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Computer Based Examination System

Exported On *	2022/11/21 16:41:17
Title *	Question Paper Answer Key
OES Exam *	GPSC06202204 / Assistant Professors in Government College in Chemistry (Physical)/ Completed / 2022-11-19

1	<p>Question Description</p> <p>Assuming standard conventions for cartesian and spherical polar coordinates and their inter-conversions, the most appropriate boundary conditions among the following, for a free particle confined on a disc of radius r would be</p> <p>A. $r = 0 \text{ to } \infty, \theta = 0 \text{ to } \pi, \phi = 0 \text{ to } 2\pi$</p> <p>B. $r = 0 \text{ to } r, \theta = 0 \text{ to } 2\pi, \phi = 0 \text{ to } \pi$</p> <p>C. $r = 0 \text{ to } \infty, \theta = 0 \text{ to } \pi, \phi = 0 \text{ to } \pi$</p> <p>D. $r = 0 \text{ to } r, \theta = \pi, \phi = 0 \text{ to } 2\pi$</p>
A	A
B	B
C	C
D	D
E	None of the above
Correct Answer	D
Marks	1

2

Question Description	Statement 1: The rate of dehydration of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is not uniform Statement 2: Amorphous dehydration products do not give cracks to yield a diffusion path for water vapour to move out.
A	Statement 1 is correct but statement 2 is incorrect
B	Statement 1 is incorrect but statement 2 is correct
C	Both statements are correct and statement 2 is the correct reason for statement 1
D	Both Statements are correct, but statement 2 is not the correct reason for statement 1
E	None of the above
Correct Answer	C
Marks	1

3

Question Description	During an X-ray diffraction experiment a 5 nm radiation is used to measure a crystal whose edge length is 5 nm. The Bragg's angle for the 100 plane is
A	30 degrees
B	45 degrees
C	60 degrees
D	90 degrees
E	None of the above
Correct Answer	A
Marks	1

4

Question Description	A compound is found to be 240 Hz downfield shifted from the TMS peak in a spectrometer operating at 60 MHz. The chemical shift in ppm relative to TMS is
A	40 ppm
B	10 ppm
C	6 ppm
D	4 ppm
E	None of the above
Correct Answer	D
Marks	1

5

Question Description	The gyromagnetic ratio for a particular nucleus is $2.5 \times 10^8 T^{-1} s^{-1}$. The magnetic field that would correspond to a precession frequency of $400 MHz$ for this nucleus would be
A	$1.6\pi T$
B	$2\pi T$
C	$3.2\pi T$
D	$4\pi T$
E	None of the above
Correct Answer	C
Marks	1

6

Question Description	The Van der Waals constants a and b for a near ideal gas is estimated to be $850 \times 10^{-5} \text{ atm l}^2$ and $160 \times 10^{-5} \text{ l}$ respectively. If density of gas is 1.98 g l^{-1} , the molecular weight of the gas is estimated to be
A	1.98
B	16.00
C	22.40
D	44.05
E	None of the above
Correct Answer	D
Marks	1

7

Question Description

Match the following with regard to vibrational rotation spectra of a molecule

I	P branch	1	$J' - J'' = 0$
II	Q Branch	2	$J' - J'' = -1$
III	R Branch	3	$J' - J'' = +1$

A

I-1, II-2, III-3

B

I-2, II-3, III-1

C

I-2, II-1, III-3

D

I-3, II-1, III-2

E

None of the above

Correct Answer

C

Marks

1

8

Question Description

Typical frequency of electronic transitions for a gaseous molecule is 10^{15} Hz . If they root mean square velocity is 600 m s^{-1} , then total frequency shift, approximately, is

A. $\pm 600 \text{ m s}^{-1}$

B. $\pm 2 \times 10^9 \text{ Hz}$

C. $\pm 10^{15} \text{ Hz}$

D. $\pm 6 \times 10^{-13} \text{ m}$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

B

Marks

1

9

Question Description	During the condensation of a vapour to liquid spherical drops, the maximum free energy change is equal to _____ of the surface free energy of the drop
A	half
B	one-fifth
C	one-third
D	two times
E	None of the above
Correct Answer	C
Marks	1

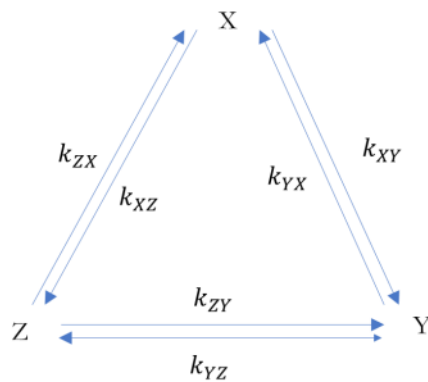
10

Question Description	The intensity of a light beam decreases by 40% when it passes through a sample of 1 cm path length. The percentage of transmitted light through the same substance, but of 3 cm path length, would be
A	6.4
B	10.0
C	15.0
D	21.6
E	None of the above
Correct Answer	D
Marks	1

11

Question Description

For the reaction scheme described below, the principle of detailed balance requires that



A. $k_{XY}k_{YZ}k_{ZX} = -k_{XZ}k_{ZY}k_{YX}$

B. $k_{XY}k_{YZ}k_{ZX} = 0$

C. $k_{XY}^2k_{YZ}^2k_{ZX}^2 = k_{XZ}k_{ZY}k_{YX}$

D. $k_{XY}k_{YZ}k_{ZX} = k_{XZ}k_{ZY}k_{YX}$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

D

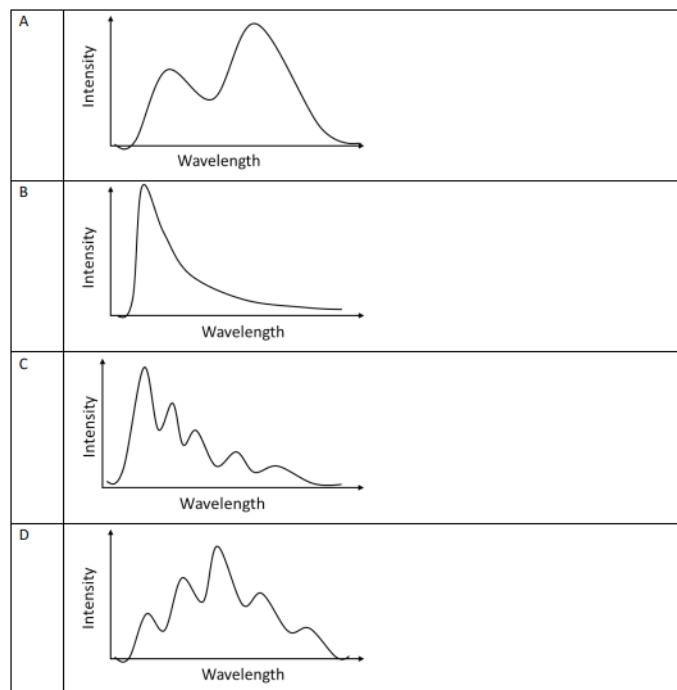
Marks

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12

Question Description

If the potential energy surface of the ground and excited state molecules is similar and there are no significant changes in internuclear distances and vibrational levels are fairly well spaced, which of the following could best represent the fluorescence spectrum of the molecule.



A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

C

13

Question Description

If the variation of enthalpy per mole of mixture of two substances, A and B, is measured and plotted against mole fraction of substance A keeping number of moles of substance A, i.e. n_A constant, while varying substance is B. Then, the partial molar enthalpy of substance B at mole fraction x_A will be given by:-

A. $\bar{H}_B = H_{mix, x_A} - x_A \left(\frac{\partial H_{mix}}{\partial x_A} \right)_{n_A}$

B. $\bar{H}_B = H_B - x_A \left(\frac{\partial H_{mix}}{\partial x_A} \right)_{n_A}$

C. $\bar{H}_B = H_{mix, x_A} - x_A \left(\frac{\partial H_A}{\partial x_A} \right)_{n_A}$

D. $\bar{H}_B = \bar{H}_A - x_A \left(\frac{\partial H_A}{\partial x_A} \right)_{n_A}$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

A

Marks

1

14

Question Description

Which of the thermodynamic expressions are equal to the difference between the heat capacity at constant pressure and volume, i.e. $C_P - C_V = ?$

- I. R
- II. $-T \left(\frac{\partial S}{\partial T} \right)_V$
- III. $T \left(\frac{\partial P}{\partial T} \right)_V \left(\frac{\partial V}{\partial T} \right)_P$
- IV. $-T \left(\frac{\partial V}{\partial T} \right)_P^2 / \left(\frac{\partial V}{\partial P} \right)_T$

A

Only I is applicable

B

Only I and III are applicable

C

Only I and III are applicable

D

Only I, II and IV are applicable

E

None of the above

Correct Answer

C

Marks

1

15

Question Description

The ratio of the reduced masses of $^{13}\text{C}^{16}\text{O}$ to $^{12}\text{C}^{16}\text{O}$ is 1.05. If the average spacing between the rotational lines of normal CO occurs are 3.81 cm^{-1} , what would be the rotational constant for the heavier carbon monoxide molecule?

A 1.81 cm^{-1} **B** 1.96 cm^{-1} **C** 1.76 cm^{-1} **D** 4.86 cm^{-1} **E**

None of the above

Correct Answer

A

Marks

1

16

Question Description	The ionic strength of 0.05 molal solution of sodium sulphate is
A	0.05 mol kg^{-1}
B	0.15 mol kg^{-1}
C	0.25 mol kg^{-1}
D	0.50 mol kg^{-1}
E	None of the above
Correct Answer	B
Marks	1

17

Question Description	A d^6 metal ion in octahedral field with two units each of 1,10 phenanthroline and thiocyanate exhibits spin crossover behavior. The CFSE and μ_{eff} at 300 K and 150 K are respectively expected to be
A	$0.4\Delta_0$, 4.90 <i>BM</i> and $2.4\Delta_0$, 0.0 <i>BM</i>
B	$2.4\Delta_0$, 2.90 <i>BM</i> and $0.4\Delta_0$, 1.77 <i>BM</i>
C	$2.4\Delta_0$, 0.00 <i>BM</i> and $0.4\Delta_0$, 4.90 <i>BM</i>
D	$1.2\Delta_0$, 4.90 <i>BM</i> and $2.4\Delta_0$, 0.0 <i>BM</i>
E	None of the above
Correct Answer	A
Marks	1

18

Question Description

Which of the following sentences are true concerning the ^1H -NMR spectrum of deuterated cyclohexane, $\text{C}_6\text{D}_{11}\text{H}$?

I. The compound exhibits identical spectra at all temperatures.

II. At extremely low temperatures, the spectrum shows one peak, while at high temperatures, two peaks are observed

III. The spectrum is broadest at very high temperatures.

IV. The spectrum becomes broader as the temperature is lowered, eventually splitting into two narrow peaks.

A

Only I is true

B

Only II and III are true

C

Only II and III are true

D

Only IV is true

E

None of the above

Correct Answer

A

Marks

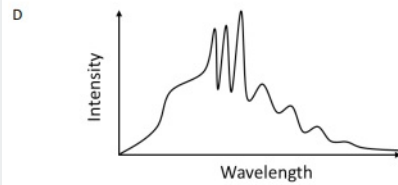
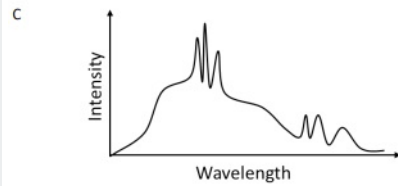
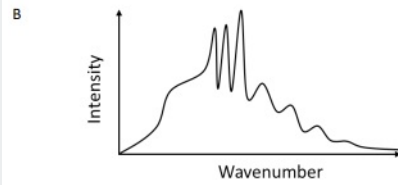
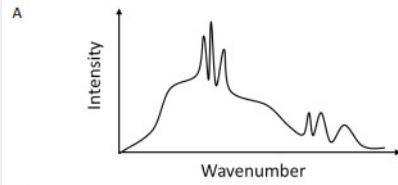
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19	Question Description	Which of the following statements are true with regard to pyrolysis of Ethane I. At low pressures, the reactions are of first order with respect to the reactant II. At high pressures and low temperatures, the order of reaction is 3/2 with respect to the reactant III. The chain termination step is formation of ethane IV. The initiation reaction is the formation of methyl radicals
	A	Only I and II are true
	B	Only I and III are true
	C	Only I, II and IV are true
	D	All statements are true
	E	None of the above
	Correct Answer	C
	Marks	1

20

Question Description

Which of the following plots would be expected if a molecule exhibits predissociation?



A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

C

21	Question Description	A certain crystal face of a 2D lattice has a miller indices of (4,1,0), the intercepts corresponding to this face is
	A	$a, 4b, \infty c$
	B	$4a, b, \infty c$
	C	$a, 4b, 0 c$
	D	$4a, b, 0 c$
	E	None of the above
	Correct Answer	A
	Marks	1

22	Question Description	The ionic strength of a salt with monovalent ions whose $\log \gamma_{\pm} = -0.51$ is
	A	0.5
	B	1.0
	C	2.0
	D	4.0
	E	None of the above
	Correct Answer	B
	Marks	1

23

Question Description	Which of the following does not have a presence in NMR?
A	^{19}F
B	^2H
C	^{13}C
D	^{31}p
E	None of the above
Correct Answer	B
Marks	1

24

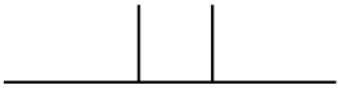



Question Description	The fundamental stretching frequency of a diatomic molecule is observed at 850 cm^{-1} , and its first overtone is observed at 1670 cm^{-1} . The harmonic frequency of this molecule is (approx)
A	880 cm^{-1}
B	850 cm^{-1}
C	835 cm^{-1}
D	820 cm^{-1}
E	None of the above
Correct Answer	A
Marks	1

25	Question Description	The Arrhenius constant and activation energy for a bimolecular decomposition of a gaseous molecule are $10^{13} M^{-1} s^{-1}$ and $10^5 J mol^{-1}$ respectively. Evaluate the for ΔH^\ddagger this reaction at 300 K.
	A	$95 kJ mol^{-1}$
	B	$97 kJ mol^{-1}$
	C	$99 kJ mol^{-1}$
	D	$100 kJ mol^{-1}$
	E	None of the above
	Correct Answer	A
	Marks	1

26

Question Description

Schematic of a few typical two spin NMR spectra as a function of $\frac{J_{12}}{\delta_{12}\nu_0}$ are shown below.
Match the two columns.

I	$J_{12} = 0$	1	
II	$J_{12} = \frac{1}{4} \nu_0 \delta_{12}$	2	
III	$J_{12} = 2\nu_0 \delta_{12}$	3	
IV	$J_{12} = \nu_0 \delta_{12}$	4	

A I-1, II-2, III-3, IV-4

B I-1, II-4, III-2, IV-3

C I-2, II-3, III-4, IV-1

D I-2, II-4, III-3, IV-1

E None of the above

Correct Answer A

Marks 1

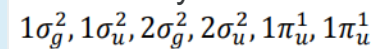
27

Question Description	The number of lines in the ESR spectrum of di-tert-butyl nitroxide are
A	three equally intense lines due to the Nitrogen nucleus
B	three lines with intensity ratio 1:2:1 due to the Nitrogen nucleus
C	three equally intense lines due to the Oxygen nucleus
D	complex multiplet of alternating intensity due to nitrogen and oxygen
E	None of the above
Correct Answer	A
Marks	1

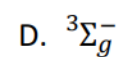
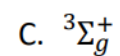
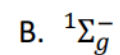
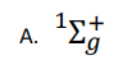
28

Question Description

The term symbol of a molecule with the following electronic configuration



would be

**A**

A

B

B

C

C

D

D

E

None of the above

Correct Answer

D

Marks

1

29

Question Description	The Fourier transform of the Dirac delta function is
A	0
B	1
C	$\sin(\omega t)$
D	$\cos(\omega t)$
E	None of the above
Correct Answer	B
Marks	1

30

Question Description

A photoacid at $pH = 1$ has an absorbance maximum at λ_1 and at $pH = 13.5$ has absorbance maximum at λ_2 . If the changes in entropy in the ground and excited state is negligible, which of the following expressions relates the ground and excited state acidity constants? All symbols have their usual meanings.

A. $pK_a - pK_a^* = \frac{N_a h c \left[\frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right]}{2.303 R T}$

B. $pK_a - pK_a^* = \frac{h c \left[\frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right]}{2.303 R T}$

C. $pK_a - pK_a^* = \frac{N_a h c [\lambda_1 - \lambda_2]}{2.303 R T}$

D. $pK_a = pK_a^* = \frac{N_a h c \left[\frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right]}{2.303 R T}$

A A

B B

C C

D D

E None of the above

Correct Answer A

Marks 1

Question Description

A particle of mass m is confined to a 1D box whose potential varies as

$$V = \infty \text{ for } x < -a$$

$$V = 0 \text{ for } -a < x < a$$

$$V = \infty \text{ for } x > a$$

The energy difference between the fourth and fifth quantum state would be

A. $\frac{9\hbar^2\pi^2}{8ma^2}$

B. $\frac{9h^2}{8ma^2}$

C. $\frac{\hbar^2\pi^2}{8ma^2}$

D. $\frac{h^2}{8ma^2}$

A

A

B

B

C

C

D

D

E	None of the above
Correct Answer	A
Marks	1

32

Question Description	<p>The wavefunction of a one electron system is given by $\frac{1}{162\sqrt{\pi}} \left(\frac{z}{a_0}\right)^{\frac{3}{2}} \rho^2 e^{-\frac{\rho}{3}} \sin^2 \theta e^{\pm 2i\phi}$</p> <p>Where</p> $\rho = \frac{zr}{a_0};$ <p>Following standard conventions for cartesian and polar coordinates, the equation for the nodal planes for an orbital formed by the above wavefunction can be represented by</p>
A	$3z^2 - 1 = 0$
B	$xz = 0$
C	$yz = 0$
D	$xy = 0$
E	None of the above
Correct Answer	D
Marks	1

33

Question Description

The heat capacities of air at constant pressure and volume, respectively are $c_P = 0.27 \text{ cal}$ and $c_V = 0.19 \text{ cal}$.
What will be the equivalent mechanical work done in expansion when the temperature 1 g of air is raised by 1°C

A0.05 *cal*.**B**0.08 *cal*.**C**0.46 *cal*.**D**0.70 *cal*.**E**

None of the above

Correct Answer

B

Marks

1

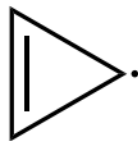
34

Question Description	The energy of a photon that can induce an absorption resulting in a single quantum rotational transition from a quantum state J is
A	BhJ
B	$2BhJ$
C	$Bh(J + 1)$
D	$2Bh(J + 1)$
E	None of the above
Correct Answer	B
Marks	1

35

Question Description

Identify the Huckel determinant for Cyclopropyl radical



A.
$$\begin{vmatrix} \alpha - E & \beta & \beta \\ \beta & \alpha - E & \beta \\ \beta & \beta & \alpha - E \end{vmatrix}$$

B.
$$\begin{vmatrix} \alpha - E & \beta & 0 \\ 0 & \alpha - E & \beta \\ \beta & 0 & \alpha - E \end{vmatrix}$$

C.
$$\begin{vmatrix} 0 & \beta & \beta \\ \beta & \alpha - E & \beta \\ \beta & \beta & \alpha - E \end{vmatrix}$$

D.
$$\begin{vmatrix} \alpha - E & 0 & \beta \\ \beta & \alpha - E & 0 \\ \beta & \beta & \alpha - E \end{vmatrix}$$

A A

B B

C C

D D

E None of the above

Correct Answer A

Marks 1

36

Question Description

Which of the following statements are true for a sample of toroid shaped superconductor?

I. In the presence of magnetic field If the sample is cooled below critical temperature, the flux lines are expelled

II. If the magnetic field is switched off below the critical temperature, the flux lines form closed loops.

III. The closed loop flux lines below the critical temperature in absence of magnetic field decays rapidly

IV The closed loop flux lines below the critical temperature in absence of magnetic field are persistent for many years

A

Only I, II and III are true

B

Only I, II and IV are true

C

Only I and II are true

D

Only II and IV are true

E

None of the above

Correct Answer

B

Marks

1

37

Question Description

The fluorescence intensity of a compound is monitored and it is found that at time t , 50% of the initial intensity is achieved. The experiment is performed in presence of pressurised gas and it is observed that at time t , only 33% of initial intensity is achieved. By what factor has the quantum yield change due to the addition of pressurised gas. {Given $\log 2=0.30$, $\log 3=0.47$, $\log 5=0.70$ }

A

Decrease by 20 %

B

Decrease by 37 %

C

Decrease by 43 %

D

Decrease by 63 %

E

None of the above

Correct Answer

B

Marks

1

Question Description

Which of the following electronic transitions are allowed in benzene? The character table for D_{6h} point group is given below for your reference

D_{6h}	E	$2C_6$	$2C_3$	C_2	$3C_2'$	$3C_2''$	i	$2S_3$	$2S_6$	σ_h	$3\sigma_d$	$3\sigma_v$		
A_{1g}	1	1	1	1	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
A_{2g}	1	1	1	1	-1	-1	1	1	1	1	-1	-1		
B_{1g}	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1		
B_{2g}	1	-1	1	-1	-1	1	1	-1	1	-1	-1	1		
E_{1g}	2	1	-1	-2	0	0	2	1	-1	-2	0	0	(R_x, R_y)	(xz, yz)
E_{2g}	2	-1	-1	2	0	0	2	-1	-1	2	0	0		$(x^2 - y^2, xy)$
A_{1u}	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1		
A_{2u}	1	1	1	1	-1	-1	-1	-1	-1	-1	1	1	z	
B_{1u}	1	-1	1	-1	1	-1	-1	1	-1	1	-1	1		
B_{2u}	1	-1	1	-1	-1	1	-1	1	-1	1	1	-1		
E_{1u}	2	1	-1	-2	0	0	-2	-1	1	2	0	0	(x, y)	
E_{2u}	2	-1	-1	2	0	0	-2	1	1	-2	0	0		

A. $A_{1g} \rightarrow B_{1u}$

B. $A_{1g} \rightarrow B_{2u}$

C. $A_{1g} \rightarrow E_{1u}$

D. All of the above

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

C

Marks

1

39

Question Description

The weaker line of every doublet in the high-resolution IR spectrum of gaseous HCl is due to

A. $^1H^{35}Cl$

B. $^2H^{35}Cl$

C. $^1H^{37}Cl$

D. $^2H^{37}Cl$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

C

Marks

1

Question Description

Two unknown compounds A and B exhibit the following absorption and emission characteristics in different solvents. What can you predict about the change in dipole moments of the molecule due photoexcitation

	Hexane		Methanol	
	λ_{abs}	λ_{ems}	λ_{abs}	λ_{ems}
Compound A	40000 cm^{-1}	35000 cm^{-1}	40200 cm^{-1}	35200 cm^{-1}
Compound B	40000 cm^{-1}	30000 cm^{-1}	40200 cm^{-1}	20200 cm^{-1}

A The change in dipole moment due to photoexcitation in compound B is much larger compared to compound A

B The change in dipole moment due to photoexcitation in compound B is much smaller compared to compound A

C The change in dipole moment due to photoexcitation in methanol is more in compound A but less in compound B

D The change in dipole moment due to photoexcitation in Hexane is more in compound A but less in compound B

E None of the above

Correct Answer A

Marks 1

41

Question Description	Which of the following planes are observed in the X-ray diffraction of the crystal of NaCl
A	100
B	110
C	200
D	210
E	None of the above
Correct Answer	C
Marks	1

Question Description

Two compartments are connected by a flexible, diathermal wall are kept at constant temperature and pressure. If matter transport between two compartments is the only process allowed, which of the following expressions are true

A. $dS_{prod} = dn_1(\mu_1 - \mu_2) \geq 0$

B. $dS_{prod} = -dn_1(\mu_1 - \mu_2) \geq 0$

C. $TdS_{prod} = -dn_1(\mu_1 - \mu_2) \geq 0$

D. $TdS_{prod} = -dn_1(\mu_1 - \mu_2) \leq 0$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

C

Marks

1

43

Question Description

In the thermal reaction with between H_2 and Br_2 the equilibrium concentration of Bromine atoms is proportional to

A. $[Br_2]$

B. $[Br_2]^{\frac{1}{2}}$

C. $[Br_2]^{\frac{3}{2}}$

D. $[Br_2]^2$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

B

Marks

1

44

Question Description

The concentration of K^+ ions across a cellular membrane are 400 mmol L^{-1} and 40 mmol L^{-1} . If the activity coefficients across the membranes are same, what is the magnitude of potential (approx.) across the membrane. Given, $T = 300 \text{ K}$, $F = 96500 \text{ C mol}^{-1}$, $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$

A

77 mV

B

60 mV

C

25mV

D

0 mV

E

None of the above

Correct Answer

B

Marks

1

45

Question Description	In the presence of external magnetic field, the total number of energy levels a state with $I = 5/2$ splits into are
A	2
B	3
C	6
D	7
E	None of the above
Correct Answer	C
Marks	1

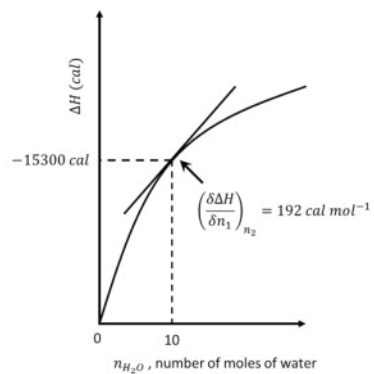
46

Question Description	Two nonlinear molecules form a nonlinear activated complex. If the activated complex contains N atoms, then the total number of vibrational degrees of freedom in the activated complex would be
A	$3N-4$
B	$3N-5$
C	$3N-6$
D	$3N-7$
E	None of the above
Correct Answer	D
Marks	1

47

Question Description

The following graph gives the integral heat of solution of an acid in water at room standard temperature and pressure. Determine the differential heat of solution of solute, i.e. ΔH_{acid} for a solution containing 1 mole of acid in 10 moles of water.



- A -13380 cal
- B -17220 cal
- C 13380 cal
- D 17220 cal
- E None of the above

Correct Answer A

Marks 1

48

Question Description

Suppose a reaction in aqueous medium is catalysed by acid as well as base and k_0 is the rate constant for uncatalysed reaction, the effective rate constant for the reaction can be given by

A. $k = k_0 + K_w[H_2O]$

B. $k = k_0 - k_{H^+}[OH^-] - k_{OH^-}[H^+]$

C. $k = k_0 + k_{H^+}[H^+] + K_w[H_2O]$

D. $k = k_0 + k_{H^+}[H^+] + \frac{k_{OH^-}K_w}{[H^+]}$

A

A

B

B

C

C

D

D

E

None of the above

Correct Answer

D

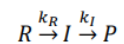
Marks

1

49

Question Description

A chemical reaction proceeds via a series of first order reactions given by



Where R, I and P are reactant, Intermediate and Product respectively. The symbols above the arrow represent the rate constants for respective reactions. At what time will the intermediate concentration be maximum if $k_A = 2k_I = 0.5 \text{ s}^{-1}$. (Given $\log_{10}2 = 0.30$, $\log_{10}3 = 0.48$ and $\log_{10}5 = 0.70$)

A 2.8 s

B 4.4 s

C 5.5 s

D 6.4 s

E None of the above

Correct Answer A

Marks 1

50

Question Description	For salts such as MgF_2 I. At small values of ionic strength (I), $\gamma_{\pm} < 1$, and solubility increases as γ_{\pm} decreases until a minimum value in the plot of $\log \gamma_{\pm}$ vs I II. At high values of ionic strength, $\gamma_{\pm} > 1$, and the solubility is less than at low values of I
A	Both statements are correct
B	Statement I is correct but statement II is incorrect
C	Statement I is incorrect but statement II is correct
D	Both statements are incorrect
E	None of the above
Correct Answer	A
Marks	1

51

Comprehension

The direction of the navigation was therefore taken from the Captain and given to the Master; but this partition of authority produced innumerable inconveniences. The line of demarcation was not, and perhaps could not be, drawn with precision. There was therefore constant wrangling. The captain, confident in proportion to his ignorance, treated the Master with lordly contempt. The Master, well aware of the danger of disobliging the powerful, too often, after a struggle, yielded against his better judgement; and it was well if the loss of ship and crew was not the consequence. In general, the least mischievous of the aristocratical captains were those who completely abandoned to others the direction of the vessels, and thought only of making money and spending it.

Question Description

Read the following statements and arrange them in logical sequence

- (i) The bifurcation in command thus caused much inconvenience
- (ii) The control of navigation was handed over to the Master.
- (iii) Line of demarcation of authority, however, could not be precisely drawn.
- (iv) The captain treated the Master with highhanded contempt.

A

(ii)-(i)-(iv)-(iii)

B

(ii)-(iv)-(iii)-(i)

C

(ii)-(i)-(iii)-(iv)

D

(iv)-(iii)-(ii)-(i)

E

None of the above

Correct Answer

B

Marks

1

Comprehension

The direction of the navigation was therefore taken from the Captain and given to the Master; but this partition of authority produced innumerable inconveniences. The line of demarcation was not, and perhaps could not be, drawn with precision. There was therefore constant wrangling. The captain, confident in proportion to his ignorance, treated the Master with lordly contempt. The Master, well aware of the danger of disobliging the powerful, too often, after a struggle, yielded against his better judgement; and it was well if the loss of ship and crew was not the consequence. In general, the least mischievous of the aristocratical captains were those who completely abandoned to others the direction of the vessels, and thought only of making money and spending it.

Question Description

Read the following statements and state whether they are true or false

- (i) The chief was as contemptuous of the Master to a degree comparable with his ignorance of his own job as a captain
- (ii) Aware of the risk of not obliging the powerful, the Master yielded too often but not without a struggle.

A

(i) is true; (ii) is false

B

(i) and (ii) are both false

C

(i) and (ii) are both true

D

(i) is false; (ii) is true

E

None of the above

Correct Answer

C

Marks

1

53

Comprehension

The direction of the navigation was therefore taken from the Captain and given to the Master; but this partition of authority produced innumerable inconveniences. The line of demarcation was not, and perhaps could not be, drawn with precision. There was therefore constant wrangling. The captain, confident in proportion to his ignorance, treated the Master with lordly contempt. The Master, well aware of the danger of disobliging the powerful, too often, after a struggle, yielded against his better judgement; and it was well if the loss of ship and crew was not the consequence. In general, the least mischievous of the aristocratical captains were those who completely abandoned to others the direction of the vessels, and thought only of making money and spending it.

Question Description

As per the passage, the handing over the direction of navigation to the Master meant

A

innumerable inconveniences

B

partition of authority

C

vague demarcation of authority

D

line of demarcation

E

None of the above

Correct Answer

B

Marks

1

54

Comprehension

The direction of the navigation was therefore taken from the Captain and given to the Master; but this partition of authority produced innumerable inconveniences. The line of demarcation was not, and perhaps could not be, drawn with precision. There was therefore constant wrangling. The captain, confident in proportion to his ignorance, treated the Master with lordly contempt. The Master, well aware of the danger of disobliging the powerful, too often, after a struggle, yielded against his better judgement; and it was well if the loss of ship and crew was not the consequence. In general, the least mischievous of the aristocratical captains were those who completely abandoned to others the direction of the vessels, and thought only of making money and spending it.

Question Description

In the passage the phrase “line of demarcation”, vis-à-vis the Captain and the Master, implies

A

partition of authority

B

boundary between the two

C

conceptual separation of power

D

delimiting the authority of each

E

None of the above

Correct Answer

D

Marks

1

55

Comprehension

The direction of the navigation was therefore taken from the Captain and given to the Master; but this partition of authority produced innumerable inconveniences. The line of demarcation was not, and perhaps could not be, drawn with precision. There was therefore constant wrangling. The captain, confident in proportion to his ignorance, treated the Master with lordly contempt. The Master, well aware of the danger of disobliging the powerful, too often, after a struggle, yielded against his better judgement; and it was well if the loss of ship and crew was not the consequence. In general, the least mischievous of the aristocratical captains were those who completely abandoned to others the direction of the vessels, and thought only of making money and spending it.

Question Description

Identify the obvious figures of speech in the following sentence: “The captain, confident in proportion to his ignorance, treated the Master with lordly contempt.”

A

irony and sarcasm

B

satire and hyperbole

C

sarcasm and metaphor

D

paradox and personification

E

None of the above

Correct Answer

A

Marks

1

56	Question Description	Scientists have found a new ecosystem 'The Trapping Zone' in which country?
	A	Thailand
	B	Japan
	C	Australia
	D	Maldives
	E	None of the above
	Correct Answer	D
	Marks	1

57	Question Description	World Statistics Day is being observed on which date?
	A	October 22
	B	October 19
	C	October 20
	D	October 21
	E	None of the above
	Correct Answer	C
	Marks	1

58

Question Description	Which state has announced India's first 'Kadavur Slender Loris Sanctuary'?
A	Himachal Pradesh
B	Uttarakhand
C	Madhya Pradesh
D	Tamil Nadu
E	None of the above
Correct Answer	D
Marks	1

59

Question Description	Which actor will be the first to film in space?
A	Tom Cruise
B	Val Kilmer
C	Dwayne Johnson
D	Johnny Depp
E	None of the above
Correct Answer	A
Marks	1

60 **Question Description** When is the annual Indian Foreign Service (IFS) Day observed?

A October 08

B October 09

C October 07

D October 06

E None of the above

Correct Answer B

Marks 1

61 **Question Description** Which Solar-Powered Village become India's 1st Net-Zero Energy Community?

A Baripatha

B Modhera

C Dharnai

D Kannauj

E None of the above

Correct Answer B

Marks 1

62

Question Description	President Draupadi Murmu has launched 'PARAM KAMRUPA' Supercomputer facility in which IIT?
A	IIT Guwahati
B	IIT Bombay
C	IIT Delhi
D	IIT BHU
E	None of the above
Correct Answer	A
Marks	1

63

Question Description	Which Indian city has won World Green City Award 2022?
A	Pune
B	Hyderabad
C	Indore
D	Bhopal
E	None of the above
Correct Answer	B
Marks	1

64	Question Description	Who has become the first Indian Wrestler to win Gold Medal at U-23 World Wrestling Championships?
	A	Aman Sehrawat
	B	Sajan Bhanwala
	C	Vikas
	D	Nitesh
	E	None of the above
	Correct Answer	A
	Marks	1

65	Question Description	Which of the following has been declared a National Monument very recently ?
	A	Mangarh Dham
	B	Lascar War Memorial
	C	Balidan Stambh
	D	Jharkhand War Memorial
	E	None of the above
	Correct Answer	A
	Marks	1

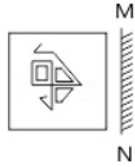
66	Question Description	A train started from point A at a speed of 60 km/hr and after 2 hours another train of same length started from A at a speed of 80 km/hr in the same direction as the first one. After how much time the second train will meet the first train?
	A	5 hours
	B	3 hours
	C	6 hours
	D	8 hours
	E	None of the above
	Correct Answer	C
	Marks	1

67	Question Description	<p>In each of the questions below consists of a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements are sufficient to answer the question.</p> <p>Is the average age of the students of a school less than 17 years?</p> <p>Statement I : The strength of the class VIII is less than 25% of the strength of the school.</p> <p>Statement II : The average age of the students of class VIII of the school is 18 years and that of the remaining classes is 16 years.</p>
	A	If the data in statement I alone is sufficient to answer the question, while the data in statement II alone is not sufficient to answer the question

B	If the data in statement II alone is sufficient to answer the question, while the data in statement I alone is not sufficient to answer the question
C	If the data either in statement I alone or in statement II alone is sufficient to answer the question
D	If the data in both statements I and II together are necessary to answer the question
E	None of the above
Correct Answer	D
Marks	1

Question Description

If a mirror is placed on the line MN, which of the option figures shows the correct image of the given question figure?



A



B



C



D



A

A

B

B

C

C

D

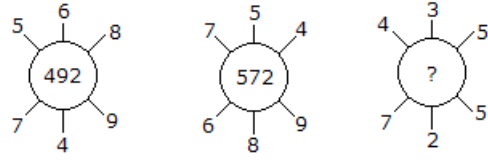
D

69

E	None of the above
Question Description	If Karan says, "Rocky's mother is the only daughter of my mother", How is Karan related to Rocky?
Correct Answer	C
Marks	Brother
B	Father
C	Uncle
D	Grandfather
E	None of the above
Correct Answer	C
Marks	1

Question Description

Which one will replace the question mark ?

**A**

115

B

130

C

135

D

140

E

None of the above

Correct Answer

B

Marks

1

71

Question Description	Pointing to a man, Rohan said, “His only brother is the father of my daughter’s father.” How is the Rohan related to the man?
A	Father
B	Grandson
C	Uncle
D	Nephew
E	None of the above
Correct Answer	D
Marks	1

72

Question Description

Find the Missing Number?

47 58 71 79 95 ?

A

108

B

107

C

105

D

109

E

None of the above

Correct Answer

D

Marks

1

73

Question Description

Find the Missing Number?

7, 9, 12, 48, ?, 890

A

128

B

190

C

172

D

168

E

None of the above

Correct Answer

C

Marks

1

74

Question Description

Which one will replace the question mark ?

A ₂	C ₄	E ₆
G ₃	I ₅	?
M ₅	O ₉	Q ₁₄

AL₁₀**B**K₁₅**C**I₁₅**D**K₈**E**

None of the above

Correct Answer

D

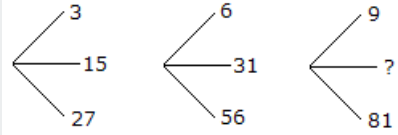
Marks

1

75

Question Description

Which one will replace the question mark ?

**A**

45

B

41

C

32

D

40

E

None of the above

Correct Answer

A

Marks

1