rightarrow S \rightarrow W \rightarrow Z$

43.

Alkaloid	Plant	Uses	Part
i) p	*Datura stromonium*	sedative	q
ii) Pyrethroids	r	Insecticide	s
iii) t	*Rauwolfia serpentina*	u	root

[ ]

Idenfity correct combination of p, q, r, s,t,u
1) p - scopolamine; q - flower; r - *Chrysanthemum*; s - fruit, t - serpentine, u - antimalarial drug
2) p - cocain, q - stem, r - *Tridax*, s - flower, t - reserpine, u - antidote for snake bite
3) p - scopolamine, q - fruit, r - *Tridax*, s - flower, t - reserpine, u - medicine for snake bite
4) p - nimbin, q - flower, r - *Chrysanthemum*, s - flower, t - morphine, u - cardiovascular dialator

44. The process in which organisms do not require light, pigments and synthesize their food by utilizing energy released by the oxidation of inorganic and organic substances is [ ]
1) Saprophytism 2) Photoautotropism 3) Chemosynthesis 4) Heterotropism

45. The removal of a ring of bark from the trunk of a tree eventually kills it, since [ ]
1) Mineral salts cannot go up
2) Water cannot go up
3) Food does not travel down and roots are starved
4) The exposed part becomes infected with fungi

46. Read the following statements : [ ]
I. Reabsorption of calcium occurs in early DCT
II. Diuretics inhibits the secretion of ADH
III. Presence of interstitial gradient in the medulla, allows water to be reabsorbed by osmosis in the collecting duct.
Correct statement is/are
1) I & II 2) II & III 3) I & III 4) I, II & III

47. A vein differs from the artery in having [ ]
1) Narrow lumen 2) Strong cuticular and muscular wall
3) Valves to control direction of blood flow 4) Dark pigmented wall

48. Krishna sets up an experiment on photosynthesis as follows : [ ]
He takes water in a glass tumbler and adds chlorophyll into the contents and keeps the tumbler exposed to sunlight hoping that he has provided all the necessary ingredients required for photosynthesis to proceed. What happens after few hours of exposure of light to the experimental set up ? give your inference
1) Photosynthesis takes place by producing glucose
2) Photosynthesis will not takes place because intact chloroplasts are needed for the process
3) Photosynthesis will not takes place as CO_2 dissolved in water convert as bicarbonate ion
4) Photosynthesis will takes place and starch will be produced which turn the mixture turbid

49. Match the following [ ]

	Group - A		**Group - B**
A)	Loop of Henle	1)	Carries blood into the kidney
B)	Renal artery	2)	Area where a considerable amount of reabsorption takes place
C)	Proximal convoluted tubule	3)	Main area of secretion
D)	Glomerulus	4)	Filtration of blood
E)	Distal convoluted tubule	5)	Plays a role in concentration of urine

The correct pairing sequence is
1) A - 5, B -1, C - 2, D - 4, E - 3
2) A - 5, B - 1, C - 2, D - 3, E - 4
3) A - 1, B - 5, C - 3,D - 3, E - 2
4) A - 4, B - 1, C - 2, D - 3, E - 5

50. Which of the following statement is incorrect with respect to the mechanism of breathing ?
1) The movement of air into and out of the lungs is carried out by creating a pressure gradient between the lungs and atmosphere. [ ]
2) Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber
3) The contraction of external intercostal muscles lifts up the ribs and sternum causing decrease in the volume of thoracic chamber.
4) On an average, a healthy human breathes 12 - 16 times/min