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STUDENT EDITION

TUESDAY, SEPTEMBER 28, 2021

PM MODI LAUNCHES PRADHAN MANTRI DIGITAL HEALTH MISSION

Prime Minister Narendra Modi, on Monday, launched the Pradhan Mantri Digital Health Mission(PM-DHM) via video conference.

■ PM-DHM will create a seamless online platform through the provision of a wide-range of data, information and infrastructure services, duly leveraging open, interoperable, standards-based digital systems while ensuring the security, confidentiality and privacy of health-related personal information

■ The mission will enable access and exchange of longitudinal health records of citizens with their consent
The key components of PM-DHM include a health ID for every citizen that will also work as their health account, to which personal health records can be linked and viewed with the help of a mobile application, a Healthcare Professionals Registry (HPR) and Healthcare Facilities Registries (HFR) that will act as a repository of all healthcare providers across both modern and traditional systems of medicine.

CBSE introduces Blockchain TO GO PAPERLESS, MAKE RESULTS TAMPER-PROOF

In a bid to go completely paperless and keep Board results secure and tamper-proof, the Central Board of Secondary Education (CBSE) has introduced 'Blockchain' technology. The CBSE Director of Information and Technology, Antriksh Johri, said, "Blockchain implementation has been done by CBSE. Earlier, we introduced Artificial Intelligence (AI) and Machine learning (ML) for affiliation systems. Here, the data is linked and stored with cryptographic security so that it is immutable and traceable." Johri further stated, "This will serve as a single source truthful data for verification for students going for higher education or employment."

■ Blockchain technology records the data in a distributed ledger with the ownership of all participating stakeholders. The data is recorded in the chain based on the consensus among the stakeholders and simultaneously replicated at all the locations in the distributed network of BlockChain nodes
■ This eliminates the dependency on a third party for verification. The data of the last three years, starting from 2019 has been recorded in this, and the other data of previous years will be uploaded gradually

In 2016, CBSE was the first to develop its own academic repository named 'Parinam Manjusha'

$3.7 TRILLION

SOCIAL COST OF PLASTIC; MORE THAN INDIA'S GDP!

According to the World Wild Fund (WWF), the pollution, emissions and clean-up costs of plastic produced in 2019 alone could be $3.7 trillion. In the same year, **India's GDP was at around $2.87 trillion**. The report, titled 'Plastics: The Cost to Society, Environment and the Economy', warns that unless urgent action is taken, these social costs for plastic produced in **2040 will rise to $7.1 trillion — greater than the combined GDP of Germany, Canada and Australia in 2019.** "Tragically, the plastic pollution crisis is showing no signs of slowing down," said Marco Lambertini, director-general of WWF International. If the status quo remains, we might end up with more plastic than fish way before 2050, he added.

FACTOID

By social or societal costs, the wildlife body means the pollution, emissions and clean-up costs of plastic pro-

DID YOU KNOW?

Since the 1950s, roughly 8.3 billion metric tons of plastic have been produced. Nearly 60 per cent of that plastic finds its way into the landfills or the natural environment, and eventually, a bulk of that ends up in the oceans. While the plastic in the oceans finds its way into the turtles' guts, the plastic debris in the landfills is responsible for the deaths of more than a million seabirds and more than 100,000 marine mammals each year

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VIEWPOINT

A law on front-of-pack labelling on packaged junk food?

To help India fight obesity and diet-related non-communicable diseases (NCDs) epidemic, the Centre for Science and Environment (CSE) has called for a law on front-of-pack labelling to inform the consumers about the unhealthy packaged junk food, enabling them to make informed decisions about what they intake. "Countries are working to find ways to nudge the consumers into healthy food choices and to contain the growing crisis of obesity and diet-related NCDs such as diabetes, hypertension and heart ailments. It is a crisis that increasingly impacts children and also worsens the Covid-19 symptoms," said Sunita Narain, Director General, CSE.

The analysis underlined how even after seven years, four committees and two draft regulations, India still does not have the much-needed front-of-pack labelling law to warn the consumers about the harmful levels of fat, salt and sugar hiding in ultra-processed junk food.

■ The analysis clearly enumerates how the draft thresholds –limits above which a product could be marked unhealthy– proposed by the FSSAI-constituted working group have suited the packaged food industry, as they were much relaxed than those proposed by the FSSAI in its earlier labelling drafts of 2018 and 2019 as well as those adopted by countries with best practices. The proposed thresholds have now been put on hold after most consumer organisations opposed them

■ This working group was formed to look into the issue of thresholds following a CSE study in December 2019, which said that most popular packaged junk food have salt and fat content several times higher than the thresholds proposed by the FSSAI in its labelling drafts of 2018 and 2019. Therefore, they would have been marked 'red' as per the proposed law at that time.

Share your views at toinie175@gmail.com

SRK makes it to Indian Sign Language dictionary

Actor Shah Rukh Khan's name has been included among the 10,000 words in the Indian Sign Language(ISL) dictionary, which was launched by Prime Minister Narendra Modi recently. Deaflympics, online banking and carpooling are some of the words that have been newly-drafted into the digital dictionary of India's non-voiced lexicon.

One needs to hold the fingers of their right hand like a gun and tap on their heart twice to signify Shah Rukh Khan

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TWITTER WILL ALLOW HOSTS TO ADD TOPICS TO SPACES

Micro-blogging site Twitter is set to add topics to Spaces for hosts to tag their Spaces with up to three relevant topics. "New in Spaces: Topics, when creating or scheduling a Space,

TECHAWAY

Currently, there are only 10 Topics to choose from limited to English. The initial 10 Topics are business, finance, music, sports, technology, gaming, world news, entertainment, arts-culture, home-family and careers

some of you on Android can choose up to 3 Topics to tag it with from a list of our top 10 Topics. But it's only 10 Topics for now and we'll expand as we build together," the company said in a tweet.

1 Twitter also started rolling out a new update to Spaces to allow hosts to designate up to two co-hosts for its social audio rooms

2 The update will make it easier for hosts of the audio space to help manage and

moderate conversations

3 Once invited, the co-hosts have almost all the same moderation and managing privileges as the main host, they can speak, invite other members of the room to speak, pin tweets, boot people from the room, and more

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02

You don't have to see the whole staircase. Just take the first step.
-Martin Luther King Jr

FOCUS. LEARN. MASTER

TUESDAY, SEPTEMBER 28, 2021

Exams R fun

CLASS: XII - 2020-21
SUBJECT: PHYSICS (CBSE)
Time Allowed: 3 Hours
Maximum Marks: 70

REVISE, MAKE A QUANTUM LEAP IN PHYSICS EXAM

PAPER SET BY SUNITHA GUJJULA, PRINCIPAL, WESTBERRY SCHOOL, BHIMAVARAM, ANDHRA PRADESH

SECTION-A

All questions are compulsory. In case of internal choices, attempt any one of them.

Q1. An electron beam is moving vertically upwards. If it passes through a magnetic field directed from South to North in a horizontal plane, in what direction will the beam be deflected? [1]

Q2. Two long, parallel wires are separated by a distance d, as shown. One wire carries a steady current I into the plane of the page while the other wire carries a steady current I out of the page. At what points in the plane of the page and outside the wires, besides points at infinity, is the magnetic field due to the currents zero? Justify your answer. [1]
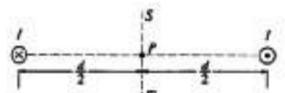
Q3. A strong bar magnet is held very close to the opening of a solenoid as shown in the diagram. As the magnet is moved away from the solenoid at constant speed, what is the direction of conventional current through the resistor? [1]

OR

Define capacitor reactance. Write its S.I. units?

Q4. Identify the part of the electromagnetic spectrum to which the following wavelengths belong: [1]
(i) 10^{-1} m **(ii)** 10^{-12} m

Q5. An electron and alpha particle have the same de Broglie wavelength associated with them. How are their kinetic energies related to each other? [1]

Q6. According to the Bohr Theory of the hydrogen atom, electrons starting in the 4th energy level and eventually ending up in the ground state, could produce a total of how many lines in the hydrogen spectra? [1]

Q7. In decay of free neutron, name the elementary particle emitted along with proton and electron in nuclear reaction. [1]

Q8. How does the width of a depletion region of a pn junction vary if doping concentration is increased? [1]

OR

In half wave rectification, what is the output frequency if input frequency is 50 Hz.

Q9. Which specially fabricated pn junction diode is used for detecting light intensity? [1]

Q10. When a voltage drop across a pn junction diode is increased from 0.50 V to 0.51V, the change in the diode current is 9 mA. What is the dynamic resistance of diode? [1]

For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true but R is NOT the correct explanation of A
c) A is true but R is false
d) A is false and R is also false

Q11. Assertion: The focal length of lens changes when red light is replaced by blue light.
Reason: The focal length of lens does not depend on colour of light used.

Q12. Assertion: Propagation of light through an optical fibre is due to total internal reflection taking place at the core - clad interface.
Reason: Refractive index of material of core of optical fiber is greater than that of air.

Q13. Assertion: In bringing an electron towards a proton electrostatic potential energy of the system decreases.
Reason: Potential due to proton is negative.

Q14. Assertion: Two particles of same charge projected with different velocity normal to electric field experience same force
Reason: A charged particle experiences force , independent of velocity in electric field

SECTION-B (4 MARKS EACH)

Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.

Q15. Suppose the parallel plates in the above Fig. each have an area of 0.2 m2 and are 1 cm apart. We connect the capacitor to a power supply, charge it to a potential difference of 3 k V and disconnect the power supply. We then insert a sheet of insulating plastic material between the plates, completely filling the space between them. We find that the potential difference decreases to 1 kV while the charge on each capacitor plate remains constant.

1. The capacitance after the dielectric is inserted
a) 431 pF **b)** 531 pF **c)** 631 pF **d)** 731 pF
2. The dielectric constant of the dielectric
a) 1 **b)** 2 **c)** 3 **d)** 4
**3.** The original electric field between the plates
a) 1×10^5 V/m **b)** 2×10^5 V/m
c) 3×10^5 V/m **d)** 4×10^5 V/m
4. The electric field after the dielectric is inserted.
a) 1×10^5 V/m **b)** 2×10^5 V/m
c) 3×10^5 V/m **d)** 4×10^5 V/m

Q16. Coherent monochromatic light of wavelength ? in air is incident on two narrow slits, the centers of which are 2 mm apart, as shown below. The interference pattern observed on a screen 5 m away is represented in the figure by the graph of light intensity I as a function of position x on the screen.
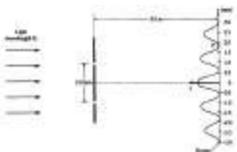
1. At point P (1.8 mm) in the diagram, there is a minimum in the interference pattern. Determine the path difference between the light arriving at this point from the two slits.
a) 6.2×10^{-7} m **b)** 7.2×10^{-7} m
c) 8.2×10^{-7} m **d)** 9.2×10^{-7} m
2. Determine the wavelength, ?, of the light.
a) 1.8×10^{-7} m **b)** 2.8×10^{-7} m
c) 3.8×10^{-7} m **d)** 4.8×10^{-7} m
3. What is fringe width?
a) 1.2mm **b)** 2.2mm **c)** 3.3mm **d)** 4.3mm
4. What is fringe width if above experiment is performed in water having refractive index 4.3?
a) 0.8mm **b)** 0.9mm **c)** 1.6mm **d)** 1.8mm

SECTION-C (2 MARKS)

All questions are compulsory. In case of internal choices, attempt anyone.

Q17. A square loop of wire 0.3 meter on a side carries a current of 2 amperes and is located in a uniform 0.05-tesla magnetic field. The left side of the loop is aligned along and attached to a fixed axis. When the plane of the loop is parallel to the magnetic field in the position shown, what is the magnitude of the torque exerted on the loop about the axis?

Q18. Obtain the expression for the potential energy of an electric dipole of dipole moment **p** placed in an electric field **E**.

OR

(i) Can two equi-potential surfaces intersect each other? Give reasons.
(ii) Two charges -q and + q are located at points A (0, 0, - a) and B(0, 0, + a) respectively. How much work is done in moving a test charge from point P(7, 0, 0) to Q(-3, 0, 0)?

Q19. Explain with help of circuit diagram, the action of a forward biased p-n junction diode which emits spontaneous radiation. State the least band gap energy of this diode to have emission in visible region.

Q20. A square loop is placed in a uniform magnetic field perpendicular to the plane of the loop as shown. The loop is 0.50 meters on a side and the magnetic field B has a strength of 2 T. If the loop is rotated through an angle of 90° in 0.1 second what would be the average induced EMF in the loop?
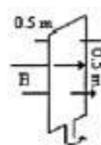
Q21. In a single slit diffraction experiment, when a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the shadow of the obstacle. Explain why? State two points of difference between the interference pattern obtained in Young's double slit experiment and the diffraction pattern due to a single slit.

Q22. Waves are produced by two point sources S and S' vibrating in phase. See the diagram. X represents the location of the 2nd dark fringe. The path difference SX - SX is 4.5 cm. Then find the wavelength of the waves (approximately)

Q23. A ray of light, incident on an equilateral glass prism ($\mu = \sqrt{3}$) moves parallel to the base line of the prism inside it. Find the angle of incidence for this ray.

Q24. What happens to the resistance of a p-n junction when it is **(i)** forward biased, **(ii)** reverse biased?

Q25. (i) Name the three elements of the Earth's magnetic field.
(ii) Where on the surface of the Earth is the vertical component of the Earth's magnetic field zero?

SECTION-D (3 MARKS)

All questions are compulsory. In case of internal choices, attempt any one.

Q26. Using the postulates of Bohr's model of hydrogen atom, obtain an expression for the frequency of radiation emitted when atom make a transition from the higher energy state with quantum number ni to the lower energy state with quantum number nf (nf <ni).

Q27. Light of wavelength 2000 Å falls on a metal surface of work functions 4.2 eV. What is the kinetic energy (in eV) of the fastest electrons emitted from the surface?
(i) What will be the change in the energy of the emitted electrons if the intensity of light with same wavelength is doubled?
(ii) If the same light falls on another surface of work functions 6.5 eV, what will be the energy of emitted electrons?

Q28. A cell of emf 'E' and internal resistance 'r' is connected across a variable load resistor R.
Draw the plots of the terminal voltage V versus **(i)** R and **(ii)** the current I.
It is found that when R=4 ohm, the current is 1 A and when R is increased to 9 ohm, the current reduces to 0.5 A. Find the values of the emf E and internal resistance r.

OR

Explain the term 'drift velocity' of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of 'drift velocity'. From above expression obtain ohms law.

Q29. An inductor L of inductance XL is connected in series with a bulb B and an ac source. How would brightness of the bulb change when
(i) number of turn in the inductor is reduced, **(ii)** an iron rod is inserted in the inductor and **(iii)** a capacitor of reactance XC = XL is inserted in series in the circuit.
Justify your answer in each case.

Q30. a) Give one point of difference between nuclear fission and nuclear fusion.
b) Suppose we consider fission of a 56Fe26 into two equal fragments of 28Al 13nucleus. Is the fission energetically possible? Justify your answer by working out Q value of the process. Given (m) 56Fe26 = 55.93494 u and (m) 28Al 13 = 27.98191

SECTION-E (5 MARKS)

All questions are compulsory. In case of internal choices, attempt any one.

Q31. Draw a labelled ray diagram of a compound microscope and write an expression for its magnifying power. The focal length of the objective and eye-lens of a compound microscope are 2 cm, 6.25 cm respectively. The distance between the lenses is 15 cm.
(i) How far from the objective lens, will the object the be kept, so as to obtain the final image at the near point of the eye?
(ii) Also calculate its magnifying power.

OR

Draw a labelled ray diagram of an astronomical telescope, in the normal adjustment position and write the expression for its magnifying power. An astronomical telescope uses an objective lens of focal length 15 m and eye-lens of focal length 1 cm. What is the angular magnification of the telescope?
If this telescope is used to view moon, what is the diameter of the image of moon formed by the objective lens? (Diameter of moon =3.5 ×10⁶ m and radius of lunar orbit =3.8×10⁸m).

Q32. Describe briefly, with the help of a labelled diagram, the basic elements of an AC generator. State its underlying principle. Show diagrammatically how an alternating emf is generated by a loop of wire rotating in a magnetic field. Write the expression for the instantaneous value of the emf induced in the rotating loop.

OR

A series LCR circuit is connected to an ac source having voltage v=vₘ sin ωt. Derive the expression for the instantaneous current J and its phase relationship to the applied voltage. Obtain the condition for resonance to occur.
Draw the graph between current and applied frequency.

Q33. (a) Define electric flux. Write its S.I. units.
(b) Using Gauss's law, prove that the electric field at a point due to a uniformly charged infinite plane sheet is independent of the distance from it.
(c) How is the field directed if **(i)** the sheet is positively charged, **(ii)** negatively charged?

OR

(a) Define electric dipole moment. Is it a scalar or a vector? Derive the expression for the electric field of a dipole at a point on the equatorial plane of the dipole. **(b)** Draw the equipotential surfaces due to an electric dipole. Locate the points where the potential due to the dipole is zero.

PLASMOLYSIS AND DEPLASMOLYSIS

MY SCHOOL PROJECT

Our school gave us the opportunity to showcase our scientific interests through experiments at the Science Fair. As Biology is a subject that interests me, I decided to perform an experiment on plasmolysis which refers to the shrinkage of the protoplasm of a plant cell from its cell wall due to exosmosis under the influence of hypertonic solution.
Plasmolysis can either be concave or convex. It is divided into three stages - incipient (initial stage), evident and final plasmolysis stage.

ABSTRACT

Onion peel undergoes plasmolysis under the influence of salt solution, and if the process is reversed, it will undergo deplasmolysis and get back its original structure.
Therefore, the question is, how does onion behave in salt solution?
The variables are salt solution and water.
When onion comes in contact with salt solution (minimum 11 M concentration), the cell content should shrink to the bottom of the cell and revert if diluted.

LIST OF MATERIALS USED

1. Glass cover
2. Microscopic slides
3. Microscope
4. Onion peel
5. Sodium Chloride (Table salt)
6. Distilled water

THE EXPERIMENT

1. Prepare a slide with an onion peel.
2. Place it under the microscope and note your observations (The higher the magnification, the better for you to observe the effects. The images in this report are at 2000x magnification).
3. Drop two to three drops of 11g of NaCl mixed in 100ml of water, on the slide. Use a filter paper to help the water seep into the onion peel by capillary movement. Now place this slide under the microscope.
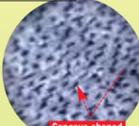
OBSERVATION

Normal cells of an onion peel before adding the salt solution. The structure of the cells is defined and rectangular in shape.

NOTE:
No liquids or stains were used while preparing the onion peel slide.

Cells as observed after 10 minutes of placing the NaCl solution on the onion peel.

The onion peel has undergone concave plasmolysis. This is the process where the plasma membrane separates from the cell wall due to the formation of several concave pockets.

Concave shaped pockets

DEPLASMOLYSIS

Plasmolysis is reversible. This is deplasmolysis, where the cell structure can be reversed into its original shape and turgidity by placing it in a hypotonic solution (diluted NaCl solution).
Water enters the plasmolysed cell leading to the enlargement of the protoplasm into its original size.

CONCLUSION

Plasmolysis is the contraction of the cell membrane as a result of water loss from the cell.

WHAT'S NEXT?

Given the opportunity, I'd like to take this one step further and try to understand the impact of plasmolysis/deplasmolysis on the strength or life of the cell walls and its impact on the life of the plant.

Vreethi K, Class XI, DPS Whitefield, Bengaluru