# FIITJEE RET – 8

## (2017 – 2019)(2ND YEAR_REGULAR)

## IIT-2017 (P2)_SET–A

## DATE: 10.09.2018

**Time: 3 hours** **Maximum Marks: 183**

**INSTRUCTIONS:**

**A. General**

1. This booklet is your Question Paper containing 54 questions.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
3. Fill in the boxes provided for Name and Enrolment No.
4. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
5. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

**B. Filling in the OMR:**

6. The instructions for the OMR sheet are given on the OMR itself.

**C. Question paper format & Marking Scheme**

7. Each part has three sections as detailed in the following table:

| Section | Question Type | Number of Questions | Category wise Marks Each Question | | | | Maximum marks of the section |
|---|---|---|---|---|---|---|---|
| | | | Full Marks | Partial Marks | Zero Marks | Negative Marks | |
| 1 | **Single Correct Option** | 7 | **+3** If only the bubble corresponding to the correct option is darkened | —— | **0** If none of the bubbles is darkened | **–1** In all other cases | **21** |
| 2 | **One or more correct option(s)** | 7 | **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened. | **+1** For darkening a bubble corresponding to each correct option, provided **NO** incorrect option is darkened. | **0** If none of the bubbles is darkened. | **–2** In all other case. | **28** |
| 3 | **Comprehension** | 4 | **+3** If only the bubble corresponding to the correct option is darkened | —— | **0** In all other case. | —— | **12** |

**Don't write / mark your answers in this question booklet.**
**If you mark the answers in question booklet, you will not be allowed to continue the exam.**

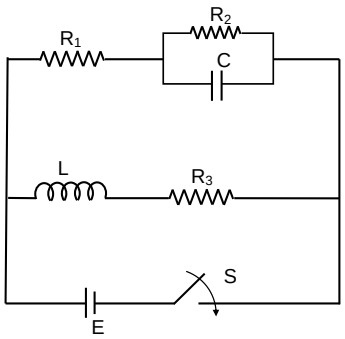
**NAME:** ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

**ENROLLMENT NO.:** ☐☐☐☐☐☐☐☐☐☐☐☐

# PAPER–II
# PART I: PHYSICS
## SECTION 1 (Maximum Marks: 28)

∗ This section contains **SEVEN** questions.
∗ Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
∗ For each question, darken the bubble corresponding to all the correct option in the ORS.

1. At t = 0, switch S is closed. The instantaneous power delivered by the battery at t = 0 is



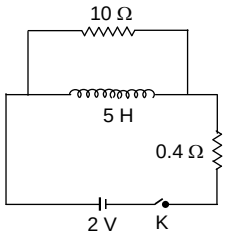

(A) $\frac{E^2}{R_2}$ (B) $\frac{E^2}{R_1}$

(C) $\frac{E^2}{R_3}$ (D) None

2. Flux $\phi$ (in weber) in a closed circuit of resistance 10 ohm varies with time t(in sec) according to the equation $\phi = 6t^2 - 5t + 1$.The magnitude of the induced current at t = 0.25 sec is.

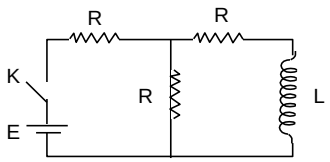
(A) 0.1 A (B) 0.2 A (C) 0.5 A (D) 0.8 A

3. Two resistances of 10 Ω and 0.4 Ω and an ideal inductor of inductance 5 H are connected to a battery of 2 V through a key K as shown in Figure. If at t = 0, Key is closed, the final current through 0.4 Ω resistor after a long time is found to be K (in amperes). Find K.




(A) 2 (B) 4 (C) 5 (D) 8

4. In the circuit shown key is closed at t = 0. The current flowing through the cell just after closing the key IS.

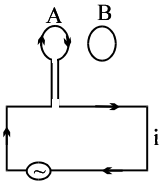



(A) $\frac{\varepsilon}{2R}$ (B) $\frac{\varepsilon}{3R}$

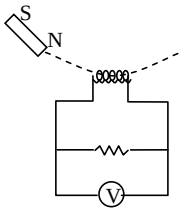
(C) $\frac{\varepsilon}{9R}$ (D) $\frac{\varepsilon}{20R}$

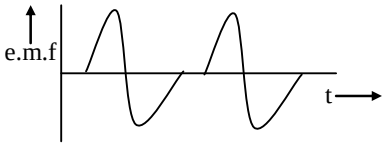
***Space for rough work***

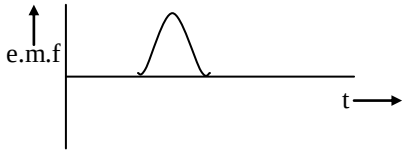
5. Two circular coils A and B are facing each other as shown in figure.
The current i through A can be altered
(A) there will be repulsion between A and B if i is increased
(B) there will be attraction between A and B if i is increased
(C) there will be neither attraction nor repulsion when i is changed
(D) attraction or repulsion between A and B depends on the direction of current. It does not depend whether the current is increased or decreased.

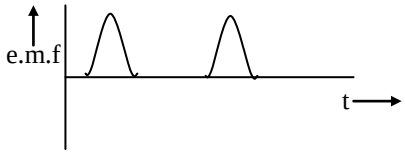


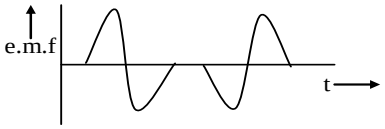

6. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e.m.f. generated across the coil during one cycle is



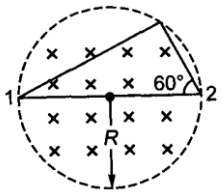

(A) 


(B) 


(C) 


(D) 


7. Loop in a circular region of time varying magnetic field at a rate of $\frac{dB}{dt}$ = 2 T/ S and $\pi R^2 = 10 m^2$. Then find the induced emf in the loop (in SI unit)
(A) 5 V (B) 10 V (C) 4 V (D) Zero

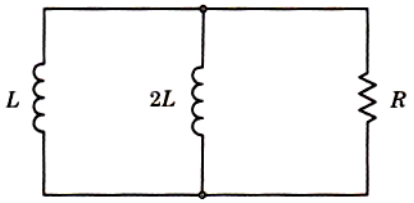



***Space for rough work***

## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

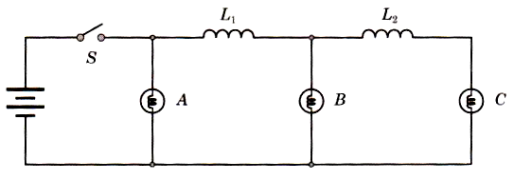
8. The circuit shown consists of parallel combination of two coils of inductances L and 2 L and a resistance R. Initially currents of equal magnitude $I_0$ are flowing in the coils in the same direction. How much charge will flow and how much heat will be dissipated in the resistance over long period after this initial instant.




(A) $Q = \frac{4LI_0}{3R}$ (B) $W = \frac{4LI_0^2}{3}$

(C) $Q = \frac{3LI_0}{4R}$ (D) $W = \frac{3LI_0^2}{4}$

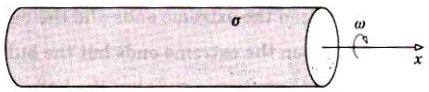
9. Three identical lamps A, B and C and two identical inductive coils $L_1$ and $L_2$ are connected to a DC power supply through a switch S as shown in the figure. initially the switch is closed for a long time and steady state is reached. Now the switch S is opened. Which of he following statements incorrectly describes order of brightness of the bulbs immediately after the switch is opened ?




(A) Brightness of A suddenly increases but that of B and C remains unchanged.
(B) Brightness of B suddenly increase but that of A and C remains unchanged
(C) Brightness of C suddenly increase but that of A and B remains unchanged
(D) Brightness of all the bulbs suddenly increases equally.

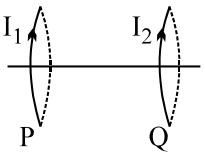
***Space for rough work***

10. A long thin wooden cylindrical shell of radius R carries uniform surface charge density $\sigma$. It is rotating about its axis with angular velocity $\omega$, which increases slowly with time t as $\omega = kt$ where k is a constant. Which of the following statements is / are correct ?



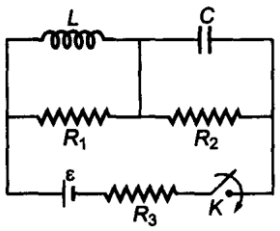

(A) Both the magnetic and the electric fields are uniform and constant
(B) The magnetic field is uniform but not constant and the electric field is constant but not uniform
(C) The magnetic field is constant but not uniform and the electric field is uniform but not constant
(D) Total energy U stored in both types of fields varies with time as $U = a + bt^2$, where a and b are positive constants.

11. Two circular coils P & Q are fixed coaxially & carry currents $I_1$ and $I_2$ respectively the coils tends to move apart.




(A) if $I_2$ = 0 & P moves towards Q, a current in the same direction as $I_1$ is induced in Q
(B) if $I_1$ = 0 & Q moves towards P, a current in the opposite direction to that of $I_2$ is induced in P.
(C) when $I_1 \neq 0$ and $I_2 \neq 0$ are in the same direction then the two coils tend to move apart
(D) when $I_1 \neq 0$ and $I_2 \neq 0$ are in opposite directions then

12. A circuit containing R,L and C is connected to a battery of emf $\varepsilon$. Let us close the key at t = 0. Then :




(A) the initial current is $\frac{\varepsilon}{R_1 + R_3}$

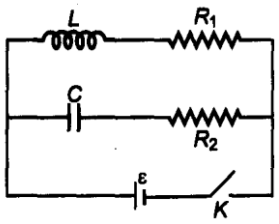
(B) the final current is $\frac{\varepsilon}{R_2 + R_3}$

(C) the energy stored in the inductor at t = $\infty$ is $\frac{L\varepsilon^2}{2(R_1 + R_2 + R_3)^2}$

(D) the charge stored in the capacitor plates at t = $\infty$ is $\frac{C\varepsilon R_2}{R_2 + R_3}$

***Space for rough work***

13. When we close the key K in the given circuit at t = 0;
(A) the voltage drop across the inductor is equal to $\varepsilon$ at t = 0
(B) the voltage drop across the capacitor is zero at t = 0
(C) the initial current is $\frac{\varepsilon}{R_1}$
(D) the final $(t \to \infty)$ current is $\frac{\varepsilon}{R_2}$




14. L, C and R represent the physical quantities inductance, capacitance and resistance respectively. Which of the following combinations have dimensions of frequency ?
(A) $\frac{1}{RC}$ (B) $\frac{R}{L}$ (C) $\frac{1}{\sqrt{LC}}$ (D) $\frac{C}{L}$

## SECTION 3 (Maximum Marks: 18)

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.

### Paragraph–1

Consider the circuit shown. When switch $S_1$ is closed, let i be the current at time t, then applying Kirchoff' s law

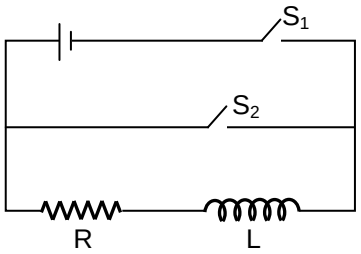
$$E - iR - L\frac{di}{dt} = 0$$

or $$\int_0^i \frac{di}{E - iR} = \frac{1}{L}\int_0^t dt$$

Solving we get $i = \frac{E}{R}\left(1 - e^{\frac{-R}{L}.t}\right)$

$\frac{L}{R}$ = time constant of circuit

When current reaches its steady value (= $i_0$), open $S_1$ and close $S_2$. the current does reach to zero finally but decays exponentially. The decay equation is given as $i = i_0 e^{\frac{-R}{L}.t}$.



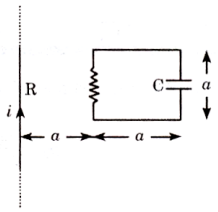

***Space for rough work***

15. A solenoid of inductance 50 mH and resistance 10 Ω is connected to a battery of 6V. The time elapsed before the current acquires half of its steady state value is
(A) 1.5 ms (B) 2.5 ms (C) 3.5 ms (D) 4 ms

16. An L-R circuit is switched on at t = 0, If emf of battery is E, the charge which passes through battery in one time constant is
(A) $\frac{i_0\tau}{\rho}$ (B) $i_0\tau$ (C) $\frac{3i_0\tau}{2}$ (D) $\frac{2i_0\tau}{3}$

## Paragraph–2

A square loop of side 'a' containing a resistor R and a capacitor C is placed in plane of an infinite current carrying wire as shown in figure. The current in the wire varies as $\left(i = \frac{i_0 t}{t_0}\right)$.




17. Induced emf (ξ) in the circuit is
(A) $\frac{\mu_0 a i_0 \ell n2}{2\pi t_0}$ (B) $\frac{\mu_0 a i_0 \ell n2}{\pi t_0}$ (C) $\frac{2\mu_0 a i_0 \ell n2}{\pi t_0}$ (D) None of these

18. Find the charge on capacitor as a function of time.
(A) $q = c\xi(1 - e^{-t/RC})$ (B) $q = c\xi(1 + e^{-t/RC})$ (C) $q = -c\xi(1 + e^{-t/RC})$ (D) None of these

***Space for rough work***

# PART II: CHEMISTRY

## SECTION 1 (Maximum Marks: 28)

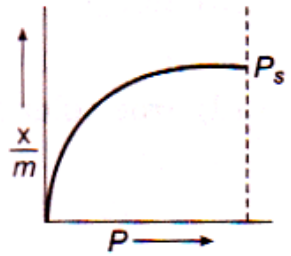
* This section contains **SEVEN** questions.
* Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
* For each question, darken the bubble corresponding to all the correct option in the ORS.

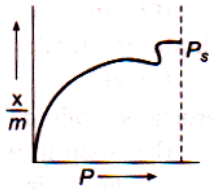
19. The size of particles in suspension, true solution and colloidal solution varies in the order
(A) suspension > colloidal > true solution (B) true solution > suspension > colloidal
(C) suspension > colloidal = true solution (D) none of these

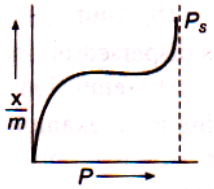
20. Which of the following statement is not correct ?
(A) physical adsorption is due to van der waal's forces
(B) physical adsorption is irreversible
(C) chemical adsorption increases with increase in temperature upto certain limit that decreases
(D) enthalpy of adsorption for a chemical adsorption is greater than that of physical adsorption.

21. Sorption is the phenomenon
(A) reverse of adsorption
(B) reverse of absorption
(C) when adsorption and absorption takes place simultaneously
(D) none of these

22. Which of the following adsorption isotherms represents the adsorption of a gas by a solid involving multilayers of layers ? ($P_s$ = saturation pressure)

(A) 


(B) 


(C) 


(D) 


***Space for rough work***

23. An inhibitor is essentially
(A) a negative catalyst (B) a heterogeneous catalyst
(C) an autocatalyst (D) a homogeneous catalyst

24. Surface tension of lyophilic sols is
(A) lower than water (B) more than water
(C) equal to water (D) none of these

25. Bredig's arc method cannot be used for the preparation of colloidal sol of
(A) copper (B) gold (C) silver (D) sodium

## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
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- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

26. Select the correct statement(s)
(A) Physical adsorption is multilayer, non–directional
(B) Chemical adsorption highly specific in nature
(C) Physical adsorption is due to free valence of atoms
(D) Chemical adsorption is due to stronger interaction or bond formation

27. If adsorption of a gas on a solid is limited to monolayer formation, then which of the following statements are true ?

(A) At low pressure, $\frac{x}{m}$ varies proportionately with p

(B) At moderate pressures, $\frac{x}{m}$ values less than proportionately with p

(C) At high pressures, $\frac{x}{m}$ becomes independent of p

(D) At high pressure, $\frac{x}{m}$ varies more than proportionately with p

***Space for rough work***

28. In the aqueous solution of soaps above CMC
(A) the cations associate to form the aggregates
(B) the anions associate to form the clusters of colloidal dimension
(C) the polar ends of the ions forming the clusters are directed towards water
(D) the non–polar (hydrocarbons) ends are directed towards water.

29. The catalyst cannot be used in the manufacture of nitric acid by ostwald's process is
(A) Mo (B) Pt (C) $V_2O_5$ (D) Fe

30. Which is of the following enzyme cannot be used. Glucose or fructose is converted into $C_2H_5OH$.
(A) Invertase (B) diastase (C) maltose (D) zymase.

31. Which of the following statement(s) is/are correct ?
(A) Adsorption is a non-spontaneous process
(B) Surface energy decreases during the process of adsorption
(C) Adsorption takes place with decrease of entropy
(D) Physical adsorption is exothermic process whereas chemisorption is endothermic

32. Point out the false statement
(A) Brownian motion and Tyndall effect are shown by colloidal systems
(B) The colloidal solution of a liquid in liquid is called emulsion
(C) Hardy–Schulze law is related with coagulation of a sol
(D) Higher is the gold number, greater will be the protective power of a lyophilic colloid

## SECTION 3 (Maximum Marks: 18)

∗ This section contains **TWO** paragraphs.
∗ Based on each paragraph, there are **TWO** questions.
∗ Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
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***Space for rough work***

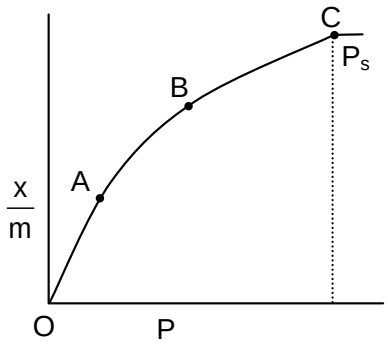
## Paragraph–1

A graph between x/m and the pressure P of the gas at a constant temperature is called adsorption isotherm. Where x is the no. of moles of the adsorbate and m is the mass of the adsorbent. Adsorption isotherms of different shapes have been experimentally observed. According to Frundlich adsorption isotherm.

$x/m = kP^{1/n}$

Where k and n are constant parameters depending upon the nature of the solid and gas

33. In the given isotherm select the incorrect statements




(A) $\frac{x}{m} \propto P^{1/n}$ along OA

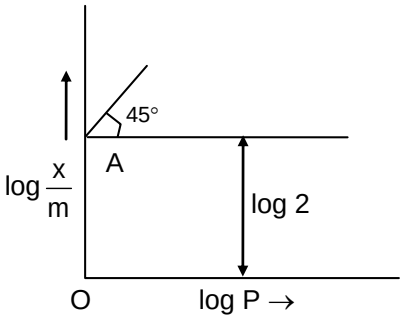
(B) $\frac{x}{m} \propto P^{0}$ when point be is reached

(C) $\frac{x}{m}$ does not increase as rapidly with pressure along BC due to less surface are available for adsorption

(D) nature of isotherm is different for two gases for same adsorbent.

34. Graph between $\log\left(\frac{x}{m}\right)$ and log P is a straight line at angle 45° with intercept OA as shown.

Hence, $\left(\frac{x}{m}\right)$ at a pressure of 2 atm is :




(A) 2 (B) 4 (C) 8 (D) 1

***Space for rough work***

**Paragraph–2**

Coagulation is the process by which the dispersed phase of a colloid is made to aggregate and thereby separate from the continuous phase. The minimum concentration of an electrolyte in milli–moles per litre of the electrolyte solution which is required to cause the coagulation of colloidal sol is called coagulation value.

$$\text{Coagulation value} \propto \frac{1}{\text{coagulating power}}$$

The coagulation values of different electrolytes are different. This behaviour can be easily understood by Hardy–Schulze rule which states.
"The greater is the valency of the effective ion greater is its precipitating power."

35. $As_2S_3$ sol is negatively charged, capacity to precipitate it is highest in
(A) $K_2SO_4$ (B) $Na_3PO_4$ (C) $AlCl_3$ (D) $CaCl_3$

36. The coagulation of colloidal particles of the sol can be caused by
(A) heating (B) adding electrolyte
(C) adding oppositely charged sol (D) all of these

# PART III: MATHEMATICS

## SECTION 1 (Maximum Marks: 28)

* This section contains **SEVEN** questions.
* Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
* For each question, darken the bubble corresponding to all the correct option in the ORS.

37. Let $f(xy) = f(x).f(y)\ \forall x > 0, y > 0$ and $f(1+x) = 1 + x\{1 + g(x)\}$ where $\lim_{x\to 0} g(x) = 0$ then $\int \frac{f(x)}{f'(x)}dx =$

(A) $\frac{x^2}{2} + c$ (B) $\frac{x^3}{3} + c$ (C) $x + c$ (D) $\frac{x^4}{4} + c$

38. If $\int \frac{(x^4+1)}{x(x^2+1)^2}dx = a\log|x| + \frac{b}{x^2+1} + c$ then a + b is equal to
(A) 0 (B) 1 (C) 2 (D) 4

***Space for rough work***

39. If $\int \left(2-3\sin^2 x\right)\sqrt{\sec x}\,dx = 2f(x)\sqrt{g(x)}+c$ and f(x) is non constant function then

(A) $f^2(x)+g^2(x)=1$ (B) $f^2(x)-g^2(x)=1$ (C) $f(x)g(x)=1$ (D) $f(x)=g(x)$

40. $\int \frac{\cos^2 x+\sin 2x}{(2\cos x-\sin x)^2}dx = \frac{\cos x}{(2\cos x-\sin x)}+Ax+B\ln|2\cos x-\sin x|+c$, then (A, B) =

(A) $\left(-\frac{1}{5},\frac{-2}{5}\right)$ (B) $\left(\frac{1}{5},\frac{2}{5}\right)$ (C) $\left(\frac{2}{5},\frac{1}{5}\right)$ (D) $\left(-\frac{1}{\sqrt{5}},\frac{-2}{\sqrt{5}}\right)$

41. $\int \frac{\left(\sqrt{1-x^2}-x\right)}{\sqrt{1-x^2}\left(1+x\sqrt{1-x^2}\right)}dx$ is

(A) $2\,\text{Tan}^{-1}(x+\sqrt{1-x^2})+C$ (B) $\text{Tan}^{-1}(x+\sqrt{1-x^2})+C$

(C) $2\text{Sin}^{-1}(x+\sqrt{1-x^2})+\cos^{-1}\sqrt{1-x^2}+C$ (D) $\text{Sin}^{-1}\left(x+\sqrt{1-x^2}\right)+C$

42. If $A=\int_1^{\sin\theta}\frac{t\,dt}{1+t^2}dt, B=\int_1^{\text{cosec}\theta}\frac{1}{t\left(1+t^2\right)}dt$ then $\begin{vmatrix} A & A^2 & B \\ e^{A+B} & B^2 & -1 \\ 1 & A^2+B^2 & -1 \end{vmatrix} = ?$

(A) $\sin\theta$ (B) $\text{cosec}\theta$ (C) 0 (D) 1

43. Let $I_1=\int_0^1 \frac{e^x}{1+x}dx$ and $I_2=\int_0^1 \frac{x^2dx}{e^{x^3}\left(2-x^3\right)}$. Then $\frac{I_1}{I_2}$ is

(A) $\frac{3}{e}$ (B) $\frac{e}{3}$ (C) $3e$ (D) $\frac{1}{3e}$

***Space for rough work***

## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

44. If $\int \frac{\sin x}{\sin 4x}dx = A\ \ln\left|\frac{1-\sin x}{1+\sin x}\right| + B\ln\left|\frac{1-\sqrt{2}\sin x}{1+\sqrt{2}\sin x}\right| + c$

(A) $A = -\frac{1}{8}$ (B) $A = \frac{1}{8}$ (C) $B = \frac{1}{4\sqrt{2}}$ (D) $B = -\frac{1}{4\sqrt{2}}$

45. $\int \frac{1}{(\sin x + 2\cos x)(\cos x + 2\sin x)}dx =$

(A) $\frac{1}{3}\ln\left|\frac{2\tan x + 1}{\tan x + 2}\right| + c$ (B) $\frac{1}{3}\ln\left|\frac{\tan x + 2}{\tan x + 1}\right| + c$

(C) $\frac{1}{3}\ln\left|\frac{\sin x + \cos x}{2\sin x + \cos x}\right| + c$ (D) $\frac{1}{3}\ln\left|\frac{2\sin x + \cos x}{\sin x + 2\cos x}\right| + c$

46. If $\int f(x)\ \sin x.\cos x\ dx = \frac{1}{2(b^2 - a^2)}\ \ln|f(x)| + c$ then $\frac{1}{f(x)}$ can be

(A) $a^2\sin^2 x + b^2\cos^2 x$ (B) $-a^2\cos^2 x - b^2\sin^2 x$

(C) $\frac{1}{2}\left(b^2 - a^2\right)\cos 2x$ (D) $\frac{1}{2}\left(a^2 - b^2\right)\cos 2x$

47. $\int \frac{4e^x + 6e^{-x}}{9e^x - 4e^{-x}}dx = Ax + B\log_e(9e^{2x} - 4) + C$ then

(A) $A = \frac{-1}{2}$ (B) $A + B = \frac{-19}{36}$ (C) $B = \frac{35}{36}$ (D) $A = 3/2$

***Space for rough work***

48. $\int \sqrt{x+\sqrt{x^2+2}}\,dx = A\left\{x+\sqrt{x^2+2}\right\}^{3/2} + \frac{B}{\sqrt{x+\sqrt{x^2+2}}} + c$

(A) B = –2 (B) B = $-\frac{1}{4}$ (C) A = $\frac{1}{3}$ (D) A = $-\frac{1}{2}$

49. The value of $\frac{29\int_0^1 (1-x^4)^7\,dx}{4\int_0^1 (1-x^4)^6\,dx}$ is

(A) 0 (B) 5

(C) 7 (D) same as the value of $\int_0^1 (x^2-x)\,dx$

50. $\int_0^{\frac{\pi}{2}} f(\sin 2x).\sin x\,dx =$

(A) $\pi\int_0^{\frac{\pi}{2}} f(\cos x)\,dx$ (B) $\int_0^{\frac{\pi}{4}} \sqrt{2} f(\cos 2x)\cos x\,dx$

(C) $\frac{1}{\sqrt{2}}\int_{\frac{7\pi}{4}}^{\frac{9\pi}{4}} f(\cos 2x)\cos x\,dx$ (D) $\frac{\pi}{4}\int_0^{\frac{\pi}{2}} f(\cos x)\,dx$

***Space for rough work***

## SECTION 3 (Maximum Marks: 18)

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.

### Paragraph–1

Repeated application of integration by parts gives us, the reduction formulae if the integrand depends on a natural number n.

51. If $I_{m,n} = \int x^m (1-x)^{n-1}\,dx$, then $I_{m,n} - \frac{n-1}{m+n}\, I_{(m,n-1)} =$

(A) $\frac{x^m(1-x)^{n-2}}{m+n}$ (B) $\frac{x^{m+1}(1-x)^{n-1}}{m+n}$ (C) $\frac{x^{m-1}(1-x)^{n-1}}{m+n}$ (D) $\frac{x^{m-1}(1-x)^{n-2}}{m+n-2}$

52. If $I_n = \int \frac{x^n}{\sqrt{ax^2+2bx+c}}\,dx$ then $(n+1)aI_{n+1} + (2n+1)bI_n + nc\, I_{n-1}$ is equal to

(A) $x^{n-1}\sqrt{ax^2+2bx+c}$ (B) $\frac{x^{n-2}}{\sqrt{ax^2+2bx+c}}$ (C) $x^n\sqrt{ax^2+2bx+c}$ (D) $\frac{x^n}{\sqrt{ax^2+2bx+c}}$

### Paragraph–2

Consider $\int \frac{x^3+3x^2+2x+1}{\sqrt{x^2+x+1}}dx = (ax^2+bx+c)\sqrt{x^2+x+1} + \lambda\int \frac{dx}{\sqrt{x^2+x+1}}$ then

53. Value of c =

(A) $\frac{-13}{6}$ (B) $\frac{-7}{24}$ (C) $\frac{-10}{7}$ (D) 1

54. Value of $\lambda$

(A) $\frac{1}{16}$ (B) $\frac{10}{3}$ (C) $\frac{10}{7}$ (D) 1

***space for rough work***

# FIITJEE RET – 8

## (2017 – 2019)(2ND YEAR_REGULAR)

## IIT-2017 (P2)_SET–A

## DATE: 10.09.2018

## ANSWERS

**PHYSICS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | **B** | 2. | **B** | 3. | **C** | 4. | **A** |
| 5. | **A** | 6. | **A** | 7. | **D** | 8. | **AB** |
| 9. | **B,C,D** | 10. | **B,D** | 11. | **B** | 12. | **A,B,D** |
| 13. | **A,B** | 14. | **A,B,C** | 15. | **C** | 16. | **Bonus** |
| 17. | **A** | 18. | **A** | | | | |

**CHEMISTRY**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19. | **A** | 20. | **B** | 21. | **C** | 22. | **A** |
| 23. | **A** | 24. | **A** | 25. | **D** | 26. | **ABD** |
| 27. | **ABC** | 28. | **BC** | 29. | **ACD** | 30. | **ABC** |
| 31. | **BC** | 32. | **D** | 33. | **B** | 34. | **B** |
| 35. | **C** | 36. | **D** | | | | |

**MATHEMATICS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37. | **A** | 38. | **C** | 39. | **A** | 40 | **A** |
| 41. | **A** | 42. | **C** | 43. | **C** | 44. | **BD** |
| 45. | **AD** | 46. | **ABC** | 47. | **BC** | 48. | **AC** |
| 49. | **C** | 50. | **BC** | 51 | **B** | 52 | **C** |
| 53. | **B** | 54. | **A** | | | | |

# FIITJEE RET – 8

## (2017 – 2019)(2ND YEAR_REGULAR)

## IIT-2017 (P2)_SET–B

## DATE: 10.09.2018

**Time: 3 hours** **Maximum Marks: 183**

**INSTRUCTIONS:**

**A. General**

1. This booklet is your Question Paper containing 54 questions.
6. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed to be carried inside the examination hall.
7. Fill in the boxes provided for Name and Enrolment No.
8. The answer sheet, a machine-readable Objective Response (ORS), is provided separately.
9. DO NOT TAMPER WITH / MULTILATE THE ORS OR THE BOOKLET.

**B. Filling in the OMR:**

6. The instructions for the OMR sheet are given on the OMR itself.

**C. Question paper format & Marking Scheme**

7. Each part has three sections as detailed in the following table:

| Section | Question Type | Number of Questions | Category wise Marks Each Question | | | | Maximum marks of the section |
|---|---|---|---|---|---|---|---|
| | | | Full Marks | Partial Marks | Zero Marks | Negative Marks | |
| 1 | **Single Correct Option** | 7 | **+3** If only the bubble corresponding to the correct option is darkened | —— | **0** If none of the bubbles is darkened | **–1** In all other cases | **21** |
| 2 | **One or more correct option(s)** | 7 | **+4** If only the bubble(s) corresponding to all the correct option(s) is (are) darkened. | **+1** For darkening a bubble corresponding to each correct option, provided **NO** incorrect option is darkened. | **0** If none of the bubbles is darkened. | **–2** In all other case. | **28** |
| 3 | **Comprehension** | 4 | **+3** If only the bubble corresponding to the correct option is darkened | —— | **0** In all other case. | —— | **12** |

**Don't write / mark your answers in this question booklet.**
**If you mark the answers in question booklet, you will not be allowed to continue the exam.**

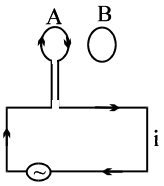
**NAME:** ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

**ENROLLMENT NO.:** ☐☐☐☐☐☐☐☐☐☐☐☐

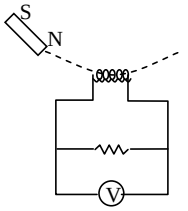
# PAPER–II
# PART I: PHYSICS
## SECTION 1 (Maximum Marks: 28)

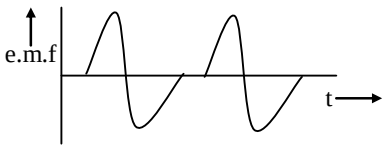
* This section contains **SEVEN** questions.
* Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
* For each question, darken the bubble corresponding to all the correct option in the ORS.

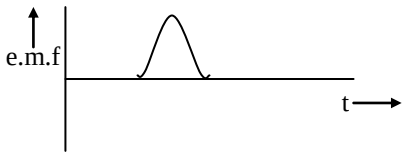
1. Two circular coils A and B are facing each other as shown in figure.
The current i through A can be altered
(A) there will be repulsion between A and B if i is increased
(B) there will be attraction between A and B if i is increased
(C) there will be neither attraction nor repulsion when i is changed
(D) attraction or repulsion between A and B depends on the direction of current. It does not depend whether the current is increased or decreased.

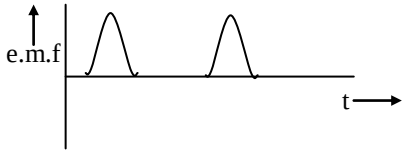


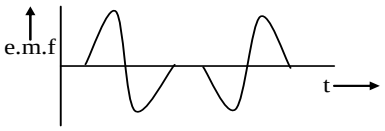

2. A magnet is made to oscillate with a particular frequency, passing through a coil as shown in figure. The time variation of the magnitude of e.m.f. generated across the coil during one cycle is




(A) 


(B) 

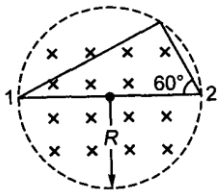

(C) 


(D) 


***Space for rough work***

3. Loop in a circular region of time varying magnetic field at a rate of $\frac{dB}{dt}$ = 2 T/ S and $\pi R^2 = 10 m^2$. Then find the induced emf in the loop (in SI unit)

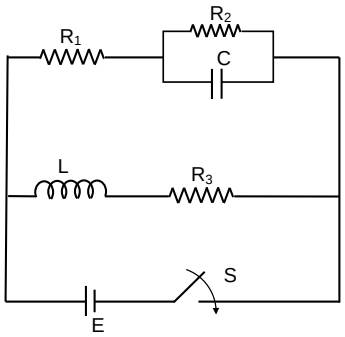
(A) 5 V (B) 10 V (C) 4 V (D) Zero




4. At t = 0, switch S is closed. The instantaneous power delivered by the battery at t = 0 is

(A) $\frac{E^2}{R_2}$ (B) $\frac{E^2}{R_1}$

(C) $\frac{E^2}{R_3}$ (D) None

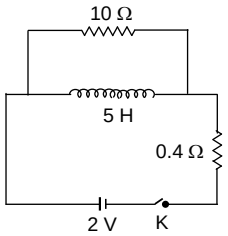



5. Flux $\phi$ (in weber) in a closed circuit of resistance 10 ohm varies with time t(in sec) according to the equation $\phi = 6t^2 - 5t + 1$.The magnitude of the induced current at t = 0.25 sec is.

(A) 0.1 A (B) 0.2 A (C) 0.5 A (D) 0.8 A

6. Two resistances of 10 $\Omega$ and 0.4 $\Omega$ and an ideal inductor of inductance 5 H are connected to a battery of 2 V through a key K as shown in Figure. If at t = 0, Key is closed, the final current through 0.4 $\Omega$ resistor after a long time is found to be K (in amperes). Find K.

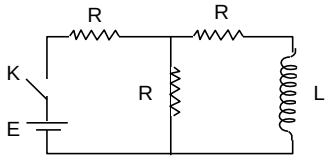
(A) 2 (B) 4 (C) 5 (D) 8




7. In the circuit shown key is closed at t = 0. The current flowing through the cell just after closing the key IS.

(A) $\frac{\varepsilon}{2R}$ (B) $\frac{\varepsilon}{3R}$

(C) $\frac{\varepsilon}{9R}$ (D) $\frac{\varepsilon}{20R}$

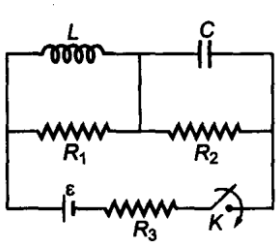



***Space for rough work***

## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

8. A circuit containing R,L and C is connected to a battery of emf $\varepsilon$. Let us close the key at t = 0. Then :



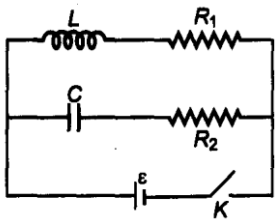

(A) the initial current is $\frac{\varepsilon}{R_1+R_3}$

(B) the final current is $\frac{\varepsilon}{R_2+R_3}$

(C) the energy stored in the inductor at t = $\infty$ is $\frac{L\varepsilon^2}{2(R_1+R_2+R_3)^2}$

(D) the charge stored in the capacitor plates at t = $\infty$ is $\frac{C\varepsilon R_2}{R_2+R_3}$

9. When we close the key K in the given circuit at t = 0;




(A) the voltage drop across the inductor is equal to $\varepsilon$ at t = 0

(B) the voltage drop across the capacitor is zero at t = 0

(C) the initial current is $\frac{\varepsilon}{R_1}$

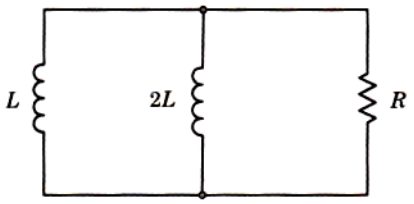
(D) the final $(t \to \infty)$ current is $\frac{\varepsilon}{R_2}$

10. L, C and R represent the physical quantities inductance, capacitance and resistance respectively. Which of the following combinations have dimensions of frequency ?

(A) $\frac{1}{RC}$ (B) $\frac{R}{L}$ (C) $\frac{1}{\sqrt{LC}}$ (D) $\frac{C}{L}$

***Space for rough work***

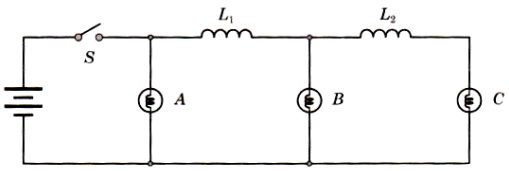
11. The circuit shown consists of parallel combination of two coils of inductances L and 2 L and a resistance R. Initially currents of equal magnitude $I_0$ are flowing in the coils in the same direction. How much charge will flow and how much heat will be dissipated in the resistance over long period after this initial instant.




(A) $Q = \frac{4LI_0}{3R}$ (B) $W = \frac{4LI_0^2}{3}$

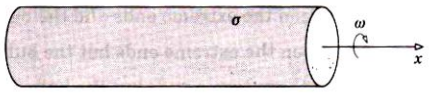
(C) $Q = \frac{3LI_0}{4R}$ (D) $W = \frac{3LI_0^2}{4}$

12. Three identical lamps A, B and C and two identical inductive coils $L_1$ and $L_2$ are connected to a DC power supply through a switch S as shown in the figure. initially the switch is closed for a long time and steady state is reached. Now the switch S is opened. Which of he following statements incorrectly describes order of brightness of the bulbs immediately after the switch is opened ?




(A) Brightness of A suddenly increases but that of B and C remains unchanged
(B) Brightness of B suddenly increase but that of A and C remains unchanged
(C) Brightness of C suddenly increase but that of A and B remains unchanged
(D) Brightness of all the bulbs suddenly increases equally

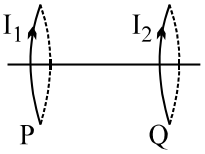
13. A long thin wooden cylindrical shell of radius R carries uniform surface charge density $\sigma$. It is rotating about its axis with angular velocity $\omega$, which increases slowly with time t as $\omega = kt$ where k is a constant. Which of the following statements is / are correct ?




(A) Both the magnetic and the electric fields are uniform and constant
(B) The magnetic field is uniform but not constant and the electric field is constant but not uniform
(C) The magnetic field is constant but not uniform and the electric field is uniform but not constant
(D) Total energy U stored in both types of fields varies with time as $U = a + bt^2$, where a and b are positive constants.

***Space for rough work***

14. Two circular coils P & Q are fixed coaxially & carry currents $I_1$ and $I_2$ respectively the coils tends to move apart.




(A) if $I_2 = 0$ & P moves towards Q, a current in the same direction as $I_1$ is induced in Q

(B) if $I_1 = 0$ & Q moves towards P, a current in the opposite direction to that of $I_2$ is induced in P.

(C) when $I_1 \neq 0$ and $I_2 \neq 0$ are in the same direction then the two coils tend to move apart

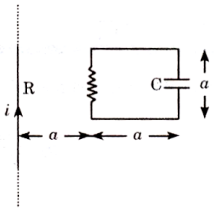
(D) when $I_1 \neq 0$ and $I_2 \neq 0$ are in opposite directions then

## SECTION 3 (Maximum Marks: 18)

- This section contains **TWO** paragraphs.
- Based on each paragraph, there are **TWO** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.

### Paragraph–1

A square loop of side 'a' containing a resistor R and a capacitor C is placed in plane of an infinite current carrying wire as shown in figure. The current in the wire varies as $\left(i = \frac{i_0 t}{t_0}\right)$.




15. Induced emf ($\xi$) in the circuit is

(A) $\frac{\mu_0 a i_0 \ell n 2}{2\pi t_0}$ (B) $\frac{\mu_0 a i_0 \ell n 2}{\pi t_0}$ (C) $\frac{2\mu_0 a i_0 \ell n 2}{\pi t_0}$ (D) None of these

16. Find the charge on capacitor as a function of time.

(A) $q = c\xi\,(1 - e^{-t/RC})$ (B) $q = c\xi\,(1 + e^{-t/RC})$ (C) $q = -c\xi\,(1 + e^{-t/RC})$ (D) None of these

***Space for rough work***

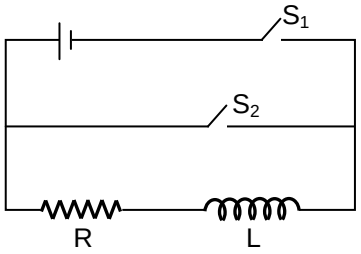
## Paragraph–2

Consider the circuit shown. When switch $S_1$ is closed, let i be the current at time t, then applying Kirchoff' s law

$$E - iR - L\frac{di}{dt} = 0$$

or $$\int_0^i \frac{di}{E - iR} = \frac{1}{L}\int_0^t dt$$

Solving we get $i = \frac{E}{R}\left(1 - e^{\frac{-R}{L}.t}\right)$




$\frac{L}{R}$ = time constant of circuit

When current reaches its steady value (= $i_0$), open $S_1$ and close $S_2$. the current does reach to zero finally but decays exponentially. The decay equation is given as $i = i_0 e^{\frac{-R}{L}.t}$.

17. A solenoid of inductance 50 mH and resistance 10 Ω is connected to a battery of 6V. The time elapsed before the current acquires half of its steady state value is
(A) 1.5 ms (B) 2.5 ms (C) 3.5 ms (D) 4 ms

18. An L-R circuit is switched on at t = 0, If emf of battery is E, the charge which passes through battery in one time constant is
(A) $\frac{i_0\tau}{\rho}$ (B) $i_0\tau$ (C) $\frac{3i_0\tau}{2}$ (D) $\frac{2i_0\tau}{3}$

***Space for rough work***

# PART II: CHEMISTRY

## SECTION 1 (Maximum Marks: 28)

* This section contains **SEVEN** questions.
* Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
* For each question, darken the bubble corresponding to all the correct option in the ORS.

19. An inhibitor is essentially
(A) a negative catalyst (B) a heterogeneous catalyst
(C) an autocatalyst (D) a homogeneous catalyst

20. Surface tension of lyophilic sols is
(A) lower than water (B) more than water
(C) equal to water (D) none of these

21. Bredig's arc method cannot be used for the preparation of colloidal sol of
(A) copper (B) gold (C) silver (D) sodium

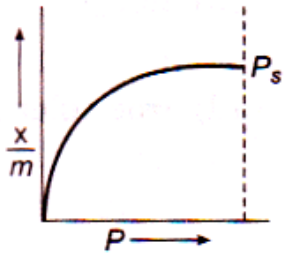
22. The size of particles in suspension, true solution and colloidal solution varies in the order
(A) suspension > colloidal > true solution (B) true solution > suspension > colloidal
(C) suspension > colloidal = true solution (D) none of these

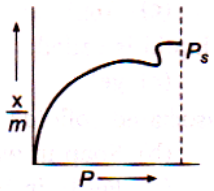
23. Which of the following statement is not correct ?
(A) physical adsorption is due to van der waal's forces
(B) physical adsorption is irreversible
(C) chemical adsorption increases with increase in temperature upto certain limit that decreases
(D) enthalpy of adsorption for a chemical adsorption is greater than that of physical adsorption.

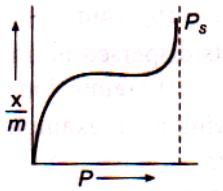
24. Sorption is the phenomenon
(A) reverse of adsorption
(B) reverse of absorption
(C) when adsorption and absorption takes place simultaneously
(D) none of these

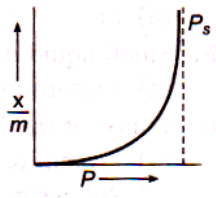
***Space for rough work***

25. Which of the following adsorption isotherms represents the adsorption of a gas by a solid involving multilayers of layers ? ($P_s$ = saturation pressure)

(A) 


(B) 


(C) 


(D) 


## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four options is(are) correct.
- For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS.
- For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will get +4 marks; darkening only (A) and (D) will get +2 marks; and darkening (A) and (B) will get –2 marks, as a wrong option is also darkened.

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26. Which is of the following enzyme cannot be used. Glucose or fructose is converted into $C_2H_5OH$.
(A) Invertase (B) diastase (C) maltose (D) zymase.

27. Which of the following statement(s) is/are correct ?
(A) Adsorption is a non-spontaneous process
(B) Surface energy decreases during the process of adsorption
(C) Adsorption takes place with decrease of entropy
(D) Physical adsorption is exothermic process whereas chemisorption is endothermic

28. Point out the false statement
(A) Brownian motion and Tyndall effect are shown by colloidal systems
(B) The colloidal solution of a liquid in liquid is called emulsion
(C) Hardy–Schulze law is related with coagulation of a sol
(D) Higher is the gold number, greater will be the protective power of a lyophilic colloid

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***Space for rough work***

29. Select the correct statement(s)
(A) Physical adsorption is multilayer, non–directional
(B) Chemical adsorption highly specific in nature
(C) Physical adsorption is due to free valence of atoms
(D) Chemical adsorption is due to stronger interaction or bond formation

30. If adsorption of a gas on a solid is limited to monolayer formation, then which of the following statements are true ?

(A) At low pressure, $\frac{x}{m}$ varies proportionately with p

(B) At moderate pressures, $\frac{x}{m}$ values less than proportionately with p

(C) At high pressures, $\frac{x}{m}$ becomes independent of p

(D) At high pressure, $\frac{x}{m}$ varies more than proportionately with p

31. In the aqueous solution of soaps above CMC
(A) the cations associate to form the aggregates
(B) the anions associate to form the clusters of colloidal dimension
(C) the polar ends of the ions forming the clusters are directed towards water
(D) the non–polar (hydrocarbons) ends are directed towards water.

32. The catalyst cannot be used in the manufacture of nitric acid by ostwald's process is
(A) Mo (B) Pt (C) $V_2O_5$ (D) Fe

## SECTION 3 (Maximum Marks: 18)

∗ This section contains **TWO** paragraphs.
∗ Based on each paragraph, there are **TWO** questions.
∗ Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
∗ For each question, darken the bubble corresponding to the correct option in the ORS.

### Paragraph–1

Coagulation is the process by which the dispersed phase of a colloid is made to aggregate and thereby separate from the continuous phase. The minimum concentration of an electrolyte in milli–moles per litre of the electrolyte solution which is required to cause the coagulation of colloidal sol is called coagulation value.

$$\text{Coagulation value} \propto \frac{1}{\text{coagulating power}}$$

The coagulation values of different electrolytes are different. This behaviour can be easily understood by Hardy–Schulze rule which states.
"The greater is the valency of the effective ion greater is its precipitating power."

33. $As_2S_3$ sol is negatively charged, capacity to precipitate it is highest in
(A) $K_2SO_4$ (B) $Na_3PO_4$ (C) $AlCl_3$ (D) $CaCl_3$

***Space for rough work***

34. The coagulation of colloidal particles of the sol can be caused by
(A) heating (B) adding electrolyte
(C) adding oppositely charged sol (D) all of these

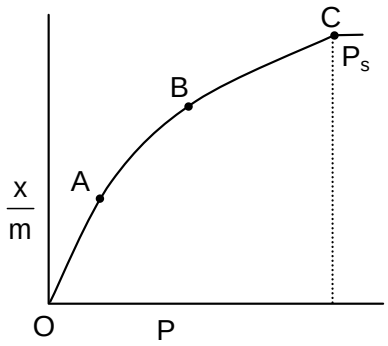
## Paragraph–2

A graph between x/m and the pressure P of the gas at a constant temperature is called adsorption isotherm. Where x is the no. of moles of the adsorbate and m is the mass of the adsorbent. Adsorption isotherms of different shapes have been experimentally observed. According to Frundlich adsorption isotherm.

$x/m = kP^{1/n}$

Where k and n are constant parameters depending upon the nature of the solid and gas

35. In the given isotherm select the incorrect statements




(A) $\frac{x}{m} \propto P^{1/n}$ along OA

(B) $\frac{x}{m} \propto P^{0}$ when point be is reached

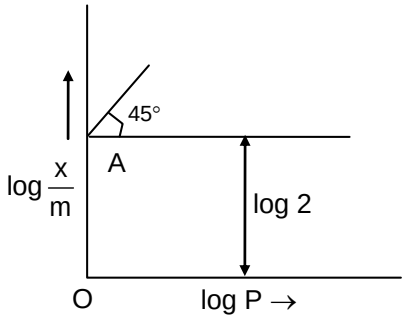
(C) $\frac{x}{m}$ does not increase as rapidly with pressure along BC due to less surface are available for adsorption

(D) nature of isotherm is different for two gases for same adsorbent.

***Space for rough work***

36. Graph between $\log\left(\frac{x}{m}\right)$ and log P is a straight line at angle 45° with intercept OA as shown.

Hence, $\left(\frac{x}{m}\right)$ at a pressure of 2 atm is :




(A) 2 (B) 4 (C) 8 (D) 1

# PART III: MATHEMATICS

## SECTION 1 (Maximum Marks: 28)

∗ This section contains **SEVEN** questions.
∗ Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
∗ For each question, darken the bubble corresponding to all the correct option in the ORS.

37. $\int \frac{\left(\sqrt{1-x^2}-x\right)}{\sqrt{1-x^2}\left(1+x\sqrt{1-x^2}\right)}dx$ is

(A) $2\,\text{Tan}^{-1}(x+\sqrt{1-x^2})+C$ (B) $\text{Tan}^{-1}(x+\sqrt{1-x^2})+C$

(C) $2\text{Sin}^{-1}(x+\sqrt{1-x^2})+\cos^{-1}\sqrt{1-x^2}+C$ (D) $\text{Sin}^{-1}\left(x+\sqrt{1-x^2}\right)+C$

38. If $A=\int_1^{\sin\theta}\frac{t\,dt}{1+t^2}dt, B=\int_1^{\text{cosec}\theta}\frac{1}{t\left(1+t^2\right)}dt$ then $\begin{vmatrix} A & A^2 & B \\ e^{A+B} & B^2 & -1 \\ 1 & A^2+B^2 & -1 \end{vmatrix}=?$

(A) $\sin\theta$ (B) $\text{cosec}\theta$ (C) 0 (D) 1

***Space for rough work***

39. Let $I_1 = \int_0^1 \frac{e^x}{1+x}dx$ and $I_2 = \int_0^1 \frac{x^2dx}{e^{x^3}\left(2-x^3\right)}$. Then $\frac{I_1}{I_2}$ is

(A) $\frac{3}{e}$ (B) $\frac{e}{3}$ (C) $3e$ (D) $\frac{1}{3e}$

40. Let $f(xy) = f(x).f(y)\ \forall x > 0, y > 0$ and $f(1+x) = 1 + x\{1+g(x)\}$ where $\lim_{x\to 0} g(x) = 0$ then $\int \frac{f(x)}{f'(x)}dx =$

(A) $\frac{x^2}{2} + c$ (B) $\frac{x^3}{3} + c$ (C) $x + c$ (D) $\frac{x^4}{4} + c$

41. If $\int \frac{(x^4+1)}{x(x^2+1)^2}dx = a\log|x| + \frac{b}{x^2+1} + c$ then a + b is equal to

(A) 0 (B) 1 (C) 2 (D) 4

42. If $\int \left(2-3\sin^2 x\right)\sqrt{\sec x}\,dx = 2f(x)\sqrt{g(x)} + c$ and f(x) is non constant function then

(A) $f^2(x) + g^2(x) = 1$ (B) $f^2(x) - g^2(x) = 1$ (C) $f(x)g(x) = 1$ (D) $f(x) = g(x)$

43. $\int \frac{\cos^2 x + \sin 2x}{(2\cos x - \sin x)^2}dx = \frac{\cos x}{(2\cos x - \sin x)} + Ax + B\ln|2\cos x - \sin x| + c$, then (A, B) =

(A) $\left(-\frac{1}{5}, \frac{-2}{5}\right)$ (B) $\left(\frac{1}{5}, \frac{2}{5}\right)$ (C) $\left(\frac{2}{5}, \frac{1}{5}\right)$ (D) $\left(-\frac{1}{\sqrt{5}}, \frac{-2}{\sqrt{5}}\right)$

***Space for rough work***

## SECTION 2 (Maximum Marks: 15)

- This section contains **SEVEN** questions.
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44. $\int \sqrt{x+\sqrt{x^2+2}}\,dx = A\left\{x+\sqrt{x^2+2}\right\}^{3/2} + \frac{B}{\sqrt{x+\sqrt{x^2+2}}} + c$

(A) B = –2 (B) B = $-\frac{1}{4}$ (C) A = $\frac{1}{3}$ (D) A = $-\frac{1}{2}$

45. The value of $\frac{29\int_0^1 (1-x^4)^7\,dx}{4\int_0^1 (1-x^4)^6\,dx}$ is

(A) 0 (B) 5

(C) 7 (D) same as the value of $\int_0^1 (x^2-x)\,dx$

46. $\int_0^{\frac{\pi}{2}} f(\sin 2x).\sin x\,dx =$

(A) $\pi\int_0^{\frac{\pi}{2}} f(\cos x)\,dx$ (B) $\int_0^{\frac{\pi}{4}} \sqrt{2} f(\cos 2x)\cos x\,dx$

(C) $\frac{1}{\sqrt{2}}\int_{\frac{7\pi}{4}}^{\frac{9\pi}{4}} f(\cos 2x)\cos x\,dx$ (D) $\frac{\pi}{4}\int_0^{\frac{\pi}{2}} f(\cos x)\,dx$

***Space for rough work***

47. If $\int \frac{\sin x}{\sin 4x}dx = A\ \ln\left|\frac{1-\sin x}{1+\sin x}\right| + B\ln\left|\frac{1-\sqrt{2}\sin x}{1+\sqrt{2}\sin x}\right| + c$

(A) $A = -\frac{1}{8}$ (B) $A = \frac{1}{8}$ (C) $B = \frac{1}{4\sqrt{2}}$ (D) $B = -\frac{1}{4\sqrt{2}}$

48. $\int \frac{1}{(\sin x + 2\cos x)(\cos x + 2\sin x)}dx =$

(A) $\frac{1}{3}\ln\left|\frac{2\tan x + 1}{\tan x + 2}\right| + c$ (B) $\frac{1}{3}\ln\left|\frac{\tan x + 2}{\tan x + 1}\right| + c$

(C) $\frac{1}{3}\ln\left|\frac{\sin x + \cos x}{2\sin x + \cos x}\right| + c$ (D) $\frac{1}{3}\ln\left|\frac{2\sin x + \cos x}{\sin x + 2\cos x}\right| + c$

49. If $\int f(x)\ \sin x.\cos x\ dx = \frac{1}{2(b^2 - a^2)}\ \ln|f(x)| + c$ then $\frac{1}{f(x)}$ can be

(A) $a^2\sin^2 x + b^2\cos^2 x$ (B) $-a^2\cos^2 x - b^2\sin^2 x$

(C) $\frac{1}{2}\left(b^2 - a^2\right)\cos 2x$ (D) $\frac{1}{2}\left(a^2 - b^2\right)\cos 2x$

50. $\int \frac{4e^x + 6e^{-x}}{9e^x - 4e^{-x}}dx = Ax + B\log_e(9e^{2x} - 4) + C$ then

(A) $A = \frac{-1}{2}$ (B) $A + B = \frac{-19}{36}$ (C) $B = \frac{35}{36}$ (D) $A = 3/2$

***Space for rough work***

## SECTION 3 (Maximum Marks: 18)

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### Paragraph–1

Consider $\int \frac{x^3+3x^2+2x+1}{\sqrt{x^2+x+1}}dx = (ax^2+bx+c)\sqrt{x^2+x+1} + \lambda\int \frac{dx}{\sqrt{x^2+x+1}}$ then

51. Value of c =

(A) $\frac{-13}{6}$ (B) $\frac{-7}{24}$ (C) $\frac{-10}{7}$ (D) 1

52. Value of $\lambda$

(A) $\frac{1}{16}$ (B) $\frac{10}{3}$ (C) $\frac{10}{7}$ (D) 1

### Paragraph–2

Repeated application of integration by parts gives us, the reduction formulae if the integrand depends on a natural number n.

53. If $I_{m,n} = \int x^m (1-x)^{n-1} dx$, then $I_{m,n} - \frac{n-1}{m+n} I_{(m,n-1)} =$

(A) $\frac{x^m(1-x)^{n-2}}{m+n}$ (B) $\frac{x^{m+1}(1-x)^{n-1}}{m+n}$ (C) $\frac{x^{m-1}(1-x)^{n-1}}{m+n}$ (D) $\frac{x^{m-1}(1-x)^{n-2}}{m+n-2}$

54. If $I_n = \int \frac{x^n}{\sqrt{ax^2+2bx+c}}dx$ then $(n+1)aI_{n+1} + (2n+1)bI_n + nc\, I_{n-1}$ is equal to

(A) $x^{n-1}\sqrt{ax^2+2bx+c}$ (B) $\frac{x^{n-2}}{\sqrt{ax^2+2bx+c}}$ (C) $x^n\sqrt{ax^2+2bx+c}$ (D) $\frac{x^n}{\sqrt{ax^2+2bx+c}}$

***space for rough work***

# FIITJEE RET – 8

## (2017 – 2019)(2ND YEAR_REGULAR)

## IIT-2017 (P2)_SET–B

## DATE: 10.09.2018

## ANSWERS

**PHYSICS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | **A** | 2. | **A** | 3. | **D** | 4. | **B** |
| 5. | **B** | 6. | **C** | 7. | **A** | 8. | **A,B,D** |
| 9. | **A,B** | 10. | **A,B,C** | 11. | **AB** | 12. | **B,C,D** |
| 13. | **B,D** | 14. | **B** | 15. | **A** | 16. | **A** |
| 17. | **C** | 18. | **Bonus** | | | | |

**CHEMISTRY**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19. | **A** | 20. | **A** | 21. | **D** | 22. | **A** |
| 23. | **B** | 24. | **C** | 25. | **A** | 26. | **ABC** |
| 27. | **BC** | 28. | **D** | 29. | **ABD** | 30. | **ABC** |
| 31. | **BC** | 32. | **ACD** | 33. | **C** | 34. | **D** |
| 35. | **B** | 36. | **B** | | | | |

**MATHEMATICS**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37. | **A** | 38. | **C** | 39. | **C** | 40. | **A** |
| 41. | **C** | 42. | **A** | 43. | **A** | 44. | **AC** |
| 45. | **C** | 46. | **BC** | 47. | **BD** | 48. | **AD** |
| 49. | **ABC** | 50. | **BC** | 51. | **B** | 52. | **A** |
| 53. | **B** | 54. | **C** | | | | |