

Hall Ticket Number

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Q.B.No. 

4	4	1	4	3	2
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Booklet Code : 

<b>B</b>
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Marks : 100

Time : 120 minutes

**3PP1S**

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Signature of the Candidate

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Signature of the Invigilator

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### INSTRUCTIONS TO THE CANDIDATE

(Read the Instructions carefully before Answering)

1. Separate Optical Mark Reader (OMR) Answer Sheet is supplied to you along with Question Paper Booklet. Please read and follow the instructions on the OMR Answer Sheet for marking the responses and the required data.
2. The candidate should ensure that the Booklet Code printed on OMR Answer Sheet and Booklet Code supplied are same.
3. **Immediately on opening the Question Paper Booklet by tearing off the paper seal, please check for (i) The same booklet code (A/B/C/D) on each page, (ii) Serial Number of the questions (1-100), (iii) The number of pages and (iv) Correct Printing.** In case of any defect, please report to the invigilator and ask for replacement of booklet with same code within five minutes from the commencement of the test.
4. Electronic gadgets like Cell Phone, Calculator, Watches and Mathematical/Log Tables are not permitted into the examination hall.
5. **There will be  $\frac{1}{4}$  negative mark for every wrong answer.** If the response to the question is left blank without answering, there will be no penalty of negative mark for that question.
6. Using Blue/Black ball point pen to darken the appropriate circles of (1), (2), (3) or (4) in the OMR Answer Sheet corresponding to correct or the most appropriate answer to the concerned question number in the sheet. Darkening of more than one circle against any question automatically gets invalidated and will be treated as wrong answer.
7. Change of an answer is NOT allowed.
8. Rough work should be done only in the space provided in the Question Paper Booklet.
9. Return the OMR Answer Sheet and Question Paper Booklet to the invigilator before leaving the examination hall. Failure to return the OMR sheet and Question Paper Booklet is liable for criminal action.

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**This Booklet consists of 20 Pages for 100 Questions + 3 Pages of Rough Work + 1 Title Page i.e. Total 24 Pages.**

**3PP1S**

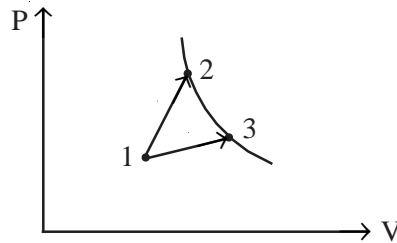
Booklet Code **B**

**SPACE FOR ROUGH WORK**

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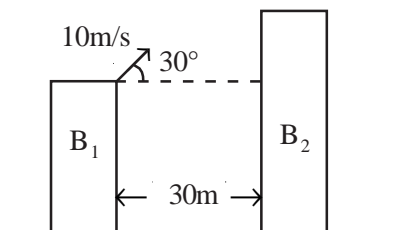
5. A gas takes part in two thermal processes 1-2 and 1-3 as shown in the figure below, in which it is heated from the same initial state temperature to the same final temperature.



The comparison between the amount of heat  $\Delta Q$  received by the gas and the work done ( $A$ ) by the gas during the two processes 1-2 and 1-3 are

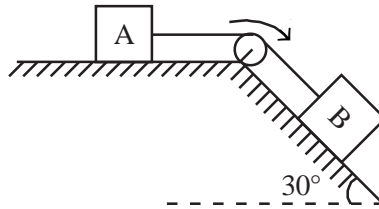
- (1)  $\Delta Q_{13} > \Delta Q_{12}$  and  $A_{13} < A_{12}$
  - (2)  $\Delta Q_{13} < \Delta Q_{12}$  and  $A_{13} > A_{12}$
  - (3)  $\Delta Q_{13} > \Delta Q_{12}$  and  $A_{13} > A_{12}$
  - (4)  $\Delta Q_{13} < \Delta Q_{12}$  and  $A_{13} < A_{12}$
- 
6. A train travelling at 50 m/s sounds its horn at a frequency of 900 Hz and it approaches a tunnel in a cliff. The sound from the horn reflects off the cliff back to the train driver. What will be the frequency of the reflected sound the driver hears. (sound speed  $\approx 350$  m/sec)
- (1) 300 Hz
  - (2) 1050 Hz
  - (3) 1200 Hz
  - (4) 150 Hz
- 
7. Consider a ball thrown from the top of a building  $B_1$  of height 100 m towards another tall building  $B_2$  (taller than  $B_1$ ) 30 m away with initial velocity of 10 m/s as shown in the figure. Approximately how far above or below its original level will the ball strike the opposite wall

[Assume  $g = 10 \text{ m/s}^2$ ]



- (1) 25 m above the original level
- (2) 95 m above the original level
- (3) 95 m below the original level
- (4) 43 m below the original level

8. Two boxes of same mass 10 kg are held by a massless cord as shown in the figure. Both boxes experience a sliding friction force with  $\mu_k = 0.2$ . What is the tension in the cord. ( $g = 10 \text{ m/sec}^2$ )



- (1) 12.3 N                      (2) 6.3 N                      (3) 26.3 N                      (4) 32.3 N

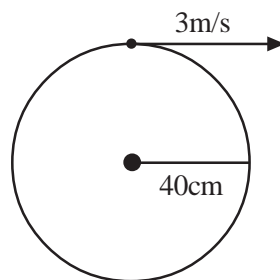
9. A mass ' $m$ ' is moving in a circular orbit of radius ' $r$ ' having angular momentum ' $j$ ' about its center. The kinetic energy in terms of  $j$ ,  $m$  and  $r$  is

- (1)  $\frac{j^2}{2mr^2}$                       (2)  $\frac{2j}{3mr^2}$                       (3)  $\frac{j}{mr}$                       (4)  $\frac{3}{4} \frac{j^2}{mr}$

10. A snow ball of 40 kg travelling at 4 m/s collides with another snow ball of mass 60 kg travelling at 2 m/s in the same direction. If the two snow balls join together and moves in same direction after the collision, determine how much kinetic energy is lost by the joint-snow ball

- (1) 480 J                      (2) 48 J                      (3) 392 J                      (4) 88 J

11. A boy whirls a ball vertically at constant energy tying it to the end of a 40 cm string. If the ball's speed at the top of the circle is 3 m/s, what is its speed at the bottom of the circle. (Use  $g = 10 \text{ m/s}^2$ )



- (1) 4.1 m/s                      (2)  $2\sqrt{2}$  m/s                      (3) 5 m/s                      (4) 6 m/s

12. Two planets A and B have the same material density. If the radius of A is thrice that of B, then the ratio of escape velocity of A to escape velocity of B is

- (1) 27                      (2) 3                      (3) 12                      (4) 9

13. When a charged particle moves perpendicular to the magnetic field, the variable quantity is
- (1) Speed (2) Momentum  
(3) Moment of inertia (4) Energy

14. Choose the sequence showing the correct statements
- A) Magnetic field lines move from South to North  
B) Stationary charges are not affected by the magnetic field  
C) The direction of current in a conductor is perpendicular to the direction of magnetic field produced  
D) With increase in the temperature magnetic susceptibility of antiferromagnetic material first decreases and then increases
- (1) B and D (2) B and C (3) A and C (4) A, B and D

15. Choose the sequence having correct match between left and right panels.

Left	Right
A) Diamagnetic	i) Nickel
B) Paramagnetic	ii) $\text{Fe}_3\text{O}_4$
C) Ferromagnetic	iii) Chromium
D) Antiferromagnetic	iv) Magnesium
E) Ferrimagnetic	v) Gold
(1) A-iv, B-v, C-ii, D-iii, E-i	(2) A-v, B-iii, C-i, D-iv, E-ii
(3) A-iv, B-v, C-iii, D-i, E-ii	(4) A-v, B-iv, C-i, D-iii, E-ii

16. The unit of magnetic field strength is
- (1) Weber/A.m (2) A/m  
(3) Tesla/m (4) Weber/m<sup>2</sup>

17. A non-conducting thin disc of radius R rotates about its axis with angular velocity  $\omega$ . If the disc is charged with surface charge density varying with distance from the center as

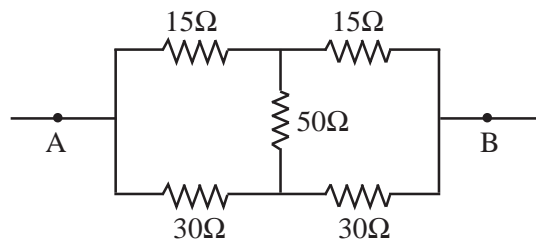
$$\sigma(r) = \sigma_0 \left[ 1 + \left( \frac{r}{R} \right)^2 \right], \text{ where } \sigma_0 \text{ is a constant. If the magnetic induction at the center is}$$

$$B = \alpha(\mu_0 \sigma_0 \omega R), \text{ then the value of constant } \alpha \text{ is}$$

- (1)  $\frac{2}{3}$  (2)  $\frac{3}{4}$  (3)  $\frac{4}{5}$  (4)  $\frac{6}{7}$

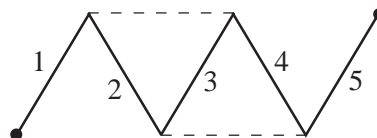
18. A sphere of radius 3 cm carried a charge of 10 nC distributed uniformly throughout the sphere. The charge density of the sphere approximately is  
 (1)  $20 \mu\text{C}/\text{m}^3$       (2)  $38 \mu\text{C}/\text{m}^3$       (3)  $88 \mu\text{C}/\text{m}^3$       (4)  $99 \mu\text{C}/\text{m}^3$
- 
19. Two charges  $q_1$  and  $q_2$  are placed such that, the electric field at one-fourth of the way from  $q_1$  to  $q_2$  is zero. Determine the ratio  $q_1:q_2$   
 (1) 1:9      (2) 2:1      (3) 1:16      (4) 16:1
- 
20. A 12 V storage battery is being charged at the rate of 15 C/s. How much energy is stored in the battery if it is charged at this rate for 60 min.  
 (Assume charging process is perfectly efficient)  
 (1)  $1.08 \times 10^4 \text{ J}$       (2)  $5.4 \times 10^4 \text{ J}$       (3)  $6.5 \times 10^5 \text{ J}$       (4)  $4.3 \times 10^5 \text{ J}$

21. Find the equivalent resistance of the network shown in the figure below between the points A and B



- (1) 10 Ω      (2) 15 Ω      (3) 20 Ω      (4) 25 Ω
- 
22. Calculate the EMF when the flux is given by  $(3 \sin \omega t + 5 \cos \omega t)/\omega$   
 (1)  $3 \cos \omega t - 5 \sin \omega t$       (2)  $-3 \cos \omega t + 5 \sin \omega t$   
 (3)  $-3 \sin \omega t - 5 \cos \omega t$       (4)  $3 \cos \omega t + 5 \sin \omega t$

23. Consider the circuit of resistance  $R_1$  shown in the figure.



If two similar conductors are added as shown by the dashed line, the circuit resistance changes to  $R_2$ . The ratio of the change in the resistance of the circuit ( $R_2/R_1$ ) consisting of the five (1 – 5) identical conductors before and after the addition of conductors is

- (1) 3/5      (2) 5/3      (3) 0      (4) 5/2





28. The approximate average binding energy of a nucleon in the nucleus of an atom is
- (1) 7.9 eV (2) 2.8 k eV  
(3) 5.6 M eV (4) 8.9 G eV
- 
29. Free neutrons of mass,  $1.67 \times 10^{-27}$  kg and de Broglie wavelength 1 nm have a mean life time of about 900 s. The distance from the source where the number of neutrons have decayed to one-half its initial value is ( $h = 6.62 \times 10^{-34}$  Js)
- (1)  $2.4 \times 10^5$  m (2)  $2.4 \times 10^{-4}$  m  
(3)  $4.8 \times 10^5$  m (4)  $4.8 \times 10^{-4}$  m
- 
30. How long does it take for 80% of a radioactive sample to decay? Given half-life period is 3.465 days ( $\ln 2 = 0.693$ )
- (1) 5 ln 1.25 days (2) 0.2 ln 5 days  
(3) 0.2 ln 1.25 days (4) 5 ln 5 days
- 
31. With N denoting number of neutrons, Z-denoting number of protons and A denoting the mass number, the sequence containing the correct statements is
- A) Nuclei with same N and different A are called isotopes  
B) Nuclei with same A and different Z are known as isobars  
C) Nuclei with same N and different Z are known as isotones  
D) N/Z becomes less than 1 for higher Z
- (1) B and C (2) C and D (3) A and B (4) B and D
- 
32. Singly charged ions of mass ' $m$ ' amu, and charge ' $e$ ' emitted from a heated anode are accelerated by a potential ' $V$ ' applied between the anode and cathode. If the ions then pass through a hole in the cathode into a uniform magnetic field of strength ' $B$ ' applied perpendicular to their direction of motion, then the radius of the path of the ions is
- (1)  $\frac{1}{B} \left( \frac{2Vm}{e} \right)^{\frac{1}{4}}$  (2)  $\frac{1}{B} \left( \frac{2Vm}{e} \right)$  (3)  $\sqrt{\frac{1}{B} \left( \frac{2Vm}{e} \right)}$  (4)  $\frac{1}{B} \sqrt{\left( \frac{2Vm}{e} \right)}$
- 
33. The mobility of electron in Si at 300 K is  $0.13 \text{ m}^2/\text{V}\cdot\text{s}$ . Calculate the diffusion constant of electron ( $k_B = 1.38 \times 10^{-23} \text{ J/K}$ )
- (1)  $0.0034 \text{ m}^2/\text{s}$  (2)  $0.0024 \text{ m}^2/\text{s}$   
(3)  $0.0044 \text{ m}^2/\text{s}$  (4)  $0.0054 \text{ m}^2/\text{s}$
-



41. In a certain system of units, 1 unit of time is 5 sec, 1 unit of mass is 20 kg and 1 unit of length is 5 m. In this system, one unit of power will correspond to
- (1) 4 W (2) 2 W  
(3) 8 W (4) 5 W
- 
42. A doctor checks the heart beat rate of a person by counting the number of beats in 30 s. If  $40 \pm 1$  beats are counted in  $30 \pm 0.5$  s, what is the heart rate and its uncertainty in beats per minute
- (1)  $80 \pm 3$  beats/min. (2)  $100 \pm 4$  beats/min.  
(3)  $80 \pm 4$  beats/min. (4)  $80 \pm 2$  beats/min.
- 
43. Choose the correct True (T) - False (F) sequence of the following statements
- A) Fine organic and inorganic particles suspended in air is called aerosol  
B)  $\text{SO}_2$  is a secondary pollutant  
C)  $\text{SO}_3$  air pollution cause corrosion of building  
D) The percentage of nitrogen in air is 68
- (1) T, T, F, F (2) F, F, T, T (3) T, F, F, F (4) F, F, F, T
- 
44. Which of the following elements have been recognized as inorganic contaminants in drinking water on a worldwide basis
- (1) Chlorine and Magnesium (2) Calcium and Magnesium  
(3) Arsenic and Fluoride (4) Arsenic and Iron
- 
45. Choose the sequence containing all in-correct statements
- A) A tropical cyclone has a low pressure centre.  
B) Study of earthquakes is called meteorology.  
C) As the degree of natural calamities increases their frequency of occurrence increases.  
D) Powerful tsunami are most frequently produced by earthquakes.  
E) The four phases of disaster management planning are mitigation, preparedness, recovery and reconstruction.
- (1) A, B and D (2) C and D (3) A, B and E (4) B, C and E
-



50. The main constituents of air are 80% of nitrogen molecules of molar mass 28 kg/k mol and 20% oxygen molecules of molar mass 32 kg/k mol. The mass of air in 50 cm<sup>3</sup> volume at  $9.3 \times 10^4$  Pa pressure at room temperature (20°C) is

[use ideal gas law] ( $R = 8.314 \times 10^3$  J/k mol/K)

- (1) 5.5 kg (2)  $55 \times 10^{-3}$  kg  
(3) 55 kg (4)  $5.5 \times 10^{-5}$  kg
- 

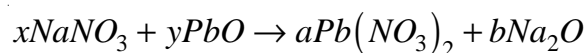
51. The co-ordination number and oxidation state respectively of 'X' in  $[X SO_4 (NH_3)_4] Cl$

- (1) 3, 6 (2) 2, 6  
(3) 6, 3 (4) 6, 4
- 

52. The density of 3 M NaCl solution is 1.25 g ml<sup>-1</sup>. Calculate the molality (m) of the solution [M.Wt. of NaCl = 58.5]

- (1) 3 (2) 2.79 (3) 1.07 (4) 3.75
- 

53. Balance the following equation



$x$ ,  $y$ ,  $a$  and  $b$  respectively are

- |     | $x$ | $y$ | $a$ | $b$ |
|-----|-----|-----|-----|-----|
| (1) | 1   | 1   | 2   | 2   |
| (2) | 2   | 4   | 1   | 2   |
| (3) | 2   | 1   | 1   | 1   |
| (4) | 2   | 1   | 2   | 1   |
- 

54. If a domestic microwave oven emits radiation of wavelength 0.5 cm, what is the corresponding frequency in Hz

- (1)  $6.67 \times 10^{-7}$  (2)  $6 \times 10^8$   
(3)  $6 \times 10^{23}$  (4)  $6 \times 10^{10}$
-

55. Identify the representation where Aufbau rule is violated?

- |     | 2s                           | 2p  |
|-----|------------------------------|---|
| (1) | $\boxed{\uparrow\downarrow}$ | $\boxed{1}\boxed{1}\boxed{1}$                                   |
| (2) | $\boxed{\uparrow\downarrow}$ | $\boxed{\uparrow\downarrow}\boxed{1}\boxed{\phantom{1}}$        |
| (3) | $\boxed{\uparrow\downarrow}$ | $\boxed{\uparrow\downarrow}\boxed{\uparrow\downarrow}\boxed{1}$ |
| (4) | $\boxed{1}$                  | $\boxed{\uparrow\downarrow}\boxed{1}\boxed{1}$                  |

56. The normalised radial wave function for 2 p electron is correctly represented in

- |  |  |
|--|--|
| (1) $2\left(\frac{1}{a_0}\right)^{\frac{3}{2}}e^{-\frac{r}{a_0}}$  | (2) $\frac{1}{2\sqrt{6}}\left(\frac{1}{a_0}\right)^{\frac{1}{2}}\left(\frac{r}{a_0}\right)e^{-\frac{r}{2a_0}}$ |
| (3) $\frac{1}{2\sqrt{2}}\left(\frac{1}{a_0}\right)^{\frac{3}{2}}\left(2-\frac{r}{a_0}\right)e^{-\frac{r}{2a_0}}$ | (4) $\frac{1}{2}\left(\frac{1}{a_0}\right)^{\frac{1}{2}}$  |

57. Calculate the De-Broglie wavelength of an electron moving with a velocity of  $5.93 \times 10^6 \text{ ms}^{-1}$ .  
(Given  $m_e = 9.11 \times 10^{-31} \text{ kg}$  and  $h = 6.626 \times 10^{-34} \text{ Js}$ )

- (1) 123 pm                      (2) 123 nm                      (3) 123  $\mu\text{m}$                       (4) 123 mm

58. If 'r' is the radius of an orbit, the angular momentum of H-atom is proportional to

- (1)  $r^2$                       (2)  $\frac{1}{r}$                       (3)  $\sqrt{r}$                       (4)  $\frac{1}{\sqrt{r}}$

59. The speed of the electron in Bohr first orbit of H-atom is 'x' then speed of the electron in 3<sup>rd</sup> orbit is

- (1)  $x/3$                       (2)  $x/9$                       (3)  $3x$                       (4)  $9x$

60. The correct representation of the electric configuration of copper atom in ground state is

- |     | 3d   | 4s |    |    |    |    |    |
|-----|--|----|----|----|----|----|----|
| (1) | <table style="border-collapse: collapse; width: 100%;"> <tr> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> </tr> </table> | ↑↓ | ↑↓ | ↑↓ | ↑↓ | ↑↓ | ↑↓ |
| ↑↓  | ↑↓   | ↑↓ | ↑↓ | ↑↓ |    |    |    |
| (2) | <table style="border-collapse: collapse; width: 100%;"> <tr> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑↓</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> </tr> </table>     | ↑↓ | ↑  | ↑  | ↑  | ↑  | ↑↓ |
| ↑↓  | ↑  | ↑  | ↑  | ↑  |    |    |    |
| (3) | <table style="border-collapse: collapse; width: 100%;"> <tr> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> <td style="border: 1px solid black; padding: 2px; text-align: center;">↑</td> </tr> </table>      | ↑  | ↑  | ↑  | ↑  | ↑  | ↑  |
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61. Which state of  $\text{Be}^{3+}$  has the same orbit radius as that of ground state H-atom?

- (1)  $n = 2$                       (2)  $n = 3$                       (3)  $n = 4$                       (4)  $n = 1$

62. Which one of the following expressions is correct according to Henry Moseley's observation?

[Hint:  $\nu$  = frequency,  $z$  is nuclear charge,  $a$  and  $b$  are constants]

- |                        |                                       |
|------------------------|---------------------------------------|
| (1) $\nu = a(z - b)^2$ | (2) $\sqrt{\nu} = a(z - b)$           |
| (3) $\nu = az$         | (4) $\frac{1}{\sqrt{\nu}} = a(z - b)$ |

63. Identify the correct statements from the following

- a) The atomic radius of Si, Na, Cl follow the order,  $\text{Na} > \text{Si} > \text{Cl}$
- b) Gadolinium is a f-block element
- c) Electronegativity of halogens follow the order,  $\text{Cl} > \text{F} > \text{Br} > \text{I}$
- d)  $\text{F}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$  and  $\text{O}^-$  are isoelectronic species

- |                        |                   |
|------------------------|-------------------|
| (1) (a), (b), (c), (d) | (2) (a), (c), (d) |
| (3) (c), (d)           | (4) (a), (b)      |

64. Predict the general formula of compound, which might be formed by Aluminium and Sulphur

- |                             |                             |
|-----------------------------|-----------------------------|
| (1) $\text{Al}_2\text{S}_3$ | (2) $\text{AlS}_4$          |
| (3) $\text{Al}_4\text{S}_2$ | (4) $\text{Al}_3\text{S}_2$ |

65. Assertion (A) : Be has higher ionisation potential than B.  
Reason (R) : Removal of electron from *s* orbital needs more energy than *p* orbital
- (1) Both (A) and (R) correct, and (R) is the correct explanation of (A)
  - (2) Both (A) and (R) are correct, but (R) is not the correct explanation of (A)
  - (3) (A) is correct, but (R) is wrong
  - (4) (A) is wrong, but (R) is correct
- 
66. The correct order of first ionisation potential of the 3<sup>rd</sup> period elements is
- (1)  $\text{Na} > \text{Al} > \text{S} > \text{P} > \text{Mg}$
  - (2)  $\text{Na} < \text{Al} < \text{S} < \text{P} < \text{Mg}$
  - (3)  $\text{Na} < \text{Al} < \text{Mg} < \text{S} < \text{P}$
  - (4)  $\text{Na} < \text{Mg} < \text{Al} < \text{P} < \text{S}$
- 
67. Which of the following statements are correct for lanthanide contraction?
- a) There is a steady decrease in the ionic size
  - b) Basic nature decreases from Ce to Lu
  - c) Many trivalent lanthanides ions are colored
  - d) There is a slight decrease in electronegativity with increase in atomic number of lanthanides
- (1) (a), (b), (d)
  - (2) (a), (b), (c)
  - (3) (a), (c), (d)
  - (4) (a), (b), (c), (d)
- 
68. Which of the following is the correct representation of the isoelectronic species?
- (1)  $\text{P}^{3-}, \text{S}^{2-}, \text{Cl}^-, \text{Ar}, \text{K}^+$
  - (2)  $\text{P}^{2+}, \text{S}^{-1}, \text{Cl}^+, \text{K}^+, \text{Ar}$
  - (3)  $\text{Si}^{3+}, \text{Na}^+, \text{Mg}^{2+}, \text{Al}^{3+}, \text{Ar}$
  - (4)  $\text{Na}^+, \text{Mg}^+, \text{Al}^+, \text{Si}^+, \text{P}^+$
- 
69. From the given set of compounds, identify the number of compounds in which 'S' does not obey octal rule  
 $\text{SO}_2, \text{SF}_2, \text{SF}_4, \text{SF}_6$
- (1) 4
  - (2) 3
  - (3) 1
  - (4) 2



70. Which of the following compounds has ionic, covalent and coordinate covalent bonds?

- (1)  $\text{PCl}_3$  (2)  $\text{NH}_4\text{Cl}$   
 (3)  $\text{MgCl}_2$  (4)  $\text{NaCl}$

71. The correct order of Lewis acidity of  $\text{BF}_3$ ,  $\text{BCl}_3$ ,  $\text{BBr}_3$  and  $\text{BI}_3$  is

- (1)  $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$  (2)  $\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3 < \text{BI}_3$   
 (3)  $\text{BBr}_3 > \text{BI}_3 > \text{BCl}_3 > \text{BF}_3$  (4)  $\text{BBr}_3 > \text{BCl}_3 > \text{BF}_3 > \text{BI}_3$

72. Identify the set of species with the correct order of bond order

- (1)  $\text{NO}_3^- > \text{NO}_2^- > \text{NO}_2^+$  (2)  $\text{NO}_2^- > \text{NO}_3^- > \text{NO}_2^+$   
 (3)  $\text{NO}_2^+ > \text{NO}_3^- > \text{NO}_2^-$  (4)  $\text{NO}_2^+ > \text{NO}_2^- > \text{NO}_3^-$

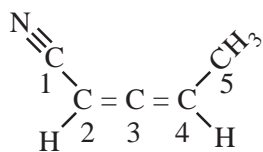
73. The correct order of the bond angles of  $\text{NH}_3$ ,  $\text{NH}_4^+$  and  $\text{NH}_2^-$  is

- (1)  $\text{NH}_4^+ > \text{NH}_3 > \text{NH}_2^-$  (2)  $\text{NH}_2^- > \text{NH}_3 > \text{NH}_4^+$   
 (3)  $\text{NH}_3 > \text{NH}_2^- > \text{NH}_4^+$  (4)  $\text{NH}_3 > \text{NH}_4^+ > \text{NH}_2^-$

74. What is special about the bonding of  $\text{B}_2\text{H}_6$ ?

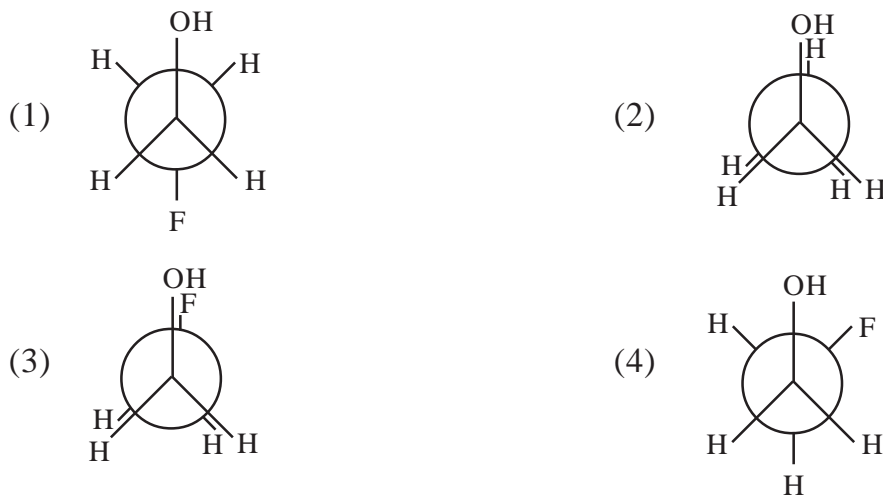
- (1) B-atom in  $\text{B}_2\text{H}_6$  does not obey octet rule because each B-atom contributes only three valence electrons  
 (2) B-atoms in  $\text{B}_2\text{H}_6$  obey octet rule by forming two three-center-2e-bonds  
 (3) B-atoms in  $\text{B}_2\text{H}_6$  obey octet rule by forming a B-B covalent bond  
 (4) B-atoms shares three H-atoms in the middle to satisfy the octet rule

75. Indicate the hybridization of each carbon atoms of the below compound

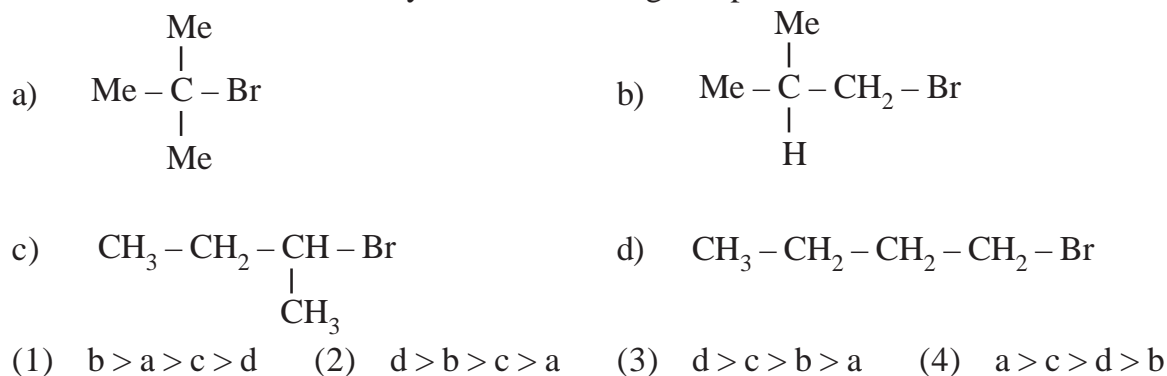


- (1)  $\text{C}_1 - sp, \text{C}_2 - sp^2, \text{C}_3 - sp, \text{C}_4 - sp^2, \text{C}_5 - sp^3$   
 (2)  $\text{C}_1 - sp, \text{C}_2 - sp^2, \text{C}_3 - sp^2, \text{C}_4 - sp^2, \text{C}_5 - sp^3$   
 (3)  $\text{C}_1 - sp, \text{C}_2 - sp^2, \text{C}_3 - sp^2, \text{C}_4 - sp, \text{C}_5 - sp^3$   
 (4)  $\text{C}_1 - sp^2, \text{C}_2 - sp^2, \text{C}_3 - sp, \text{C}_4 - sp^2, \text{C}_5 - sp^3$

76. Which one among the following conformational isomers is relatively more stable?



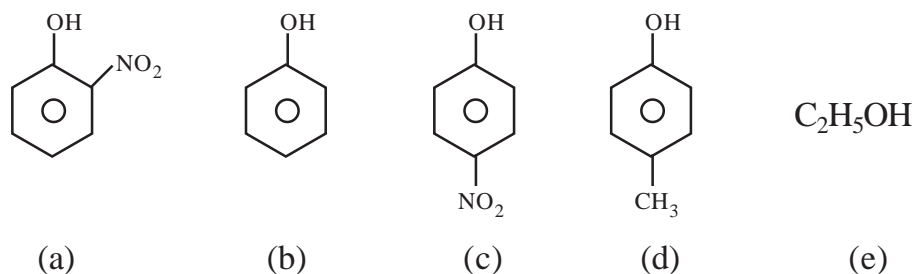
77. The correct order of reactivity for the following compounds in  $S_N2$  reactions is



78. The possible compounds with the empirical formula " $\text{CH}_2$ " are

- (1) acetylene, ethylene, benzene      (2) ethylene, butene, cyclohexane  
 (3) ethylene, cyclobutene, benzene    (4) butene, cyclopentane, cyclohexene

79. Arrange the following compounds in decreasing acid character

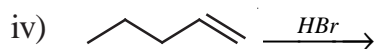
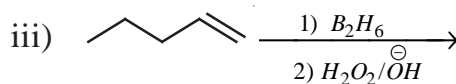
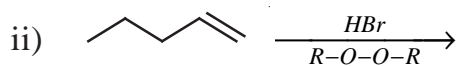
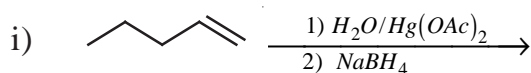


- (1)  $d > c > a > b > e$       (2)  $d > b > a > c > e$   
 (3)  $c > a > b > d > e$       (4)  $c > e > a > b > d$

80. Identify polysaccharides from the following

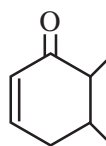
- |              |            |
|--------------|------------|
| a) starch    | b) maltose |
| c) cellulose | d) glucose |
| e) glycogen  | f) sucrose |
- (1) (a), (c), (d), (e)  
 (2) (b), (c), (d), (e)  
 (3) (a), (c), (e)  
 (4) (a), (c), (f)

81. Identify the reactions which follow Markovnikov's addition from the following :



- |                |                |
|----------------|----------------|
| (1) (i), (ii)  | (2) (ii), (iv) |
| (3) (i), (iii) | (4) (i), (iv)  |

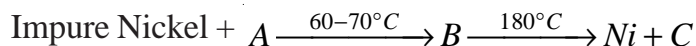
82. IUPAC name for the below compound is



- (1) 2, 3-Dimethyl cyclohex-5-en-1-one  
 (2) 5, 6-Dimethyl cyclohex-2-en-1-one  
 (3) 4, 5-Dimethyl cyclohex-1-en-3-one  
 (4) 4, 5-Dimethyl cyclohex-1-en-6-one



87. Identify A, B, C respectively in the following reaction.



- (1)  $\text{CO}_2, \text{Ni}(\text{CO})_4, \text{H}_2\text{O}$  (2)  $\text{CO}, \text{NiCO}_3, \text{CO}$   
 (3)  $\text{CO}_2, \text{Ni}(\text{CO})_4, \text{CO}$  (4)  $\text{CO}, \text{Ni}(\text{CO})_4, \text{CO}$

88. One of the following is responsible for Bhopal gas tragedy. Identify its formula

- (1)  $\text{CH}_3\text{CHO}$  (2)  $\text{CH}_3\text{NCO}$   
 (3)  $\text{CH}_3\text{CN}$  (4)  $\text{CH}_3\text{NC}$

89. The ore that is concentrated by froth flotation is

- (1) Chalcopyrites (2) Cryolite  
 (3) Cuprite (4) Calamine

90. Calculate the length of column of water that could exert 2 bar of pressure. Given, height of mercury column required to exert 1 bar pressure is 750 mm and density of Hg is  $13.6 \text{ g cm}^{-3}$ .

- (1) 20400 mm (2) 10200 mm (3) 750 mm (4) 1500 mm

91. 11.2 L of a gas at STP weighs 14 g. Which of the following is the gas?

- (1)  $\text{N}_2\text{O}$  (2)  $\text{CO}_2$  (3)  $\text{SO}_2$  (4)  $\text{CO}$

92. In general, High Performance Liquid Chromatography (HPLC) cannot be used to

- a) Identify various Pigments in a leaf extract  
 b) Separate organic pesticides  
 c) Determine arsenic content in a water sample  
 d)  $\text{O}_2$  content in a given gas sample
- (1) (a), (b) (2) (b), (c) (3) (d), (a) (4) (c), (d)

93. 1 mole of carbondioxide and 1 mole of Ammonia are placed in a container kept at  $850^\circ\text{C}$ . What is the ratio of effusion rate of  $\text{NH}_{3(\text{g})}$  to  $\text{CO}_{2(\text{g})}$

- (1)  $\sqrt{\frac{44}{17}}$  (2)  $\sqrt{\frac{88}{17}}$  (3)  $\sqrt{\frac{44}{34}}$  (4) 1

94. Bleaching powder is prepared by the action of  $\text{Cl}_2$  on
- (1) slaked lime (2) quick lime  
(3) limestone (4) soda lime
- 
95. On adding dilute acid to 'X' produced a compound 'Y', which has rotten egg smell. Compound X and Y respectively are
- (1)  $\text{Fe}; \text{SO}_2$  (2)  $\text{FeS}; \text{H}_2\text{S}$   
(3)  $\text{FeSO}_4; \text{SO}_2$  (4)  $\text{FeO}; \text{H}_2\text{S}$
- 
96. If 20 g of  $\text{CaCO}_3$  is treated with 20 g of  $\text{HCl}$ , how many grams of  $\text{CO}_2$  is produced?
- (1) 29.4 g (2) 44 g (3) 77 g (4) 8.8 g
- 
97. Approximately how much time it would take to react Avogadro's number of atoms, at a rate of 1 billion atoms in one second
- (1)  $19 \times 10^8$  year (2)  $19 \times 10^7$  year  
(3)  $19 \times 10^6$  year (4)  $19 \times 10^5$  year
- 
98. Input materials for the Solvay process are
- (1)  $\text{NaCl}$  and  $\text{NH}_3$   
(2)  $\text{NaCl}$ , Conc.  $\text{NH}_3$   
(3)  $\text{NH}_4\text{Cl}$ ,  $\text{NaHCO}_3$  and  $\text{H}_2\text{O}$   
(4) Saturated solution of  $\text{NaCl}$ , Conc.  $\text{NH}_3$  and  $\text{CO}_2$
- 
99. Identify conjugate acid-base pairs from the following
- a)  $\text{HCl}, \text{NaOH}$   
b)  $\text{H}_2\text{O}, \text{OH}^-$   
c)  $\text{H}_2\text{SO}_4, \text{SO}_4^{2-}$   
d)  $\text{HClO}_4, \text{ClO}_3^-$   
e)  $\text{H}_3\text{C-NH}_2, \text{H}_3\text{C-NH}_3^+$   
f)  $\text{H}_2\text{SO}_3, \text{HSO}_3^-$
- (1) (a), (b), (d), (e) (2) (b), (d), (f)  
(3) (b), (e), (f) (4) (e), (f)
- 
100. A sample of hydrated magnesium sulphate,  $\text{MgSO}_4 \cdot x \text{H}_2\text{O}$  has 51.1% water. What is the value of 'x'?
- (1) 5 (2) 6 (3) 4 (4) 7
-

**3PP1S**

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**SPACE FOR ROUGH WORK**

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