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Technology for Self Reliance

English Language questions

OPTION I

Read the passage below and answer the questions that follow.

Our planet is at risk. Our environment is under threat. The air we breathe, the water we drink, the seas we fish in, the soils we farm, the forest, animals and plants which surround us are in danger. More and more gases and rubbish escape from our factories. Rubbish, oil spillage and detergents damage our rivers and seas. The loss of forests results in soil erosion and also endangers wildlife.

The richer countries of the world are mainly responsible for industrial pollution. This is where most of the commercial energy is consumed. In developing countries, poverty causes people to overgraze grasslands and to cut down trees for timber building, furniture and fuel. They are also destroyed to provide land on which to graze animals and build new villages and towns.

But trees are needed to protect the land from heavy down pour of rain and their roots help hold the soil together. In our forests, there may be plants and animals which could help in the discovery of new medicines or crops.

To rescue and conserve our beautiful world, we must act cooperatively. Individuals, communities, nations and international associations, all have a responsibility. By learning to protect the natural environment, we can manage the earth's resources for generations to come.

1. The risk referred to in the passage is
 - A. sociologically produced
 - B. environmentally induced
 - C. industrially produced
 - D. man-made.

2. According to the passage, the size of the forest depleted annually is
 - A. minimal
 - B. colossal
 - C. infinitesimal
 - D. infinite.

3. The writer holds the advanced nations responsible for industrial pollution because of their
 - A. technological innovations
 - B. energy requirements
 - C. industrial revolution
 - D. environmental production.

4. The writer's message is that
 - A. developed countries need to assist the poorer ones.
 - B. global warming will increase



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- C. researchers should produce medicines from forests
D.. the natural environment needs to be protected.
5. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. The presence of the principal makes the students ill at ease.
- A. easily ill
B impatient
C uncomfortable
D sickly.
6. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. In spite of the harsh realities at home, Tutu treats her studies with considerable levity.
- A. lassitude
A. wastefulness
C. seriousness
D. enthusiasm
7. Choose the most appropriate option opposite in meaning to the italicized word/phrase. I find open-ended questions more challenging in tests.
- A. easy
B. multiple-choice
C. essay-type
D. gap-completion
8. Choose the most appropriate option opposite in meaning to the italicized word/phrase. Ojo's knowing smile infuriated his sister
- A. confused
B. surprised
C. annoyed
D. pleased



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9. Which of the following highlighted consonants is pronounced differently from the others?

- A. fife
- B. off
- C. laugh
- D. of

10. Which of these words has a vowel pronounced differently from the others?

- A. steak
- B. break
- C leak
- D. strange

OPTION II

Read the passage below and answer the questions that follow.

Delinquency describes actions that would not be crimes if performed by adults. If a young person performs one of such actions then he or she has committed a crime. Delinquency is one of several status offences – offences that can be committed only by people in particular stations of life as determined by age, profession or a person's role in society. For young people such offences include drinking, driving and smoking under age. Usually they are offences only to the extent that they help preserve some of the good things of life for the exclusive enjoyment of the adult world. Delinquency is therefore a weapon forged in adult minds and directed by adult hands against young people. It is born out of envy, adult pride and intolerance. If the world changed overnight and the responsibility to make and enforce laws fell on juvenile shoulders, the adults should expect a raw deal in return. Delinquency would then certainly refer only to many of the adult actions now freely committed by them.

11 The writer of the passage believes that delinquency laws are

- A. only fit for young people
- B. not relevant to human society
- C unfair to the juveniles
- D. very fair to the adult world.

12 In the view of the writer drinking under age is an offence because

- A. adults do not want the juveniles to get drunk



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- B. adults have a duty to protect young persons
C adults want to have all the drinks to themselves
D. drunken juveniles can cause disorder in the society.
- 13 Status offences are
A. very fair to the adult world.
B. not relevant to human society
C. unfair to the young people
D. only fit for young people.
14. If the world changed overnight
A delinquency would no longer be a crime
C. delinquency would also change in meaning
C. there would be no more delinquency
D. delinquency would refer to all adult actions.
15. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase People could not understand why a man of means should live a Spartan life.
A. foreign
B. frugal
C. extravagant
D. flamboyant
- 16 choose the most appropriate option nearest in meaning to the italicized word/phrase.
My boss is an exacting taskmaster.
A. hardworking
B. easygoing
C demanding



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- D. cooperative

17. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. The *explosive* growth in world population is partly due to improved healthcare.

- A. gradual
- B. sudden
- C. combustible
- D. dangerous

18. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. I would have enjoyed the novel but for its *convoluted* theme.

- A. simple
- B. complex
- C. immoral
- D. boring

19. Which of the following highlighted consonants is pronounced differently from the others?

- A. chef
- B. shoe
- C. chief
- D. ocean

20. Which of these words has a vowel pronounced differently from the others?

- A. key
- B. quay
- C. steak
- D. greed



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OPTION III

Read the passage below and answer the questions that follow.

Standard English refers to the authoritative and correct use of the language, the medium of expression for government and education. Its opposite is a dialectal variant of the language, that is, accepted and recognized words, expressions and structures peculiar to a smaller group of language users who are generally set apart from standard usage by cultural group or geographical region. For example, Nigerian, American, Irish and British English differ from one another in many respects and each is identifiable, yet in every case the standard (formal) variety approaches a single and hypothetical classification known as International English. As one moves towards informality and away from the observance of strict rules, emphasis falls on the difference between dialects. In addition to American English being distinguishable from British English, it is also true that British English is not uniform within the United Kingdom. The level of formality is determined by education and aspiration, while dialects vary from region to region.

21. One characteristic of a dialect as mentioned in the passage is its

- A. possession of variants
- B. informality
- C. distinction from British English
- D. restricted area of usage

22. According to the author, Nigerian and American English are

- A. standard varieties
- B. registers
- C. different languages
- D. different styles

23. The author considers International English

- A. an arbitrary classification
- B. an informal standard
- C. an imaginary classification
- D. a recognized formal standard



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24. The observance of strict rules is a feature of
- A. variety
 - B. unconventionality
 - C. formality
 - D. languages.
- 25 **Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase.** He was under pressure to **retract** his statement before the panel.
- A. reiterate
 - B. withdraw
 - C. assert
 - D. repeat
26. **Choose the most appropriate option nearest in meaning to the italicized bold word/phrase** His family wishes he would stop his **nefarious** activities
- A. nocturnal
 - B. respectable
 - C. promiscuous
 - D. degenerate
27. **Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase.** The nouveau riche tend to be **niggardly** in their ways.
- A. Stingy
 - B. miserly
 - C. generous
 - D. beggarly



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28. Choose the most appropriate option nearest in meaning to the italicized word/phrase.
Mrs Ojodu may be well-heeled but her dressing is often tasteless.

- A. vulgar
- B. garish
- C sophisticated
- D. salty

- 29 Which of the following highlighted consonants is pronounced differently from the others?

- A. tight
- B. Thames
- C though
- D. team

30. Which of these words has a vowel pronounced differently from the others?

- A. gloom
- B. glum
- C. glue
- D. glume

OPTION IV

Read the passage below and answer the questions that follow.

Erosion in nature is a beneficent process without which the world would have died long ago. The same process, accelerated by human mismanagement, has become one of the most vicious and destructive forces that have ever been released by man. ‘Geological erosion’ or ‘denudation’ is an early and important process in soil formation, whereby the original rock material is continuously broken down and sorted by wind and water until it becomes suitable for colonization by plants. Plants, by the binding effects of their roots, by the protection they afford against rain and wind and by the fertility they impart to the soil, bring denudation almost to a standstill. Nevertheless, some slight denudation is always occurring. As each superficial film of plant-covered soil becomes exhausted it is removed by rain or wind, to be deposited mainly in the rivers and sea, and a corresponding thin layer of soil forms by slow weathering of the



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Technology for Self Reliance

underlying rock. The depth is sometimes only a few inches, occasionally several feet deep, but within it lies the whole capacity of the earth to produce life. Below that thin layer comprising the delicate organism known as soil is a planet as lifeless as the moon.

31. ‘Geological erosion’ means the same as

- A. soil erosion
- B. natural erosion
- C. erosion by man
- D. all of the above

32. Denudation

- A. is an important process in soil formation
- B. destroys the surface of the earth
- C. results from man’s reduction of soil fertility
- D. will bring national extinction

33. One important function of plants is to:

- A. denude the soil
- B. bind and fertilize the soil
- C. erode the soil to smoothness
- D. look pretty

34. The layer of soil is generally

- A. between a few inches and a few feet deep.
- B. miles deep
- C. never more than a few inches deep
- D. as lifeless as the moon.



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35. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. Practising law is not as lucrative as people think.
- A. know
 - B. understand
 - C assume
 - D. consider
- 36 Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. The family puts up a brave face but their financial situation is precarious
- A. buoyant
 - B. precious
 - C. unjustifiable
 - D. insecure
37. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. As is usually the case when Tanus got involved, the discussion became animated.
- A. unruly
 - B. specialized
 - C. lively
 - D. boring
38. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. Gender-sensitivity is part of the new political correctness.
- A. inclusiveness
 - B. naiveté
 - C insensitivity
 - D. ideology



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39. Which of the following highlighted consonants is pronounced differently from the others?

- A. world
- B. **w**hore
- C. hoar
- D. **w**hole

40. Which of these words has a vowel pronounced differently from the others?

- A. beast
- B. heft
- C. breast
- D. wealth

OPTION V

Read the passage below and answer the questions that follow.

When, in the course of human events, it becomes necessary for one people to dissolve the bands that have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and nature's God entitle them, a decent respect to the opinions of humanity requires that they declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all human beings are created equal, that they are endowed by their creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness. We affirm also that to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed. Whenever any form of government becomes destructive of these ends, it is the right of the people to alter or abolish it, and to institute a new government, laying its foundations on such principles, and organising its power in such form, as to them shall seem most likely to secure their safety and happiness.

Adapted from *The Declaration of Independence*

41. Why does the writer find it necessary to state the reasons that the colonies have for breaking away from their colonial masters ?

- A. because they have had a long relationship with the colonial power



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- B. because they were obedient to God's laws
- C in order to show that they respect world opinion
- D. because they have been a colony for a long time.
42. When, according to the author, can people excusably put an end to any form of government?
- A. when that government rigs elections
- B. when the literate citizens no longer respect the government
- C. when the government has stayed too long in power
- D. when the government stops protecting the rights of the people
43. By saying that some truths are 'self-evident', the writer means that those assertions
- A. can be defended
- B. cannot be disputed
- C. need evidence
- D. none of the above
44. The right of a nation to self-governance derives ultimately from
- A. the strength of that nation
- B. a respect for the opinions of human beings
- C the laws of God
- D. the laws of nature
45. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. The little village became more enchanting at dusk.
- A. bewitched
- B accommodating
- C attractive



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- D. fascinating
46. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase. More students are relying on virtual resources for study and entertainment.
A. fundamental
B. righteous
C. automated
D. computer-generated
47. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase.. I wonder why her brother is indifferent to her financial situation.
A. Interested in
B. troubled by
C. discouraged by
D. filled with
48. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. I would have enjoyed the novel but for its convoluted theme.
A. simple
B. complex
C. immoral
D. boring
49. Which of the following highlighted consonants is pronounced differently from the others?
A. hiccough
B. poppy
C. cup
D. tough



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50. Which of these words has a vowel pronounced differently from the others?

- A. height
- B. high
- C. heist
- D. eight

OPTION VI

Read the passage below and answer the questions that follow.

We knew early in life that the atmosphere in our home was different from that in many other homes where husbands and wives quarrel and where there was drunkenness, laziness or indifference – things we never saw in our family. We also knew that our father was an uncommon man. Whenever my mother was away, my father could and did do all the household jobs. We lived in this way in a community in which housework was regarded as being beneath male dignity. In our family, however, boys did girls' work and my father did it with us.

We had to get water at the public tap nearly a kilometre away from our house and make the trek back with water tins balanced on our heads. All the children in the neighbourhood knew we did women's work, and I can still hear their derisive laughter. We did our jobs doggedly because our parents expected it of us. Out of choice, our father did everything we did, including fetching water on occasion, and commanded us by sheer force of his example.

51. By describing his father as *an uncommon man*, the writer means that he is

- A. aristocratic
- B. lazy
- C. remarkable
- D. amenable

52. Which of the following was likely to be true of the writer's family when he was young?

- A. his mother was lazy
- B. his father was a drunk
- C. the family was happy
- D. the sons were ruffians



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53. Which of the following describes the father's role in the family?

- A.. serving the wife
- B. being too hard on the children
- C leading by example
- D. usurping the wife's role

54. Now that the writer is grown up, he

- A. thinks that he had a miserable childhood.
- B. thinks that his father was a bully
- C is grateful for his upbringing
- D. sad about his upbringing

55. **Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase.** He was under pressure to retract his statement before the panel

- A. reiterate
- B. withdraw
- C. assert
- D. repeat

56. **Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase.** He was told to forget the niceties and go straight to his main point

- A. specifics
- B. politeness
- C. greetings
- D. nice things



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57. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. Our visit to the village was *nothing to write home about*.

- A. not interesting
- B. not a home affair
- C quite pleasant
- D. nobody's business

58. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. Ojo's knowing smile *infuriated* his sister

- A. confused
- B. surprised
- C. annoyed
- D.C pleased

59. Which of the following highlighted consonants is pronounced differently from the others?

- A. dung
- B. dog
- C. dagger
- D. agog

60. Which of these words has a consonant pronounced differently from the others?

- A. tough
- B. Thames
- C though
- D. team



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OPTION VII

Read the passage below and answer the questions that follow.

Creoles, according to the most general account, arise when a pidgin language becomes the native language of a new generation of children. One way this can come about is when a man and woman who speak different languages marry, both know a pidgin, and neither learns the other's language. The pidgin then becomes the shared home language and becomes the mother tongue of the children. A setting in which this has happened occurred during the bleakest days of slavery in the Western hemisphere, when efforts were made to separate African slaves with the same native language in order to forestall insurrections. Only pidgin languages were available as common languages and they became the basis for the mother tongue of new generations.

Once a pidgin language becomes a mother tongue, it must support all the interactive needs of its speakers, since they have no other language to fall back on. A creole becomes simpler (in the sense of more regular) and expands its grammatical machinery, as well as stabilizing and expanding its lexicon. If a creole is in touch with its lexifier language, it may 'decreolize' and develop varieties increasingly like the lexifier language. If the less decreolized varieties fall out of use, the decreolized remnants of the old creole may be seen simply as substandard dialects of the lexifier language. As we will see, this has been proposed as the origin for the US Vernacular Black English.

61 . Creoles may be defined as:

- (A) a pidgin spoken by West African slaves,
- (B) a pidgin that has acquired native speakers,
- (C) a native language of a new generation of children,
- (D) the mother tongue of children born in an inter-ethnic marriage.

62. African slaves who spoke the same language were separated ...

- (A) in order to make them forget their first languages,
- (B) so that there would be no rebellion,
- (C) so that they would learn their master's language,
- (D) to make their days bleaker.

63 The following are characteristics of a creole language except...

- (A) an expanded vocabulary,



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- (B) varieties similar to the lexifier language,
(C) young native speakers,
(D) a more regular grammatical system.
64. Vernacular Black English is ...
(A) a pidgin,
(B) a creole,
(C) a decreolized variety,
(D) a less decreolized variety.
65. Choose the most appropriate option nearest in meaning to the italicized word/phrase.
He is a prolific writer as well as a human rights activist.
A. well-known
B. productive
C. promising
D. promiscuous
66. Choose the most appropriate option nearest in meaning to the italicized word/phrase.
Her meddlesome husband ruined her business relationships.
A. uncaring
B. detached
C prying
D. intimidating
67. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. The government is making concerted efforts at improving the standard of living in the rural areas.
A. dissipated



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- B. unconcerned
C. uncontrolled
D. unsuccessful
68. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase. The politician's passionate appeal doused the tension
A. heightened
B. smothered
C. lifted
D. drowned
69. Which of the following highlighted consonants is pronounced differently from the others?
A. dodge
B. doge
C. dogged
D. drudge
70. Which of these words has a vowel pronounced differently from the others?
A. stead
B. stealth
C steam
D. bread

OPTION VIII

Read the passage below and answer the questions that follow.



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Underlying any relationship between Haiti and Africa is the fact that the population of that country originated from Africa to a far greater extent than on other Caribbean Islands; 90% of the Haitians are full-blooded Negroes, the rest mulattoes. The total eradication of the white element was the consequence of a particular political and economic situation of the island Saint-Domingue, which was the name of Haiti under French colonization. Other than on the other Caribbean islands where the early arrival of European settlers resulted in a development of a white indigenous population, Saint-Domingue remained untouched until 1697, when the peace treaty of Riswyck ended the dispute between France and Spain over the ownership of this island. At that time it had already been proved that the production of sugar was the most profitable industry in this area particularly if the estates were large enough and labour costs could be kept low by extensive use of slave labour, which was brought over from Africa. So the new settlers of Saint-Domingue belonged to two groups greatly contrasted in social condition and number. On the one side, there was a small group of French noblemen, owners of immense sugar estates maintaining in Saint-Domingue the privileges which they had lost in France under Louis XIV, on the other side there were the African slaves living in miserable conditions but conscious that they outnumbered their masters by hundreds of thousands. These contradictions within the society led to the outbreak of the slave revolt in 1792, which differed from other revolts in that area in that it was successful, and in 1804 after many ups and downs the victorious slaves of Saint-Domingue proclaimed a new state, named Haiti. Most of the white landlords had fled the island during the hostilities and the few remaining ones were killed after independence.

71. The population of Haiti

- A. is made up predominantly of mulattoes
- B. originated from Spain and France
- C. originated predominantly from Africa
- D. came from other Caribbean Islands

72. Haiti did not develop a white indigenous population as early as other Caribbean Islands because

- A. it was less suited for sugar cultivation
- B. there was a controversy over the ownership of the island
- C. the indigenous Negro population was very hostile
- D. the island was not discovered early enough

73. The French settlers preferred to live in Saint-Domingue because

- A. Louis XIV allowed them their usual privileges there



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Technology for Self Reliance

- B. the African slaves there lived in miserable conditions
- C. they could enjoy the rights they had lost in France
- D. they were not patriotic
74. The clause, ‘which differed from other revolts in that area in that it was successful,’ suggests that
- A. there were many successful slave revolts
- B. slave revolts were not unusual then in the Caribbean
- C. the islands of the Caribbean are ruled by rebel slaves
- D. the slaves in Saint-Domingue differed with slaves on other islands
75. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase.
- A. The young groom is quite an astute businessman.
- A. acute
- B. shrewd
- C. honest
- D. considerate
76. Choose the most appropriate option nearest in meaning to the italicized or bold word/phrase.

The family puts up a brave face but their financial situation is precarious.

- A. buoyant
- B. precious
- C. unjustifiable
- D. insecure



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77. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase.

The volume contains the **complete** works of Shakespeare.

- A. reprinted
- B. abridged
- C. edited
- D. selected

78. Choose the most appropriate option opposite in meaning to the italicized or bold word/phrase .I find **open-ended** questions more challenging in tests.

- A. easy
- B. multiple-choice
- C. essay-type
- D. gap-completion

79. Which of the following highlighted **consonants** is pronounced differently from the others?

- A. **chalet**
- B. **champion**
- C. **chagrin**
- D. **chaise**

80. Which of these words has a **vowel** pronounced differently from the others?

- A. steak
- B. break
- C. leak
- D. strange



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English language Answers

1 D 21 D 41 C 61 B 11 C 31 B 51 D 71 C
2 B 22 A 42 D 62 B 12 C 32 A 52 C 72 B
3 B 23 C 43 B 63 B 13 C 33 B 53 C 73 C
4 D 24 C 44 C 64 C 14 B 34 A 54 C 74 C
5 C 25 B 45 D 65 B 15 B 35 C 55 B 75 B
6 C 26 D 46 D 66 C 16 C 36 D 56 A 76 D
7 B 27 C 47 A 67 A 17 A 37 D 57 C 77 D
8 C 28 C 48 A 68 A 18 B 38 C 58 D 78 B
9 D 29 C 49 D 69 C 19 C 39 A 59 A 79 B
10 C 30 D 50 D 70 C 20 C 40 A 60 C 80 C



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Chemistry Questions

1. What is the molecular formula of a compound whose empirical formula is CH_2O and molar mass is 180? ($\text{H}=1, \text{C}=12, \text{O}=16$): (A) $\text{C}_6\text{H}_{12}\text{O}_6$ (B) $\text{C}_4\text{H}_8\text{O}_3$ (C) $\text{C}_6\text{H}_{10}\text{O}_5$ (D) $\text{C}_4\text{H}_8\text{O}_2$
2. Which of the following pollutants is biodegradable? (A) Plastics (B) Sewage compounds (C) Metal scraps (D) Hydrogen sulphide
3. Which of the following equations represents the reaction leading to the removal of permanent hardness of water? (A) $\text{MgSO}_4 + \text{Na}_2\text{CO}_3 \rightarrow \text{MgCO}_3 + \text{Na}_2\text{SO}_4$ (B) $\text{Ca}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$
(C) $\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 \rightarrow 2\text{CaCO}_3 + 2\text{H}_2\text{O}$ (D) $\text{MgSO}_4 + \text{BaCl}_2 \rightarrow \text{MgCl}_2 + \text{BaSO}_4$
4. How many mole of AgNO_3 are there in 500 cm^3 of 0.01 M AgNO_3 solution? A. 0.005 mole B. 0.05 mole C. 0.5 mole D. 1 mole
5. Which of the following statements explains why tetraoxosulphate (IV) acid is regarded as a strong acid? A. Tetraoxosulphate (VI) acid is dibasic. B. The acid is concentrated. C. The acid is completely ionized in aqueous solution. D. Tetraoxosulphate (VI) ions are very reactive.
6. To what temperature must a gas be raised from 273K in order to double both its volume and pressure? A. 300K B. 546K C. 819K D. 1092K
7. If 3 moles of electrons are required to deposit 1 mole of a metal, M during the electrolysis of its molten chloride, the empirical formula of the metallic chloride is: A. M_3Cl B. M_3Cl_2 C. M_2Cl_3 D. MCl_3
8. Nuclear reactions can be used in the following except: A. gauging the thickness of objects. B. making atomic bombs. C. curing cancer. D. purifying water
9. Which of the following compounds crystallizes without water of crystallization? A. Na_2Co_3 B. CuSO_4 C. MgSO_4 D. NaCl
10. The products of the electrolysis of dilute sodium chloride solution with platinum electrodes are A. hydrogen and oxygen. B. oxygen and chlorine. C. chlorine and water. D. sodium amalgam and chlorine.
11. Which of the following statements is not correct of Group 7 elements? A. They are diatomic B. They are good oxidizing agent C. They are highly electronegative. D. They have relatively low ionization Potentials.
12. Which of the following statements is not correct? Cathode rays A. are positive charged B. travel in straight lines. C. are deflected away from negative plates. D. are very light,
13. $\text{CH}_4(g) + 2\text{O}_2 \rightarrow 2\text{H}_2\text{O}_{(l)} + \text{CO}_{2(g)}$ $\Delta H = 890 \text{ kJ mol}^{-1}$ ΔH in the reaction represented by the equation is called the enthalpy of: A. formation. B. combustion. C. activation D. neutralization.





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Technology for Self Reliance

15. Compounds that have the same molecular formula but different structures are said to be
A. isomeric B. isotopic. C. polymeric D. allotropic
16. When a crystal was added to its solution, it did not dissolve and the solution remained unchanged, showing that the solution was: A. concentrated B. unsaturated C. colloidal D. saturated.
17. When steam is passed over white-hot coke, the products are: A. carbon (IV) oxide and nitrogen. B. carbon (II) oxide and hydrogen. C. carbon (II) oxide and nitrogen D. carbon (IV) oxide and hydrogen.
18. The maximum number of electrons that can be accommodated in the shell having the principal quantum number 3 is; A. 3 B. 9 C. 18 D. 32
19. Methanol is obtained from wood by A. esterification. B. destructive distillation.
C. combustion D fractional distillation.
20. Study carefully the reaction represented by the equation $2\text{H}_2\text{O}_{2(\text{l})} \rightarrow \text{O}_{2(\text{g})} + 2\text{H}_{2\text{o}(\text{l})}$ Which of the following will not increase the reaction rate? A. Heating the hydrogen peroxide B Adding a pinch of MnO_2 to the reactant. C Increasing the concentration of the H_2O_2 D. Adding water to the reactant
21. Which of the following processes is a physical reaction? A. Electrolysis B Hydrolysis C, Allotropic change D. Neutralization
22. The following acids are monobasic except A. methanoic acid B. dioxonitrate (III) acid.
C. ethanedioic acid. D. oxochlorate I acid
23. The rate of a reaction is proportional to the number of effective collisions occurring per second between the reactants" This statement is associated with the A. kinetic theory, B rate law. C. atomic theory.
D. collision theory
24. In the reaction represented by the following equation; $2\text{H}_2\text{S}_{(\text{q})} + \text{SO}_{2(\text{g})} \rightarrow 2\text{H}_2\text{O}_{(\text{l})} + 3\text{S}_{(\text{s})}$ SO_2 is acting as
A. a reducing agent. B. an oxidizing agent, C. a dehydrating agent. D. a bleaching agent.
25. When iron rusts, it undergoes A. chemical decomposition. B. hydrolysis. C. redox reaction,
D. combustion.
26. The following salts are readily soluble in water except: A. Na_2CO_3 B. $\text{Pb}(\text{NO}_3)_2$ C. KCl D. FeSO_4
27. When sucrose is warmed with Fehling's solution. A. a silver mirror is produced. B. solution turns milky.
C. brick-red precipitate is formed D. there is no precipitate.
28. The ionic radii of metals are usually A. greater than their atomic radii. B. unaffected by the charge on the ion.
C less than their atomic radii D. greater than those of non-metals.





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31. Which of the following compounds is not a raw material for the manufacture of plastics? A. Ethene B. Ethane C. Monochloroethene D. Propene
32. The energy required to remove the most loosely bound electron from an atom in the gaseous state is known as the A. bond energy B. ionization energy, C. potential energy. D. activation energy.
33. If a reaction is said to be exothermic, which of the following statements is a correct deduction from the information? A. The reaction vessel gets hotter as the reaction proceeds. B. ΔH for the reaction is positive C. The rate of reaction increases with time D. The activation energy of the reaction is high.
34. Which of the following pH values is likely to be that of a slightly alkaline solution? A. 2 B. 5 C. 7 D. 8
35. Which of the following minerals contains fluorine as one of its constituent elements? A. Cryolite B. Bauxite. C. Potash alum D. Kaolin
36. The product of the reaction between propanoic acid and ethanol is A. ethylpropanoate. B. ethylethanoate. C. methylpropanoate. D. propylethanoate
37. Which of the following accounts for the difference in the mode of conduction of electricity by metals and aqueous salt solutions? A. electrons are present in metals but not in salt solutions. B. Metals are conductor while salts are electrolytes. C. electricity is carried by mobile electrons in metals but by ions in aqueous salts solution. D. Salts ionize in aqueous solution while metals do not.
38. Starch undergoes complete hydrolysis to produce A. maltose. B. lactose. C. fructose. D. glucose.
39. Which of the following solids has a network structure? A. Diamond B. Iodine C. Sulphur D. Graphite
40. The properties of electrovalent compounds include the following except: A. high melting point and boiling point. B. conduction of electricity in the molten state. C. high volatility at room temperature. D. ionization in aqueous solution,
41. Which of the following pairs illustrates isotopy? A. But-1-ene and but 2-ene B. carbon and hydrogen C. Oxygen and ozone D. Hydrogen and deuterium
42. Carbon is often deposited in the exhaust-pipe of cars because of the A. presence of carbon in petrol. B. dehydrogenation of petrol. C. incomplete combustion of petrol, D. presence of additives in petrol.
43. Sulphur burns in air to form: A. an acidic oxide B. a basic oxide C. an amphoteric oxide D. a neutral oxide.
44. Chlorine is used in water treatment as: A. a germicide. B. a decolorizing agent. C. an antioxidant D. a coagulating agent.
45. What amount of copper will be deposited if a current of 10 A was passed through a solution of copper (II) salt for 965 seconds? (F= 96500 C): A. 0.005 mole B. 0.025 mole C. 0.05 mole D. 1.00 mole





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Technology for Self Reliance

47. Consider the reaction represented by the following equation:
 $\text{CaCl}_{2(\text{aq})} + \text{H}_2\text{C}_2\text{O}_{4(\text{aq})} \rightarrow \text{CaC}_2\text{O}_{4(\text{s})} + 2\text{HCl}_{(\text{aq})}$ which of the following would dissolve the precipitate of $\text{CaC}_2\text{O}_{4(\text{s})}$ formed? A. Stirring the mixture vigorously B. adding more calcium chloride solution, C. Increasing the concentration of the ethanedioic acid D. Adding concentrated hydrochloric acid.
48. What volume of distilled water should be added to 400 cm^3 of 2.0 mole dm^{-3} H_2SO_4 to obtain $0.20 \text{ mole dm}^{-3}$ of solution? A. 600 cm^3 B. 800 cm^3 C. $1,000 \text{ cm}^3$ D. $3,600 \text{ cm}^3$
49. What volume of propane is left unreacted when 20 cm^3 of oxygen and 20 cm^3 of propane react according to the following equation? $\text{C}_3\text{H}_8 + 5\text{O}_{2(\text{g})} \rightarrow 3\text{CO}_{2(\text{g})} + 4\text{H}_2\text{O}$ A. 16 cm^3 B. 5 cm^3 C. 14 cm^3 D. 15 cm^3
50. The component of air that is removed when air is bubbled into alkaline pyrogallol solution is: A. Carbon (IV) oxide. B. oxygen C. water vapour. D. nitrogen.
51. Which of the following compounds of tin is a strong reducing agent? A. SnCl_2 B. SnCl_4 C. SnO_2 D. SnH_4
52. Which of the following pairs are both substances deliquescent? A. CaCl_2 and H_2S_4 B. NaOH and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ C. CaCl_2 and NaOH D. CuO and NaCl
53. An alkene may be converted to an alkane by A. halogenation. B. hydrolysis. C. dehydration. D. hydrogenation.
54. The product of the reaction between ethanol and excess acidified $\text{K}_2\text{Cr}_2\text{O}_7$ is; A. ethanal B. ethylethanoate C. ethanoic acid D. ethyne.
55. What does the following equation illustrate? $^{238}_{92}\text{U} \rightarrow ^{234}_{90}\text{Th} + ^4_2\text{He}$
A. Nuclear fission B. Nuclear fusion C. Artificial radioactivity D. Spontaneous disintegration
56. Zinc displaces copper from an aqueous solution of copper (II) salt because A. copper is a transition element. B. copper is moderately reactive metal C. zinc and copper have reducing properties. D. zinc is more reactive than copper.
57. The components of universal indicator solution can best be separated by: A. evaporation. B. chromatography C. crystallization. D. fractional distillation.
58. When naphthalene on heating changes from the solid state directly to the gaseous state, it undergoes: A. evaporation. B. sublimation. C. decomposition. D. ionisation.
59. How many faradays of electricity are required to liberate 9 g of aluminium? ($\text{Al} = 27$) A. 0.1 B. 0.3 C. 1.0 D. 3.0
60. $\text{Mg}_{(\text{s})} + 2\text{HCl}_{(\text{aq})} \rightarrow \text{MgCl}_{2(\text{aq})} + \text{H}_{2(\text{g})}$ From the equation above, what mass of hydrogen would be produced if 12.0 g magnesium reacted completely with dilute hydrochloric acid? ($\text{H} = 1, \text{Mg} = 24$) A. 1.0 g B. 2.0 g C. 6.0 g D. 12.0 g





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Technology for Self Reliance

- D. oxiaizing agent
62. Alkanols have unexpectedly high boiling points relative to their molar masses because of intermolecular
A. hydrogen bonding. B. metallic bonding. C. covalent bonding. D. ionic bonding.
63. If an element X with electronic configuration 2,8,3, combines with another element Z with electronic configuration 2,8,6, the compound formed will have the formula A. XZ. B. XZ₂. C. X₂Z. D. X₂Z₃
64. Which of the following molecules is linear in shape? A. CH₄ B. H₂O C. H₂S D. Cl₂
65. What is the percentage by mass of copper in copper (I) oxide (Cu₂O)? [O = 16; Cu = 64] A. 88.9%
B. 80.0% C. 66.7% D. 20.0%
66. The most suitable method for preparing lead (II) chloride is by A. action of dilute HCl on PbSO₄. B. action of dilute HCl on lead. C. mixing aqueous solutions of Pb (NO₃)₂ and NaCl. D. bubbling chlorine into a solution of Pb (NO₃)₂.
67. Sodium chloride cannot conduct electricity in the solid state because it A. is a normal salt. B. is highly soluble in water. C. is an electrovalent compound. D. does not contain mobile ions.
68. Alums are classified as: A. simple salts. B. acid salts. C. anhydrous salts. D. double salts.
69. H₃O⁺_(aq) + OH⁻_(aq) → 2H₂O(l). The heat change accompanying the process represented by this equation is the heat of: A. neutralization. B. formation. C. solution. D. dilution
70. In which of the following processes are larger molecules broken down into smaller molecules?
A. Vulcanization of rubber B. Hydrogenation of palm oil C. Hydrolysis of starch
D. Polymerization
71. What is the amount (in mole) of hydrogen gas that would be produced if 0.6 mole of hydrochloric acid reacted with excess zinc according to the following equation? Zn_(s) + 2HCl_(aq) → ZnCl_{2(aq)} + H_{2(g)} A. 0.1 mole B. 0.2mole C. 0.3mole D. 1.0 mole
72. Chlorine is prepared on a large scale by the A. electrolysis of concentrated sodium chloride solution.
B. action of manganese (IV) oxide on hot concentrated hydrochloric acid. C. action of concentrated tetraoxosulphate (VI) acid on sodium chloride. D. oxidation of concentrated hydrochloric acid with potassium tetraoxomanganate (VII)
73. Which of the following statements is correct about the following system at equilibrium? PCl_{5(g)} + Cl_{2(g)} ⇌ PCl_{3(g)} + Cl_{2(g)} ΔH positive A. Increase in temperature increases the yield of PCl₅. B. PCl₅ is less stable at high pressures. C. The concentrations of PCl₃ and Cl₂ increase at higher pressures. D. Decrease In pressure favours the forward reaction.
74. Isotopes of a given element have the same: A. Neutron B. atomic number C. chemical properties.





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Technology for Self Reliance

76. Which of the following statements is correct about catalysts? They A. alter the rate of chemical reactions, B. are generally specific in action. C. remain changed chemically at the end of the reaction. D. shift the equilibrium position in a reversible reaction.
77. If the change in free energy (ΔG) of a reaction is negative, it can be deduced that the reaction will: A. not proceed in the direction indicated. B. be reversible. C. not occur at room temperature. D. be feasible.
78. Which of the following denotes an alpha particle? A. 1_0n B. 4_2He C. ${}^0_{-1}e$ D. ${}^9_{-4}Be$
79. When an atom gains an electron, it becomes: A. chemically inactive B. negatively charged C. oxidized D. a cation.
80. "Equal volumes of all gases at the same temperature and pressure contain the same number of molecules" is an expression of: A. Charle's Law B. Boyle's Law C. Graham's Law D. Avogadro's Law.
81. The following acids are monobasic except: A. trioxonitrate (V) acid B. hydrochloric acid C. ethanoic acid. D. tetraoxophosphate (V) acid.
82. An arrangement of two different metals in aqueous solutions of their salts to produce an electric current is known as: A. electrochemical cell B. activity series C thermocouple. D. voltameter.
83. The rate of production of hydrogen gas from the reaction between zinc granules and hydrochloric acid can be increased by: A. cooling the reaction mixture B. using zinc powder instead of zinc granules. C. using zinc rod instead of zinc granules. D, carrying out the reaction at a higher pressure.
84. Nitrogen is prepared on a large scale by the A. fractional distillation of liquefied air. B. decomposition of ammonium dioxonitrate (III). C. electrolysis of brine. D. Haber process
85. Which of the following metals will be the most suitable for use where lightness and resistance to corrosion are of importance? A. Lead B aluminum. C. Iron. D. Copper
86. The products formed when sodium hydrogen trioxocarbonate (IV) is heated strongly are: A. carbon (IV) oxide and sodium hydride. B. carbon (IV) oxide and sodium trioxocarbonate (IV). C. carbon (IV) oxide and steam. D. sodium trioxocarbonate (IV), carbon (IV) oxide and steam.
87. Pipe-borne water is usually chlorinated in order to: A. improve the taste of the water. B. remove the hardness in the water. C. coagulate sediments in the water. D. kill harmful bacteria in the water.
88. In linear molecules, the bond angle is: A. 90° B. 104° C. 180° D. 120°
89. An increase in the pressure of a gas results in a decrease in its: A. mass. B. vapour density. C. volume. D. concentration.
90. An acid is a substance which in the presence of water produces: A. salts. B. oxygen. C. effervescence. D. hydroxonium ions.





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92. Which of the following ions will migrate to the cathode during electrolysis? A. Zinc ions. B. Chloride ions. C. Sulphide ions. D. Tetraoxosulphate (VI) ions.
93. What quantity of electrons (in mole) is lost when one mole of iron (II) ions is oxidized to iron (III) ions?
A. 5 mole B. 4 mole C. 3 mole D. 1 mole.
94. The position of equilibrium in a reversible reaction is affected by: A. particle size of the reactants B. change in concentration of the reactants. C. change in size of the reaction vessel. D. vigorous stirring of the reaction mixture.
95. Ethene undergoes mainly additional reactions because it is A. a gas. B. a hydrocarbon. C. unsaturated. D. easily polymerized.
96. The reaction between alkanoic acids and alkanols in the presence of a mineral acid is known as:
A. saponification. B. hydrolysis. C. polymerization. D. esterification.
97. Which of the following is used widely in the manufacture of flavours and perfumes?
A. Alkanoates. B. Alkanines. C. Alkanes reaction. D. complex sugars
98. When chlorine is added to slaked lime, the product obtained is A. bleaching powder. B. chlorinated water C. hydrochloric acid. D. oxochlorate (I) acid.
99. Which of the following, when heated strongly in air will leave a metal as residue?
A. Sodium trioxonitrate (V) B. Potassium trioxonitrate (V) C. Silver trioxonitrate (V) D. Lead trioxonitrate (V).
100. Which of the following methods is suitable for the preparation of an insoluble salt? A. Action of an acid on a metal. B. Double decomposition. C. Neutralization. D. Action of an acid on a trioxocarbonate (IV) salt



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Chemistry Answers

- 1.A 2.B 3.A 4.A 5.C 6.D 7.D 8.D 9.D 10 11.D 12.A 13.B
14.C 15. 16.D 17.B 18.C 19.B 20.D 21.C 22.C 23.D 24.B 25.C 26.D
27.D 28.C 29.C 30.C 31.B 32.B 33.A 34.D 35.A 36.A 37.C 38.D 39.D
40.C 41.D 42.C 43.A 44.A 45.C 46.C 47.D 48.D 49.A 50.B 51.D 52.C
53.D 54.C 55.A 56.D 57.B 58.B 59.B 60.A 61.A 62.A 63.D 64.D 65.A
66.A 67.D 68.D 69.A 70.C 71.C 72.A 73.D 74.B 75.D 76.A 77.D 78.B
79.B 80.D 81.D 82.A 83.B 84.A 85.B 86.D 87.D 88.C 89.C 90.D 91.A
91.A 93.D 94.B 95.C 96.D 97.D 98.A 99.D 100.B





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Physics Questions

1. A boy runs 100 m due north and then 100 m due east. What is his displacement?
A. 200m 45°E B. 10,000m 45°E
C. 200m 45°N D. 100m 45°N
2. The speed of an air force jet was 400 m/s when it flew past an anti-aircraft gun. Calculate its distance from the gun 4 s later when the gun was fire
A. 100 m B. 1600 m
C D. 1600 km
3. A mango fruit dropped to the ground from the top of a tree 40 m tall. Find how long it takes the fruit to reach the ground if acceleration due to gravity $g = 10 \text{ m/s}^2$
A. 2 s B. 80 s
C 4 s D. 2 s
4. A 0.1-m long elastic band extends 5 mm when a load of 80 N is hung from its end. Calculate the strain on the band
A. 5 B. 0.5 C. 0.05 D. 16
5. Which of the following statements describes what happened when an ice block that floats in a glass of water that is filled to the brim melts?
A. The level of the water remains the same.
B. There is a drop in the level of water in the glass due to condensation on its outside.
C. The water in the glass overflows
D. The water level drops because melted ice occupies less volume.
6. A machine with a mass of 4 kg fires a 45 g bullet at a speed of 100 m/s. Find the recoil speed of the machine gun.
A. 1.1 m/s B. 2 m/s C. 3.5 m/s D. 0 m/s
7. Which of the following would you use to determine the weight of an object?
A. chemical balance B. beam balance
C. spring balance D. weight balance
8. The force that causes an object to move in a circular path is called
A. centrifugal force B. centripetal force
C. centre-seeking force <C>none of the above
9. A solid suspended by a piece of string is completely immersed in water. On attempting to lift the solid out of the water, the string breaks when the solid is partly out of the water. This is because
A. the tension in the string decreases as the solid is lifted
B. the mass of the solid has increase
C. the solid apparently weighs less when completely immersed in water than when partially immersed
D. part of the solid still in water is exerting more force on the string
10. The following statements were made by some students describing what happened during and experiment to determine the melting point of solids
i. The temperature of the solid was constant until melting started
ii. The temperature of the solid rose until melting started
iii During melting, the temperature was rising
iv. During melting, the temperature was constant
v.. The temperature continued to rise after all the solid had melted
vi. temperature stopped rising after the solid had melted
which of the following gives correct statements in the right order?





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- A. 2, 4 and 5 B. 2, 3 and 6
C. 1, 3 and 6 D. 1, 3 and 5
11. When some grains of table salt were put in a cup of cold water, kept at constant temperature and left undisturbed, all the water tasted salty after some time. This is due to
A. capillarity B. surface tension
C. mixing D. diffusion
12. Given that the latent heat of fusion of ice is 80 cal/g, how much heat will change 100 g of ice at 0oC into water at the same temperature?
A. 8kcal B. 8 cal C. 800 cal
D. 8000 kcal
13. A blacksmith dropped a 1.5 kg iron bead at 300oC into some quantity of water. If the temperature of the water rose from 15oC to 18oC, what is the mass of the water assuming no heat is lost to the surrounding? (Take the specific heat of iron as 0.46 J kg⁻¹ C⁻¹ and that of water as 4.2x10³ J kg⁻¹ C⁻¹)
A. 15.44 kg B. 194.58 g C. 15.44 g
D. 194.58 kg
14. Which of the following properties are not those of a suitable thermometric liquid?
I. It should be a good conductor of heat
II. It should be opaque
III. Its expansion should be regular
IV. It should wet glass
V. It should have a high melting point and low boiling point
A. I and II B. II and III
C. III and IV D. IV and V
15. A gas at pressure P1 N/m² and temperature 30oC is heated to 61oC at constant volume. Find its new pressure.
A. 1.1 N/m² B. 1.2 P1 N/m²
C. 1.01 P1 N/m² D. 1.1 P1 N/m²
16. A steel bar has a width of 10 cm at 50oC At what temperature will it fit exactly into a hole of constant width 10.005 cm if coefficient of linear expansion of steel is 11x10⁻⁶ C⁻¹)?
A. 75oC B. 0.005oC C. 75.5oC D. -75.5oC
17. The amount of heat that is required to raise the temperature of unit mass of a substance one degree Celsius is called
A. Heat capacity B. thermal capacity
C. Specific heat D. Heat energy
18. Two lamps rated 60 W and 240 V each are connected in series. What is the total power dissipated in both?
A. 30W B. 60W C. 90W D. 120W
19. Three 3 Ω resistors connected in parallel have a potential difference of 24 V applied across the combination. What is the current in each resistor?
A. 8A B. 3A C. 24A D. 4A
20. If PHCN charges 25 k per kWh, find the cost of operating for 36 hours a lamp requiring 1.5 A on a 240 V line.
A. N324 B. N32.4 C. N3.24 D. N0.324
21. In order to convert a galvanometer to a voltmeter
A. a low resistance shunt is connected in parallel
B. a low resistance shunt is connected in series
C. a high resistance multiplier is connected in parallel
D. a high resistance multiplier is connected in series





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22. Which of the following is not applicable to an ac generator?
 A. Armature B. Commutator
 C. Field magnet D. Slip rings
23. A potential difference of 5 V is used to produce a current of 4 A for 4 hours through a heating coil. What is the heat produced?
 A. 80 J B. 4.8 kJ C. 20 J D. 4800 kJ
24. Determine the absolute temperature at which the Fahrenheit temperature is twice the Celsius temperature.
 A. 299.82K B. 433.15K
 C. 273.25K D. 406.35K
25. Which of the following law forms the basis of the thermometry?
 A. Charles' and Gay-Lussac's law
 B. Fist law of thermodynamics
 C. Boyle's and pressure law
 D. Zeroth law of thermodynamics
26. A 500m long aluminium chair expands when it was placed in the sun. Its temperature increases from 20°C to 60°C. Determine its new length. [$\alpha = 2.30 \times 10^{-5} K^{-1}$].
 A. 500.46m B. 456.65m
 C. 540.28m D. 460.32m
27. An electric heater which produces 900 W of power is used to vaporize water. How much water at 100°C can be changed to steam in 3 mins by the heater? [Heat of vaporization = $2.26 \times 10^6 \text{ J/kg}$, Specific heat capacity of water = $4.2 \times 10^3 \text{ J/kg.K}$]
 A. 0.0226 kg B. 0.275 kg
 C. 0.072 kg D. 0.167 kg
28. The amount of heat required to produce unit temperature rise in a substance is called:
 A. Latent heat B. Heat capacity
29. An ideal gas has a volume 100 cm³ at $1 \times 10^5 \text{ Pa}$ and 27°C. What is its volume at $2 \times 10^5 \text{ Pa}$ and 60°C?
 A. 42.5 cm³ B. 55.5 cm³
 C. 50.2 cm³ D. 40.5 cm³
30. Which of the following thermometer can be used to measure high temperature up to 1000°C?
 A. Electrical thermometer B. Pyrometer
 C. Bimetal thermometer D. Thermoelectric thermometer
31. 4000 J of heat is applied to a 1.5 kg silver pendant initially at temperature of 150°C. Determine its final temperature [Latent heat = 336 J kg^{-1} , specific heat capacity = 233 J/kg.K].
 A. 26.4°C B. 38.4°C
 C. 41.5°C D. 15.5°C
32. The specific heat capacity of a substance depends on all the following except:
 A. Mass of the substance
 B. Change in temperature
 C. Surface area of the substance
 D. Energy needed
33. Which of the following quantities is a vector?
 A. Mass B. Velocity C. Distance D. Speed
34. A hose ejects water at 80 cl/s through a hole 2 mm in diameter. The water impinges on a wall and drops off without rebounding. What is the force on the wall?
 A. 2.04 N B. 240.0 N C. 20.4 N D. 24.0 N
35. A train travelling at 72 km/h undergoes a uniform retardation of 2 m/s when brakes are applied. Find the distance travelled from the place where the brakes were applied





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Technology for Self Reliance

- A. 10 m B. 50 m C. 100 m D. 250 m 43.
36. A force of 200 N pulls a sledge of mass 50 kg and overcomes a constant frictional force of 40 N. What is the acceleration of the sledge?
 A. 4.0 m/s B. 50 m/s C. 4.5 m/s D. 3.2 m/s
37. An object A of mass 2 kg is moving with a velocity of 3 m/s and collides head-on with another object B of mass 1kg moving in the opposite direction with a velocity of 4 m/s. Assuming the objects move off together after collision, calculate their common velocity.
 A. 0.67 m/s B. 0.50 m/s
 C. 0.35 m/s D. 0.55 m/s
38. In elastic collision, which of the following quantities is conserved?
 A. Kinetic energy B. Potential energy
 C. Activation energy D. Conservation energy
39. A weight of 20 N hangs from a fixed point by a light inextensible string. It is pulled aside by a horizontal force with the string inclined at an angle of 30° to the vertical. The tension in the string is
 A. 11 N B. 40 N C. 5 N D. 30 N
40. A stone of mass 50 kg released from a height of 2 m above the ground If the stone falls freely to a height of 5 m above the ground, its velocity is
 A. 19.6 m/s B. 49.0 m/s C. 17.15 m/s
 D. 39.2 m/s
41. Calculate the kinetic energy of a trolley of mass 40 kg moving with a velocity 0.5 m/s
 A. 20 J B. 5 J C. 15 J D. <C>10 J
42. A car of mass 500 kg accelerates from rest at 1 m/s². What is the total distance covered in 1 minute?
 A. 2000 m B. 3600 m C. 1800 m D. 2400 m
43. Niagara falls are 50 m high. Calculate the potential energy of 0.1 cubic meter of water at the top relative to the bottom. Density of water is 1000 kg m^{-3} . Take $g = 10 \text{ m/s}^2$
 A. 48 kJ B. 50 kJ C. 51 kJ D. 61 kJ
44. A bullet of mass 15 g is fired from a rifle with a velocity 100 m/s. If the mass of the rifle is 1 kg. What is the recoil velocity of the rifle?
 A. 1.5 m/s B. 1.8 m/s C. 1.2 m/s D. 2.1 m/s
45. A ball is thrown vertically upwards with a velocity of 30 m/s. Find the greatest height attained
 A. 40 m B. 50 m C. 55 m D. 45 m
46. The tension in a rope pulling a log is 100 N, the mass of the log is 50 kg and the frictional force on the log is 20 N. What is the acceleration of the log?
 A. 2 m/s² B. 1.6 m/s² C. 1.8 m/s² D. 2.2 m/s²
47. A body of mass 1 kg falls freely from rest through a height of 150 m. Calculate the velocity of the body when it strikes the floor ($g=10 \text{ m/s}^2$).
 A. 54.8 m/s B. 45.2 m/s C. 38.7 m/s D. 65.8 m/s
- 48.. A car moving with a velocity of 16 m/s accelerates uniformly at the rate of 1 m/s² to reach a velocity of 20 m/s. Find the distance covered
 A. 85 m B. 75 m C. 82 m D. 72 m
49. An athlete runs 100 m in 12 s. What is his speed in km/h?
 A. 33 km/h B. 36 km/h
 C. 30 km/h D. 27 km/h
50. Which of the following statements best describes the specific heat capacity of a substance?
 A. The quantity of heat required to produce a unit temperature rise;
 B. The random kinetic energy of the particles composing a system;





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- C. The quantity of heat required to change the temperature of a unit mass of the substance by one degree;
D. The quantity of heat required to vaporise a unit mass of the substance at constant temperature.
51. Determine the temperature whose Fahrenheit and Kelvin scales have the same reading to the nearest degree.
A. 273K B. 300K C. 500K D. >574K
52. The SI unit of specific heat capacity of a substance is:
A. JK^{-1} B. $\text{Jkg}^{-1}\text{K}^{-1}$ C. Joules D. $\text{Cal/g}^{\circ}\text{C}$
53. The density of nitrogen at standard temperature and pressure is 1.251 kgm^{-3} . Calculate the root mean square velocity of nitrogen molecules.
A. 240 m/s B. 1×10^4 m/s C. 340 m/s
D. 493 m/s
54. A malaria patient has a body temperature of 98.6°F . What is this temperature on the Celsius scale?
A. 37°C B. 20°C C. 32°C D. 35°C
55. A thermos bottle containing 250 g of coffee at 90°C is added with a 20 g of milk at 5°C . After thorough mixing, what is the final temperature? c for water, coffee and milk is $1.00\text{Cal/g}^{\circ}\text{C}$
A. 84°C B. 84°K C. 84°F D. 55°C
56. Determine the temperature T_f that results when 150 g of ice at 0°C is mixed with 300 g of water at 50°C
A. 67°C B. 6.7°C C. 48°C D. 80°C
57. The only mode of heat energy transfer that needs no material medium is:
A. Convection B. Radiation
C. Conduction D. Thermal conduction
58. When heat energy is added to a system which of the following observations usually occur:

(I) The internal energy of the system increases;
(II) Work may be done on the surroundings;
(III) The volume of system is directly proportional to the temperature.
A. I and II only B. I, II and III C. III only
D. None of the above.
- 59 The transfer of heat energy from one part of a body to another part without the actual movement of any part of the body is called convection.
A. True B. False C. Neither true nor false
D. I cannot tell.
- 60.. Which of the following quantities are scalars?
I. Mass II. Work III. force IV. Magnetic flux
A. II and III only B. I and II only
C. IV only D. I and IV only
61. A force $(15\mathbf{i} - 16\mathbf{j} + 27\mathbf{k})\text{N}$ is added to a force $(23\mathbf{j} - 40\mathbf{k})\text{N}$. What is the magnitude of the resultant?
A. 17N B. 28N C. 63N D. 21N
62. Which of the following statements is/are correct about an object in equilibrium under parallel forces?
I. The total force in one direction equals the total force in the opposite direction.
II. The body must not rotate.
III The resolved components along the x-axis equals the resolved components along the y-axis.
A. I and II only B. I, II and III
B. II and III only C. I and III only.
63. A car moving with a speed of 90 km/h was brought to rest in 10 s by the application of the brakes. How far did the car travel after the brakes were applied
A. 150 m B. 15 m C. 250 m D. 125 m
64. A metre rule is found to balance at the 48 cm mark. When a body of mass 60 g is suspended at the 6 cm mark, the balance point is found to be at the 30 cm





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- mark. Find the mass of the metre rule.
A. 60 g B. 360 g C. 80 g D. 180 g.
65. A ball of mass 0.1 kg moving with a horizontal velocity of 15 m/s is shot into a wooden block of mass 0.4 kg lying at rest on a smooth horizontal surface. Find their common velocity after impact.
A. 15.0 m/s B. 3.8 m/s C. 7.5 m/s
D. 3.0 m/s
66. A body of mass 2 kg moves velocity of 10 m/s. Neglecting air resistance, determine the kinetic energy of the body.
A. 200 N B. 200 J C. 100 J D. 100 N
67. Three forces of magnitude 15 N, 10 N and 5 N act on a particle in the direction which make 120° with one another. Find the resultant and the angle the resultant makes with the x-axis.
A. 8.66 N, 30° B. 4.33 N, 60°
C. 7.4 N, 45° D. 2.52 N, 60°
681. Which of the following statements best defines a couple?
A. Two parallel and opposite forces acting on one another.
B. Two equal forces acting in the same direction.
C. Two parallel and opposite forces acting on a body whose lines of action do not coincide
D. None of the above.
69. A force $F = (5i + 3j)$ N acts on a body and causes a displacement $r = (7i - j)$ m. Determine the work done.
A. 53 J B. 32 J C. 35 J D. 21 J.
- 70.. A force of 0.6 N acts on a body of mass 40 g, initially at rest. What is the resulting acceleration?
A. 35 m/s² B. 40 m/s² C. 15 m/s²
D. 25 m/s²
71. Which of the following statements is not correct about stable equilibrium?
A. the body returns to its original position when it is slightly displaced and released
B. a slight displacement raises its centre of gravity.
C. a slight displacement lowers its centre of gravity.
D. a slight displacement does not raise or lower its centre of gravity.
72. A body is projected vertically upwards with a velocity of 9.78 m/s. How high does it travel before it comes to rest momentarily at the top of its motion? (g = 9.78 m/s²)
A. 2.45 m B. 4.89 m C. 6.89 m D. 9.78 m
73. Calculate the time taken for a car to cover a distance of 125 m if the initial speed is 5 m/s and it has a constant acceleration of 1.5 m/s²
A. 8 s B. 10 s C. 15 s D. 12 s
74. Calculate the braking force to bring a body of mass 1 kg to rest from 25 m/s on a level ground in 60 m with uniform retardation.
A. 5.2 N B. 5.5 N C. 5.6 N D. 5.0 N
75. A drop hammer is lifted to a height of 50 m above the ground and then allowed to fall from rest on to a forging at ground level. Calculate the downward velocity of the hammer when it strikes the forging. (g = 10 m/s²)
A. 10.95 m/s B. 25.8 m/s C. 31.6 m/s
D. 35.5 m/s
76. A uniform rod of weight 10 N is balanced at a point 75 cm from the end B. The pivot is removed to point 30 cm from A. What force must be applied at A to balance the rod horizontally?
A. 25 N B. 10 N C. 30 N D. 15 N
77. An equilateral triangular lamina has each side equal to 50 cm. How far is the centre of gravity





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- from each vertex?
- A. 34.64 cm B. 33.3 cm C. 36.9 cm
D. 28.9 cm
78. A man can row a boat at 13 m/s in still water. If he aims at crossing to the opposite bank of a river flowing at 5 m/s, at what angle to the bank of the river must he row the boat?
- A. 67.4° B. 21° C. 56.8° D. 22.6°
79. The lower and upper fixed points of a thermometer are 30 mm and 180 mm respectively. Calculate the temperature in degrees Celsius when the thermometer reads 45 mm.
- A. 10.0°C B. 15.0°C C. 20.0°C
D. 30.0°C
80. An immersion heater rated 400 W, 220 V is used to heat a liquid of mass 0.5 kg. If the temperature of the liquid increases uniformly at the rate of 2.5°C per second, calculate the specific heat capacity of the liquid assuming no heat loss,
- A. 1100 J/kg.K B. 320 J/kg.K
C. 200 J/kg.K D. 176 J/kg.K
81. A balloon filled with 1000 cm³ of gas at 127°C and pressure of 70 cm Hg. If the pressure changes to 28 cm Hg and temperature to -23.3°C, calculate the new volume of the gas.
- A. 136 cm³ B. 218 cm³ C. 250 cm³
D. 485 cm³
82. A density glass bottle contains 44.25 g of a liquid at 0°C and 42.02 g at 50°C. Calculate the real cubic expansivity of the liquid (Linear expansivity of glass = $1.0 \times 10^{-5} \text{ K}^{-1}$)
- A. $1.09 \times 10^{-3} \text{ K}^{-1}$ B. $1.06 \times 10^{-3} \text{ K}^{-1}$
C. $3.0 \times 10^{-5} \text{ K}^{-1}$ D. $1.03 \times 10^{-3} \text{ K}^{-1}$
83. Which of the following properties is not used to measure the temperature of a substance?
- A. variation of pressure with temperature
B. mass of a liquid
C. change in resistance of a conductor
D. change in colour with temperature
84. The clinical thermometer is characterized by having a
- A. wide range of temperatures B. wide bore
C. long stem D. constriction
85. The amount of heat given out or absorbed when a substance changes its state at a constant temperature is known as
- A. latent heat B. heat capacity
C. specific heat capacity D. specific latent heat
86. A block of aluminium is heated electrically by a 25 W heater. If the temperature rises by 10°C in 5 minutes, what is the heat capacity of aluminium?
- A. 850 J/K B. 750 J/K C. 650 J/K
D. 500 J/K
87. In a gas experiment, if the volume of the gas is plotted against the reciprocal of the pressure, the unit of the slope of the resulting curve is:
- A. power B. work C. temperature D. force
88. Thermal equilibrium between two objects exist when:
- A. the heat capacity of both objects are the same
B. one object loses heat continuously to the other
C. temperature of both objects are equal
D. the quantity of heat in both objects is the same.
89. A shepherd calling to fellow shepherd heard his voice reflected by a rock 3 s later. Calculate the velocity of sound in air if the rock is 510 m away.
- A. 510 m/s B. 1.5 m/s C. 340 m/s D. 170 m/s
90. An object 3 cm high placed on the axis of a converging lens form an image 30 cm from the lens.





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- If the focal length of the lens is 15 cm the height of the image is
A. 3 cm B. 1 cm C. 6 cm
D. none of the above
91. An object is placed between two plane mirrors inclined at 60° to each other. If the object is equidistant from each find the number of images formed
A. 2 B. 3 C. 4 D. 6
92. Before frying, the volume of 0.8 g/cm^3 vegetable oil was 500 cm^3 . If the density of the oil was 0.5 g/cm^3 after frying and there was no loss of oil due to spilling, what is the new volume of the oil?
A. 400 cm^3 B. 800 cm^3 C. 600 cm^3 D. 200 cm^3
93. A 650 kg car that was initially at rest traveled with an acceleration of 4 m/s^2 . Find its kinetic energy after 4 s.
A. 5200 J B. 31200 J C. 83200 J D. 832 kJ
94. The temperature at which the water vapour present in the air and begins to condense is called
A. condensation point B. dew point
C. boiling point D. critical point
95. Which of the following types of waves will travel through vacuum? I. light waves II. sound waves III. Radio waves
A. I only B. I and II only C. II and III only
D. I and III only
96. In a simple pendulum experiment, a student increased the length of the inextensible string by a factor of 9. By what factor is the period increased?
A. 3 B. $1/3$ C. 2 D. $1/2$
97. A vapour is said to be saturated when:
A. the vapour of a substance is in equilibrium with its own liquid
B. the vapour of a substance is in equilibrium with its own gas
C. the vapour of a substance is in equilibrium with its own solid-liquid phase
D. none of the above
98. A wave travels with a velocity of 360 m/s . If its wavelength is 120 cm then its period is:
A. 0.0017 s B. 0.33 s C. 33 s D. 1.7 s
99. The heights of the mercury thread in a mercury-in-glass thermometer when melting ice and then in steam are 2 cm and 22 cm respectively. What would be the height of the mercury thread at 70°C ?
A. 14 cm B. 12 cm C. 16 cm D. 18 cm
100. An object is placed 45 cm in front of a concave mirror of focal length 15 cm . What is the linear magnification produced?
A. $1/3$ B. 2 C. 3 D. $1/2$
101. A man has five 40 W electric light bulbs, six 60 W bulbs and two 100 W bulbs in his house. If all the points are on for five hours daily and PHCN charges 12 k per unit , what is his bill for 30 days?
A. $\text{N}13.68$ B. $\text{N}0.46$ C. $\text{N}2.74$
D. none of the above
102. In a resonance tube experiment, the first resonance position is 16 cm when the velocity of sound in air is 327.68 m/s . Find the frequency of the tuning fork used
A. 512 kHz B. 256 Hz C. 128 Hz D. 512 Hz
103. Half-life of a radioactive substance is:
A. the average life time of the substance
B. the time it takes the substance to decay to half of its original quantity
C. the time it takes the activity of the substance to





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- decay to half of its original value
D. all of the above
104. The headlamp bulb of a motor car is rated 60 W, 12 V. Calculate the resistance of its filament.
A. 0.2 Ω B. 5 Ω C. 2.4 Ω D. 2 V
105. In an electrolysis experiment, a cathode of mass 4.5 g weighs 4.52 g after a current of 4.5 A flows for 1 hour. The electrochemical equivalent of the deposited substance is:
A. 0.00444 g/C B. 0.00741 g/C
C. 0.00074 g/C D. 0.00007 g/C
106. An object falls freely under gravity from a given height. At half way point, its kinetic energy is:
A. exactly half of its initial potential energy
B. exactly half of its kinetic energy
C. exactly half of its final potential energy
D. zero
107. The silvered walls of a vacuum flask are used to prevent:
A. heat loss due to opacity
B. heat loss due to radiation
C. heat loss due to convection
D. heat loss due to conduction
108. The law of universal gravitation states that:
A. All bodies on the surface of the earth are attracted towards the centre of the universe
B. Any two bodies attract each other with a force which is directly proportional to product of their masses and inversely proportional to the square of the distance between them.
C. All bodies attract each other with a force which is directly proportional to product of their masses and inversely proportional to the square of the distance between them.
109. The nucleus of an atom consists of:
A. protons and neutrons B. protons and electrons
C. electrons and neutrons
D. electrons, protons and neutrons
110. A certain quantity of heat increases the temperature of 185 g of water from 10oC to 20oC and increases the temperature of an equal volume of 140 g of oil from 7oC to 18oC. The ratio of the specific heat of the oil to that of water is:
A. 0.83 B. 1.26 C. 1.07 D. 0.93
111. The motion of the pendulum bob is:
A. rotational B. circulatory
C. oscillatory D. none of the above
112. Which of the following is not one of the factors that affect the capacitance of a capacitor?
A. temperature B. area of plates
C. distance between the plate
D. dielectric between the plates
113. Which of the following statements is true of gamma-rays?
A. they are deflected by electric field
B. they ionize intensely
C. they carry no electric charge
D. they originate outside the nucleus of the atom
114. The virtual image formed of an object placed 10 cm from a convex lens is 2. Find the focal length of the lens.
A. 7.5 cm B. 15 cm C. 30 cm
D. 10 cm
115. A milliammeter of resistance 2.5 Ω and full scale deflection of 50 mA is to be used to measure a





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

- potential difference of 50 V. What is the resistance of the multiplier?
- A. 99.75 B. 997.5 C. 9975 D. 9.98
117. The ice and steam points of a mercury-in-glass thermometer of centigrade scale and of uniform bore correspond respectively to 3 cm and 23 cm lengths of the mercury thread. What is the temperature when the length of the mercury thread is 12 cm?
- A. 40oC B. 60oC C. 75oC D. 45oC
118. When a ray of light passes from glass to air, it is:
- A. bent towards the normal
B. away from the normal
C. not deviated
D. spread out in a pure spectrum
119. What is the resistance of the filament of an electric lamp rated 220 V, 100 W?
- A. 0.45 B. 2.2 C. 484 D. 440
120. Pressure cooker cooks faster because
- A. the inside is polished
B. inside the cooker, the boiling point of water is raised
C. inside the cooker, the boiling point of water is lowered
D. inside the cooker, the pressure of water is raised
121. A gasoline generator is used to power ten 40 W lamps, five 60 W lamps and a musician's 1000 W amplifying system. If the generator runs for 5 hours, the energy used is
- A. 1.7 kWh B. 8.5 kWh C. 1.0 kWh
D. none of the above
122. Which of the following statements is not true about sound waves?
- A. Sound waves are longitudinal waves
B. Sound waves are transverse waves
- C. Sound waves are mechanical waves
D. Sound waves can not propagate through vacuum
123. Which of the following statements is not true about the human eye?
- A. the focal length of its lens is fixed
B. the focal length of its lens is variable
C. image distance is fixed
D. all of them
124. Hypermetropia can be corrected by using
- A. concave spectacle lenses
B. convex spectacle lenses
C. plano-concave spectacle lenses
D. plano-convex spectacle lenses
125. In the astronomical telescope
- A. there are three convex lenses
B. the eyepiece has a longer focal length than the objective
C. the eyepiece has a shorter focal length than the objective
D. the eyepiece and the objective have the same focal length
126. Which of the following apparatuses is not needed for the production of pure spectrum?
- A. source of light B. rectangular glass block
C. slit D. convex lens
127. The principle of moment states that:
- A. Action and reaction are equal and opposite
B. If a body is in equilibrium under the action of a number of parallel forces, sum of clockwise moment equals sum of anticlockwise moment
C. If a body is in equilibrium under the action of a number of parallel forces, sum of clockwise moment about a point equals sum of anticlockwise moment about the same point.
D. If a body is in equilibrium under the action of a number of parallel forces, all forces cancel out





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

128. A uniform metre rule of mass 90 g is pivoted at the 40 cm mark. If the metre rule is in equilibrium with an unknown mass M placed at the 10 cm mark and a 72 g mass at the 70 cm mark, then M is
A. 162 g B. 30 g C. 72 g D. 102 g
129. A pole AB of length 10 m weighs 800 N and has its centre of gravity 4 m from the end A, and lies on horizontal ground. The least vertical force required to lift its end B is
A. 320 N B. 80 N C. 2000 N D. 20 N
130. A metre rule is found to balance horizontally at the 48 cm mark. When a body of mass 60 g is suspended at the 6 cm mark the balance point shifts to the 30 cm mark. The mass of the metre rule is:
A. 1.33 g B. 80 g C. 3.33 g D. 45 g
131. The elastic limit of a material is:
A. the yield point
B. the limit of stress within which the strain in the material completely disappears when the stress is removed
C. a point at which a sudden increase in elongation occurs with only a small increase in tension.
D. none of the above.
132. A 10 g mass placed on the pan of a spring balance causes an extension of 5 cm. If a 15 g mass is placed on the pan of the same spring balance, the extension produced is:
A. 2.0 cm B. 30.0 cm C. 7.5 cm D. 1.5 cm
133. Which of the following does not reduce surface of a liquid?
I. addition of impurities like detergent or alum to the liquid
II. heating the liquid
III. cooling the liquid
A. I only B. II only C. III only
134. Which of the following is not an application of capillarity?
A. sap from the soil rises up plant stem.
B. kerosene rises up the wick of a lamp
C. blotting paper absorbs ink
D. none
135. Which of the following statements is not correct?
A. electric charges can be produced by friction
B. electric charges can be produced by induction
C. electric charges can be produced by conduction
D. none
136. Which of the following is not simple harmonic motion?
A. The motion of the prongs of a sounding tuning fork
B. The motion of an object suspended from the free end of a spiral spring
C. The motion of the plucked string of a musical instrument
D. The motion of Earth around the sun
137. The period of a body making simple harmonic motion is defined as:
A. number of complete oscillation performed in one second
B. time taken to make one complete oscillation
C. time taken to make one oscillation
D. the maximum displacement of the body from its equilibrium position
138. A machine gun fires a bullet with an initial velocity of 200 m/s at an angle of 60° to the horizontal. If $g = 10 \text{ m/s}^2$, the total time of flight of the bullet is:
A. 34.64 s B. 17.32 s C. 51.96 s D. 69.28 s
139. A bullet of mass 20 g is fired horizontally at a stationary wooden block of mass 380 g with a





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

velocity of 200 m/s. If the bullet embeds itself in the block, their common velocity is:

- A. 10.0 m/s B. 0.1 m/s C. 4.0 m/s
- D. 0.0 m/s

140. The velocity ratio of a simple machine is defined as:

- A. the ratio of the distance moved by effort to the distance moved by load
- B. the ratio of the distance moved by load to the distance moved by effort
- C. the ratio of the useful work output of the machine to the total work input
- D. none of the above

141. A machine has a velocity ratio of 6 and is 80% efficient. The effort needed to lift a load of 300 N with the aid of the machine is:

- A. 4.8 N B. 300 N C. 62.5 N D. 63.5 N

142. An open organ pipe has a length of 6 m. If the speed of sound in air is 340 m/s and neglecting the end-corrections, the frequency of its first overtone is

- A. 56.67 Hz B. 28.33 Hz C. 85 Hz D. 1.3 kHz

143. A piano wire 0.5 m long has a total mass of 0.01 kg and is stretched with a tension of 800 N. The frequency of its fundamental note is:

- A. 400 Hz B. 100 Hz C. 200 Hz D. 300 Hz

144. Two capacitors of $8 \mu\text{F}$ and $10 \mu\text{F}$ are connected in series to a 100 V dc supply. The charge on either place of each capacitor is:

- A. $2.25 \times 10^{-1}\text{C}$ B. 4.4 C
- C. $4.4 \times 10^{-3}\text{C}$ D. $4.4 \times 10^{-4}\text{C}$

145. A conductor of length 5 m carrying a current of 15 A is placed in a uniform magnetic field of flux density 0.25 T. If the conductor is placed at 60° to the field then the force on it is:

- A. 18.75 N B. 9 N C. 16.24 N D. 35 N

146. When an inclined plane of angle θ is used as a simple machine, its velocity ratio is:

- A. $1/\cos\theta$ B. $\cos\theta$ C. $1/\sin\theta$ D. $\sin\theta$

147. Which of the following statements is not true of a real image formed by a concave mirror?

- A. It is inverted B. It is erect
- C. It can be observed on a screen D. None

148. A 8 kg mass rests on an inclined plane. If the limiting frictional force 50 N and $g = 10 \text{ m/s}^2$, then the angle of inclination of the plane is:

- A. 37.8° B. 38.7° C. 87.3° D. 78.3°

149. Which of these gives the dimension of torque?

- A. MLT B. ML⁻¹T C. ML⁻¹T⁻²
- D. ML²T⁻²

150. An object of mass 80 kg is kicked above the ground and in 20 s it has reached a height of 600 cm. Calculate the power of the object.

- A. 40 W B. 240 W C. 402 W D. 204 W

151. Which of these statements is true?

- A. Energy cannot be destroyed and cannot be transformed from one form to another
- B. Momentum before impact is not necessarily equal to the momentum after impact
- C. Impulse is the product of force and time
- D. In perfectly elastic collision, there is a small loss of energy.

152. A load of 2 tonnes is raised with 10 N efforts. Calculate the mechanical advantage of the machine with which the load is raised

- A. 200 N B. 0.20 N C. 2000 D. 102

153. An object of mass 4000 g is 60 cm above the ground. Calculate its kinetic energy 50 cm above the ground (Take $g = 10 \text{ m/s}^2$)

- A. 4 J B. 40 J C. 4 N D. 40 N





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

154. A fast moving object of mass 200 g travels at 100 m/s and hits a block of wood of mass 2 kg. The two bodies moved together after impact. Find the velocity with which they moved together after collision.
A. 9.09 m/s B. 90.9 m/s C. 0.910 m/s
D. 1.96m/s.
155. Determine the distance traveled by a particle whose initial velocity is 48 km/h. The particle accelerated uniformly at the rate of 1.8 m/s² and attained a velocity of 72 km/h.
A. 6.167m B. 61.67 m C. 616.7 m
D. 6167 m
156. An object floats in a liquid with one third of its volume above the liquid surface. Determine the density of the liquid, if the object density is 7100 kg/m³ (Take $g = 10\text{m/s}^2$)
A. 1056 kg/m³ B. 1560 kg/m³
C. 10650 kg/m³ D. 15.60 kg/m³
157. A metal block of mass 2125 g displaces 250 cm³ of water. What is its density?
A. 8300 kg/m³ B. 8800 kg/m³
C. 8500 kg/m³ D. 8700 kg/m³
158. A body starting from rest travels for 100 s with uniform acceleration of 1.5 m/s. What distance does it cover in the last 2 seconds?
A. 27.0 m B. 26.2 m C. 29.8 m D. 30.8 m
159. A pile driver of mass 125 kg falls through a height of 80 m before striking the pile. What is its momentum at the instance it strikes the pile? $g = 10\text{m/s}^2$
A. 40 kg.m/s B. 5000 kg.m/s C. 1600 kg.m/s
D. 5000 kg.m
160. A gun weighing 1500 kg fires a shot weighing 50 kg with a velocity 360 m/s. What is the recoil velocity of the gun?
A. 14.0 m/s B. 12.0 m/s C. 11.0 m/s
D. 13.0 m/s
161. A car of mass 1000 kg travels with a velocity 45 km/h on a rough road and it is brought to a rest after 10s. What is the force exerted on the car?
A. 1333 N B. 1250 N C. 1282 N D. 1067 N
162. A bridge 100m long weighs 500 kN. A lorry weighing 100 kN is 25 m from one end of it. Find the force exerted at this support.
A. 350 kN B. 300 kN C. 330 kN D. 325 kN
163. What is the kinetic energy of a rock of mass 220 g after it has fallen freely for 5 seconds? $g=10\text{ m/s}^2$.
A. 350 J B. 225 J C. 275 J D. 250 J
164. When equal masses of iron and water are given equal quantity of heat, the piece of iron becomes much hotter than water after a shorter time because:
A. the specific heat of iron is higher than that of water
B. the specific heat of iron is lower than that of water
C. iron is in solid state while water is in liquid state
D. heat flows faster in solids
165. The speed of light in air is 3.0×10^8 m/s. What is its speed in glass having a refractive index of 1.65?
A. 6.0×10^8 m/s B. 4.95×10^8 m/s
C. 1.65×10^8 m/s D. 1.82×10^8 m/s
166. Atmospheric pressure is 1.0×10^5 N/m². If the barometer liquid has a density of 1250 kg/m³, what is the minimum length of the tube required?
 $g=10\text{m/s}^2$.
A. 7.8 m B. 0.76 m C. 8.0 m D. 10 m
167. Young's modulus for steel is 2×10^{11} N/m². A





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- weight of 100 N hangs from a steel wire of length 3 m and cross-sectional area $1.5 \times 10^{-6} \text{ m}^2$. Calculate the extension is 0.25 mm, calculate the extension produced
- A. 1 mm B. 1.5 mm C. 0.1 mm D. 0.15 mm
168. A load of 50 N is attached to one end of a long vertical wire of length 4 m and diameter 2.4 mm whose other end is fixed If the extension is 0.25 mm, calculate the Young modulus of the material of the wire.
- A. 18 N/m^2 B. 1800 N/m^2 C. 180 N/m^2
D. $1.8 \times 10^{11} \text{ N/m}^2$
169. Which of the following statements is not true about friction force is not correct.
- A. The centre of gravity of a body is the point where the resultant force of attraction or weight of the body acts
B. The lower the centre of gravity of a body the more stable the body is
C. The higher the centre of gravity of a body the more stable the body is
D. it is the point at which the weight of the body appears to be acting
170. A car travels with a constant velocity of 45 km/h for 10 s. What is the distance it covers in this time?
- A. 450 m B. 400 m C. 125 m D. 45 m
171. A body is projected vertically upwards with a velocity of 9.78 m/s. How high does it travel before it comes to rest momentarily at the top of its motion?
- A. 4.89 m B. 500 m C. 48 m D. 9.78 m
172. Which of the following statements is not true about the friction force?
- A. Friction always act in such a direction that opposes motion
- B. The limiting frictional force is dependent on the area of contact of the two surfaces
C. until motion takes place, the frictionally force is always equal to the force tending to produce the motion
C. when motion takes place, the friction force is less than its limiting value.
173. A solid of mass 1 kg suspended by a string, is completely immersed in water. If the tension in the string is 5 N, calculate the upthrust on the solid Take $g = 9.78 \text{ m/s}^2$
- A. 8.0 N B. 4.78 N C. 47 N D. 9.78 N
174. The resistance of a piece of wire of length 20 m, cross-sectional area $8.0 \times 10^{-6} \text{ m}^2$ and resistivity $4.0 \times 10^{-7} \Omega\text{-m}$ is:
- A. 0.5 Ω B. 1.0 Ω C. 5.0 Ω D. 10.0 Ω
- 175.. A force of 0.6 N acts on a body of mass 40 kg, initially at rest. What is the resulting acceleration?
- A. 24 m/s^2 B. 0.6 m/s^2
C. 40 m/s^2 D. 15 m/s^2
176. An object of mass 10 kg is pulled over a rough surface by a 20 N force. The object accelerates at a rate of 1.5 m/s^2 . Determine the frictional force between the object and the surface.
- A. 30 N B. 20 N C. 2 N D. 5 N
177. A body of mass 2 kg, moving with velocity 5 m/s collides with stationary body of mass 0.5 kg if the two bodies move together after impact , calculate their common velocity.
- A. 10 m/s^2 B. 4 m/s^2 C. 2.5 m/s D. 0.5 m/s^2
178. A body of mass 200 g and specific heat capacity 0.4 J/g.K cools from 37°C to 31°C Calculate the quantity of heat released by the body.
- A. 4800 J B. 1200 J C. 480 J D. 202 J





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179. The length of mercury thread when it is at 0oC, 100oC and unknown temperature XoC is 200 mm, 220 mm and 270 mm respectively. Determine the value of X.
 A. 350oC B. 57 oC C. 133 oC D. 300 oC
180. The linear expansivity of a substance is $1.2 \times 10^{-4}/K$. A cube of this substance has a volume of $8.0 \times 10^3 \text{ cm}^3$ at 30oC. Calculate the increase in its volume at 80oC
 A. 48 cm³ B. 24 cm³ C. 96 cm³ D. 72 cm³
181. At what temperature will the volume of a given ideal gas be three times its volume at 0oC?
 A. 273oC B. 300oC C. 546oC D. 819oC
182. A rectangular metal block of volume $10 \times 10^{-6} \text{ m}^3$ at 273 K is heated to 573 K. If its coefficient of linear expansion is $12 \times 10^{-5}/K$, what is the percentage change of its volume?
 A. 18 B. 1.8 C. 1.08 D. 1.2
183. Calculate the time taken, in minutes, to heat 2.0 kg of water from 30oC to 100oC in an electric kettle that draws a current of 3.0 A from 240 V supply. (Specific heat capacity is $4.2 \times 10^3 \text{ J/kg}$) neglect heat losses to the surrounding.
 A. 0.2 B. 1.9 C. 3.6 D. 21.2
184. The amount of heat needed to raise the temperature of 10 kg of copper by 1k is its:
 A. internal energy B. Specific heat capacity
 C. Heat capacity D. Molar heat capacity
185. Calculate the heat energy required to vapourise 50 g of water initially at 80oC if the specific heat capacity of water is 4.2 J/g.K. (Specific latent heat of vapourisation of water is 2260 J/g)
 A. 1533000 J B. 1172200 J C. 230200 J
 D. 113000 J
186. A piece of copper mass 200 g is heated to 100oC and is then quickly transferred to a copper calorimeter of mass 10 g, containing 100 g of water whose initial temperature is 15oC. If the specific heat capacity of copper and water are 400 J/kg.K and 4200 J/kg.K, find the final temperature of the substance.
 A. 29.1oC B. 30.1oC C. 28.4oC
 D. 27.4oC
187. Which of the following statements is not correct about the assumptions of kinetic theory of gases?
 A. the attraction between the molecules is negligible
 B. the volume of molecules is negligible compared with the volume occupied by the gas
 C. the duration of a collision is negligible compared with the time between collisions
 D. the molecules of the gas behave like perfectly inelastic spheres
188. The ice and steam points of an ungraduated thermometer are 300 mm apart. Calculate the length of thermometric liquid above the ice points which will correspond to a temperature of 75oC
 A. 275 mm B. 250 mm C. 225 mm D. 215 mm
189. A piece of copper of mass 0.55 kg is heated from 57oC to 100oC. What is the increase in the internal energy of the copper? ($c=380 \text{ J/kg.K}$)
 A. $8.9 \times 10^3 \text{ J}$ B. $9.8 \times 10^3 \text{ J}$ C. $8.987 \times 10^3 \text{ J}$
 D. $9.879 \times 10^3 \text{ J}$
190. Two metals A and B lose the same quantity of heat when their temperatures drop from 20oC to 15oC. If the specific heat capacity of A is thrice that of B, calculate the ratio of mass of A to that of B
 A. 1:3 B. 1:2 C. 3:1 d. 3:4





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191. Which of the following is/are observed when heat energy is added to a system?

- (i) the internal energy of the system increases
 - (ii) the volume of the system is directly proportional to the temperature
 - (iii) work may be done in the surroundings.
- A. (i), (ii) and (iii) B. (iii) only
C. (i) and (iii) D. none of the above

192. A constant volume gas thermometer records a pressure of 240 mmHg at 0°C and 300 mmHg at 100°C. Calculate the new temperature when the gas pressure is 270 mm of Hg

- A. 99°C B. 95°C C. 9°C D. 90°C

193. In which of the following is expansion of solids a disadvantage?

- A. the balance wheel of a watch
B. fire alarms
C. the thermostat
D. the fitting of wheels in rims.

194. How long does it take a 800 W heater to raise the temperature of 2 kg of water from 20°C to 60°C?

(specific heat capacity of water = 4200 J/kg.K)

- A. 280 s B. 420 s C. 210 s D. 120 s

195. A room is heated by means of charcoal fire. A man in the room standing away from the fire is warmed by:

- A. convection B. radiation C. conduction
D. reflection



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Physics Answers

1	D	21	D	41	A	61	D	81	C	101	A	121	B	141	C	161	B	181	A
2	B	22	B	42	C	62	A	82	A	102	A	122	B	142	A	162	B	182	D
3	A	23	B	43	B	63	D	83	D	103	C	123	A	143	C	163	C	183	C
4	B	24	B	44	A	64	C	84	D	104	C	124	B	144	D	164	B	184	B
5	D	25	D	45	D	65	D	85	A	105	D	125	C	145	C	165	D	185	B
6	A	26	A	46	B	66	C	86	B	106	A	126	B	146	C	166	C	186	B
7	C	27	C	47	A	67	A	87	B	107	B	127	C	147	B	167	A	187	C
8	B	28	B	48	D	68	C	88	C	108	B	128	D	148	B	168	D	188	C
9	C	29	B	49	C	69	B	89	C	109	A	129	A	149	D	169	C	189	D
10	A	30	B	50	C	70	C	90	A			130	B	150	B	170	C	190	C
11	D	31	A	51	D	71	B	91	D	111	B	131	B	151	C	171	A	191	A
12	A	32	C	52	B	72	B	92	B	112	C	132	C	152	C	172	D	192	D
13	C	33	B	53	D	73	B	93	C	113	A	133	C	153	A	173	B	193	A
14	D	34	A	54	A	74	A	94	B	114	C	134	D	154	A	174	B	194	B
15	D	35	C	55	B	75	C	95	D	115	C	135	C	155	B	175	D	195	C
16	C	36	D	56	B	76	D	96	A	116	B	136	D	156	C	176	D		
17	C	37	A	57	B	77	B	97	A	117	D	137	B	157	C	177	B		
18	C	38	A	58	A	78	B	98	B	118	B	138	A	158	A	178	C		
19	D	39	B	59	B	79	A	99	C	119	C	139	A	159	B	179	A		
20	C	40	C	60	B	80	B	100	D	120	B	140	A	160	B	180	A		



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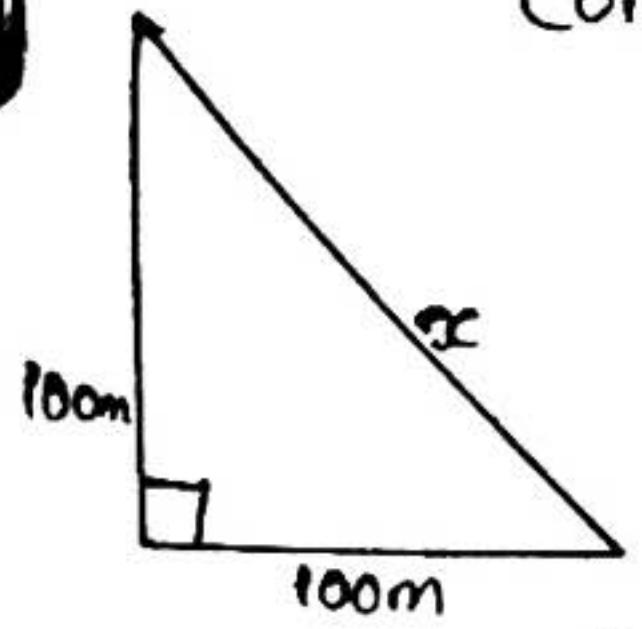
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$$x^2 = 100^2 + 100^2 \\ = 10000 + 10000$$

$$x^2 = 20000 \\ x = \sqrt{20000} \\ x = 141.42 \text{ or } 100\sqrt{2}$$

$$\tan \theta = 100/100 = 1$$

$$\theta = \tan^{-1} 1$$

$$\theta = 45^\circ //$$

2.] Speed = $\frac{\text{Distance}}{\text{Time}}$

$$\text{Speed} = 400 \text{ m/s, distance} = ? \text{ Time} = 4 \text{ secs.}$$

$$400 = \frac{\text{distance}}{4}$$

$$\text{distance} = 400 \times 4 = 1600 \text{ m.}$$

3.] $s = ut + \frac{1}{2}at^2$

$$s = 40 \text{ m}, u = 0, t = ?, a = 10 \text{ m/s}^2$$

$$40 = 0[t] + \frac{1}{2} \times 10 \times t^2$$

$$40 = \frac{1}{2} \times 10 \times t^2$$

$$40 = 5t^2$$

$$t^2 = 40/5$$

$$t^2 = 8$$

$$t = 2\sqrt{2} //$$

4.] Strain = $\frac{\text{extension}}{\text{original length}}$

$$\text{extension} = 5 \text{ mm} = 0.005 \text{ m}$$

$$\text{original length} = 0.1 \text{ m}$$

$$\text{Strain} = \frac{0.005}{0.1}$$

$$\text{Strain} = 0.05 //$$

5.] D → The water level drops because melted ice occupies less volume.

6.] momentum = $m_1 v_1 = m_2 v_2$

$$\text{mass of machine } m_1 = 4 \text{ kg}$$

$$\text{mass of bullet } m_2 = 4.5 \text{ g} = 0.0045 \text{ kg}$$

$$\text{speed of bullet } v_2 = 100 \text{ m/s}$$

$$\text{speed of machine } v_1 = x.$$

$$m_1 v_1 = m_2 v_2$$

$$4 \times x = 0.0045 \times 100$$

$$4x = 4.5$$

$$x = 4.5/4$$

$$x = 1.125 \rightarrow 1.1 \text{ m/s}$$

7.] C → Spring balance

The principle of spring balance is based on Hooke's law. When a weight is hung from the balance, the spring extends in proportion to the weight.

8.] B → Centripetal force

This is the force that is required to move an object in a circular path and it is directed towards the centre of the circle.

9.] P → Solid apparently weighs less when completely immersed in water than when partially immersed. [Archimedes's principle]

10.] A, [2, 4, 5]

11.] D → Diffusion

These is the movement of molecules from a region of lower concentration to a region of higher concentration.

12.] Heat = mL

$$\text{Heat} = ? \text{ } m = 100 \text{ g } L = 80 \text{ cal/g}$$

$$\text{Heat} = 100 \times 80$$

$$= 8000$$

$$= 8 \text{ Kcal} //$$

13.] $m_1 c_1 \theta_1 = m_2 c_2 \theta_2$

$$m_1 = 1.5 \text{ kg}, c_1 = 0.46 \text{ J/kg}^{-1} \text{ } ^\circ\text{C}^{-1}, \theta_1 = 300^\circ\text{C}$$

$$m_2 = ? \text{ } c_2 = 4.2 \times 10^3 \text{ J/kg}^{-1} \text{ } ^\circ\text{C}^{-1}, \theta_2 = 18^\circ - 15^\circ = 3^\circ\text{C}$$

$$1.5 \times 0.46 \times [300 - 18] = 4.2 \times 10^3 \times 3 \times m_2$$

$$194.58 = 12600 m_2$$

$$m_2 = \frac{194.58}{12600} = 0.0154 \text{ kg}$$

$$= 15.44 \text{ g} //$$

Note: Diffusion is the process by which substances mix intimately with one another due to the random motion of their molecules. Diffusion is due to movement of the molecules of a substance and takes place in gases and liquid and occurs slowly in solids. The rate of diffusion depends on density, mass and temperature.

14) D \rightarrow [U and V]

$$15) \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$P_1 = ? \quad P_2 = ? \quad T = 30^\circ C \rightarrow 30 + 273 = 303 K$$
$$T_2 = 61^\circ C = 61 + 273 = 334 K.$$

$$\frac{P_1}{303} = \frac{P_2}{334}$$

$$P_1 334 = P_2 303$$

$$P_2 = \frac{P_1 334}{303}$$

$$P_2 = 1.1023 P_1$$

$$\therefore P_2 = 1.1 P_1 \text{ N/m}^2.$$

$$16) 2 = \frac{L_2 - L_1}{L_1 (\theta_2 - \theta_1)}$$

$$2 = 11 \times 10^{-6} C^{-1} \quad L_2 = 10.005 \text{ cm}$$

$$L_1 = 10 \text{ cm} \quad \theta_2 = ? \quad \theta_1 = 50^\circ C$$

$$11 \times 10^{-6} = \frac{10.005 - 10}{10 (\theta_2 - 50)}$$

$$(11 \times 10^{-6}) [10\theta_2 - 500] = 0.005$$

$$1.1 \times 10^{-4} \theta_2 - 5.5 \times 10^{-4} = 0.005$$

$$1.1 \times 10^{-4} \theta_2 = 0.005 + 5.5 \times 10^{-4}$$

$$\theta_2 = \frac{5.55 \times 10^{-3}}{1.1 \times 10^{-4}}$$

$$= 50.5^\circ C$$

17) C \rightarrow Specific Heat

Specific heat capacity of a substance is the quantity of heat required to raise the temperature of a unit mass [kg] of the substance through $1^\circ C$ or $1K$.

18) Total Power dissipated in bare is

$$2 \times 60W = 120W$$

Where $60W$ is the power given.

19) $V = IR$

$$V = 24V, R = \frac{1}{R} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$$

$$\frac{1}{R} = \frac{3}{3} = \frac{1}{R} = 1$$

$\therefore R = 1 \Omega$

$$24V = I \times R$$

$$I = \frac{24}{1}$$

$$I = 24A$$

$$20) E = I \times V$$

$$E = ?, I = 1.5A, t = 36h, V = 240V$$

$$E = 1.5 \times 36 \times 240$$

$$= 12960 \text{ Wh}$$

$$= 12.96 \text{ kWh}$$

$$\text{Cost} = 12.96 \times 25$$

$$= 324 \text{ K}$$

$$= 3.24 \text{ Naira.}$$

21) D \rightarrow A high resistance multiplier is connected in series.

22) B \rightarrow Commutator

23) P = 4 hours, P.d = 54, I = 5A.

Heat produced = ?

$$\text{Heat} = I^2 R t$$

$$= 5 \times 5 \times 4$$

$$= 80J$$

24) B \rightarrow 433.15K

25) D \rightarrow Zeroth law of thermodynamics.

$$26) 2 = \frac{L_2 - L_1}{L_1 (\theta_2 - \theta_1)}$$

$$2 = 2.30 \times 10^{-5} K^{-1}, L_1 = 500m, L_2 = ?$$

$$\theta_2 = 60^\circ C \quad \theta_1 = 20^\circ C$$

$$2.30 \times 10^{-5} = \frac{L_2 - 500}{500 [60 - 20]}$$

$$2.30 \times 10^{-5} = \frac{L_2 - 500}{20,000}$$

$$L_2 - 500 = 0.46$$

$$L_2 = 500 + 0.46$$

$$= 500.46m$$

$$t = mc$$

$$P = 900 \text{ W}$$

$$t = 3 \text{ min} = 3 \times 60 = 180 \text{ s}$$

$$m = ?$$

$$L = 2.26 \times 10^6 \text{ J/kg.}$$

$$Pt = mc$$

$$900 \times 180 = m \times 2.26 \times 10^6$$

$$180000 = 2260000m$$

$$m = \frac{162000}{226000}$$

$$m = 0.072 \text{ kg},$$

28.) B \rightarrow Heat capacity.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$P_1 = 1 \times 10^5 \text{ Pa} \quad P_2 = 2 \times 10^5 \text{ Pa} \quad V_1 = 100 \text{ cm}^3$$

$$T_1 = 27 \rightarrow 27 + 273 = 300 \text{ K} \quad V_2 = ?$$

$$T_2 = 60 \rightarrow 60 + 273 = 333 \text{ K}$$

$$\frac{1 \times 10^5 \times 100}{300} = \frac{2 \times 10^5 \times V_2}{333}$$

$$V_2 = \frac{6 \times 10^7}{333 \times 10^5}$$

$$V_2 = \frac{3.33 \times 10^9}{6 \times 10^7}$$

$$= 55.5 \text{ cm}^3$$

30.) B \rightarrow Pyrometer.

31.) C \rightarrow Surface area of the substances

32.) B \rightarrow Velocity.

$$Q = mc\theta + mc$$

$$Q = 4000 \text{ J}$$

$$m = 1.5 \text{ kg}$$

$$\theta_2 = ? \quad \theta_1 = 15^\circ \text{ C}$$

$$C = 223 \text{ J/kg. K}$$

$$L = 336 \text{ J kg}^{-1}$$

$$4000 = 1.5 \times 223 \times [\theta_2 - 15^\circ] + 1.5 \times 336$$

$$4000 = 334.5 [\theta_2 - 15^\circ] + 504$$

$$4000 = 334.5 \theta_2 - 5017.5 + 504$$

$$4000 + 5017.5 - 504 = 334.5 \theta_2$$

$$8513.5 = 334.5 \theta_2$$

$$34) \quad \theta_2 = \frac{8513.5}{334.5}$$

$$= 25.45^\circ \text{ C}$$

34.)

$$35.) \quad S = ut + \frac{1}{2}at^2 \quad v^2 = u^2 + 2as$$

$$v = 72 \text{ km/h} \rightarrow \frac{72 \times 1000}{3600} = 20 \text{ m/s}$$

$$u = 0, a = 2, s = ?$$

$$20^2 = 0^2 + 2 \times 2 \times s$$

$$400^2 = 4s$$

$$s = 100 \text{ m}$$

36.) Net force = force applied - force dragging the body

$$\text{force applied} = 200 \text{ N}$$

$$\text{force dragging} = 40 \text{ N}$$

$$\text{Net force} = 200 - 40 = 160 \text{ N}$$

But force = mass \times acceleration

$$160 = 50 \times a$$

$$a = 160/50$$

$$a = 3.2 \text{ m/s}^2$$

$$37.) m_1 v_1 + m_2 v_2 = [m_1 + m_2] v$$

$$m_1 = 2 \text{ kg} \quad v_1 = 3 \text{ m/s}, \quad m_2 = 1 \text{ kg}, \quad v_2 = 4 \text{ m/s}$$

$$2 \times 3 - 1 \times 4 = [2 + 1] v$$

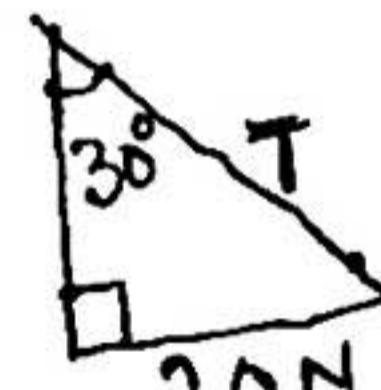
$$6 - 4 = [3] v$$

$$2 = 3 v$$

$$v = 0.66 \rightarrow 0.67 \text{ m/s}$$

38.) A \rightarrow Kinetic energy

39.)



$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 30 = \frac{20}{T}$$

$$0.5 = \frac{20}{T}$$

$$T = \frac{20}{0.5} = 40 \text{ N},$$

6 30 48

$$45.) \text{ } mgh = \frac{1}{2}mv^2$$

$$gh = \frac{1}{2}v^2$$

$$g = 10 \text{ m/s}, h = ? \text{ } v = 30 \text{ m/s}$$

$$10 \times h = \frac{1}{2} \times 30^2$$

$$10h = \frac{1}{2} \times 900$$

$$10h = 450$$

$$h = \frac{450}{10}$$

$$h = 45 \text{ m}$$

$$41.) \text{ Kinetic energy} = \frac{1}{2}mv^2$$

$$m = 40 \text{ kg} \quad v = 0.5$$

$$\begin{aligned} K.E. &= \frac{1}{2} \times 40 \times 0.5^2 \\ &= 20 \times 0.25 \\ &= 5 \text{ J} \end{aligned}$$

$$42.) \text{ } V = u + at$$

$$V = ? \text{ m/s} \quad u = 0 \quad a = ? \quad t = 1 \text{ m} = 1 \times 60 = 60 \text{ sec}$$

$$V = 0 + a \times 60$$

$$V = 60 \text{ m/s}$$

$$a = ? \quad V = 60 \text{ m/s}$$

$$Initial velocity \cdot V^2 = u^2 + 2as$$

$$60^2 = 0^2 + 2 \times 1 \times s$$

$$3600 = 2s$$

$$s = \frac{3600}{2}$$

$$s = 1800 \text{ m}$$

$$43.) \text{ Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Density} = 1000 \text{ kg/m}^3, \text{ mass} = ?, \text{ volume} = 0.1$$

$$1000 = \frac{m}{0.1}$$

$$m = 100 \text{ kg}$$

$$\text{Potential energy} = mgh$$

$$\begin{aligned} &= 100 \times 10 \times 50 \\ &= 50000 \text{ J} \\ &= 50 \text{ kJ} \end{aligned}$$

$$44.) \text{ } m_1v_1 = m_2v_2$$

$$m_1 = 15 \text{ g}, v_1 = 100 \text{ m/s}, m_2 = 1 \text{ kg} \rightarrow 1 \times 1000 = 1000 \text{ g}$$

$$v_2 = ?$$

$$15 \times 100 = 1000 \times v_2$$

$$v_2 = \frac{1500}{1000}$$

$$v_2 = 1.5 \text{ m/s.}$$

$$45.) \text{ Net force} = \text{force applied} - \text{force dragging the body.}$$

$$\text{force applied} = 100 \text{ N}$$

$$\text{force dragging the body} = 20 \text{ N}$$

$$\therefore \text{Net force} = 100 - 20 = 80 \text{ N}$$

$$f = ma$$

$$80 = 50 \times a$$

$$a = 80/50$$

$$a = 1.6 \text{ m/s}^2$$

$$46.) \text{ } mgh = \frac{1}{2}mv^2$$

$$gh = \frac{1}{2}v^2$$

$$g = 10 \text{ m/s}^2, h = 150 \text{ m}, v = ?$$

$$10 \times 150 = \frac{1}{2}v^2$$

$$1500 = \frac{1}{2}v^2$$

$$3000 = v^2$$

$$v = \sqrt{3000}$$

$$v = 54.8 \text{ m/s}$$

$$47.) \text{ } V^2 = u^2 + 2as$$

$$V = 20 \text{ m/s}, u = 16 \text{ m/s}, a = 1 \text{ m/s}^2, s = ?$$

$$20^2 = 16^2 + 2 \times 1 \times s$$

$$400 = 256 + 2s$$

$$400 - 256 = 2s$$

$$s = \frac{144}{2}$$

$$s = 72 \text{ m}$$

$$48.) \text{ Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{distance} \rightarrow 100 \text{ m}, \text{ time} \rightarrow 12 \text{ s}$$

$$= \frac{100}{1000} \times \frac{3600}{12}$$

$$= \frac{360000}{12000}$$

$$= 30 \text{ km/h}$$

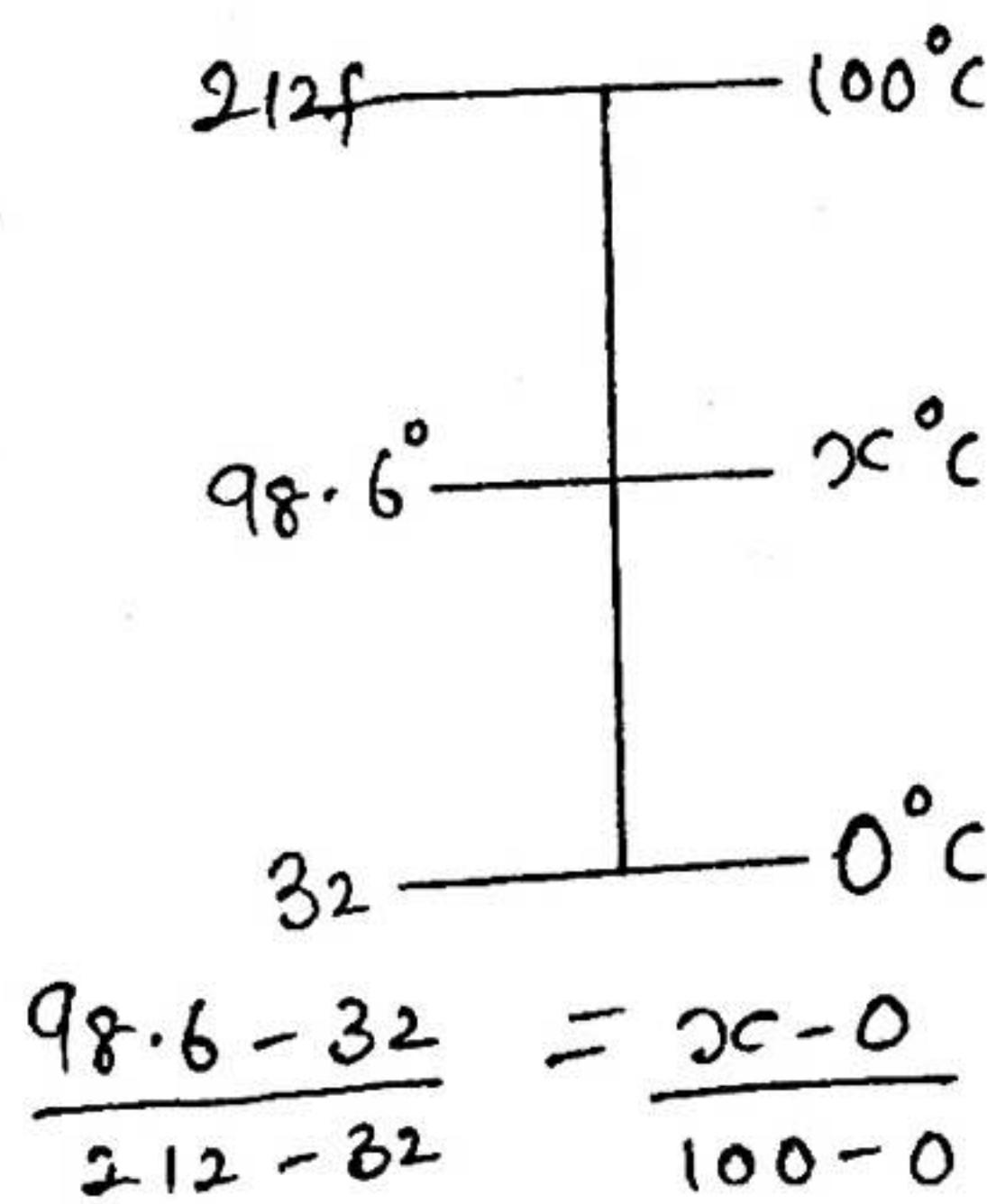
$G \rightarrow$ The quantity of heat required to change the temperature of a unit mass of the substance by one degree.

56.]

52.) $B \rightarrow \text{J kg}^{-1} \text{K}^{-1}$

53.)

54.)



$$\frac{98.6 - 32}{212 - 32} = \frac{x - 0}{100 - 0}$$

$$\frac{66.6}{180} = \frac{x}{100}$$

$$66.6 = 180x$$

$$x = 37^\circ\text{C}$$

55.)

57.) $B \rightarrow \text{Radiation}$

58.) $A \rightarrow \text{I and II only}$

59.) $B \rightarrow \text{false}$

60.) $B \rightarrow \text{I and II only}$

$$61.) [15i - 16j + 27k] + [23j - 40k] \text{N}$$

$$15i [-16 + 23] j [27 + (-40)] k$$

$$15i + 7j - 13k$$

$$\begin{aligned} A \cdot B &= \sqrt{i^2 + j^2 + k^2} \\ &= \sqrt{15^2 + 7^2 + 13^2} \\ &= \sqrt{225 + 49 + 169} \\ &= \sqrt{443} \\ &= 21 \text{ N.} \end{aligned}$$

62.) $A \rightarrow \text{I and II only}$

63.) Speed = $\frac{\text{distance}}{\text{time}}$

Speed $\rightarrow 90 \text{ km/h}$

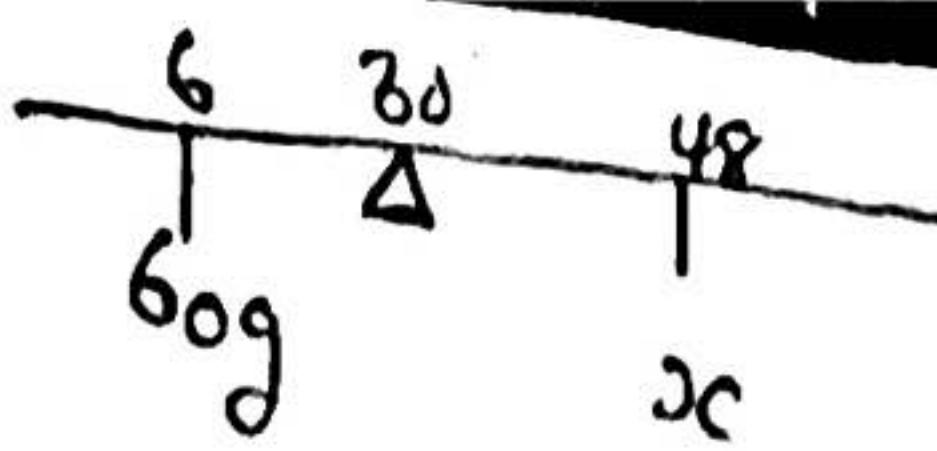
$$\begin{aligned} &\frac{90 \times 1000}{3600} \\ &= 25 \text{ m/s} \end{aligned}$$

distance = ?

Time = 10 sec

$$\therefore 25 = \frac{d}{10}$$

$$d = 250 \text{ m.}$$



Clockwise moment = Anticlockwise moment.

$$60 \times 24 = 30 \times 18$$

$$440 = 180c$$

$$c = 80g.$$

$$m_1v_1 = m_2v_2 = [m_1 + m_2]V$$

$$m_1 = 0.1 \text{ kg} \quad v_1 = 15 \text{ m/s}$$

$$m_2 = 0.4 \text{ kg} \quad v_2 =$$

$$100 \times 15 - 400 = [100 + 400]V$$

$$1500 - 400 = [500]V$$

$$1100 = 500V$$

$$V = \frac{1100}{500}$$

$$m_1v_1 = m_2v_2 = [m_1 + m_2]V$$

$$m_1 = 0.1 \text{ kg} = 0.1 \times 1000 = 100g$$

$$v_1 = 15 \text{ m/s}$$

$$m_2 = 0.4 \text{ kg} = 0.4 \times 1000 = 400g$$

$$v_2 = 0$$

$$V = ?$$

$$100 \times 15 - 400 \times 0 = [100 + 400]V$$

$$1500 = 500V$$

$$V = 3 \text{ m/s}$$

$$\text{Kinetic Energy} = \frac{1}{2}mv^2$$

$$m = 2 \text{ kg} \quad v = 10 \text{ m/s}$$

$$K.E. = \frac{1}{2} \times 2 \times 10^2$$

$$= 100 \text{ J}$$

$$R^2 = A^2 + B^2 - 2AB \cos(180 - \theta)$$

$$R^2 = 10^2 + 5^2 - 2 \times 10 \times 5 \cos(180 - 120)$$

$$R^2 = 100 + 25 - 100 \cos[60]$$

$$R^2 = 125 - 50$$

$$R^2 = 75$$

$$R = \sqrt{75}$$

$$R = 8.66 \text{ N}$$

68) C \rightarrow Two Parallel and Opposite forces on a body whose Parallel lines of action do not coincide.

69)

70) force = mass \times acceleration

$$\text{force} = 0.6 \text{ N}, \quad \text{mass} = 40 \text{ g} = 40 \times 1000 = 0.04 \text{ kg}$$

$$0.6 = 0.04 \times A$$

$$A = \frac{0.6}{0.04}$$

$$A = 15 \text{ m/s}$$

71) B \rightarrow A slight displacement raises it's centre of gravity.

$$mgh = \frac{1}{2}mv^2$$

$$m = ? \quad g = 9.78, \quad v = 9.78$$

$$mgh = \frac{1}{2}mv^2$$

$$9.78 \times h = \frac{1}{2} \times 9.78^2$$

$$9.78h = \frac{1}{2} \times 95.64$$

$$9.78h = 47.82$$

$$h = 4.89 \text{ m}$$

73) ~~QUESTION~~

$$Sf^2 = u^2 + 2as$$

$$V^2 = 5^2 + 2 \times 1.5 \times 125$$

$$V^2 = 25 + 375$$

$$V^2 = 400$$

$$V = \sqrt{400}$$

$$V = 20$$

$$V = u + at$$

$$20 = 5 + 1.5t$$

$$20 - 5 = 1.5t$$

$$15 = 1.5t$$

$$t = \frac{15}{1.5}$$

$$t = 10 \text{ sec}$$

$$V^2 = U^2 + 2as$$

$$V = ?, U = 5 \text{ m/s}, a = 1.5 \text{ m/s}^2, s = 125 \text{ m}$$

$$V^2 = 5^2 + 2 \times 1.5 \times 125$$

$$V^2 = 25 + 375$$

$$V^2 = 400$$

$$V = \sqrt{400}$$

$$V = 20 \text{ m/s}$$

$$V = u + at$$

$$20 = 5 + 1.5t$$

$$20 - 5 = 1.5t$$

$$15 = 1.5t$$

$$t = 10 \text{ sec}$$

$$75.) mg = \frac{1}{2} \rho V^2$$

$$g = \frac{1}{2} V^2$$

$$g = 10 \text{ m/s}, h = 50 \text{ m}, V = ?$$

$$10 \times 50 = \frac{1}{2} V^2$$

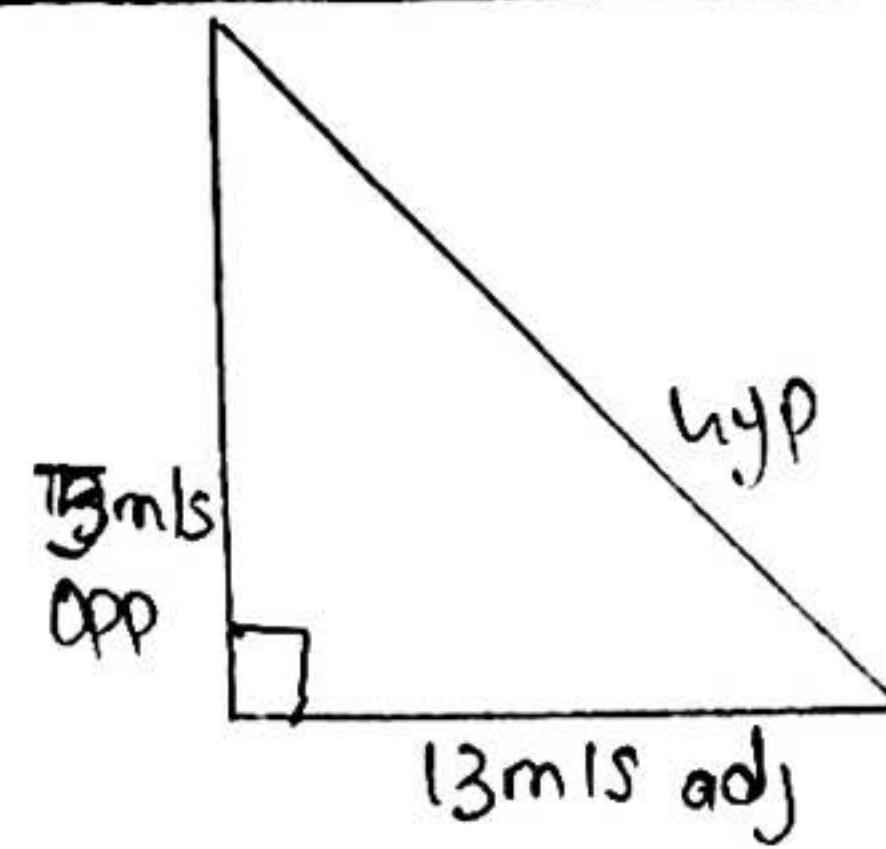
$$500 = \frac{1}{2} V^2$$

$$1000 = V^2$$

$$V = \sqrt{1000}$$

$$V = 31.6 \text{ m/s}$$

78.)



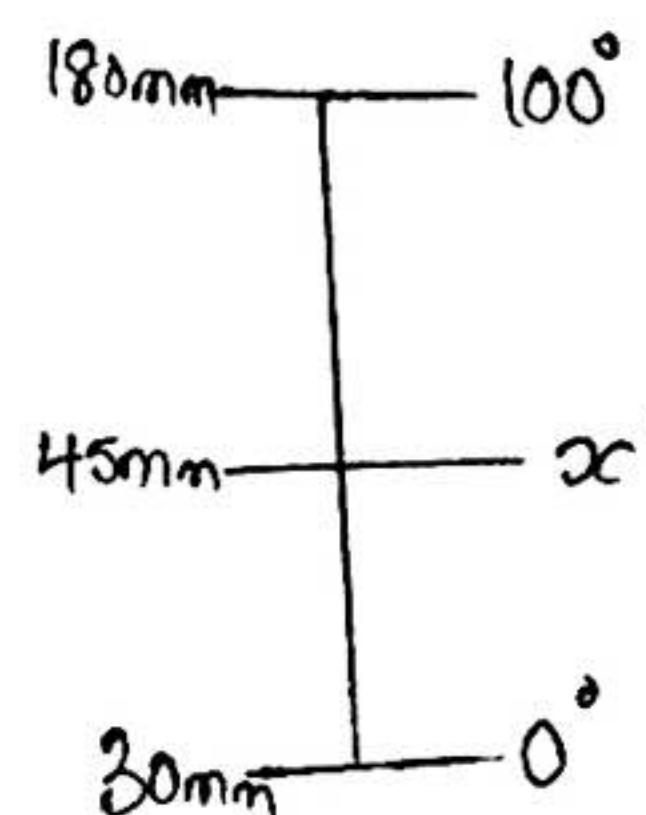
$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan \theta = \frac{5}{13}$$

$$\tan \theta = 0.3846$$

$$\theta = \tan^{-1} 0.3846 \\ = \underline{\underline{21^\circ}}$$

79.)



$$\frac{x-0}{100-0} = \frac{45-30}{180-30}$$

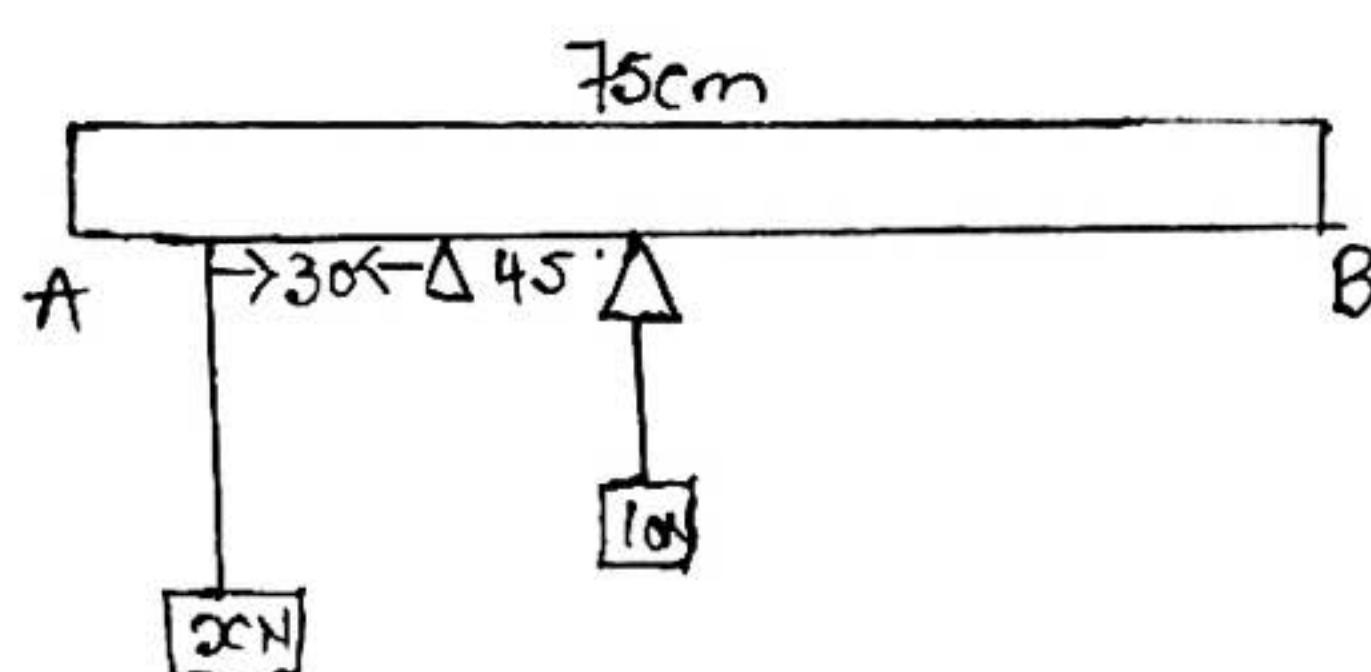
$$\frac{x}{100} = \frac{15}{150}$$

$$150x = 1500$$

$$x = \frac{1500}{150}$$

$$x = 10^\circ$$

76.)



Clockwise moment = Anticlockwise moment

$$20x = 45 \times 10$$

$$30x = 450$$

$$x = \frac{450}{30}$$

$$x = 15 \text{ N}$$

$$80.) P_t = mc\theta$$

$$P = 400 \text{ W}, t = 18 \text{ sec}, m = 0.5, \theta = ? \quad \theta = 2.5^\circ$$

$$400 \times 1 = 0.5 \times c \times 2.5$$

$$400 = 1.25c$$

$$c = \frac{400}{1.25}$$

$$c = 320 \text{ J/kg} \cdot \text{K}$$

$$81.) \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$P_1 = 70 \text{ cmHg}, V_1 = 1000 \text{ cm}^3, T_1 = 127 + 273 = 400 \text{ K}$$

$$P_2 = 28 \text{ cmHg}, V_2 = ?, T_2 = -23.3 + 273 = 249.7$$

$$T_2 = -23.3 + 273 = 249.7$$

$$\frac{70 \times 1000}{400} = \frac{28 \times V_2}{249.7}$$

$$70 \times 1000 \times 249.7 = 400 \times 28 \times V_2$$

$$17419000 = 11200 V_2$$

$$V_2 = 1560.62 \text{ cm}^3$$

E

77.)

$$82.) \frac{L_2 - L_1}{L_1 [\theta_2 - \theta_1]}$$

$$L_1 = 44.25, L_2 = 42.02 \text{ cm}, \theta_2 = 0^\circ \text{C}, \theta_1 = 50^\circ \text{C}$$

$$2 = \frac{44.25 - 42.02}{42.02 [50 - 0]}$$

$$2 = \frac{2.13}{210}$$

$$2 = 1.06 \times 10^{-3} \rightarrow \text{Apparent Cubic expansivity}$$

Cubic expansivity = $3 \times$ linear expansivity

$$= 3 \times 1.0 \times 10^{-5}$$

$$= 3 \times 10^{-5}$$

Real Cubic Expansivity = Apparent Cubic Expansivity + Cubic Expansivity

$$= 1.06 \times 10^{-3} + 3 \times 10^{-5}$$

$$= 1.09 \times 10^{-3} \text{ K}^{-1}$$

6 83) D \rightarrow Change in colour with temperature

84) D \rightarrow Constriction

85) A \rightarrow Latent heat

86) Pt = mc θ

$$P = 25W, t = 5\text{min} = 5 \times 60 = 300\text{sec}$$

$$mc = ? \quad \theta = 10^\circ\text{C}$$

$$25 \times 300 = mc \times 10$$

$$7500 = 10mc$$

$$mc = \frac{7500}{10}$$

$$mc = \underline{\underline{750 \text{ J/K}}}$$

$$\text{but } \frac{1}{t} = \frac{1}{V} + \frac{1}{U}$$

$$\frac{1}{30} = \frac{1}{30} + \frac{1}{U}$$

$$\frac{1}{30} - \frac{1}{30} = \frac{1}{U}$$

$$\frac{1-1}{30} = \frac{1}{U}$$

$$\frac{0}{30} = \frac{1}{U}$$

$$U = 30\text{cm}$$

$$\frac{V}{U} = \frac{h_1}{h_0}$$

$$\frac{30}{30} = \frac{h_1}{30}$$

$$h_0 = 30\text{cm}$$

$$h_1 = \frac{90}{30}$$

$$h_1 = 3\text{cm}$$

$$91.) n = \frac{360}{\theta} - 1$$

$$= \frac{360}{60} - 1$$

$$= 6 - 1$$

$$= 5$$

$$92.) P_1 V_1 = P_2 V_2$$

$$P_1 = 0.8, V_1 = 500 = P_2 = 0.5, V_2 = ?$$

$$0.8 \times 500 = 0.5 \times V_2$$

$$400 = 0.5 \times V_2$$

$$V_2 = \frac{400}{0.5}$$

$$V_2 = 800\text{cm}^3$$

6

87) B \rightarrow work

6 88) C \rightarrow Temperature of both objects are equal.

$$S = \frac{2d}{t} \quad [\text{echoes}]$$

$$S = \frac{2 \times 510}{3}$$

$$S = \frac{1020}{3}$$

$$= 340\text{m/s}$$

$$90.) \frac{V}{U} = \frac{h_1}{h_0}$$

$$V = 30\text{cm} \quad U = ? \quad h_1 = ? \quad h_0 = 3\text{cm}$$

$$f = 35\text{cm}$$

$$93.) V = u + at$$

$$= 0 + 4 \times 4$$

$$V = 16\text{m/s}$$

$$K.E = \frac{1}{2} m v^2$$

$$= \frac{1}{2} \times 650 \times 16^2$$

$$= 83200\text{J}$$

94.) B \rightarrow Dew Point

95.) D \rightarrow I and III Only

$$\frac{T_1^2}{L} = \frac{T_2^2}{L}$$

T = Period, L = Length

$$\frac{T_1^2}{L} = \frac{T_2^2}{9L}$$

$$\frac{T_1^2 \times q}{T_1} = \frac{T_2^2 \times q}{T_2}$$

$$T_2^2 = T_1^2 \times q$$

Square both sides

$$\sqrt{T_2^2} = \sqrt{q T_1^2}$$

$$T_2 = 3T_1$$

factor by which the period is increased is 3

- 97.) B → the vapour of a substance is in equilibrium with its own gas.

$$V = \lambda f$$

$$V = 360 \text{ ml}, \lambda = 120 \text{ cm } f = ?$$

$$360 = 120 \times f$$

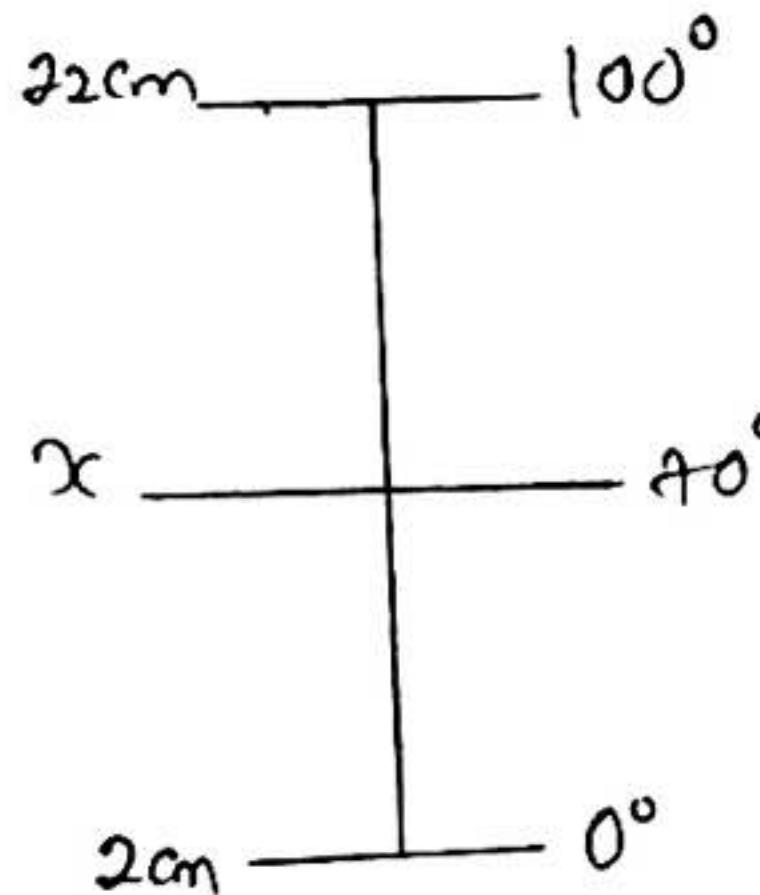
$$f = \frac{360}{120}$$

$$f = 3$$

$$f = \frac{1}{T}$$

$$3 = \frac{1}{T}$$

$$T = 0.333 \text{ sec}$$



$$\frac{x-2}{22-2} = \frac{70-0}{100-0}$$

$$\frac{x-2}{20} = \frac{70}{100}$$

$$100x - 200 = 1400$$

$$100x = 1400 + 200$$

$$100x = 1600$$

$$x = \frac{1600}{100}$$

$$x = 16 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{V} + \frac{1}{q}$$

$$\frac{1}{15} = \frac{1}{V} + \frac{1}{45}$$

$$\frac{1}{V} = \frac{1}{15} - \frac{1}{45}$$

$$\frac{1}{V} = \frac{3-1}{45}$$

$$\frac{1}{V} = \frac{2}{45}$$

$$2V = 45$$

$$V = 22.5$$

$$m = \frac{V}{4}$$

$$= \frac{22.5}{45}$$

$$= \frac{1}{2}$$

$$\begin{aligned} 101.) \text{ Total Power} &= 5 \times 40 + 6 \times 60 \times 2 \times 100 \\ &= 200 + 360 + 200 \\ &= 760 \text{ W} \\ &= 0.76 \text{ kW} \end{aligned}$$

$$\begin{aligned} \text{Bill for 30 days} &= 0.76 \times 12 \times 30 \\ &= 273.6 \text{ K} \\ &= 2.736 \text{ Naira.} \end{aligned}$$

$$102.) V = 327.8 \text{ ml}$$

$$l = 16 \text{ cm} = 0.16 \text{ m}$$

$$f = \frac{V}{4l}$$

$$\frac{327.60}{4 \times 0.16} = \frac{327.68}{0.68}$$

$$f = 512 \text{ Hz}$$

- 103.) B → The time it takes the substance to decay to half of its original quantity.

$$104.) P = \frac{V^2}{R}$$

$$P = 60, V = 12 \text{ V}$$

$$60 = \frac{12^2}{R}$$

$$60 = \frac{144}{R}$$

$$R = \frac{144}{60}$$

$$R = 2.4 \Omega$$

$$105.) \text{ mass} = Z I t$$

$$\text{mass} \rightarrow 4.5 \text{ g}$$

$$Z \rightarrow ?$$

$$I \rightarrow 4.5 \text{ A}$$

$$t \rightarrow 1 \times 60 \times 60 = 3600 \text{ sec}$$

$$4.5 = Z \times 4.5 \times 3600$$

$$4.5 = Z \times 16200$$

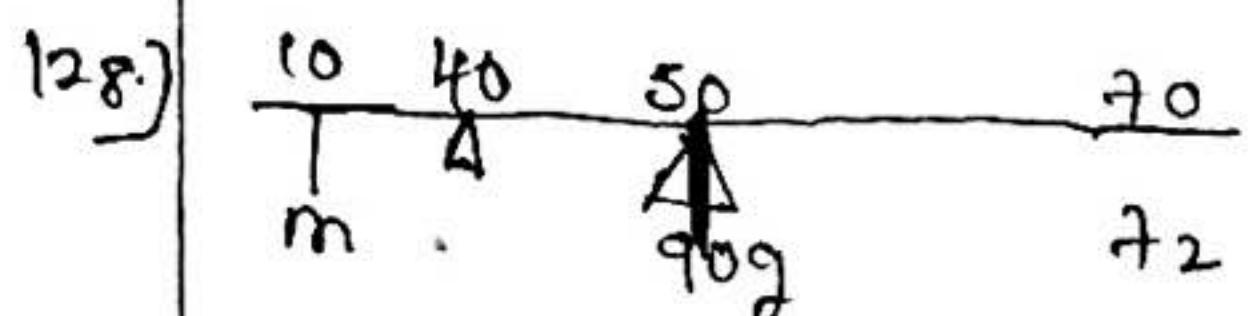
$$Z = 3600$$

106.) A → exactly half of its initial potential energy	116.) $R = \frac{V}{I_g} - R_g$ $R_g = 2.5\Omega, I_g = 50mA = 50 \times 10^{-3}A$ $V = 50V$
107.) B → Heat loss due to Radiation	
108.) B → Any two bodies attract each other with a force which is directly proportional to products of their masses and inversely proportional to the square of the distance between them.	$R = \frac{50}{0.05} - 2.5$ = 1000 - 2.5 = 997.5\Omega
109.) A → Protons and Neutrons.	
110.) $m_1 C_1 \theta_1 = m_2 C_2 \theta_2$ $m_1 \rightarrow 185g, C_1 = ? \theta_1 = 20^\circ - 10^\circ = 10^\circ C$ $m_2 = 140g C_2 = ? \theta_2 = 18^\circ C - 7^\circ C = 11^\circ C$ $185 \times C_1 \times 10 = 140 \times C_2 \times 11$ $1850C_1 = 1540C_2$ $C_1 : C_2 = \frac{1540}{1850}$ = 0.83	117.)
112.) C → oscillatory	
113.) A → Temperature factors affecting the capacitance of a capacitor	$\frac{12-3}{23-3} = \frac{90-0}{100-0}$ $\frac{9}{20} = \frac{90}{100}$ $900 = 200C$ $2C = 45^\circ C$
1.) Area of Plate	
2.) Distance between the plates	
3.) Nature of Dielectric	
114.) C → They carry no electric charge	118.) B → away from the normal.
115.)	119.) $P = \frac{V^2}{R}$ $P = 100W, V = 220V, R = ?$ $100 = \frac{220^2}{R}$ $100R = 484000$ $R = \frac{484000}{100}$ = 4840\Omega
	120.) B → Inside the cooker, the boiling point of water is raised.
	121.) Total Power = $40 \times 40 + 5 \times 60 + 1000$ = 400 + 300 + 1000 = 1700W = 1.7 kW Energy = $P \times t$ = 1.7×5 = 8.5 kW/h.
	122.) B → Sound waves are transverse wave

- A → The focal length of its lens is fixed [31.]
 B → Convex spectacle lenses.
 C → The eyepiece has a shorter focal length than the objective.

26.) B → Rectangular glass Block.

127.) C → If a body is in equilibrium under the action of a number of parallel forces sum of clockwise moment about a point equals sum of anticlockwise moment about the same point.

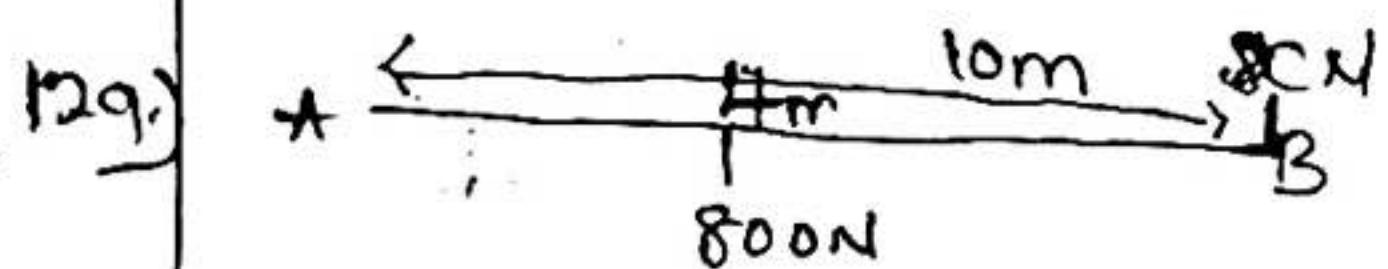


$$M \times 30 = 10 \times 90 + 72 \times 30 \\ = 900 + 2160$$

$$30m = 3060$$

$$m = \frac{3060}{30}$$

$$m = 120g$$



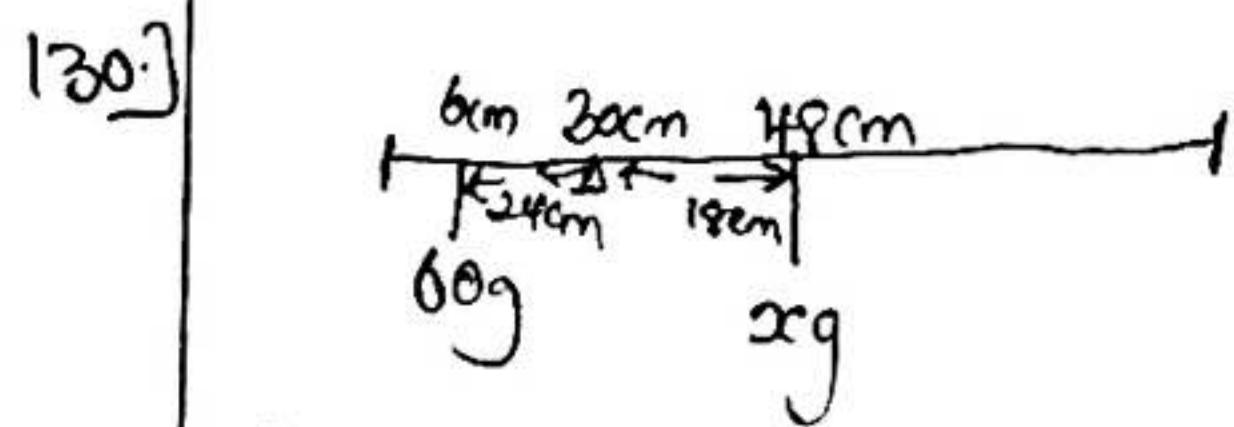
Clockwise moment = Anticlockwise moment

$$4 \times 800 = 10 \times x_c$$

$$3200 = 10x_c$$

$$x_c = \frac{3200}{10}$$

$$x_c = 320N$$



Sum of clockwise = Anticlockwise moment

$$6 \times 24 = 18 \times x_c$$

$$144 = 18x_c$$

$$x_c = \frac{144}{18}$$

$$x_c = 80g$$

B → The limit of stress within which free Schmidlin in the material completely disappears when the stress is removed.

$$\frac{10g}{15g} = \frac{5cm}{x_c}$$

$$10x_c = 75cm$$

$$x_c = 7.5cm$$

133.) C → III only

134.) D → None

135.) C → Electric charges can be produced by conductor.

136.) D → The motion of Earth around the sun

137.) B → Time taken to make one complete oscillation

$$m_1 v_1 + m_2 v_2 = [m_1 + m_2] V$$

$$m_1 = 200 \text{ m/s}, v_1 =$$

$$\text{Total time taken} = \frac{2\pi \sin \theta}{g}$$

$$v = 200 \text{ m/s}$$

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

$$\theta = 60^\circ$$

$$\frac{2 \times 200 \times \sin 60}{10}$$

$$= 40 \times 0.8660$$

$$= 34.64s$$

$$m_1 v_1 - m_2 v_2 = [m_1 + m_2] V$$

$$m_1 = 20g, v_1 = 200 \text{ m/s}$$

$$m_2 = 380g, v_2 = 0$$

$$20 \times 200 - 380 \times 0 = [20 + 380] V$$

$$4000 = 400V$$

$$V = \frac{4000}{400}$$

$$V = 10 \text{ m/s.}$$

140.) A → The ratio of the distance moved by effort to the distance moved by load.

$$\text{Efficiency} = \frac{m \cdot A}{V \cdot R} \times 100$$

$$\text{Efficiency} = 80\%, V \cdot R = 6, m \cdot A = \frac{\text{Load}}{\text{Effort}} = \frac{300}{x_c}$$

$$\frac{80}{160} = \frac{300}{x_c} \times \frac{1}{6} \cancel{\times 100}$$

$$0.8 = \frac{300}{6x_c}$$

$$4.8x_c = 300$$

$$x_c = 62.5N.$$

$$142.) \text{Open pipe} = \frac{\lambda}{2L}$$

$$f = ?$$

$$\lambda = 340 \text{ m/s}$$

$$L = 6 \text{ m.}$$

$$\therefore f = \frac{340}{2 \times 6}$$

$$= 28.33 \text{ Hz}$$

$$143.) f = \frac{1}{2L} \sqrt{\frac{T}{m}}$$

$$m = 0.01 \text{ kg}$$

$$L = 0.5 \text{ m} \quad T = 800 \text{ N} \quad m = \frac{0.01}{0.5}$$

$$f = \frac{1}{2 \times 0.5} \sqrt{\frac{800}{0.02}}$$

$$f = \frac{1}{1} \sqrt{40,000}$$

$$f = 200 \text{ Hz}$$

$$144.) C \rightarrow \frac{1}{\sin \theta}$$

145.) B → If correct.

146.)

147.) Torque = work done

$$\text{Work done} = F \times d$$

$$m L^{-2} \times L$$

$$= m L^2 T^{-2}$$

$$148.) \text{Power} = \frac{\text{work done}}{\text{time}}$$

$$\text{Work done} = mgh$$

$$m = 80 \text{ kg}, g = 10 \text{ m/s}^2, h = 600 \text{ cm} = 6 \text{ m} \quad \text{Time} = 20 \text{ s}$$

$$\text{Work done} = 80 \times 6 \times 10$$

$$= 4800$$

$$\text{Power} = \frac{4800}{20}$$

$$= 240 \text{ W}$$

149.) C → Impulse is the product of force and time

150.) Mechanical advantage = $\frac{\text{load}}{\text{effort}}$

$$\text{Load} = 2 \text{ tonnes} = 2 \times 1000$$

$$= 2000 \text{ kg} = 20,000 \text{ N}$$

$$\text{Effort} = 10 \text{ N}$$

$$M.A = \frac{20,000}{10}$$

$$= 2000$$

151.) K.E = P.E

$$\frac{1}{2}mv^2 = mgh$$

$$P.E = mgh, m = 4000, g = 10, h = [60 - 50]$$

$$m = 10 \text{ kg}$$

$$= 4 \times 10 \times 1 \times 10$$

$$= 400 \text{ J}$$

$$h = 10 \text{ cm}$$

$$= 0.1 \text{ m}$$

K.E = P.E

$$K.E = 400 \text{ J}$$

$$145.) f = BIL \sin \theta$$

$$B = 0.25 \text{ T}, I = 15 \text{ A}, L = 5 \text{ m} \quad \theta = 60^\circ$$

$$f = 0.25 \times 15 \times 5 \times \sin 60$$

$$= 18.24 \text{ N}$$

$$m_1 v_1 - m_2 v_2 = [m_1 + m_2] V$$

$$m_1 = 200g = 0.2 \text{ kg}$$

$$v_1 = 100 \text{ m/s}$$

$$v_2 = 0 \text{ m/s}, V = ?$$

$$20 \times 100 - 2 \times 0 = [2 + 0.2] V$$

$$20 - 0 = [2.2] V$$

$$20 = 2.2 V$$

$$V = 9.09 \text{ m/s}.$$

$$v^2 = u^2 + 2as$$

$$v = 72 \text{ km/h} = 72 \times \frac{1000}{3600} = 20$$

$$u = 48 \text{ km/h} = \frac{48 \times 1000}{3600} = 20$$

$$a = 10.8 \text{ m/s}^2 = \frac{72 \times 1000}{3600} = 20$$

$$20^2 = 13.33^2 + 2 \times 1.85$$

$$400 = 177.77 + 3.65$$

$$400 - 177.77 = 3.65$$

$$222.23 = 3.65$$

$$S = \frac{222.23}{3.6}$$

$$= 61.73 \text{ m.}$$

56) $\frac{1}{3}$ of the object is above the liquid

$\therefore 1 - \frac{1}{3}$ is immersed in the liquid

$\frac{2}{3}$ is immersed in the liquid

Density of the object = 7100 kg/m^3

Density of the liquid = $\frac{2}{3} \times 7100 = 4733 \text{ kg/m}^3$

$$\rho_c = \frac{7100 \times 3}{2}$$

$$x = 10650 \text{ kg/m}^3$$

$$\rho = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{2125}{250}$$

$$= 8.5 \text{ g/cm}^3$$

$$= 8500 \text{ kg/m}^3$$

$$158) S = ut + \frac{1}{2} a t^2$$

$$u = 0, t = 100s, a = 1.5 \text{ m/s}^2$$

$$S = 0 + \frac{1}{2} \times 1.5 \times 10000$$

$$= 7500 \text{ m}$$

$$S = ut + \frac{1}{2} a t^2$$

$$u = 0, t = 98s, a = 1.5 \text{ m/s}^2$$

$$S = 0 + \frac{1}{2} \times 1.5 \times 9604$$

$$S = 7203 \text{ m}$$

$$\therefore S = S_1 - S_2$$

$$S = 7500 - 7203$$

$$= 297 \text{ m}$$

$$K.E \Rightarrow P.E$$

~~$$\frac{1}{2} m v^2 = mgh$$~~

$$m = 125$$

$$v = ? \quad h = 80 \text{ m}$$

$$g = 10$$

$$\frac{1}{2} \times 125 \times v^2 = 125 \times 10 \times 80$$

$$\frac{v^2}{2} = 800$$

$$v^2 = 1600$$

$$v = 40$$

$$\text{Momentum} = m v$$

$$= 125 \times 40$$

$$= 5000 \text{ kg.m/s}$$

$$160) m_1 v_1 - m_2 v_2 = [m_1 + m_2] V$$

$$m_1 = 1500 \text{ kg}$$

$$m_2 = 50 \text{ kg} \quad v_2 = 360 \text{ m/s}$$

$$v_1 = 0 \quad v = ?$$

$$1500 \times 0 - 50 \times 360 = [50 + 1500] v$$

$$18000 = [1550] v$$

$$v = \frac{18000}{1550}$$

$$v = 11.61$$

$$= 12 \text{ m/s}$$

$$(61) V = u + at$$

$$V = 45 \text{ m/s}, u = 0, a = ? t = 10s$$

$$V = \frac{45 \times 1000}{3600}$$

$$= 12.5 \text{ m/s}$$

$$12.5 = 0 + a \times 10$$

$$12.5 = 10a$$

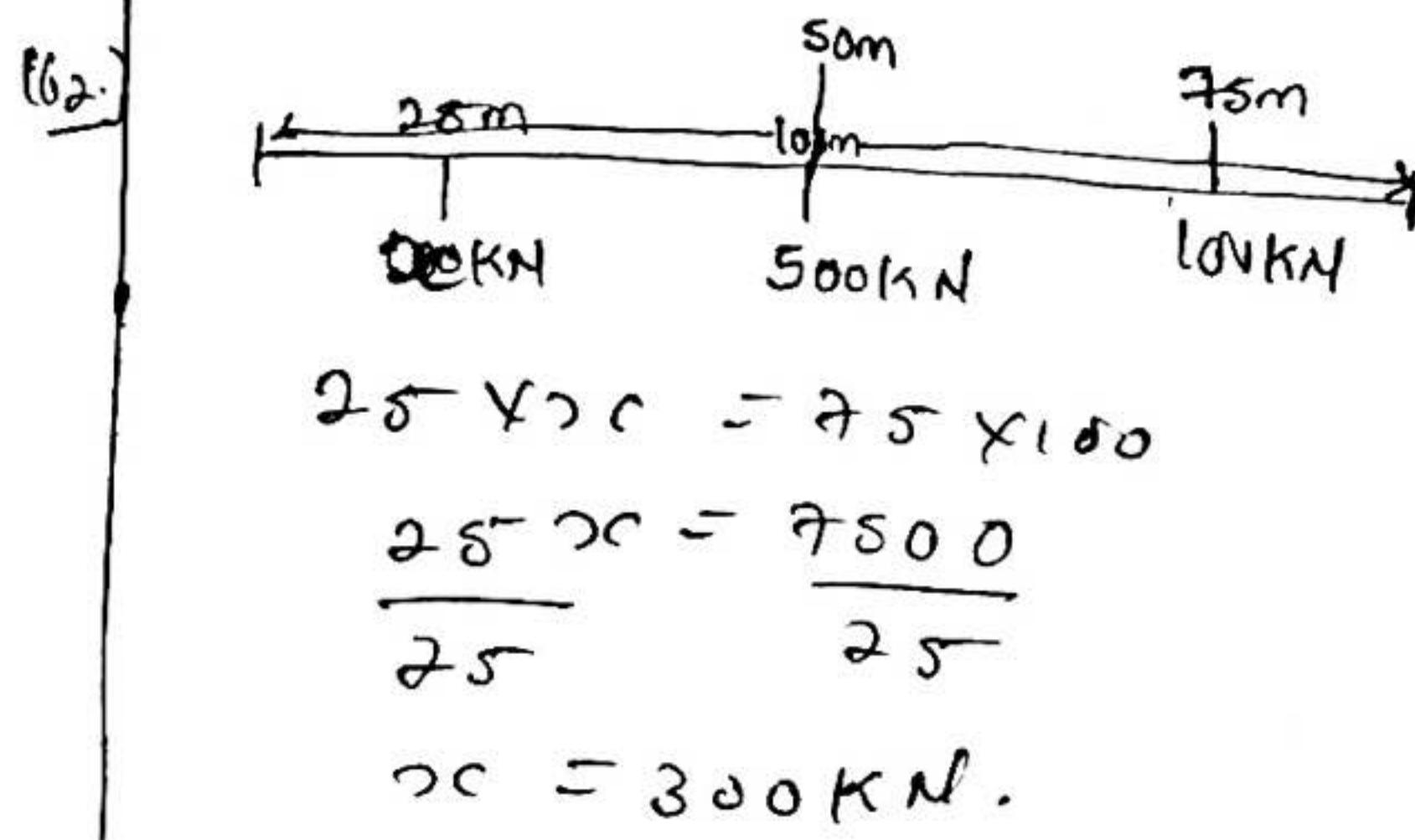
$$a = \frac{12.5}{10} = 1.25 \text{ m/s}^2$$

$$f = ma$$

$$f = ? m = 1000 \text{ kg}, a = 1.25$$

$$f = 1000 \times 1.25$$

$$= 1250 \text{ N}$$



$$(63) V = u + at$$

$$V = ? u = 0, a = 10 \text{ m/s}^2, t = 5s$$

$$V = 0 + 10 \times 5$$

$$V = 50 \text{ m/s}$$

$$\text{Kinetic energy } = \frac{1}{2}mv^2$$

$$m = 220 \text{ g} = 0.22 \text{ kg} \quad V = 50$$

$$K.E. = \frac{1}{2} \times 0.22 \times 50^2$$

$$= 275 \text{ J}$$

(64) B → The specific heat of iron is lower than that of water.

(65) refractive index $\mu = \frac{\text{Speed in Air}}{\text{Speed in glass}}$

$$\mu - 1 = 1.65, \text{ Speed in Air} = 3.0 \times 10^8 \text{ m/s}$$

$$1.65 = \frac{3.0 \times 10^8}{\text{Speed in glass}}$$

$$\text{Speed in glass} = ?$$

$$1.65 = \frac{3.0 \times 10^8}{x}$$

$$x = 1.82 \times 10^8 \text{ m/s.}$$

(66)

$$\text{Young modulus} = \frac{\text{Stress}}{\text{Strain}}$$

$$\text{Stress} = f/A$$

$$\text{Strain} = \epsilon/l$$

$$\therefore \text{if } f = 100 \text{ N, } A = 1.5 \times 10^{-6}$$

$$\epsilon = ? \text{ Young modulus} = 2 \times 10^{11} \text{ N/m}^2$$

$$l = 3 \text{ m}$$

(68)

$$\text{Young modulus} = \frac{\text{Stress}}{\text{Strain}}$$

$$\text{Stress} = f/A, \text{ Strain} = \epsilon/l$$

$$\therefore f = 50 \text{ N}, A = 2.4 \text{ mm}^2 = \pi r^2, \epsilon = 0.25 \text{ mm}$$

$$d = 2r, d = 2.4 \text{ mm} = 2.5 \times 10^{-4} \text{ m}$$

$$r = \frac{d}{2} = \frac{2.4}{2} = 1.2 \text{ mm}$$

$$\text{but } 1.2 \times 1000 = 1.2 \times 10^{-3} \text{ m}$$

$$\text{Area} = \pi r^2 = 3.142 \times (1.2 \times 10^{-3})^2$$

$$= 3.142 \times 1.44 \times 10^{-6}$$

$$A = 4.524 \times 10^{-6}$$

$$\therefore \text{Young modulus} = \frac{50}{4.524 \times 10^{-6}} \times \frac{4}{2.5 \times 10^{-4}}$$

$$= 11061946.9 \times 16000$$

$$= 1.769 \times 10^{11}$$

$$= 1.8 \times 10^{11} \text{ N/m}^2$$

→ The higher the ratio of gravity of a body the more stable the body is

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = 45 \text{ km/h} = \frac{45 \times 1000}{3600} = 12.5 \text{ m/s}$$

$$\text{distance} = ? \quad \text{time} = 10s$$

$$12.5 = \frac{d}{10}$$

$$d = 12.5 \times 10$$

$$d = 125 \text{ m}$$

(71) $\alpha/g_h = \frac{1}{2} \alpha v^2$

$$g_h = \frac{1}{2} v^2$$

$$g = 9.78 \text{ m/s}^2, h = ? \quad v = 9.78 \text{ m/s}$$

$$9.78 \times h = \frac{1}{2} \times 9.78^2$$

$$9.78 h = \frac{1}{2} \times 95.64$$

$$9.78 h = 47.82$$

$$h = \frac{47.82}{9.78}$$

$$h = 4.89 \text{ m}$$

(72) D → When friction takes place, the friction force is less than the limiting value

(73) Upthrust = weight - tension.

$$\text{Weight} = 1 \text{ kg} = 1 \times 9.78 = 9.78 \text{ N}$$

$$\text{Tension} = 5 \text{ N}$$

$$\text{Upthrust} = 9.78 - 5 \\ = 4.78 \text{ N}$$

$$(74) P = \frac{RA}{L}$$

$$P = 4.0 \times 10^{-7}, \text{ Resistance} = ? \quad \text{Length} = 20 \text{ m}$$

$$\text{Cross-sectional Area} = 8.0 \times 10^{-6} \text{ m}^2$$

$$4.0 \times 10^{-7} = R \times 8.0 \times 10^{-6}$$

$$8 \times 10^{-6} = R \cancel{8.0 \times 10^{-6} R}$$

$$R = \frac{8.0 \times 10^{-6}}{8.0 \times 10^{-6}}$$

$$R = 1 \Omega$$

(75)

(76) frictional force = force applied - force dragging the body.

$$\text{force applied} = 20 \text{ N}$$

$$\text{force dragging the body} = 10 \times 1.5 = 15 \text{ N}$$

$$\text{frictional force} = 20 - 15 \\ = 5 \text{ N}$$

(77) $m_1 v_1 - m_2 v_2 = [m_1 + m_2] v$

$$m_1 = 2 \text{ kg}, m_2 = 0.5 \text{ kg}, v_1 = 5 \text{ m/s}, v_2 = 0 \quad v = ?$$

$$[2 \times 5] - [0.5 \times 0] = [2 + 0.5] v$$

$$10 - 0 = 2.5 v$$

$$10 = 2.5 v$$

$$v = 4 \text{ m/s}$$

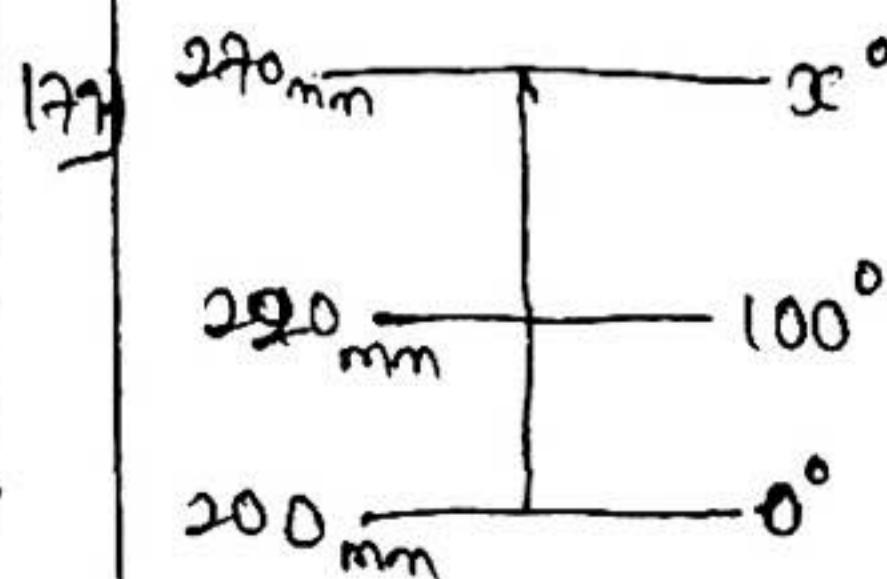
$$v = 4 \text{ m/s}^2$$

(78) $Q = mc\theta$

$$Q = ?, m = 200 \text{ g}, c = 0.4 \text{ J/kg.K} \quad \theta = \theta_2 - \theta_1$$

$$\theta = 37 - 31 \\ = 6^\circ \text{C}$$

$$Q = 200 \times 0.4 \times 6 \\ = 480 \text{ J}$$



$$\frac{100-0}{x-0} = \frac{270-200}{270-200}$$

$$\frac{100}{x} = \frac{20}{70}$$

$$7000 = 20x$$

$$x = \frac{7000}{20}$$

$$x = 350^\circ\text{C}$$

(180) Cubic expansivity = $\frac{V_2 - V_1}{V_1 [\theta_2 - \theta_1]}$

but 3 linear expansivity = cubic expansivity
 $3L = 3 \times 1.2 \times 10^{-4}$, $V_2 = ?$ $V_1 = 8.0 \times 10^3$
 $\theta_2 = 80^\circ\text{C}$, $\theta_1 = 30^\circ\text{C}$

$$3 \times 1.2 \times 10^{-4} = \frac{V_2 - 8000}{8000 [80 - 30]}$$

$$3 \times 1.2 \times 10^{-4} \times 8000 [50] = V_2 - 8000$$

$$144 = V_2 - 8000$$

$$V_2 = 144 + 8000$$

$$V_2 = 8144 \text{ cm}^3$$

$$\text{Change in temperature} = 8144 - 8000$$

$$= 144 \text{ cm}^3$$

(181) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$$V_1 = V_1$$

$$T_1 = 0 + 273 = 273 \text{ K}$$

$$V_2 = 8V_1$$

$$T_2 = ?$$

$$\frac{V_1}{273} = \frac{3V_1}{T_2}$$

$$\frac{V_1}{V_1} = \frac{273 \times 3V_1}{T_2}$$

$$T_2 = 273 \times 3$$

$$T_2 = 819 \text{ K}$$

(182) Cubic expansivity = $\frac{V_2 - V_1}{V_1 [\theta_2 - \theta_1]}$

but 3 linear expansivity = cubic expansivity

$$\text{Linear expansivity} = 12 \times 10^{-5}$$

$$V_1 = 10^{-6} \text{ cm}^3, V_2 = ? \quad \theta_1 = 273 \text{ K}$$

$$\theta_2 = 573 \text{ K}$$

$$3 \times 12 \times 10^{-5} = \frac{V_2 - 10^{-6}}{10^{-6} [573 - 273]}$$

$$3 \times 12 \times 10^{-5} \times 10^{-6} [300] = V_2 - 10^{-6}$$

$$1.08 \times 10^{-7} = V_2 - 10^{-6}$$

$$1.08 \times 10^{-7} + 10^{-6} = V_2$$

$$V_2 = 1.108 \times 10^{-6}$$

(183) Ratio of the volume and per centage =

$$= \frac{1.08 \times 10^{-7}}{10^{-6}} \times 100$$

$$= 10.8\%$$

(183) $P_t = mc\theta$

$$P = TQ$$

$$I = 3.0 \text{ A}, V = 240 \text{ V}, t = ? \quad m = 0.0 \text{ kg} \leftarrow$$

$$C = 4.2 \times 10^3 \text{ J/kg}, \theta = \theta_2 - \theta_1 = 100 - 30$$

$$14t = mc\theta$$

$$3 \times 240 \times t = 2 \times 4.2 \times 10^3 \times 70$$

$$720t = 568000$$

$$t = \frac{568000}{720}$$

$$t = 816.66 \text{ s}$$

$$t = \frac{816.66}{60} = 13.6 \text{ min.}$$

(184) B → Specific heat capacity

(185) $Q = mc\theta + mc$

$$m = 50 \text{ g}, c = 4.2 \text{ J/g.K}, L = 2260 \text{ J/g}$$

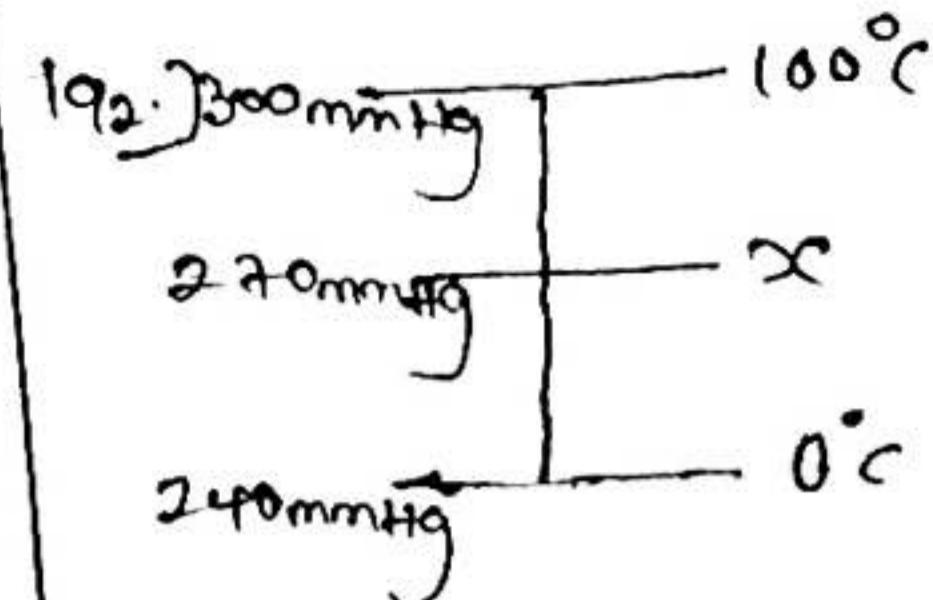
$$\theta = 80^\circ\text{C}$$

$$Q = [50 \times 4.2 \times 80] + [50 \times 2260]$$

$$Q = 16800 + 113000$$

$$= 129800 \text{ J.}$$

191.) A \rightarrow [i, ii, iii]



$$\frac{270 - 240}{300 - 240} = \frac{x - 0}{100 - 0}$$

$$\frac{30}{60} = \frac{x}{100}$$

$$30 \times 100 = x \times 60$$

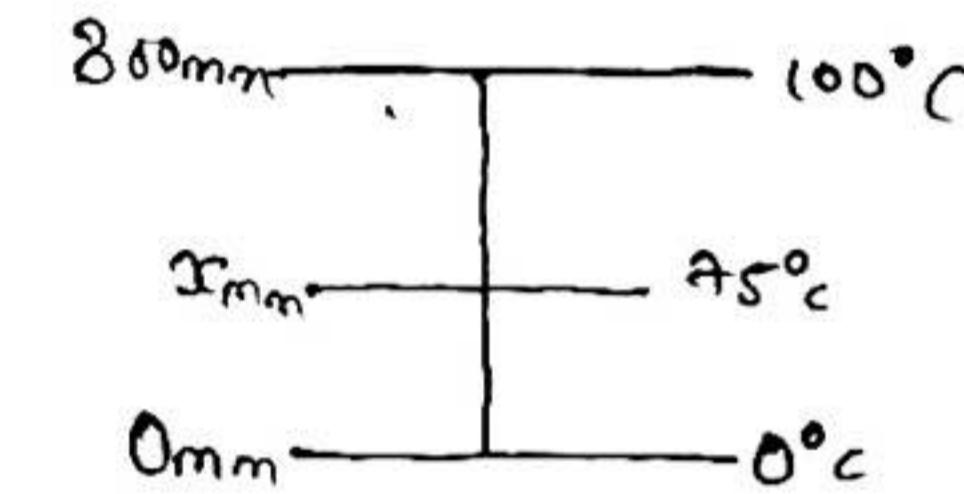
$$3000 = 60x$$

$$x = 50^\circ\text{C}$$

187)

C \rightarrow the duration of collision is negligible compared with the time between collisions.

188.)



$$\frac{x - 0}{300 - 0} = \frac{75 - 0}{100 - 0}$$

$$\frac{25}{300} = \frac{75}{100}$$

$$100x = 22500$$

$$x = 225\text{mm}$$

189.) Heat energy $= mc\theta$

$$m = 0.55\text{ kg}, c = 380\text{ J/kg.K}, \theta = \theta_2 - \theta_1 = 100 - 52$$

$$Q = mc\theta = 0.55 \times 380 \times 48$$

$$= 8987$$

$$= 8.987 \times 10^3\text{J}$$

190)

$$m.c.\theta = mc\theta$$

$$m_1 = ? \quad c_1 = 3 \times c_2 \quad \theta_1 = 20 - 15, m_2 = ? \quad c_2 = ? \quad \theta = 20 - 15$$

$$m_1 \times 3 \times c_2 \times [20 - 15] = m_2 \times c_2 \times [20 - 15]$$

$$3 = 1$$

$$\therefore 3 : 1$$

193.) A \rightarrow the balance of a watch

$$P_t = mc\theta$$

$$P = 880\text{W}, t = ?, m = 21\text{kg}$$

$$c = 4200\text{J/kg.K} \quad \theta = \theta_2 - \theta_1 = 60 - 20 = 40^\circ\text{C}$$

$$880 \times t = 2 \times 4200 \times 40$$

$$880t = 336000$$

$$t = \frac{336000}{880}$$

$$t = 382\text{s}$$

195.) B \rightarrow Radiation.

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① Empirical formula is the unit structure of a molecular formula and related with the formula:

$$(E.F) \times n = MM$$

Where E.F = Empirical formula
M.M = Molar mass.

$$\therefore (CH_2O) \times n = 180$$

$$C=12, O=16, H=1$$

$$(12+(1\times 2)+16) n = 180$$

$$(30)n = 180$$

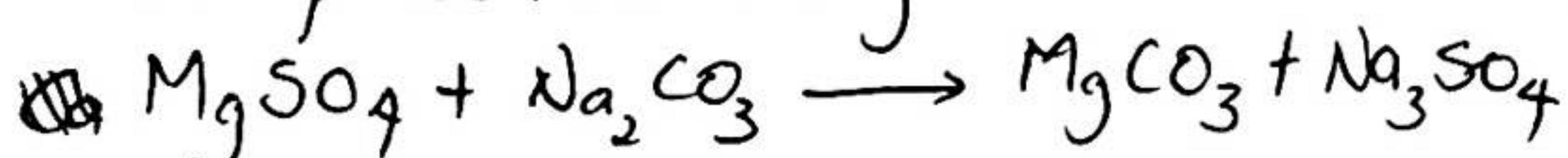
$$n = \frac{180}{30}$$

$$n = 6$$

$$\therefore \text{Molecular formula} = C_6H_{12}O_6 - A$$

② B (sewage compound is a solid-liquid compound which can degrade or broken to simpler forms through biological means).

③ Presence of (Ca, Mg or Fe) compounds of chloride, sulphate, and Nitrates ~~not~~ in water makes such a permanent hardness in water. Which can only be separated by ion exchange resin method of sodium. e.g



A

$$\begin{aligned} ④ \text{ No of moles} &= \text{Concentration} \times \text{Volume} \\ &= 0.01 \times \frac{500}{1000} \\ &= 0.005 \text{ mole} - A \end{aligned}$$

⑤ A strong acid is an acid that can ionize completely in a solution i.e. can donate all hydrogen ion in a solution when reacted with other compounds like a base. — C

$$⑥ T_1 = 273K$$

$$T_2 = ?$$

$$V_1 = V,$$

$$V_2 = V_1 \times 2$$

$$P_1 = P_1$$

$$P_2 = P_1 \times 2$$

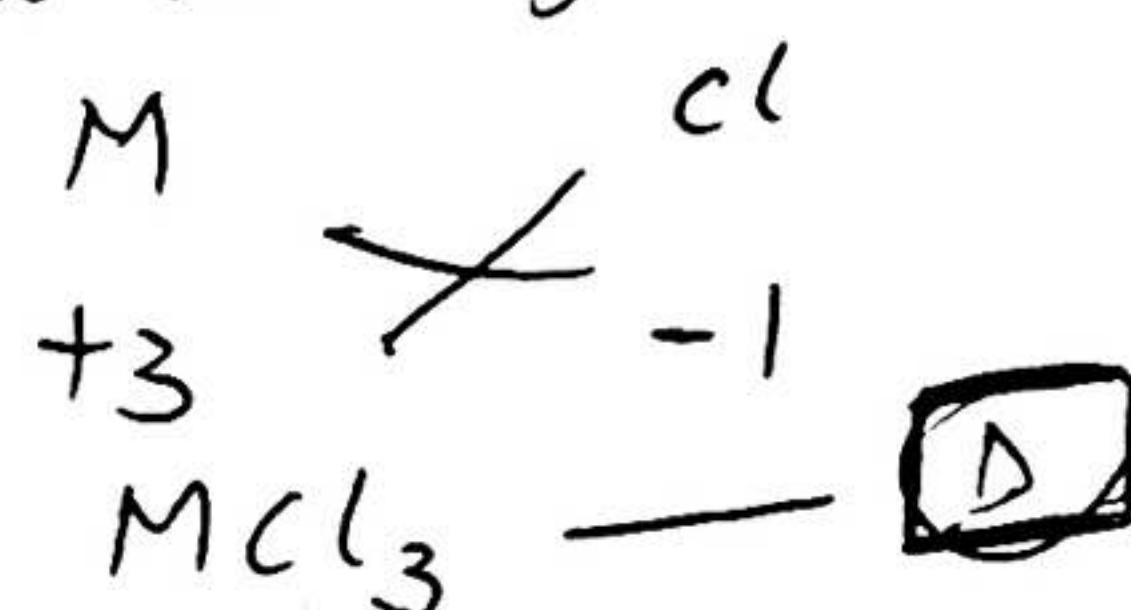
$$T_2 = \frac{P_2 V_2 T_1}{P_1 V_1}$$

$$T_2 = \frac{P_1 \times 2 \times 4 \times 2 \times 273}{P_1 \times 4}$$

$$T_2 = \frac{2 \times 2 \times 273}{1092K} - D$$

⑦ The charge on an element corresponds to the one faraday and to the deposition of 1 mole of such element (usually metals, in electron as well).

3 moles of electron of metal M means the charge on M is +3

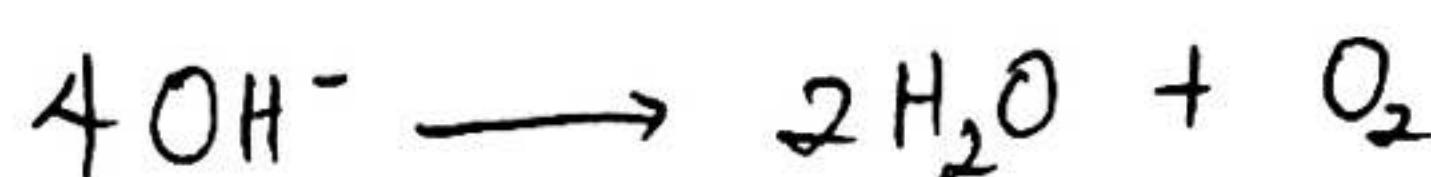


⑧ D

⑨ D

⑩ At the cathode, the possible cations to be deposited is Na^+ & H^+ while at the anode the possible anions to be deposited are OH^- and Cl^- .

But due to the electrochemical series, the lower ions are deposited in each electrodes i.e. H^+ and OH^-



This reaction is due to the fact that hydroxyl ion cannot be deposited because it is a compound.

$\therefore H_2O$ produced remains in the solution with Oxygen gas evolved

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Meaning Oxygen and Hydrogen will be deposited. — A

11 D

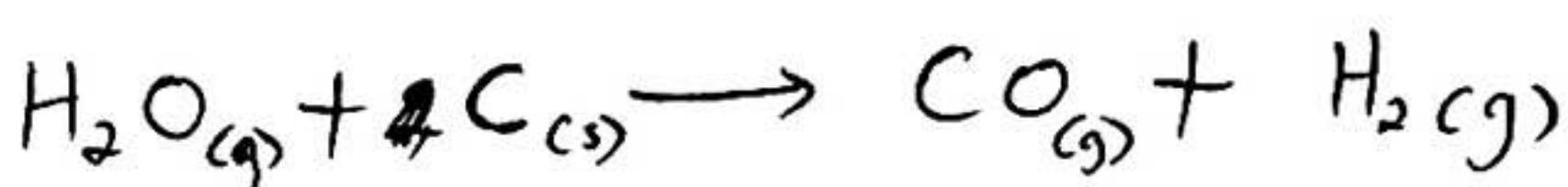
12 A

13 Any reaction involving Oxygen as one of its reactant is termed Combustion reaction. — B

14 D

15 D

17 Hot coke means Carbon. Therefore, the reaction with steam is :



However, this $CO_{(g)}$ formed reacts furtherly with either Ozone or Oxygen in the air to form $CO_2{_{(g)}}$

— B

18 C

19 B

20 D

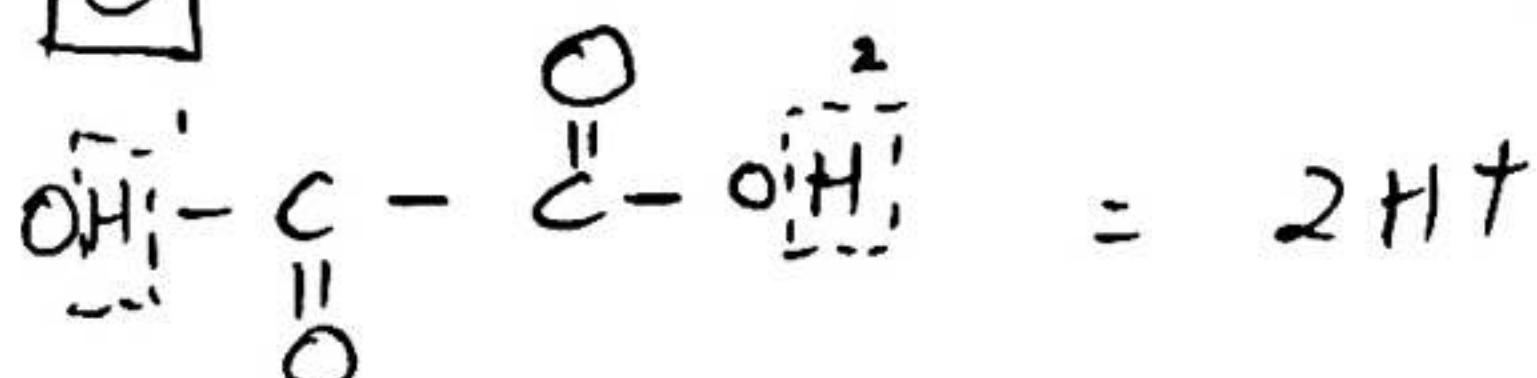
Addition of MnO_2 fasting the reaction because it acts as a catalyst. And Heating the compound (H_2O_2) will agitate the liquid compound to forming water and Oxygen gas.

Concentration increment causes or affect the reaction positively -

21 C

All other options involves chemical reactions.

22 C

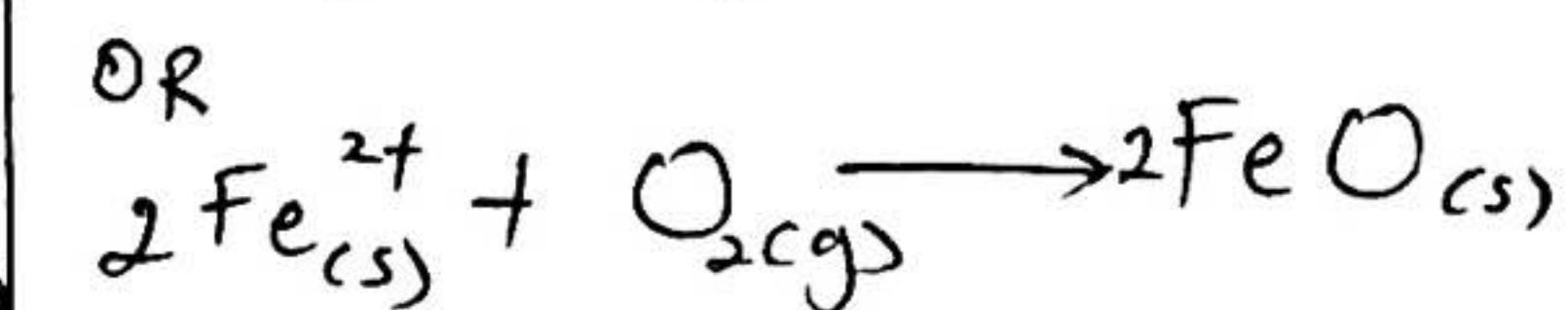
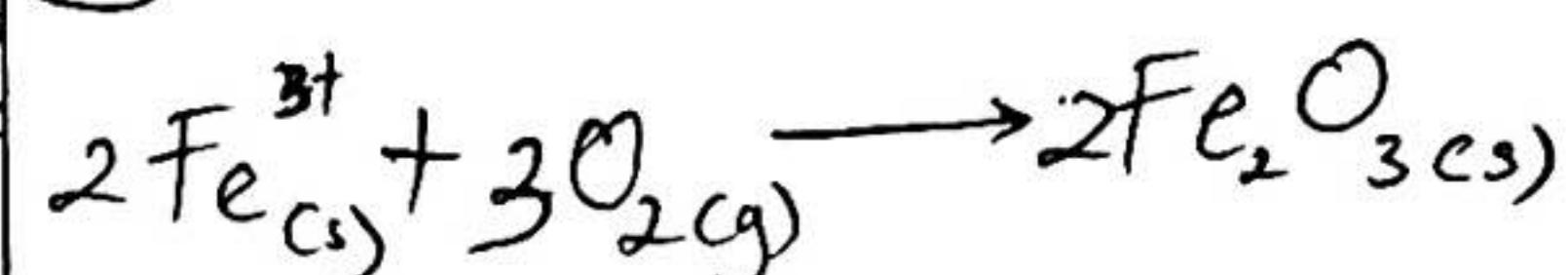


23 D

24 A

A reducing agent either removes oxygen from its conjugate or adds Hydrogen to its conjugate.

25 C



26 D

27 D

Fehling's solution is used to test for reducing sugar. Sucrose a carbohydrate is not a reducing sugar ∵ will test negative by not reacting with the reagent unlike Glucose which will ~~test~~ test positive by a brick-red precipitate colouration.

28 C

Ionic radius of metals are less than their atomic radius because atomic radius increases down the group with no changes in the ionic radius.

29 B

Ethane is gotten from plastics by hydrogenation. Plastics is however also known as Polyethene which makes it a derivative of alkenes.

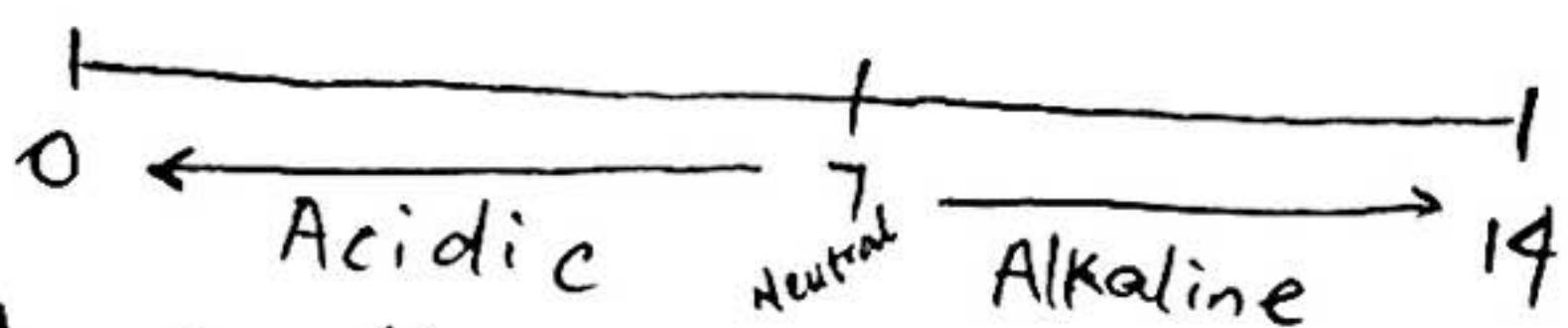
30 B

33) A

Exothermic reaction is a reaction in which the system releases heat to the environment. Such that, the environment becomes hotter than the system itself.

34) D

pH scale



As the pH scale tends towards 14, it becomes more alkaline or basic.

35) A

Bauxite - Is an ore of aluminium
Potash alum - Is a compound of Potassium
Kaolin - Is a white clay used for making ceramics.

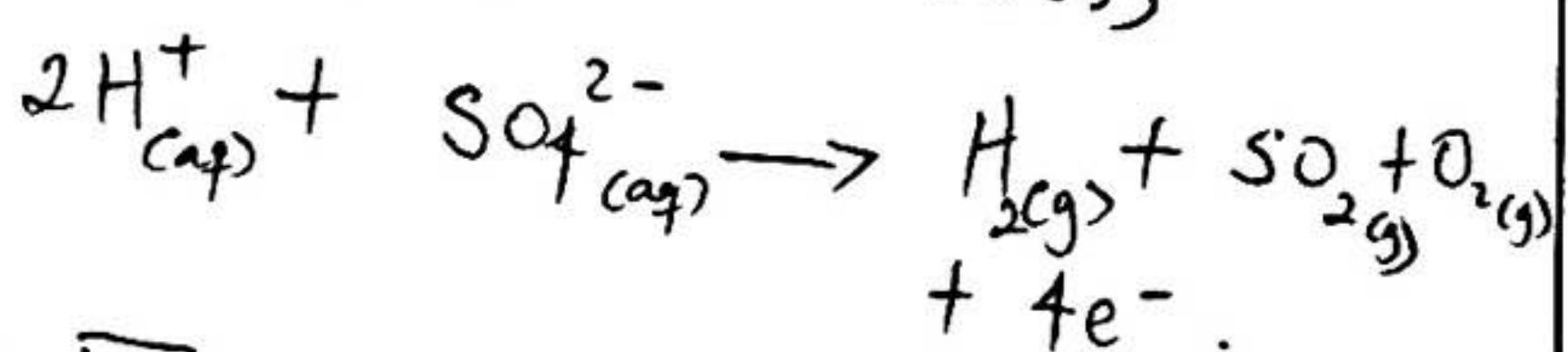
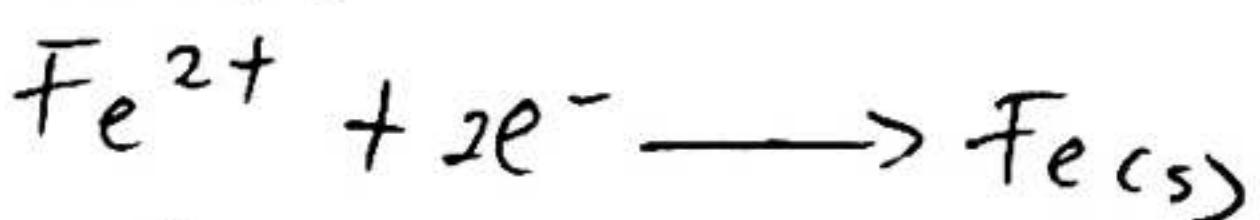
Cryolite - Is a mineral consisting of a fluoride of sodium & aluminium.

36) A

Reaction of alkanoic acid and alkanol gives alkylalkanoate (esters)

37) C

Metals contains free mobile electrons that helps to conduct electricity. While ion does that in an aqueous salts solution.



38) A

Starch are series of glucose units joined together by glycosidic bond in a specific orientation of carbon to carbon. Breakage of these bonds means that by water means the resultant is several of Glucose.

39) D

Diamond and Graphite are allotropes of carbon. But Diamonds are crystal structures that are closely-packed. While Graphite are made up of layers of hexagonal structure that are loosely packed.

40) C

41) D

42) C

See Question 13.

Complete combustion of carbon compounds or organic compounds gives $\text{CO}_{2(\text{g})}$ and $\text{H}_2\text{O}_{(\text{l})}$. While an incomplete combustion will result to a deposition of carbon.

43) A

All oxides of non-metals gives acid when reacted with water and are therefore termed acidic oxides.

44) A

45) Cu²⁺ aq)⁺ 2e⁻ \rightarrow Cu_(s)

2F will deposite 1 mole of Cu.

$$Q = I t$$

$$= 10 \times 965$$

$$= 9,650 \text{ coulombs}$$

$$2F = 2 \times 96,500$$

$$= 193,000 \text{ coulombs}$$

$$1 \text{ mole} = 193,000 \text{ coulombs}$$

$$x \text{ mole} = 9,650 \text{ coulombs}$$

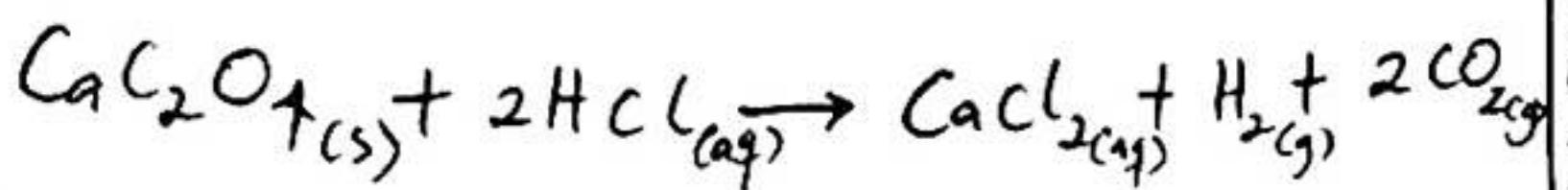
$$x \text{ moles} = \frac{9,650}{193,000}$$

$$= 0.05 \text{ mole of Cu.} -$$

C

47 D

Addition of Conc. HCl will dissolve CaC_2O_4 in the reaction



78 Concentration of $\text{H}_2\text{SO}_4 = 2.0 \text{ mol/dm}^3$

$$\text{Volume of } \text{H}_2\text{SO}_4 = \frac{400 \text{ cm}^3}{1000}$$

$$\begin{aligned}\text{No. of mole} &= CV \\ &= 2 \times 0.4 \\ &= 0.8 \text{ mol. of } \text{H}_2\text{SO}_4\end{aligned}$$

On dilution with water

$$\text{Concentration} = 0.2 \text{ mol/dm}^3$$

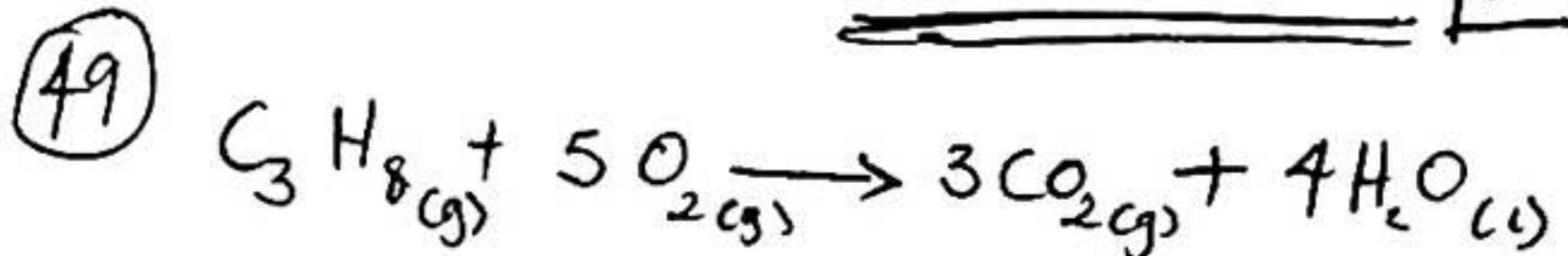
$$\text{No. of moles} = CV$$

$$\begin{aligned}\text{Volume} &= \frac{n}{C} \\ &= \frac{0.8}{0.2} \\ &= 4 \text{ dm}^3\end{aligned}$$

$$\therefore \text{Volume} = 4000 \text{ cm}^3 \text{ of } \text{H}_2\text{SO}_4(aq)$$

$$\text{Volume of water} = \text{Volume of aqueous } \text{H}_2\text{SO}_4 - \text{Volume of conc. } \text{H}_2\text{SO}_4.$$

$$\begin{aligned}\text{Volume of water} &= 4000 - 400 \\ &= 3600 \text{ cm}^3 \quad \boxed{D}\end{aligned}$$



$$1 \text{ mol} : 5 \text{ mol}$$

$$1 \text{ L} : 5 \text{ L}$$

from Gay Lussac's law:

$$\therefore \text{If } 20 \text{ cm}^3 \quad 20 \text{ cm}^3$$

$$\text{Reacted gases } 4 \text{ cm}^3 \quad 20 \text{ cm}^3$$

$$\text{Residual gas} = 16 \text{ cm}^3 \text{ of Propane gas}$$

J A

50 B

Alkaline pyrogallol solution removes Oxygen gas from its mixture.

51 D

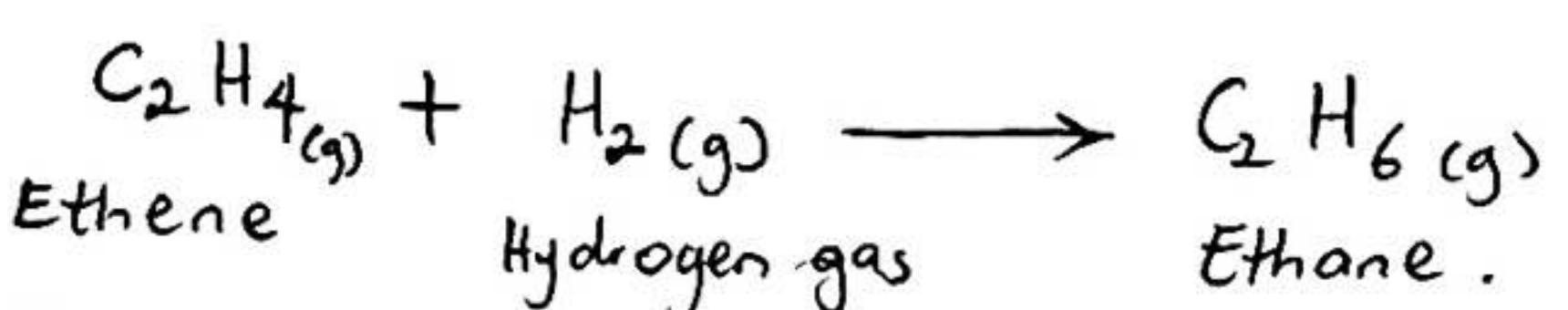
See question 24.

52 C

Deliquescent compounds are those compounds that absorb moisture from the atmosphere and form the solution of the compounds. e.g. FeCl_3

53 D

Hydrogenation means addition of hydrogen where corresponding alkanes and alkenes all differ with the differences of one hydrogen molecule. i.e.



54 C

The oxidation of alkanol gives it corresponding alkanic acid.

55 A

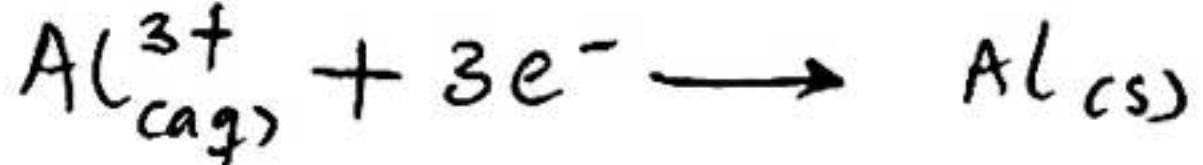
56 D

Check the electrochemical series for confirmation.

57 B

58 B

59 C



3F liberates 1 mole of Al.

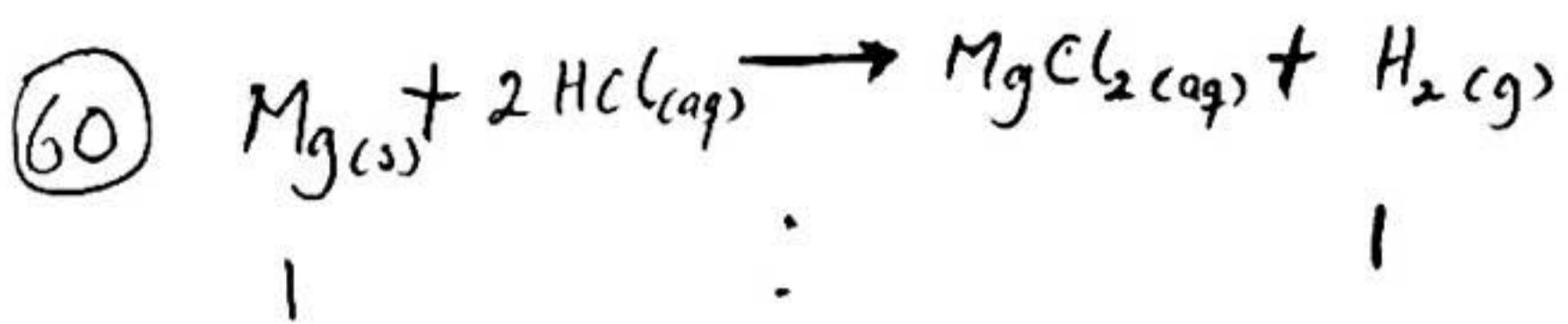
$$n = \frac{m}{M}$$

$$= \frac{9}{27} = 0.33 \text{ mole}$$

∴ xF will liberate 0.33 mole of Al

$$x = \frac{3F \times 0.33 \text{ mole}}{1 \text{ mole}}$$

$$x = 0.99 \approx 1.0F - \boxed{C}$$



$$\text{no. of moles} = \frac{\text{mass}}{\text{Molar mass}}$$

$$\text{mass of Mg}_{(s)} = 12.0 \text{ g}$$

$$\text{Molar mass of Mg} = 24 \text{ g/mol}$$

$$\text{Mass of H}_2{}_{(g)} = ?$$

$$\text{Molar mass of H} = 1 \text{ g/mol.}$$

$$n = \frac{12}{24}$$

$$n = 0.5 \text{ mol}$$

\therefore If 0.5 mol of $\text{Mg}_{(s)}$ reacted, then 0.5 mol of $\text{H}_2{}_{(g)}$ will be produced.

$$\therefore n = \frac{m}{M}$$

$$0.5 = \frac{m}{2}$$

$$m = 0.5 \times 2 = 1.0 \text{ g} - \boxed{A}$$

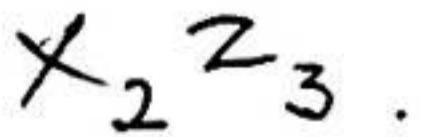
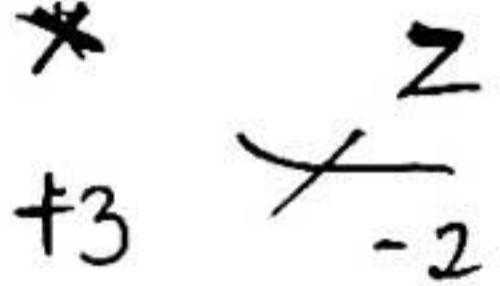
NOTE: The equation was based on Hydrogen gas and not Hydrogen alone.

62)

An exception occurs when an A_2B_3

63)

This is a reaction btw a group IIIA element and a group VIA element.



64)

CH_4 shows a tetrahedral orientation

H_2O shows a bent-shaped orientation

H_2S also shows a bent-shape or V-shape.

65) Cu_2O (copper(II) oxide)

$$\text{Cu}_2\text{O} = (2 \times 64) + 16$$

$$= 128 + 16$$

$$= 144 \text{ g/mol}$$

Percentage of Cu.

$$2\text{Cu} = 2 \times 64$$

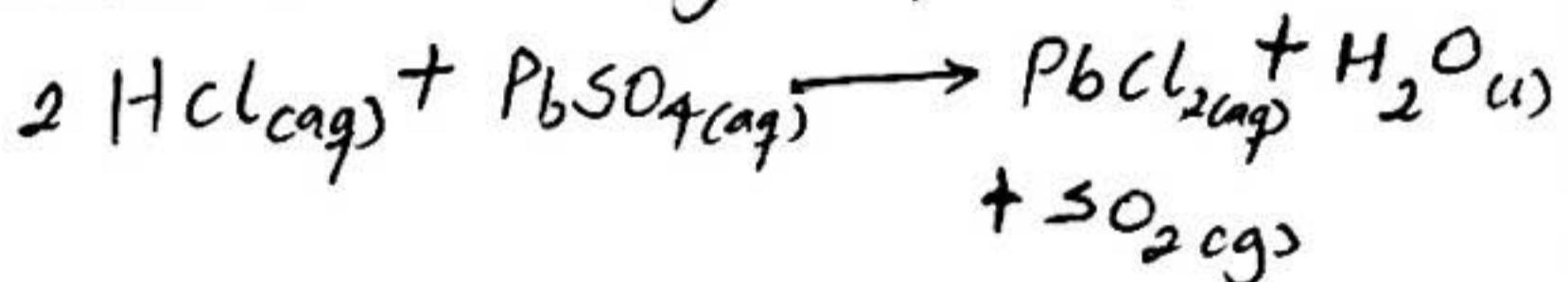
$$= 128$$

$$\% = \frac{128}{144} \times \frac{100}{1}$$

$$= \underline{\underline{88.9\%}} - \boxed{A}$$

66)

The reaction of dil. $\text{HCl}_{(aq)}$ with PbSO_4 causes an exchange of compounds.



67)

68)

Alums are usually double salts that consists of mixture of two simple salts having two different cations but a single anion. e.g. $(\text{Ba}(\text{SO}_4)_2 \cdot 2\text{H}_2\text{O} \cdot \text{A}_2\text{SO}_4)$.

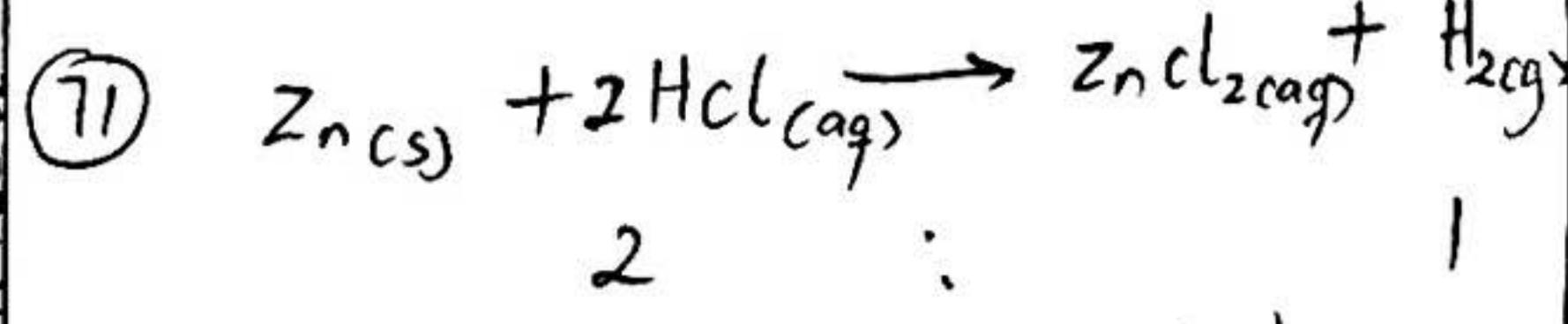
$$\text{i.e. } \text{Na}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}.$$

69)

As H_3O^+ denotes acid which is termed Hydroxonium ion and OH^- Connutes the base meaning Hydroxyl ion. Reaction btw the two compounds result into salt and Water.

70)

See question 38.



If 2 moles of HCl are needed to produce 1 mole of Hydrogen gas,

0.6 mole of HCl will produce
x mole of H_2

$$\begin{array}{rcl} 2 & = & 1 \\ 0.6 & = & x \end{array}$$

$$2x = 0.6$$

$$x = \frac{0.6}{2}$$

$$= 0.3 \text{ mole of } H_2 \quad \boxed{C}$$

72 A

73 D

Decrease in the pressure of the reactant agitates the gas molecules as they collide with the wall of their containers.

74 B

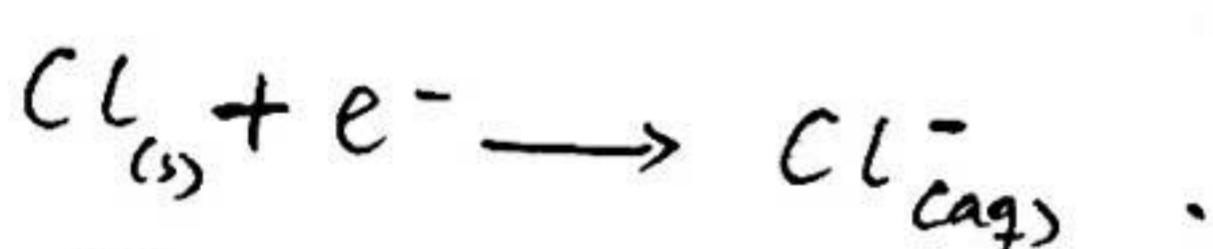
75 A

77 D

78 B

An alpha particle is represented by ~~as~~ Helium element.

79 B



80 A

81 D

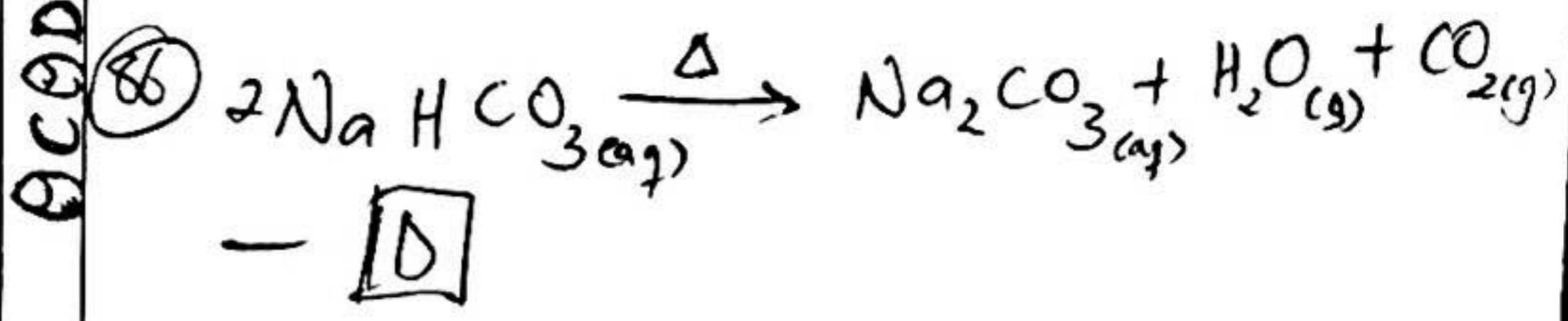
82 A

83 $Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{(aq)} + H_2$
If zinc powder is used instead of granules it fastens the rate of reaction
— B

Ozone

84 A

85 B



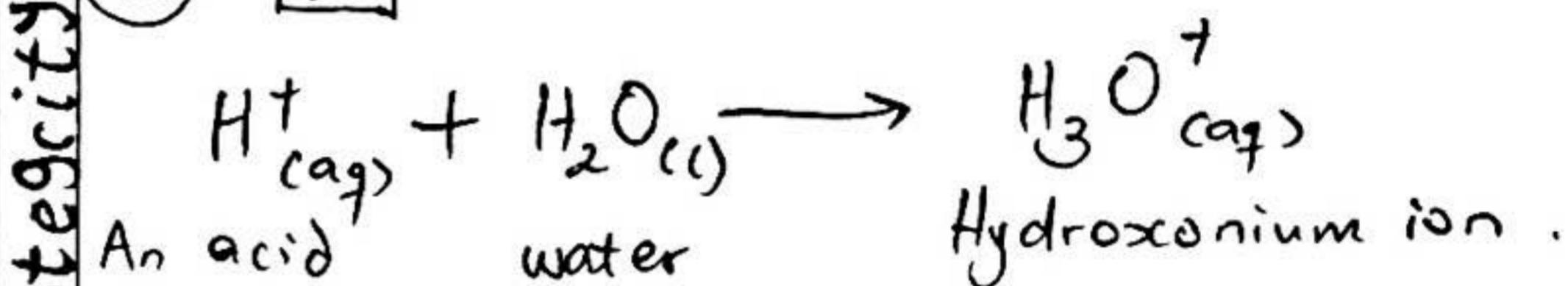
87 D

88 C

89 C

This is due to closeness in the bonds of such a gas as it turns liquid.

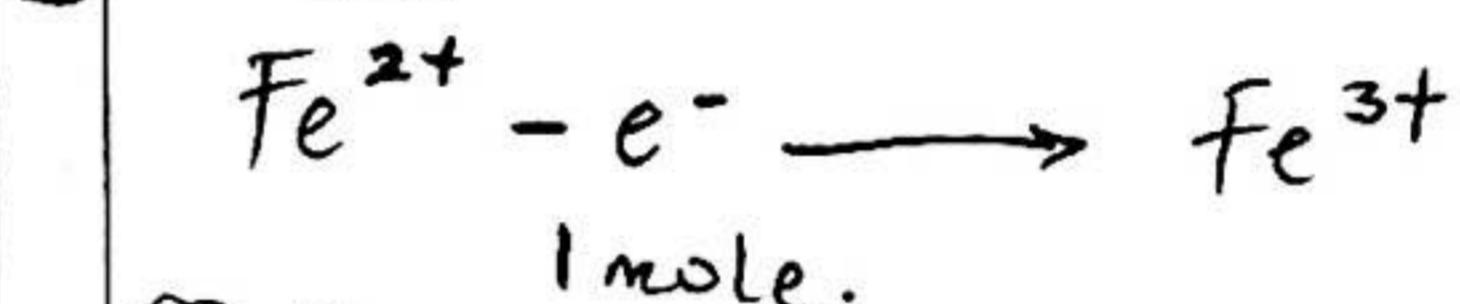
90 D



92 A

Cathodes are negatively charged and will only accept positively charged elements or ion (cation).

93 D



94 B

95 C

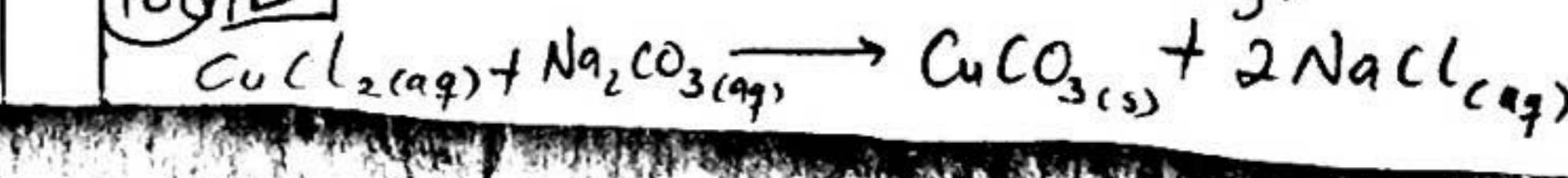
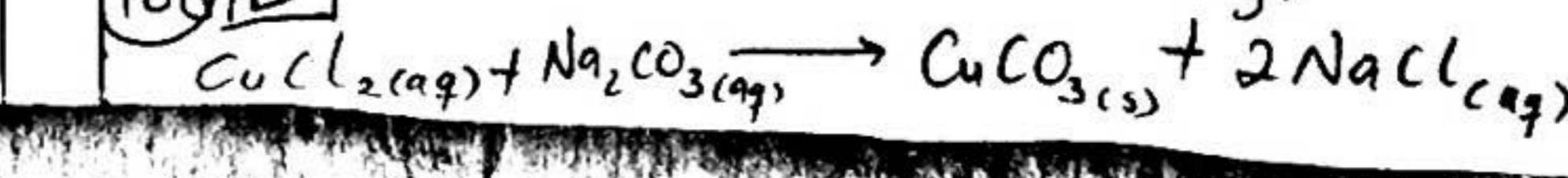
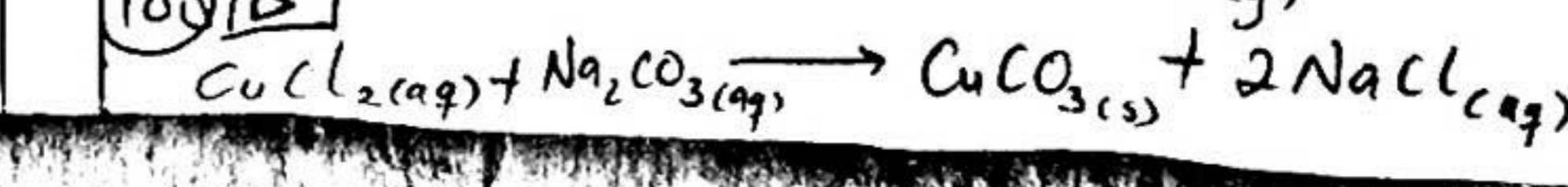
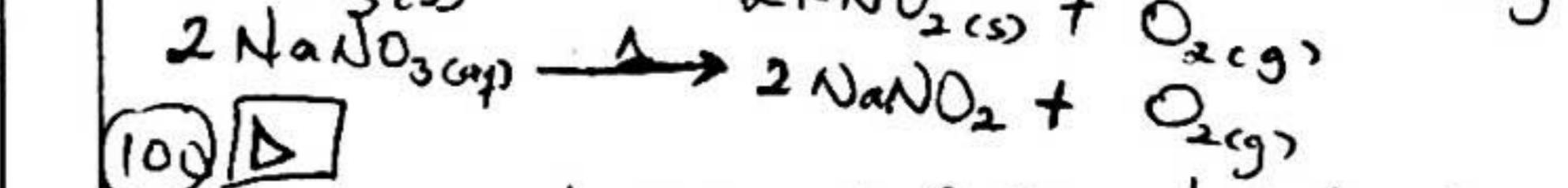
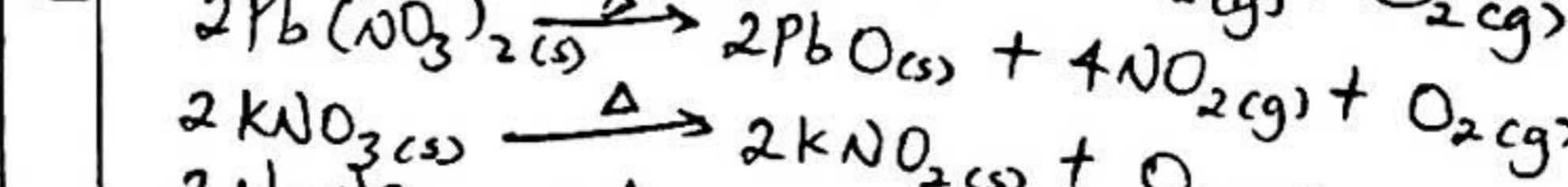
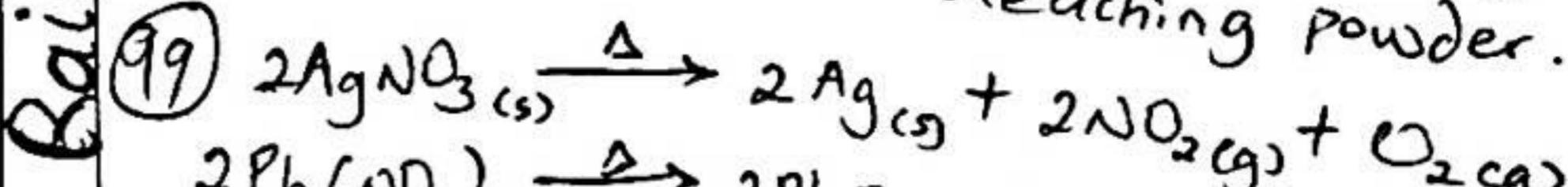
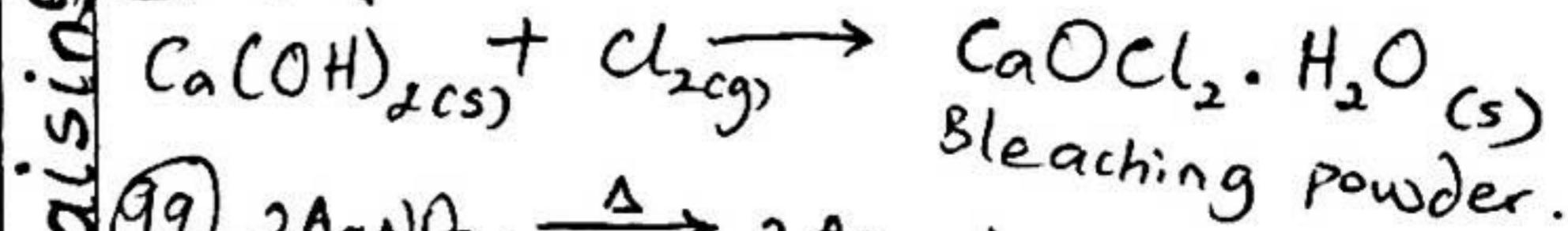
see question 53

96 D

See question 36
while the process is term esterification.

97 A

98 A



Potentials

Raising



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Technology for Self Reliance

Mathematics Questions

1. There are 8 green balls, 4 blue balls and 3 white balls in a box. Then 1 green and 1 blue ball are taken from the box and put away. What is the probability that a blue ball is selected at random from the box?
A. $\frac{3}{13}$ B. $\frac{2}{13}$ C. $\frac{4}{15}$ D. $\frac{3}{15}$
2. Find r , if $7r7_8 = 618_9$.
A. 3 B. 2 C. 6 D. 5
3. Simplify $\left(\frac{3}{4} \text{ of } \frac{4}{9} \div 9\frac{1}{2}\right) \div 1\frac{5}{19}$
A. $\frac{1}{5}$ B. $\frac{1}{4}$ C. $\frac{1}{36}$ D. $\frac{1}{25}$
4. A student measures a piece of rope and found it was $1.27m$ long. If the actual length of the rope was $1.25m$, what was the percentage error in the measurement?
A. 1.6% B. 1.0% C. 0.8% D. 0.16%
5. At what rate will the interest on ₦500 increase to ₦25 in 5 years reckoning in simple interest?
A. 2% B. 1% C. 4% D. 5%
6. If $p:q = \frac{2}{3} : \frac{1}{6}$ and $q:r = \frac{3}{4} : \frac{1}{2}$, Find $p:q:r$
A. $12:3:2$ B. $12:15:4$ C. $9:10:15$ D. $9:12:15$
7. Evaluate $\left(\frac{243}{32}\right)^{\frac{-2}{5}} \times 2^{-2}$.
A. 3 B. 6 C. $\frac{1}{6}$ D. $\frac{1}{3}$
8. Given that $\log 2 = 0.3010$, $\log 7 = 0.8451$. Evaluate $\log 224$
A. 2.1461 B. 2.3501 C. 2.0491 D. 3.1461
9. Rationalize $\frac{2\sqrt{5}+\sqrt{7}}{\sqrt{7}-\sqrt{5}}$.
A. $\frac{3\sqrt{35}-\sqrt{17}}{2}$ B. $3\sqrt{35} + \sqrt{17}$ C. $3\sqrt{35} - \sqrt{17}$ D. $\frac{3\sqrt{35}+\sqrt{17}}{2}$
10. Express the product of 0.31 and 0.34 in standard form
A. 1.0541×10^{-1} B. 1.0541×10^{-2} C. 1.0541×10^{-3} D. 1.0541×10^{-4}





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11. In a survey of 60 newspaper readers, 49 read Nation and 30 read Punch, how many read both papers?
A. 10 B. 5 C. 20 D. 15
12. Make R the subject of the formula if $P = \frac{M}{5}(X + R^2) + 2$.
A. $\sqrt{\frac{5P+10+XM}{M}}$ B. $\sqrt{\frac{5P+10-XM}{M}}$ C. $\sqrt{\frac{5P-10-XM}{M}}$
D. $\sqrt{\frac{5P-10+XM}{M}}$
13. If $9x^2 + 6xy + 4y^2$ is a factor of $27x^3 - 8y^3$, find the other factor.
A. $2y - 3x$ B. $2y + 3x$ C. $-2y - 3x$
D. $-2y + 3x$
14. Factorize completely $\frac{x^8+2x^2-15x}{2x^2-18}$
A. $\frac{x(x+5)}{2(x-3)}$ B. $\frac{x(x+5)}{2(x+3)}$ C. $\frac{x(x-5)}{2(x-3)}$ D. $\frac{x(x+5)}{2x+9}$
15. Solve for x and y if $x-y=3$ and $x^2 - y^2 = 9$
A. (-3,0) B. (0,-3) C. (3,0) D. (0,3)
16. If y varies directly as the square root of x and y=3 when x=25. Calculate y when x=100.
A. 12 B. 3 C. 5 D. 6
17. If x is inversely proportional to y and $x = 3\frac{1}{2}$ when y=2, find x if y=4.
A. $1\frac{1}{4}$ B. $2\frac{3}{4}$ C. $1\frac{3}{4}$ D. $2\frac{1}{4}$
18. For what range of values of x is $\frac{1}{3}x + \frac{1}{4} > \frac{1}{4}x + \frac{1}{2}$?
A. $x < 3$ B. $x > 3$ C. $x > -3$ D. $x < -3$
19. Solve the inequalities $-6 \leq 4 - 2x < 5 - x$.
A. $-1 < x < 5$ B. $-1 \leq x \leq 6$ C. $-1 \leq x < 6$
D. $-1 < x \leq 5$
20. Find the sum to infinity of the following series
 $0.2 + 0.02 + 0.002 + 0.0002 + \dots$
A. $\frac{1}{4}$ B. $\frac{2}{9}$ C. $\frac{2}{11}$ D. $\frac{2}{7}$





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21. The 3rd term of an arithmetic progression is -8 and the 7th term is -28. Find the 10th term of the progression.
A. -43 B. -164 C. 164 D. 44
22. If $x * y = x - y^2$, find the value of $(2 * 3) * 5$
A. -25 B. 25 C. -32 D. 32
23. If p and q are two nonzero numbers and $16(p+q) = (16+p)/q$, which of the following must be true.
A. $p < 1$ B. $p = 16$ C. $q < 1$ D. $q = 16$
24. If $\left| \begin{matrix} x & 4 \\ 3 & 7 \end{matrix} \right| = 9$, find the value of x.
A. 4 B. 5 C. 2 D. 3
25. Evaluate $\left| \begin{matrix} 3 & 0 & 6 \\ 5 & 7 & 4 \\ 9 & 0 & 2 \end{matrix} \right|$
A. -336 B. 336 C. 420 D. -420
26. A rectangular picture 6cm by 8cm is enclosed by a frame (1/2) wide. Calculate the area of the frame.
A. 15 sq cm B. 20 sq cm C. 13 sq cm D. 17 sq cm
27. The area of $3\frac{7}{8}$ and $1\frac{1}{3}$ is less than the difference between $\frac{3}{8}$ and $1\frac{2}{3}$ by
A. $3\frac{11}{12}$ B. $5\frac{1}{4}$ C. $1\frac{1}{2}$ D. $8\frac{1}{8}$
28. Multiply $(x + 3y + 5)$ by $(2x^2 + 5y + 2)$
A. $2x^3 + 3yx^2 + 10xy + 15y^2 + 13y + 10x^2 + 2x + 10$
B. $2x^3 + 6yx^2 + 5xy + 15y^2 + 31y + 10x^2 + 2x + 10$
C. $2x^3 + 3yx^2 + 5xy + 10y^2 + 13y + 5x^2 + 2x + 10$
D. $2x^3 + 2yx^2 + 10xy + 10y^2 + 31y + 5x^2 + 2x + 10$
29. The sum of the progression $1 + x + x^2 + x^3 + \dots$ is equal
A. $1/(1-x)$ B. $1/(1+x)$ C. $1/(x-1)$ D. $1/x$
30. If $x^2 + 4 = 0$, then x=
A. 4 B. -2 C. none of these D. 2
31. Five years ago, a father was 3 times as old as his son. Now, their combined ages amount to 110 years. Thus, the present age of the father is





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- A. 75 years B. 60 years C. 98 years D. 81 years
32. If $y = 2x^2 + 9x - 35$, find the range of values for which $y < 0$.
- A. $-7 \leq x < 5$ B. $-5 \leq x < 7$ C. $-\left(\frac{7}{2}\right) < x \leq 5$
D. $-7 < x < (5/2)$
33. Mother reduced the quantity of food bought for the family by **10%** when she found that the cost of living had increased by **15%**. Thus the fractional increase in the family food bill is now
- A. $1/12$ B. $6/35$ C. $19/300$ D. $7/200$
34. Given that $a * b = ab + b + a$ and $a \circ b = 1 + b + a$. Find $(a * b) \circ (a * c)$, if a, b, c are real numbers.
- A. $ac+ab+bc+b+c+1$ B. $ac+ab+a+c+2$
C. $ac+ab+2a+b+c+1$ D. $ac+ab+bc+b+c+2$
35. If the four interior angles of a quadrilateral are $(P + 10)^\circ$, $(P - 30)^\circ$, $(2P - 45)^\circ$, and $(P + 35)^\circ$, then P is
- A. 78° B. 125° C. 135° D. 60°
36. Simplify $(a - b)/(a + b) - (a + b)/(a - b)$
- A. $4ab/(a^2 - b^2)$ B. $-4ab/(a^2 - b^2)$
C. $2ab/(a^2 - b^2)$ D. $-2ab/(a^2 - b^2)$
37. The minimum point on the curve $y = x^2 - 6x + 5$ is at
- A. $(1, 5)$ B. $(3, -4)$ C. $(2, 3)$ D. $(3, 4)$
38. If $3x - \left(\frac{1}{4}\right) > \left(\frac{1}{4}\right) - x$, then the interval of values of x is
- A. $x > (1/3)$ B. $x < (1/3)$
C. $x < (9/16)$ D. $x > (9/16)$
39. A man runs a distance of 9km/h for the first 4km and then 2km/h for the rest of the distance. The whole run takes him one hour. His average speed for the first 4km is
- A. 6km/h B. 8km/h C. 9km/h D. 11km/h
40. In a soccer competition in one season, a club had scored the following goals: 2, 0, 3, 3, 2, 1, 4, 0, 0, 5, 1, 0, 2, 2, 1, 3, 1, 4, 1, and 1. The mean, median and mode are respectively.





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- A. 1, 1.8, and 1.5 B. 1.8, 1.5 and 1 C. 1.8, 1 and 1.5
D. 1.5, 1 and 1.8
41. If $\sec^2\theta + \tan^2\theta = 3$, then angle θ is equal to
A. 20° B. 60° C. 45° D. 90°
42. The set of values of x and y which satisfies the equations $x^2 - y - 1 = 0$ and $y - 2x + 2 = 0$ is
A. 1, 0 B. 1, 1 C. 2, 2 D. 0, 2
43. Two triangles have the same area if
A. two sides in one triangle are equal to two sides in the other.
B. three sides in one triangle are equal to three sides in the other.
C. two angles in one triangle are equal to two angles in the other.
D. three angles in one triangle are equal to three angles in the other.
44. If $25^{x-1} = 64(5/2)^6$, then x has the value
A. 7 B. 4 C. 32 D. 5
45. In a circle of radius 10cm, a chord of length 10cm is xcm from its centre. What is x.
A. $10\sqrt{2}$ B. $5\sqrt{3}$ C. $10\sqrt{3}$ D. $5\sqrt{2}$
46. The smallest number such that when it is divided by 8 has a remainder of 6 and when it is divided by 9 has a remainder of 7 is
A. 50 B. 70 C. 80 D. 60
47. Evaluate $\int_0^{\pi/4} \sec^2\theta d\theta$.
A. $\frac{1}{4}$ B. $\frac{\pi}{2}$ C. 1 D. $\frac{\pi}{4}$
48. When a dealer sells a bicycle for ₦81 he makes a profit of 8%. What did he pay for the bicycle?
A. ₦74 B. ₦74.52 C. ₦75 D. ₦75.52
49. Find the roots of the equation $10x^2 - 13x - 3 = 0$
A. $x=3/5$ or $-1/2$ B. $x=-1/5$ or $3/2$ C. $x=3/10$ or 1
D. $x=-3/10$ or 1
50. The median of the set of numbers; 4, 9, 4, 13, 7, 14, 10, 7 is





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- A. 13 B. $\frac{7}{4}$ C. $\frac{7}{2}$ D. 10
51. List all the integer values of x satisfying the inequality $-1 < 2x - 5 \leq 5$.
- A. 2, 3, 4, 5 B. 2, 5 C. 3, 4, 5 D. 2, 3, 4
52. The ratio of the areas of similar triangles is necessarily equal to
- A. the ratio of the corresponding sides.
B. the ratio of the square on corresponding sides.
C. the ratio of the corresponding heights of the triangles.
D. half the ratio of the corresponding heights of the triangles.
53. A man and his wife went to buy article costing ₦400. The woman had 10% of the cost and the man 40% of the remainder. How much did they have altogether.
- A. ₦216 B. ₦200 C. ₦184 D. ₦144
54. Simplify $\log_{10}8 / \log_{10}4$
- A. $\log_{10}2$ B. $\log_8 4$ C. $3/2$ D. 2
55. Three numbers are connected by the relationship $y = 4x/9 + 1$ and $z = 4y/9 + 1$. If $x = 99$, find z .
- A. $6\frac{1}{3}$ B. 20 C. 21 D. $176\frac{4}{9}$
56. In a school there are 35 students in class 2A and 40 in class 2B. The mean score for class 2A in a Mathematics examination is 60.00 and that for 2B in the paper is 52.5. Find, to one place of decimals, the mean of the combined classes.
- A. 56.5 B. 56.0 C. 56.3 D. 56.2
57. A set of data contains a total of 130 items which are divided into six groups for display on a pie chart. If one of the groups contains 26 items then the sector representing this group on the pie chart contains an angle x° at the centre of the circle where x is
- A. 3 B. 60 C. 70 D. 72
58. In triangle FGH , $\angle G = 90^\circ$, $\angle H = 60^\circ$, while triangle XZY , $\angle X = 60^\circ$, and $\angle Y = 30^\circ$. From $\triangle XYZ$, write down the ratio equal to $|FG|/|FH|$.
- A. $|YZ|/|ZX|$ B. $|YX|/|YZ|$ C. $|ZX|/|YZ|$
D. $|YZ|/|YX|$
59. A pentagon has four of its sides equal. If the size of the fifth angle is 60° find the size of each of the four equal angles.





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Technology for Self Reliance

- A. 60° B. 108° C. 120° D. 150°
60. The result of dividing $(x^a/x^b)^{a+b}$ by $(x^{a+b}/x^{a-b})^{a^2/b}$ is
A. x^{a^2} B. x^{b^2} C. $1/x^{(a^2+b^2)}$ D. $x^{(a^2-b^2)}$
61. What will be the value of k so that the quadratic equation $kx^2 - 4x + 1 = 0$ has equal roots?
A. 2 B. 3 C. 4 D. 8
62. If it is given that $5^{x+1} + 5^x = 150$ then the value of x is equal to
A. 2 B. 1 C. 3 D. 4
63. Solve the system of equations $2^{x+y} = 32$, $3^{y-x} = 27$.
A. (1, 4) B. (2, 3) C. (1, 2) D. (-1, -2)
64. Simplify the given expression $\sqrt{\frac{1-\cos x}{1+\cos x}}$
A. $(1-\cos x)/\sin x$ B. $1-\cos x$ C. $\sin x$ D. $(1+\cos x)/\sin x$
65. Find the area of the curved surface of a cone whose base radius is 6cm and whose height is 8cm. (Take $\pi = \frac{22}{7}$).
A. 1320 cm^2 B. 188.57 cm^2 C. 188 cm^2
D. 188.08 cm^2
66. The expression $x^3 - 4x^2 + cx + d$ such that $x+1$ is its factor, and its value is 1 when x is -2. Find c and d.
A. c=4 and d=9 B. c=-4 and d=9
C. c=-20 and d=-15 D. c=20 and d=-15
67. If a function is defined by $f(x+1) = 3x^2 - x + 4$. Find f(0).
A. 4 B. 6 C. 0 D. 8
68. A cylindrical motor of height 12cm has uniform thickness of 2cm. If the diameter of its outer cross-section is 10cm, find the volume of the constituent material. (Take $\pi = \frac{22}{7}$).
A. $\frac{6600}{7} \text{ cm}^3$ B. $\frac{270}{7} \text{ cm}^3$ C. $\frac{660}{7} \text{ cm}^3$ D. $\frac{1980}{7} \text{ cm}^3$
69. A cuboid has a diagonal of length 9cm and a square base of side 4cm. What is its height?





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Technology for Self Reliance

- A. 9 cm B. $\sqrt{65} \text{ cm}$ C. $4\sqrt{2} \text{ cm}$ D. 7 cm
70. If x varies inversely as y , and y varies directly as the square root of z , and z varies directly as $\frac{1}{w^2}$, write down in words how x varies with w .
- A. x varies inversely as w^2 B. x varies directly as w^2
C. x varies directly as w D. x varies inversely as w
71. Simplify $\sin^2 x / (1 + \cos x) + \sin^2 x / (1 - \cos x)$
- A. 2 B. $\sin x$ C. 1 D. $\sin^2 x$
72. From two points X and Y, 8cm apart, and in line with a pole, the angle of elevation of the top of the pole are 30° and 60° respectively. Find the height of the pole, assuming that X, Y and the foot of the pole are on the same horizontal plane and X and Y are on the same side of the pole.
- A. 4m B. $(8\sqrt{3})/3 \text{ m}$ C. $4\sqrt{3} \text{ m}$ D. $8\sqrt{3} \text{ m}$
73. A bag contains 3 apples, 4 oranges and 3 bananas. What is the probability of selecting a banana and then an apple?
- A. $9/100$ B. $9/10$ C. $1/10$ D. $2/3$
74. Evaluate ${}^n P_r / {}^{n-1} P_{r-1}$
- A. n B. n-1 C. n-2 D. 2n
75. The chance of three independent events X, Y, Z occurring are $\frac{1}{2}$, $\frac{2}{3}$, $\frac{1}{4}$ respectively. What are the chances of Y and Z only occurring.
- A. $1/8$ B. $1/24$ C. $1/12$ D. $1/4$
76. If $P = \begin{pmatrix} 2 & -1 \\ 3 & 3 \end{pmatrix}$, what is P^{-1} ?
- A. $\begin{pmatrix} -1 & -1 \\ \frac{3}{2} & \frac{9}{2} \end{pmatrix}$ B. $\begin{pmatrix} \frac{1}{3} & \frac{1}{9} \\ -1 & 2 \end{pmatrix}$ C. $\begin{pmatrix} -1 & 1 \\ \frac{3}{2} & \frac{9}{2} \end{pmatrix}$ D. $\begin{pmatrix} -1 & 1 \\ \frac{3}{2} & \frac{9}{2} \end{pmatrix}$
77. The interior angles of a quadrilateral are $(x + 20^\circ)$, $(2x - 45^\circ)$, $(x - 15^\circ)$ and $(2x + 10^\circ)$. Find the value of the least interior angle.
- A. 63° B. 88° C. 102° D. 112°
78. If the two smaller sides of right angled triangle are 8cm and 9cm, find its area.
- A. 10 cm^2 B. 12 cm^2 C. 36 cm^2 D. 24 cm^2
79. An arc subtends an angle 60° at the centre of circle of radius 6cm. Calculate the area of the sector formed. ($\pi = \frac{22}{7}$)





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Technology for Self Reliance

- A. $\frac{132}{7}$ B. $\frac{122}{7}$ C. $\frac{112}{7}$ D. $\frac{102}{7}$
80. A cylindrical pipe 40m long with radius 7m has one end open. What is the total surface area of the pipe?
- A. 609π B. 658π C. 560π D. 98π
81. What is the locus of points equidistant from points P(1,4) and Q(2,5).
- A. $y = -x - 6$ B. $y = x + 6$ C. $y = x - 6$ D. $y = -x + 6$
82. Find the distance between the points $(\frac{2}{3}, \frac{3}{3})$ and $(\frac{-1}{3}, \frac{-1}{3})$
- A. 1 B. 0 C. $\sqrt{3}$ D. $\sqrt{2}$
83. Find the gradient of the line passing through the points p(1,2) and q(2,5)
- A. 3 B. 2 C. 5 D. 4
84. Find the equation of a line perpendicular to $y = -4x + 2$ passing through (2,3)
- A. $4y + x + 10 = 0$ B. $4y - x - 10 = 0$ C. $4y - x + 10 = 0$
D. $4y + x - 10 = 0$
85. If $\cot \theta = \frac{7}{15}$, where θ is acute, find $\tan \theta$.
- A. $\frac{15}{8}$ B. $\frac{15}{7}$ C. $\frac{8}{17}$ D. $\frac{15}{17}$
86. If $y = (2x - 1)^3$, find $\frac{dy}{dx}$
- A. $6(2x - 1)$ B. $3(2x - 1)$ C. $6(2x - 1)^2$ D. $3(2x - 1)^2$
87. If $y = x \cos x$, find $\frac{dy}{dx}$
- A. $\sin x - x \cos x$ B. $\cos x - x \sin x$ C. $\cos x - \sin x$
D. $\sin x + \cos x$
88. At what value of x does the function $y = -3x + 2x + x^2$ attain a minimum value?
- A.. 1 B. -4 C. 4 D. 1
89. Evaluate $\int_0^3 (x^3 - x^2) dx$
- A. $11\frac{1}{2}$ B. $12\frac{1}{4}$ C. $10\frac{1}{4}$ D. $11\frac{1}{4}$
90. Find $\int (\cos x + 2) dx$





THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Technology for Self Reliance

90. Find $\int (\cos x + 2) dx$

- A. $\sin x + 2x + k$ B. $-\sin x + 2x + k$ C. $\sin x + x^2 + k$
D. $-\sin x + x^2 + k$

91

Marks	2	3	4	5	6	7	8
No of Students	4	2	5	2	4	1	3

From the table above if the pass mark is 5, how many students failed the test?

- A. 7 B. 6 C. 11 D. 2

92. If three unbiased coins are tossed, find the probability that they are all tails

- A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{1}{9}$ D. $\frac{1}{8}$

93. In how many ways can a committee of 3 women and 4 men be chosen from 6 men and 5 women

- A. 250 B. 25 C. 50 D. 100

94. Find the standard deviation of 2,4,5 and 6

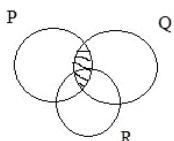
- A. $\sqrt{\frac{7}{2}}$ B. $\sqrt{\frac{2}{7}}$ C. $\sqrt{7}$ D. $\sqrt{14}$

95. Find the equation of a line parallel to $y = -3x + 2$ passing through (1,3)

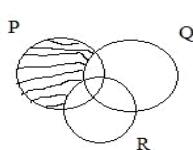
- A. $y + 3x - 6 = 0$ B. $y - 3x - 6 = 0$ C. $y - 3x + 6 = 0$
D. $y + 3x + 6 = 0$

96. Which of the Venn diagrams below represents $P \cap Q' \cap R'$

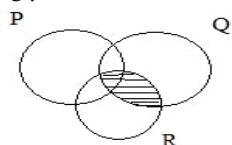
A.



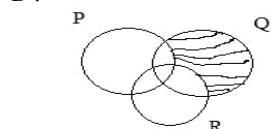
B.



C.



D.

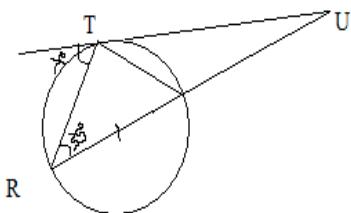




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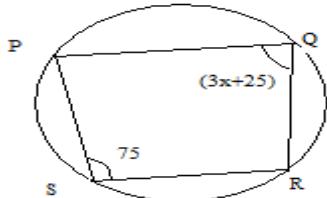
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97



From the diagram above, find x

- A. 55° B. 65° C. 50° D. 75°



98. From the cyclic quadrilateral PQRS above find the value of x.

- A. 30° B. 32° C. 60° D. 62°

99. If a and b are the roots of $x^2 - 5x + 7 = 0$, find $a^2 + b^2$

- A. 11 B. 25 C. -14 D. 39

100 Find, correct to three significant figures, the value of $\sqrt{41830}$

- A. 205 B. 647 C. 2050 D. 6470

101 Which of the following is not a factor of $12^4 - 5^4$?

- A. 169 B. 13 C. 17 D. 49

102. When a dealer sells a bicycle for #81, he makes a profit of 8%. What did he pay for the bicycle?

- A. ₦74 B. ₦76 C. ₦75.54 D. ₦75

103. The median of the set of numbers 4, 9, 4, 13, 7, 14, 10, 17 is

- A. 9.5 B. 7 C. 10 D. 8.5

104. List all the integer values of x satisfying the inequality $-1 < 2x - 5 \leq 5$





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Technology for Self Reliance

- A. 2,4,5 B. 1,4,5 C. 4,5,6 D. 3,4,5
105. A solid cylinder of radius 3cm has a total surface area of $36\pi cm^2$. Find its height.
A. 2cm B. 3cm C. 4cm D. 5cm
106. Simplify $\frac{\log_{10}^8}{\log_{10}^4}$
A. 1.5 B. 7 C. 3 D. 2
107. Write down the number 0.0052048 correct to three significant figures.
A. 0.005 B. 0.0052 C. 0.00521 D. 0.00520
108. A man and his wife went to buy an article costing #400. The woman had 10% of the cost and the man 40% of the remainder. How much did they have altogether?
A. ₦174 B. ₦164 C. ₦184 D. ₦194
109. A pentagon has four of its angles equal. If the size of the fifth angle is 60° , find the size of each of the four equal angles.
A. 120 B. 100 C. 110 D. 130
110. If it is given that $5^{x+1} + 5^x = 150$ then the value of x is equal to
A. 0 B. 1 C. 1.5 D. 2
111. Simplify the given expression $\sqrt{\frac{1-\cos x}{1+\cos x}}$
A. $\frac{1-\cos x}{\sin x}$ B. 1-cosx C. 1+sinx D. 1+cosx
112. Write the decimal number 39 to base 2.
A. 110111 B. 100111 C. 111000 D. <C> 110111
113. Find the smallest number by which 252 can be multiplied to obtain a perfect square
A. 2 B. 3 C. 7 D. 5
114. Find the reciprocal of $\frac{\frac{2}{3}}{\frac{1}{2} + \frac{1}{3}}$
A. $\frac{4}{5}$ B. $\frac{5}{4}$ C. $\frac{2}{3}$ D. $\frac{6}{7}$
115. Divide the L.C.M of 48,64 and 80 by their H.C.F.
A. 60 B. 30 C. 48 D. 20





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- 116 The ages of Sola and Akin differ by 6 and the product of their ages is 187. Write their ages in the form (x,y) , where $x > y$.
- A. (11,17) B. (11,16) C. (23,17) D. (17,11)
117. If $5^{(x+2y)} = 5$ and $4^{(x+3y)} = 16$, find $3^{(x+y)}$
- A. 1 B. 0 C. 2 D. 3
118. Find the values of x which satisfy the equation $16^x - 5 * 4^x + 4 = 0$
- A. 0 and -1 B. 1 and 2 C. 0 and 2 D. 0 and 1
119. Factorise $x^2 + 2a + ax + 2x$
- A. $(x+2a)(x+1)$ B. $(x-2a)(x+1)$ C. $(x+2a)(x-1)$
D. $(x+2)(x+a)$
120. An open rectangular box externally measures 4m x 3m x 4m. Find the cost of painting the box externally if its cost ₦2.00 to paint one square metre
- A. ₦116.00 B. ₦113.00 C. ₦112.00 D. ₦136.00
121. Find the probability that a number selected at random from 40 to 50 is a prime
- A. $\frac{3}{10}$ B. $\frac{3}{11}$ C. $\frac{3}{13}$ D. $\frac{4}{11}$
122. If x varies directly as y^3 and $x=2$ when $y=1$, find x when $y=5$.
- A. 200 B. 350 C. 450 D. 250
123. If Musa scored 75 in Biology instead of 57, his average mark in four subjects would have been 60. What was his total mark?
- A. 220 B. 222 C. 322 D. 122
124. A man kept 6 black, 5 brown and 7 purple shirts in a drawer. What is the probability of his picking a purple shirt with his eyes closed?
- A. $\frac{7}{17}$ B. $\frac{7}{19}$ C. $\frac{7}{20}$ D. $\frac{7}{18}$
125. Evaluate $212_3 - 121_3 + 222_3$
- A. 1121_3 B. 1023_3 C. 1020_3 D. 2020_3
126. Simplify $\frac{0.0324 * 0.00064}{0.48 * 0.012}$
- A. 0.0036 B. 0.036 C. 0.36 D. 3.6
127. Find n if $\log 2^4 + \log 2^7 - \log 2^n = 1$





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- A. 24 B. 13 C. 42 D. 14
128. At what points does the straight line $y=2x+1$ intersect the curve $y=2x^2+5x-1$?
A. (-2,-3) and (0.5,1) B. (-2,-3) and (0.5,2)
C. (2,3) and (0.5,2) D. (1,2) and (3,4)
129. If $\cos\theta = \frac{a}{b}$, find $1 + \tan^2\theta$
A. $\frac{a^2}{b^2}$ B. $\frac{b^2}{a^2}$ C. $1 + a^2$ D. $1 + b^2$
130. If $P=18$, $Q=21$, $R=-6$, and $S=-4$, calculate $\frac{(P-Q)^3}{R^S} + S^2$
A. $\frac{11}{216}$ B. $\frac{11}{316}$ C. $\frac{11}{416}$ D. $\frac{11}{116}$
131. Sola deposited #150.00 in the bank. At the end of 5 years, the simple interest on the principal was #55.00. At what rate per annum was the interest paid?
A. 6.33% B. 8.33% C. 7.32% D. 7.33%
132. Find the gradient of the line passing through the points (-2,0) and (0,-4)
A. 2 B. -2 C. 3 D. 4
133. At what value of x is the function $y=x^2 - 2x - 3$ minimum?
A. 2 B. -2 C. -1 D. 1
134. Solve the equation $(x-2)(x-3)=12$
A. 1,6 B. 3,6 C. -1,6 D. 1, -6
135. Find the two values of y which satisfy the simultaneous equations
 $3x+y=8$, $x^2+xy=6$
A. 1 and 5 B. 2 and 5 C. 0 and 5 D. -1 and 5
136. Find the sum of the 20 terms in an arithmetic progression whose first term is 7 and the last term is 117
A. 239 B. 1240 C. 1340 D. 1440
137. The angles of a quadrilateral are $5x-30$, $4x+60$, $60-x$ and $3x+61$. Find the smallest of these angles.
A. $60 - x$ B. $4x+60$ C. $5x-30$ D. $3x+61$
138. If $g(x)=x^2+3x+4$, find $g(x+1)-g(x)$.
A. $2(x+1)$ B. $2(x-2)$ C. $x+2$ D. $2(x+2)$





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139. Find the positive number n , such that thrice its square is equal to twelve times the number.

A. 1 B. 4 C. -4 D. -1

140. The area of a square is 144sq cm . Find the length of its diagonal.

A. $12\sqrt{2}\text{ cm}$ B. 12cm C. 13cm D. 14cm

141. Simplify $\frac{\sqrt{12}-\sqrt{3}}{\sqrt{12}+\sqrt{3}}$

A. 3 B. 0 C. 16 D. $\frac{1}{3}$

142. If $S = \{x : x^2 = 9, x > 4\}$, then S is equal to

A. 0 B. {0} C. \emptyset D. $\{\emptyset\}$

143. Express the product of 0.0014 and 0.011 in standard form.

A. 1.54×10^{-5} B. 1.54×10^{-4} C. 1.54×10^{-3}
D. 1.54×10^{-2}

144. What value of g will make the expression $4x^2 - 18xy + g$ a perfect?

A. $\frac{81y}{4}$ B. $\frac{9y^2}{4}$ C. $\frac{81y^2}{4}$ D. $\frac{81y^3}{4}$

145. If $x * y = x + y - xy$, find x when $(x * 2) + (x * 3) = 68$

A. -21 B. 21 C. 12 D. -12

146. Determine $x+y$ if $\begin{pmatrix} 2 & -3 \\ -1 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$

A. 3 B. 4 C. 7 D. 12

147. Find the minimum value of $x^2 - 3x + 2$ for all real values of x

A. -0.75 B. 0.75 C. -0.25 D. 1.25

148. If the function $f(x) = x^3 + 2x^2 + qx - 6$ is divisible by $x + 1$, find q .

A. -5 B. 5 C. -2 D. 2

149. Find the gradient of the curve $y = 2x(x-3)$ at $x=1$

A. 2 B. -2 C. 1 D. -1

150. Integrate $\frac{1}{x} + \cos x$ with respect to x

A. $\ln x + \sin x + k$ B. $\ln x - \sin x + k$ C. $\ln x - \cos x + k$ D. $\ln x - \cos x - k$



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151. Find the value of K if $\frac{K}{\sqrt{3}} = \sqrt{3}$

- A. 3 B. -3 C. 9 D. -9

152. If $\frac{\epsilon_{Cr}}{\epsilon_{Pr}} = \frac{1}{6}$, find the value of r.

- A. 1 B. 3 C. 3.5 D. 2

153 How many two-digits numbers can be formed from the digits 0,1,2,3 if a digit can be repeated and no number may begin with 0?

- A. 4 B. 6 C. 13 D. 12

154. The lengths s of the sides of a right-angled triangle are x cm, $(3x-1)$ cm and $(3x+1)$. Find x.

- A. 12 B. 11 C. 10 D. 9

155. If $y = x \sin x$, find $\frac{dy}{dx}$ when $x = \frac{\pi}{2}$.

- A. -1 B. 0 C. 1 D. 2

156. P(-6,1) and Q(6,6) are the two ends of the diameter of a given circle. Calculate the radius.

- A. 6 units B. 7.5 units C. 6.5 units D. 7 units

157. Find the rate of change of the volume of v of a sphere with respect to its radius r when $r=1$.

- A. 7π B. 9π C. 10π D. 8π

158. If $\epsilon_{Pr} = 6$, find the value of ϵ_{Pr+1}

- A. 33 B. 30 C. 32 D. 31

159. Teams A and B are involved in a game of football. What is the probability that the game ends in a draw?

- A. $\frac{1}{2}$ B. $\frac{1}{4}$ C. $\frac{1}{4}$ D. $\frac{2}{3}$

160. The range of the data $k+2, k-3, k+4, k-2, k-5, k+3, k-1$ and $k+6$ is

- A. 10 B. 11 C. 12 D. 13

161. If $A = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$ and I is a 2×2 unit matrix, evaluate $A^2 - 2A + 4I$

- A. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ B. $\begin{pmatrix} 1 & 0 \\ 3 & 4 \end{pmatrix}$ C. $\begin{pmatrix} 1 & 5 \\ 3 & 4 \end{pmatrix}$ D. $\begin{pmatrix} 1 & 7 \\ 3 & 4 \end{pmatrix}$





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162. If the 9th term of an A.P. is five times the 5th term, find the relationship between a and d.

- A. $a+2d=0$ B. $a-d=0$ C. $a+2d-1=0$ D. $a+3d=0$

163. Find the maximum value of y in the equation $y=1-2x-3x^2$

- A. $\frac{4}{3}$ B. $\frac{4}{5}$ C. $\frac{3}{5}$ D. $\frac{3}{7}$

164. The binary operation * is defined on the set of integers p and q by $p*q=pq+p+q$. Find $2*(3*4)$.

- A. 69 B. 49 C. 59 D. 79

165. Given that $Q = \begin{pmatrix} 6 & 0 \\ 4 & 5 \end{pmatrix}$ and $Q+P = \begin{pmatrix} 7 & -2 \\ 6 & 8 \end{pmatrix}$ evaluate determinant of $Q+2P$

- A. 120 B. 123 C. 100 D. 90

166. Find the tangent of the acute angle between the lines $2x+y=3$ and $3x-2y=5$

- A. 1.25 B. 1.33 C. 2.75 D. -1.75

167. If the maximum value of $y=1+hx-3x^2$ is 13, find h

- A. 12 B. 13 C. 14 D. 11

168. If the standard deviation of the set of numbers 3, 6, x, 7, 5 is $\sqrt{2}$, find the least possible value of x.

- A. 2 B. 3 C. 5 D. 6

169. Evaluate $\int_{-2}^1 (x-1)^2 dx$

- A. 11 B. 9 C. 10 D. 12

170. Find the area bounded by the curve $y=x(2-x)$, the x-axis, $x=0$ and $x=2$.

- A. 1.25 sq.units B. 1.33 sq.units C. 0.33 sq.units
D. 2.33 sq.units

171. A trader realizes $10x-x^2$ naira profit from the sale of x bags of corn. How many bags will give him the maximum profit?

- A. 6 B. 4 C. 3 D. 5

172. If a and b are the roots of the equation $3x^2+5x-2=0$, find the value of $\frac{1}{a} + \frac{1}{b}$

- A. -2.5 B. 0.4 C. 1.5 D. 2.5

173. If $P344_6 - 23P2_6 = 2PP2_6$, find the value of digit P.

- A. 4 B. 5 C. 6 D. 7





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174. Find the minimum value of the function $f(\theta) = \frac{2}{3-\cos\theta}$ for $0 \leq \theta \leq 2\pi$
- A. 0.50 B. 1.67 C. 0.67 D. 2.67
175. X and Y are two events. The probability of X or Y is 0.7 and the probability of X is 0.4. If X and Y are independent, find the probability of Y.
- A. 0.2 B. 0.4 C. 0.5 D. 0.3
176. An equilateral triangle of side 3cm is inscribed in a circle. Find the radius of the circle.
- A. 1.0cm B. 2.0cm C. 3.0cm D. 0.7cm
177. In a class of 40 students, 32 offer Mathematics, 24 offer Physics and 4 offer neither Mathematics nor Physics. How many offer both Mathematics and Physics?
- A. 16 B. 21 C. 19 D. 20
178. If $\frac{9^{2x-1}}{27^{x-1}} = 1$, find the value of x.
- A. 3 B. 5 C. 6 D. 7
179. If $\begin{vmatrix} -x & 2 \\ 4x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 3x \\ 4 & -5 \end{vmatrix}$, find the value of x
- A. 5 B. 4 C. 3 D. -5
180. A cinema hall contains a certain number of people. If 22.5% are children, 47.5% are men and 84 are women, find the number of men in the hall.
- A. 133 B. 132 C. 130 D. 123
181. Find the value of p, if the line which passes through $(-1, -p)$ and $(-2p, 2)$ is parallel to the line $2y + 8x - 17 = 0$.
- A. $\frac{6}{5}$ B. $\frac{6}{7}$ C. $\frac{6}{11}$ D. $\frac{7}{11}$
182. An arc of a circle subtends an angle of 30° on the circumference of a circle of radius 21cm. Find the length of the arc.
- A. 11cm B. 22cm C. 66cm D. 44cm
183. Find the remainder when $3x^3 + 5x^2 - 11x + 4$ is divided by $x+3$.
- A. -1 B. 2 C. 4 D. 1
184. The n th terms of two sequences are $Q_n = 3x2^{n-2}$ and $U_m = 3x2^{2m-3}$. Find the product of Q_2 and U_2 .
- A. 18 B. 16 C. 6 D. 3





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Technology for Self Reliance

185. If the operation * on the set of integers is defined by $p*q=\sqrt{pq}$, find the value of $4*(8*32)$.

A. 16 B. 8 C. 6 D. 18

186. Find the sum to infinity of the series $\frac{1}{2}, \frac{1}{6}, \frac{1}{18}, \dots$

A. 1 B. 0.25 C. 0.75 D. 1.75

187. A man 40m from the foot of a tower observes the angle of elevation of the tower to be 30° . Determine the height of the tower.

A. $\frac{40\sqrt{3}}{3} m$ B. 40m C. 20m D. $40\sqrt{3} m$

188. A cliff on the bank of a river is 300m high. If the angle of depression of a point on the opposite side of the river is 60° , find the width of the river.

A. 100m B. 150m C. $100\sqrt{3} cm$ D. 200m

189. The mean of a set of six numbers is 60. If the mean of the first five is 50, find the sixth number in the set.

A. 100 B. 120 C. 105 D. 110

190. Make r the subject of the formula $\frac{x}{a+r} = \frac{a}{r}$

A. $\frac{a}{a+r}$ B. $\frac{a^2}{x-a}$ C. $\frac{a^2}{x+a}$ <C> $\frac{a}{a-r}$

191. The inverse of the function $f(x)=3x+4$ is

A. $\frac{x-4}{3}$ B. $\frac{x+4}{3}$ C. $\frac{3}{x-4}$ D. $\frac{3}{x+4}$

192. If $\frac{dy}{dx} = 2x - 3$ and $y=3$ when $x=0$, find y in terms of x

A. $x^2 - 3x - 3$ B. $x^2 - 3x + 3$ C. $x^2 + 3x - 3$
D. $x^2 + 3x + 3$

193. A circle with a radius 5cm has its radius increasing at the rate of 0.2cm/s. What will be the corresponding increase in the area?

A. 3π B. 4π C. 2π D. 5π

194. Find the range of values of x for which $\frac{x+2}{4} - \frac{2x-3}{3} < 4$

A. $x < 6$ B. $x > 6$ C. $x < -6$ D. $x > -6$

195. If -2 is the solution of the equation $2x+1-3c=2c+3x-7$, find the value of c

A. 2 B. -2 C. 3 D. -3





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Technology for Self Reliance

196. The sum of the interior angles of a regular polygon is 1800° . Calculate the size of one exterior angle of the polygon.

A. 45° B. 60° C. 30° D. 90°

197. Find the simple interest rate percent per annum at which #1,000 accumulates to #1,240 in 3 years.

A. 8% B. 7% C. 6% D. 5%

198. Three consecutive positive integers k, l and m are such that $l^2=3(k+m)$. Find the value of m.

A. 4 B. 5 C. 6 D. 7

199. Find the value of x if $\frac{\sqrt{2}}{x+\sqrt{2}} = \frac{1}{x-\sqrt{2}}$

A. $3\sqrt{2}-4$ B. $3\sqrt{2}+4$ <C> $3\sqrt{2}-3$ <C> $3\sqrt{2}+3$

200. The expression $ax^2 + bx + c$ equals 5 at $x=1$. If its derivative is $2x+1$, what are the values of a,b,c respectively.

A. 1,3,1 B. 1,-3,1 C. 1,1,3 D. 1,3,-1

201. If $\tan \theta = \frac{5}{4}$, find $\sin^2 \theta - \cos^2 \theta$

A. $\frac{41}{9}$ B. $\frac{41}{3}$ C. $\frac{9}{41}$ D. $\frac{19}{41}$

202. If $2q3_5 = 77_8$, find q.

A. -2 B. 3 C. 2 D. 4

203. Simplify $\frac{\frac{3}{5} \times \frac{5}{6} \times \frac{2}{3}}{\frac{11}{15} \times \frac{5}{4} \times \frac{2}{27}}$.

A. 50 B. 30 C. 45 D. 35

204. A man invested #5000 for 9 months at 4%. What is the simple interest?

A. ₦ 220 B. ₦ 130 C. ₦ 150 D. ₦ 250

205. If the numbers M,N,Q are in the ratio 5:4:3, find the value of $\frac{2N-Q}{M}$.

A. 1 B. 2 C. 4 D. 31

206. Simplify $\left(\frac{16}{81}\right)^{\frac{1}{4}} \div \left(\frac{9}{16}\right)^{-\frac{1}{2}}$

A. $\frac{2}{3}$ B. $\frac{1}{2}$ C. $\frac{8}{9}$ D. $\frac{1}{3}$





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207. If $\log_3 18 + \log_3 3 - \log_3 x = 3$, find x.
- A. 2 B. 1 C. 0 D. 3
208. Rationalize $\frac{2-\sqrt{5}}{3-\sqrt{5}}$.
- A. $\frac{1-\sqrt{5}}{2}$ B. $\frac{1-\sqrt{5}}{3}$ C. $\frac{1+\sqrt{5}}{4}$ D. $\frac{1-\sqrt{5}}{4}$
209. Simplify $(\sqrt{2} + \frac{1}{\sqrt{3}})(\sqrt{2} - \frac{1}{\sqrt{3}})$.
- A. $\frac{7}{3}$ B. $\frac{5}{3}$ C. $\frac{5}{2}$ D. $\frac{3}{2}$
210. Raila has 7 different posters to be hanged in her bedroom, living room and kitchen. Assuming she has plans to replace at least a poster in each of the 3 rooms, how many choices does she have?
- A. 49 B. 170 C. 210 D. 21
211. Find the remainder when $x^3 - 2x^2 + 3x - 3$ is divided by $x^2 + 1$.
- A. $x+3$ B. $2x-1$ C. $2x+1$ D. $x-3$
212. Factorize completely $9y^2 - 16x^2$.
- A. $(3y-2x)(3y+4x)$ B. $(3y+4x)(3y+4x)$
C. $(3y+2x)(3y-4x)$ D. $(3y+4x)(3y-4x)$
213. Solve for x and y respectively in the simultaneous equations $-2x - 5y = 3$, $x + 3y = 0$.
- A. -9, 3 B. 9, -3 C. 3, -9 D. -3, -9
214. If x varies directly as square root of y and $x=81$ when $y=9$, find x when $y=1\frac{7}{9}$.
- A. 27 B. 20.25 C. 36 D. 2.25
215. T varies inversely as the cube of R. When $R=3$, $T=\frac{2}{81}$, find T when $R=2$.
- A. $\frac{1}{18}$ B. $\frac{1}{12}$ C. $\frac{1}{24}$ D. $\frac{1}{6}$
216. Solve the inequality $-6(x+3) \leq 4(x-2)$.
- A. $x \leq 2$ B. $x \leq -2$ C. $x \leq -1$ D. $x \geq -1$
217. Solve the inequality $x^2 + 2x > 15$.
- A. $x > 3$ or $x < -5$ B. $x < -3$ or $x > 5$ C. $-5 < x < 3$ D. $x < 3$ or $x > 5$
218. Find the sum of the first 18 terms of the series 3, 6, 9, ..., 36





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- A. 513 B. 505 C. 433 D. 635
219. The second term of a geometric series is 4 while the fourth term is 16. Find the sum of the first five terms.
A. 60 B. 54 C. 64 D. 62
220. A binary operation $*$ on real numbers is defined by $x * y = xy + x + y$ for two real numbers x and y . Find the value of $3 * -\frac{2}{3}$.
A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. -1 D. 2
221. If $\begin{vmatrix} 2 & 3 \\ 5 & 3x \end{vmatrix} = \begin{vmatrix} 4 & 1 \\ 3 & 2x \end{vmatrix}$, find the value of x .
A. -6 B. 6 C. 12 D. -12
222. Evaluate $\begin{vmatrix} 4 & 2 & -1 \\ 2 & 3 & -1 \\ -1 & 1 & 3 \end{vmatrix}$.
A. 45 B. 15 C. 55 D. 25
223. The inverse of matrix $N = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ is
A. $\frac{1}{5} \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ B. $\frac{1}{5} \begin{pmatrix} 4 & -3 \\ -1 & 2 \end{pmatrix}$ C. $\frac{1}{5} \begin{pmatrix} 2 & -1 \\ -3 & 4 \end{pmatrix}$
D. $\frac{1}{5} \begin{pmatrix} 4 & 3 \\ 1 & 2 \end{pmatrix}$
224. What is the size of each interior angle of a 12-sided regular polygon?
A. 120^0 B. 150^0 C. 30^0 D. 180^0
225. A circle of perimeter 28cm is opened to form a square. What is the maximum possible area of the square?
A. 56cm^2 B. 98cm^2 C. 49cm^2 D. 28cm^2
226. A chord of a circle of radius 7cm is 5cm from the centre of the circle. What is the length of the chord?
A. $4\sqrt{6}\text{cm}$ B. $3\sqrt{6}\text{cm}$ C. $6\sqrt{6}\text{cm}$ D. $2\sqrt{6}\text{cm}$
227. A solid metal cube of side 3cm is placed in a rectangular tank of dimensions 3, 4 and 5 cm. What volume of water can the tank now hold?
A. 48 cm^3 B. 33 cm^3 C. 60 cm^3 D. 27 cm^3
228. The perpendicular bisector of a line XY is the locus of a point
A. whose distance from X is always twice its distance from Y





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- B whose distance from Y is always twice its distance from X
C which moves on the line XY
D which is equidistant from the points X and Y
- 229 The midpoint of P(x, y) and Q(8, 6) is (5, 8). Find x and y.
A (2, 10) B. (2, 8) C. (2, 12) D. (2, 6)
- 230 Find the equation of a line perpendicular to line $2y=5x+4$ which passes through (4,2).
A. $5y-2x-18=0$ B. $5y+2x-18=0$ C. $5y-2x+18=0$
D. $5y+2x-2=0$
- 231 In a right angled triangle, if $\tan\theta = \frac{3}{4}$. What is $\cos\theta - \sin\theta$?
A. $\frac{1}{4}$ B. $\frac{3}{5}$ C. $\frac{1}{5}$ D. $\frac{2}{5}$
- 232 A man walks 100m due West from a point X to Y, he then walks 100m due North to a point Z. Find the bearing of X from Z.
A. 195^0 B. 135^0 C. 225^0 D. 045^0
- 233 The derivative of $(2x+1)(3x+1)$ is
A. $12x+1$ B. $6x+5$ C. $6x+1$ D. $12x+5$
- 234 Find the value of x at the minimum point of the curve $y=x^3+x^2-x+1$.
A. $\frac{1}{3}$ B. $-\frac{1}{3}$ C. 1 D. -1
- 235 Evaluate $\int_0^1 (3 - 2x) dx$.
A. 2 B. 5 C. 6 D. 3
- 236 Find $\int \cos 4x dx$.
A. $\frac{3}{4} \sin 4x + k$ B. $-\frac{1}{4} \sin 4x + k$ C. $\frac{1}{4} \sin 4x + k$
D. $-\frac{3}{4} \sin 4x + k$
- 237 The sum of four consecutive integers is 34. Find the least of these numbers.
A. 6 B. 8 C. 7 D. 5





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No.	0	1	2	3	4	5
Frequency	1	4	3	8	2	5

238 find the median and range of the data respectively.

- A. (8, 5) B. (3, 5) C. (5, 8) D. (5, 3)

Class Interval	0-2	3-5	6-8	9-11
Frequency	1	4	3	8

239 Find the mode of the above distribution.

- A. 9 B. 8 C. 10 D. 7

Class Interval	3-5	6-8	9-11
Frequency	2	2	2

240 Find the standard deviation of the above distribution

- A. $\sqrt{3}$ B. $\sqrt{5}$ C. $\sqrt{7}$ D. $\sqrt{2}$

241 In how many ways can the letters of the word ELATION be arranged?

- A. 6! B. 5! C. 8! D. 7!

242 In how many ways can five people sit round a circular table?

- A. 60 B. 24 C. 12 D. 120

243 Find the probability that a number picked at random from the set {43, 44, 45, ..., 60} is a prime number.

- A. $\frac{2}{3}$ B. $\frac{2}{9}$ C. $\frac{1}{3}$ D. $\frac{7}{9}$

244 In a class of 60 students, 30 offer Physics and 40 offer Chemistry. If a student is picked at random from the class, what is the probability that the student offer both Physics and Chemistry?

- A. $\frac{1}{3}$ B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\frac{1}{6}$





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245 Convert 72_6 to a number in base three.

- A. 2211 B. 2121 C. 1212 D. 1122

246 Simplify $\frac{2\frac{2}{3} \times 1\frac{1}{2}}{4\frac{4}{5}}$

- A. $1\frac{2}{4}$ B. $1\frac{1}{6}$ C. $\frac{5}{6}$ D. $\frac{4}{5}$

247 Evaluate $\frac{21}{9}$ to 3 significant figures.

- A. 2.30 B. 2.31 C. 2.32 D. 2.33

248 A man earns ₦ 3 500 per month out of which he spends 15% on his children's education. If he spends additional ₦ 1 950 on food, how much does he have left?

- A. ₦ 525 B. ₦ 1 025 C. ₦ 1 950 D. ₦ 2 975

249 If $27^{x+2} \div 9^{x+1} = 3^{2x}$ find x .

- A. 3 B. 4 C. 5 D. 6

250 If $\log_3 x^2 = -8$, what is x ?

- A. $\frac{1}{3}$ B. $\frac{1}{9}$ C. $\frac{1}{27}$ D. $\frac{1}{81}$

251 Simplify $(\sqrt{6} + 2)^2 - (\sqrt{6} - 2)^2$.

- A. $2\sqrt{6}$ B. $4\sqrt{6}$ C. $8\sqrt{6}$ D. $16\sqrt{6}$

252 If P is a set of all prime factors of 30 and Q is a set of all factors of 18 less than 10, find $P \cap Q$.

- A. {3} B. {2,3} C. {2,3,5} D. {1,2}

253 In a class of 46 students, 22 play football and 26 play volleyball. If 3 students play both games, how many play neither?

- A. 1 B. 2 C. 3 D. 4

254 Make n the subject of the formula if $w = \frac{v(2 + cn)}{1 - cn}$

- A. $\frac{1}{c} \left(\frac{w - 2v}{v + w} \right)$ B. $\frac{1}{c} \left(\frac{w - 2v}{v - w} \right)$ C. $\frac{1}{c} \left(\frac{w + 2v}{v - w} \right)$

- D. $\frac{1}{c} \left(\frac{w + 2v}{v + w} \right)$





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- 255 Find the remainder when $2x^3 - 11x^2 + 18x - 1$ is divided by $x + 3$.

A. -871 B. -781 C. -187 D. -178

- 256 Solve for x and y in the equation below.

$$x^2 - y^2 = 4$$

$$x + y = 2$$

A. $x = 0, y = -2$ B. $x = 0, y = 2$ C. $x = 2, y = 0$

D. $x = -2, y = 0$

- 257 If y varies directly as \sqrt{n} and $y = 4$ when $n = 4$, find y when $n = 1\frac{7}{9}$.

A. $\sqrt{17}$ B. $\frac{4}{3}$ C. $\frac{8}{3}$ D. $\frac{2}{3}$

- 258 U is inversely proportional to the cube of V and $U=81$ when $V=2$. Find U when $V=3$.

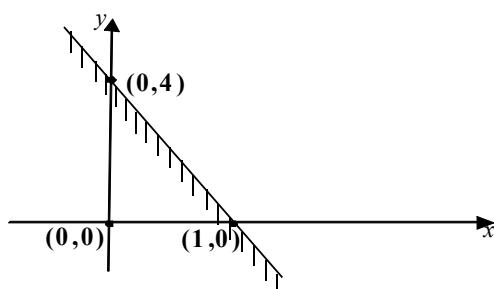
A. 24 B. 27 C. 32 D. 36

- 259 The value of y for which $\frac{1}{5}y + \frac{1}{5} < \frac{1}{2}y + \frac{2}{5}$ is

A. $y > \frac{2}{3}$ B. $y < \frac{2}{3}$ C. $y > -\frac{2}{3}$ D. $y < -\frac{2}{3}$

- 260 Find the range of values of m which satisfies $(m - 3)(m - 4) < 0$.

A. $2 < m < 5$ B. $-3 < m < 4$ C. $3 < m < 4$
D. $-4 < m < 3$



- 261 The shaded region above is represented by the equation.

A. $y \leq 4x + 2$ B. $y \geq 4x + 2$ C. $y \leq -4x + 4$
D. $y \leq 4x + 4$





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- 262 The n th term of a sequence is $n^2 - 6n - 4$. Find the sum of the 3rd and 4th terms.
A. 24 B. 23 C. -24 D. -25
- 263 The sum to infinity of a geometric progression is $-\frac{1}{10}$ and the first term is $-\frac{1}{8}$. Find the common ratio of the progression.
A. $-\frac{1}{5}$ B. $-\frac{1}{4}$ C. $-\frac{1}{3}$ D. $-\frac{1}{2}$
- 264 The binary operation $*$ is defined on the set of integers such that $p * q = pq + p - q$. Find $2 * (3 * 4)$.
A. 11 B. 13 C. 15 D. 22
- 265 A binary operation on the set of real numbers is defined by $m * n = \frac{mn}{2}$ for all $m, n \in R$. If the identity element is 2, find the inverse of -5.
A. $-\frac{4}{5}$ B. $-\frac{2}{5}$ C. 4 D. 5
- 266 If $\begin{vmatrix} 5 & 3 \\ x & 2 \end{vmatrix} = \begin{vmatrix} 3 & 5 \\ 4 & 5 \end{vmatrix}$, find the value of x
A. 3 B. 4 C. 5 D. 7
- 267 Given that I_3 is a unit matrix of order 3, find $|I_3|$
A. -1 B. 0 C. 1 D. 2
- 268
-
- In the diagram above, $QR//TU$, $\angle PQR=80^\circ$ and $\angle PSU=95^\circ$. Calculate $\angle SUT$.
A. 15° B. 25° C. 30° D. 80°
- 269 The angles of a polygon are given by x , $2x$, $3x$, $4x$ and $5x$ respectively. Find the value of x
A. 24° B. 30° C. 33° D. 36°

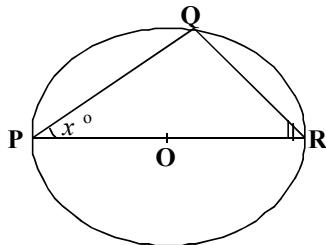




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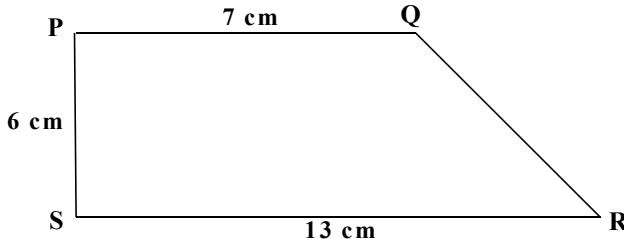
270



In the diagram above, PQR is a cyclic quadrilateral with centre O . If $\angle QPR = x^\circ$, find $\angle QRP$.

- A. x° B. $(90 - x)^\circ$ C. $(90 + x)^\circ$ D. $(180 - x)^\circ$

271



Find the area of the trapezium above.

- A. 91 cm^2 B. 78 cm^2 C. 60 cm^2 D. 19 cm^2

272

A circular arc subtends an angle of 150° at the centre of a circle of radius 12 cm. Calculate the area of the sector of the arc.

- A. $30\pi \text{ cm}^2$ B. $60\pi \text{ cm}^2$ C. $120\pi \text{ cm}^2$ D. $150\pi \text{ cm}^2$

273

Calculate the volume of a cuboid of length 0.76 cm, breadth 2.6 cm and height 0.82 cm.

- A. 3.92 cm^3 B. 2.13 cm^3 C. 1.97 cm^3 D. 1.62 cm^3

274

The locus of a point equidistant from the intersection of lines $3x - 7y + 7 = 0$ and $4x - 6y + 1 = 0$ is a

- A. line parallel to $7x - 13y + 8 = 0$ B. circle
C. semicircle D. bisector of the line $7x - 13y + 8 = 0$.

275

The gradient of the straight line joining the points $P(5, -7)$ and $Q(-2, -3)$ is

- A. $\frac{1}{2}$ B. $\frac{2}{5}$ C. $-\frac{4}{7}$ D. $-\frac{2}{3}$

276

The distance between the point $(4, 3)$ and the intersection of $y = 2x + 4$ and $y = 7 - x$ is





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- A. $\sqrt{13}$ B. $3\sqrt{2}$ C. $\sqrt{26}$ D. $10\sqrt{5}$

277 Find the equation of the lines through the points $(-2, 1)$ and $(-\frac{1}{2}, 4)$

- A. $y = 2x - 3$ B. $y = 2x + 5$ C. $y = 3x - 2$
D. $y = 2x + 1$

278 If angle θ is 135° , evaluate $\cos \theta$.

- A. $\frac{1}{2}$ B. $\frac{\sqrt{2}}{2}$ C. $-\frac{\sqrt{2}}{2}$ D. $-\frac{1}{2}$

279 A man stands on a tree 150 cm high and sees a boat at an angle of depression of 74° . Find the distance of the boat from the base of the tree.

- A. 52 cm B. 43 cm C. 40 cm D. 15 cm

280 If $y = x^2 - \frac{1}{x}$, find $\frac{dy}{dx}$.

- A. $y = 2x - \frac{1}{x^2}$ B. $2x + x^2$ C. $2x - x^2$
C. $2x + \frac{1}{x^2}$

281 Find $\frac{dy}{dx}$, if $y = \cos x$.

- A. $\sin x$ B. $-\sin x$ C. $\tan x$ D. $-\tan x$

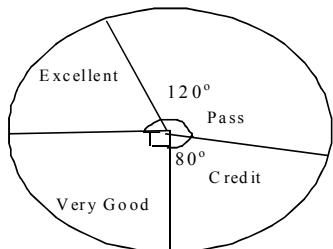
282 Evaluate $\int_1^2 (x^2 - 4x) dx$.

- A. $\frac{11}{3}$ B. $\frac{3}{11}$ C. $-\frac{3}{11}$ D. $-\frac{11}{3}$

283 Evaluate $\int_0^{\frac{\pi}{4}} (\sec^2 \theta) d\theta$.

- A. 1 B. 2 C. 3 D. 4

284





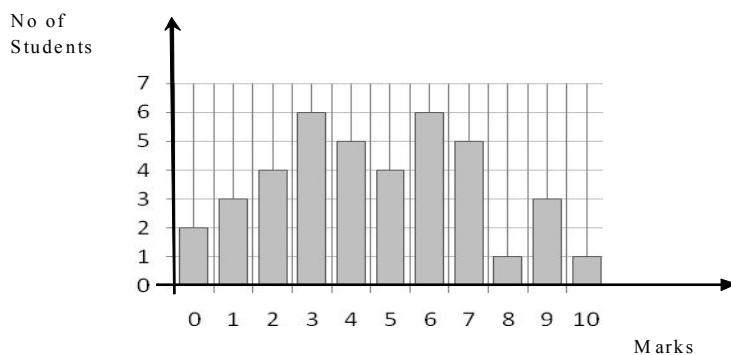
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The grades of 36 students in a class test are as shown in the pie chart above.
How many students have excellent?

- A. 12 B. 9 C. 8 D. 7

285



The bar chart above shows the distribution of marks in a class test. If the pass mark is 5, what percentage of the students failed the test?

- A. 10% B. 20% C. 50% D. 60%

286 The mean of seven numbers is 96. If the eighth number is added, the mean becomes 112. Find the eighth number.

- A. 126 B. 180 C. 216 D. 224

287 Find the median of 2,3,7,3,4,5,8,9,9,4,5,3,4,2,4 and 5

- A. 9 B. 8 C. 7 D. 4

288 Find the range of 4,9,6,3,2,8,10 and 11.

- A. 11 B. 9 C. 8 D. 4

289 Find the standard deviation of 2,3,8, 10 and 12.

- A. 3.9 B. 4.9 C. 5.9 D. 6.9

290 Evaluate ${}^{n+1}C_{n-2}$ If $n = 15$.

- A. 3630 B. 3360 C. 1120 D. 560

291 In how many ways can the letters of the word TOTALITY be arranged?

- A. 6720 B. 6270 C. 6207 D. 6027

292 The probability that a student passes a physics test is $\frac{2}{3}$, If he takes three physics test, what is the probability that he passes two of the test.





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- A. $\frac{4}{9}$ B. $\frac{6}{9}$ C. $\frac{4}{27}$ D. $\frac{2}{27}$

293 The probability that a man and his wife live for 80 years are $\frac{2}{3}$ and $\frac{3}{5}$ respectively. Find the probability that at least one of them will live up to 80 years.

- A. $\frac{2}{15}$ B. $\frac{3}{15}$ C. $\frac{7}{15}$ D. $\frac{13}{15}$



FITA PAST QUESTION SOLUTION

MATHEMATICS

~~Don't do this / better~~

Total number of balls = 13
 $P(\text{blue ball}) = \frac{3}{13}$ (A)

② If $7r_7 = 6189$
 $7 \times 8 + 1 \times 8 + 7 \times 8^0 = 6 \times 9 + 1 \times 9 + 8 \times 9^0$
 $7 \times 64 + 8r + 7 = 6 \times 81 + 9 + 8$
 $455 + 8r = 503$
 $8r = 503 - 455$
 $8r = 48$
 $r = 6$. (C)

③ $\left(\frac{3}{4} \text{ of } \frac{4}{9} \div 9\frac{1}{2} \right) \div 1\frac{5}{9}$
 $\left(\frac{3}{4} \times \frac{4}{9} \times \frac{2}{19} \right) \times \frac{19}{24}$
 $= \frac{\frac{21}{57}}{3} \times \frac{18}{24}$
 $= \frac{1}{36}$ (C)

④ Actual = 1.25m \Rightarrow Measured length = 1.27m
 Error = 1.27 - 1.25
 $= 0.02$
 $\% \text{ Error} = \frac{0.02}{1.25} \times 100$
 $= 1.6\%$ (A)

⑤ $I = \frac{PRT}{100}$
 $R = \frac{100I}{PT} = \frac{100 \times 25}{500 \times 5}$
 $R = 1\%$ (E)

⑦ $\left(\frac{243}{32} \right)^{-\frac{15}{5}} \times 2^{-2}$
 $\left(\frac{27}{2^5} \right)^{-\frac{15}{5}} \times 2^{-2}$
 $\times \left(\frac{3}{2} \right)^{\frac{5}{5} \times -\frac{1}{2}} \times \frac{1}{2^2} = \left(\frac{3}{2} \right)^{-1} \times \frac{1}{4} = \frac{2}{3} \times \frac{1}{4} = \frac{1}{6}$ (C)

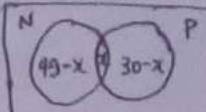
⑧ $\log 2 = 0.3010 \Rightarrow \log 7 = 0.8451$
 $\log 224 = \log(32 \times 7)$
 $= \log 32 + \log 7$
 $= \log 2^5 + \log 7$
 $= 5 \log 2 + \log 7$
 $= 5 \times 0.3010 + 0.8451$
 $= 2.3501$ (B)

⑨ $\frac{2\sqrt{5} + 7}{\sqrt{7} - \sqrt{5}}$

By Rationalizing

$$\begin{aligned} & \frac{2\sqrt{5} + 7}{\sqrt{7} - \sqrt{5}} \times \frac{\sqrt{7} + \sqrt{5}}{\sqrt{7} + \sqrt{5}} \\ &= \frac{2\sqrt{35} + 10 + 7 + \sqrt{35}}{7 - 5} \\ &= \frac{3\sqrt{35} + 17}{2} \end{aligned} \quad (\text{D})$$

⑩ 0.31×0.345
 $= 0.1054$
 $= 1.054 \times 10^{-3}$ (A)

⑪ 

$n(N) = 60$
 $n(N) = 49$
 $n(P) = 30$
 $n(P \cap N) = x$

$$\begin{aligned} 49 - x + x + 30 - x &= 60 \\ 49 + 30 - x &= 60 \\ 79 - x &= 60 \\ -x &= 60 - 79 \\ -x &= -19 \\ x &= 19 \end{aligned}$$

⑫ $P = \frac{M(x+R^2)}{5} + 2$

$$5P = M(x+R^2) + 2$$

$$5P = MX + MR^2 + 2$$

$$5P - MR^2 = MR^2$$

Dividing both sides by M

$$\frac{5P - MR^2}{M} = \frac{MR^2}{M}$$

$$R^2 = \frac{5P - MX - 2}{M}$$

$$R = \sqrt{\frac{5P - MX - 2}{M}}$$

No option

⑬ $\frac{x^3 + 2x^2 - 18x}{2x^2 - 18}$
 $= \frac{x[x^2 + 2x - 18]}{2[x^2 - 9]}$
 $= \frac{x[(x+5)(x-3)]}{2[(x+3)(x-3)]}$
 $= \frac{x[(x+5)]}{2[(x+3)]}$

⑭ Using Option (d) to multiply the factor
 $(9x^2 + 6xy + 4y^2)(-2y - 3x)$
 $= -18x^3y - 12x^2y^2 - 8y^3 + 27x^2 + 18x^2y + 12xy^2$
 $- 8y^3 + 27x^3 \Rightarrow 27x^3 - 8y^3$ (D)

⑮ $x - y = 3 \Rightarrow x^2 - y^2 = 9 \dots \star$
 $x = 3 + y \dots \textcircled{1}$

Substitute $x = 3 + y$ into eqn \star

$$(3+y)^2 - y^2 = 9$$

~~$9 + 6y + y^2 - y^2 = 9$~~

~~$9 + 6y = 9$~~

~~$6y = 0$~~

~~$y = 0$~~

ACADEMY TUTORIAL

COMPILED BY: BLESSED

Substituting $y = 0$ into *

$$x - 0 = 3$$

$$x = 3$$

$$\therefore x = 3, y = 0 \quad (C)$$

16) $y \propto \sqrt{x}$

$$y = k\sqrt{x}$$

$$k = \frac{y}{\sqrt{x}}$$

$$k = \frac{3}{\sqrt{25}} = \frac{3}{5}$$

When $x = 100$

$$\frac{3}{5} = \frac{y}{\sqrt{100}}$$

$$5y = 3 \times 10$$

$$5y = 30$$

$$y = 30/5 = 6 \quad (D)$$

17) $x \propto \frac{1}{y}$

$$x = \frac{k}{y}$$

$$\frac{7}{2} = \frac{k}{2}$$

$$2k = 14$$

$$k = 7$$

When $y = 4$

$$x = \frac{7}{4}$$

$$x = 1\frac{3}{4} \quad (C)$$

18) $\frac{1}{3}x + \frac{1}{4} > \frac{1}{4}x + \frac{1}{2}$

$$\frac{1}{3}x - \frac{1}{4}x > \frac{1}{2} - \frac{1}{4}$$

$$\frac{4x - 3x}{12} > \frac{2-1}{4}$$

$$\frac{x}{12} > \frac{1}{4}$$

$$4x > 12$$

$$x > 3 \quad (B)$$

19) $-6 \leq 4 - 2x < 5 - x$

$$-1 < x \leq 5 \quad (D)$$

20) $S_{\infty} = \frac{a}{1-r} = \frac{0.2}{1.01} = \frac{0.2}{0.9} = \frac{2}{9} \quad (B)$

21) $a+2d = 3^{\text{rd}} \text{ term} = -8$

$$a+6d = 7^{\text{th}} \text{ term} = -28$$

$$\therefore a+2d = -8 \quad \text{--- (i)}$$

$$a+6d = -28 \quad \text{--- (ii)}$$

Subtract eqtn (i) from (ii)

$$-4d = 20$$

$$d = -5$$

Substitute $d = -5$ into eqtn (i)

$$a+2(-5) = -8$$

$$a+10 = -8$$

$$a = -18$$

$$a = 2$$

Then

$$a+qd = 10^{\text{th}} \text{ term}$$

$$2+9(-5) = 2-45$$

$$= -43 \quad (A)$$

22) $x+y = x-y^2$

$$(2x3) \times 5 =$$

Solving the One in the bracket

$$2x3 = 2-3^2$$

$$= 2-9$$

$$= -7$$

Then

$$-7 \times 5 = -7-(5)^2$$

$$= -7-25$$

$$= -30 \quad (C)$$

23) $16(P+Q) = \frac{16+P}{Q}$

$$16P+16Q \dots \text{R.H.S}$$

$$16P = -16Q$$

$$P = -Q$$

$$\frac{16+P}{Q} = 0 \dots \text{L.H.S}$$

$$16+P = 0$$

$$P = -16$$

If $P = -16$ and $QP = -Q$

$$-Q = -16 \quad \cancel{-16}$$

$$Q = 16 \quad (D)$$

24) $\begin{vmatrix} x & 9 \\ 3 & 7 \end{vmatrix} = 9$

$$7x - 12 = 9$$

$$7x = 9+12$$

$$7x = 21$$

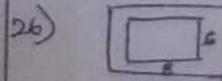
$$x = 3 \quad (D)$$

25) $\begin{vmatrix} 3 & 0 & 6 \\ 5 & 7 & 4 \\ 9 & 0 & 2 \end{vmatrix}$

$$3[14-0] - 0[10-36] + 6[0-63]$$

$$= 42 - 0 - 378$$

$$= -336 \quad (A)$$



Since the rectangular picture is enclosed by a frame ($\frac{1}{2}$)

$$\therefore 6 + \frac{1}{2} = \frac{13}{2}$$

$$\text{and } 8 + \frac{1}{2} = \frac{17}{2}$$

Then $L+B = \frac{13}{2} + \frac{17}{2}$

$$= \frac{13+17}{2}$$

$$= \frac{30}{2}$$

$$= 15 \text{ cm}$$

27) $\text{Area} = \text{Sum} = \frac{3\frac{3}{8}}{8} + \frac{1\frac{1}{3}}{3} = \frac{31}{8} + \frac{4}{3} = \frac{93+64}{24} = \frac{157}{24}$
 Difference between ~~$\frac{3}{8}$~~ and $\frac{1\frac{1}{3}}{3} = \frac{5}{3} - \frac{3}{8} = \frac{40-9}{24} = \frac{31}{24}$
 $\text{Difference} = \frac{157}{24} - \frac{31}{24} = \frac{157-31}{24} = \frac{126}{24} = 5\frac{1}{4}$ (B)

28) Multiplying
 (x+3y+5) by (2x²+5y+10)
 $= 2x^3 + 5xy^2 + 2x^2 + 6x^2y + 15y^2 + 6y + 10x^2 + 25y + 10$
 $= 2x^3 + 5xy^2 + 2x^2 + 6x^2y + 15y^2 + 6y + 10x^2 + 25y + 10$
 $= 2x^3 + 6y^2x^2 + 5xy^2 + 15y^2 + 31y + 10x^2 + 2x + 10$ (B)

29) $S_n = a \frac{(1-r^n)}{1-r}$
 $= \frac{1(1-r^n)}{1-r} = \frac{1}{1-r}$ (A)

30) $x^2 + 4 = 0$, then $x = \pm \sqrt{-4}$
 Therefore it is none of the option (D)

31) Let Son age be x
 Five years ago
 $5 + 3x - 110 \Rightarrow 3x = 110 - 5$
 $3x = 105$
 $x = \frac{105}{3}$
 $x = 35$

Present age of father = y
 $y + x = 110$ [sum of ages]
 $y + 35 = 110$
 $y = 110 - 35$
 $y = 75$ (A)

32) $y = 2x^2 + 9x - 35$
 $2x^2 + 14x - 5x - 35$
 $2x[x+7] - 5[x+7]$
 $2x - 5 = 0 \quad x = \frac{5}{2}$
 or $x+7 = 0 \quad x = -7$
 Then $-7 < x < \frac{5}{2}$ (D)

33) Question not complete

34) $a * b = ab + b + 9$
 $a * b = 1 + b + 9$
 $(a * b) * (a * c)$
 $a * b = ab + b + 9$
 $a * c = ac + c + 9$
 $(a * b) * (a * c) = 1 + ac + c + 9 + ab + b + 9$
 $= 1 + ac + c + 2a + ab + b$ (C)

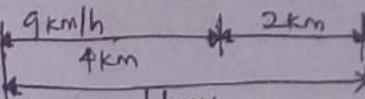
35) Add all angles and equate to 360°
 $(P+10^\circ)+(P-30^\circ)+(P-45^\circ)+(P-35^\circ) = 360^\circ$
 $P+10+P-30+P-45+P-35 = 360^\circ$
 $5P-30 = 360^\circ$
 $5P = 360+30 \quad \therefore P = \frac{390}{5} = 78^\circ$ (A)

36) $\frac{(a-b)}{(a+b)} - \frac{(a+b)}{(a-b)}$
 $\frac{(a-b)(a-b) - (a+b)(a+b)}{(a+b)(a-b)}$
 $\frac{a^2 - 2ab + b^2 - a^2 - 2ab - b^2}{a^2 - ab + ab - b^2}$
 $= \frac{-4ab}{a^2 - b^2}$ (B)

37) $y = x^2 - 6x + 5$
 $\frac{dy}{dx} = 2x - 6$
 at turning point $\frac{dy}{dx} = 0$
 $2x - 6 = 0$
 $2x = 6$
 $x = 3$

To get the values, Substitute $x = 3$ into y
 $y = 3^2 - 6(3) + 5$
 $= 9 - 18 + 5$
 $= -4$
 $\therefore [3, -4]$ (B)

38) $3x - \frac{1}{4} > \frac{1}{4} - x$
 $3x + x > \frac{1}{4} + \frac{1}{4}$
 $4x > \frac{1}{2}$
 $8x > 1$
 $x > \frac{1}{8}$

39) 
 Average time = $\frac{1 \text{ hour}}{2} = 0.5 \text{ hour}$

For the first 4 km = $\frac{\text{distance}}{\text{time}}$

$s = \frac{4}{0.5}$
 $s = 8 \text{ km/h}$ (B)

40) Mean = $\frac{36}{20} = 1.8$

Median = 1.5
 Mode = 1 (B)

41) $\sec^2 \theta + \tan^2 \theta = 3$
 Recall that $\sec^2 \theta = 1 + \tan^2 \theta$
 $1 + \tan^2 \theta + \tan^2 \theta = 3$
 $2\tan^2 \theta = 3 - 1$
 $2\tan^2 \theta = 2$
 $\tan^2 \theta = 1 \Rightarrow \tan \theta = (\pm 1)^2$
 $\tan \theta = 1$
 $\theta = \tan^{-1}(1)$
 $\theta = 45^\circ$ (C)

$$49) x^2 - y - 1 = 0 \quad \text{--- (1)}$$

$$y - 2x + 2 = 0 \quad \text{--- (2)}$$

From eqtn (ii)

$$y = 2x - 2 \quad \text{--- (iii)}$$

$$\text{or } y = 2(x - 1)$$

Substitute (iii) into (1)

$$x^2 - (2x - 2) - 1 = 0$$

$$x^2 - 2x + 2 - 1 = 0$$

$$x^2 - 2x + 1 = 0$$

$$x^2 - x - x + 1 = 0$$

$$x(x - 1) - 1(x - 1) = 0$$

$$(x - 1) = 0 \quad \therefore x = 1$$

$$\text{or } (x - 1) = 0 \quad \therefore x = 1$$

Substitute $x = 1$ into (3)

$$y = 2(1) - 2$$

$$= 2 - 2$$

$$y = 0$$

$$\therefore (x, y) = (1, 0)$$

50) $25^{x-1} = 64 \left(\frac{5}{2}\right)^6$

$$5^{2(x-1)} = \cancel{2^6} \times \frac{5^6}{2^6}$$

$$5^{2x-2} = 5^6$$

$$2x-2 = 6$$

$$2x = 6+2$$

$$2x = 8$$

$$x = 4$$



$$\cos \theta = \frac{x}{10}$$

$$10 \cos \theta = x$$

$$10 \cos 30^\circ = x$$

$$8\sqrt{3} \text{ cm or } 5\sqrt{3} = x$$

45)

46)

47)

48)

49)

51) $y = \frac{4x}{9} + 1 \quad \text{If } y = 99$

$$z = \frac{4y}{9} + 1$$

$$\text{Then } \frac{4x+1}{9} \text{ from } z = \frac{4x+1}{9} + 1 = \frac{396+9}{9} = \frac{405}{9} = 45$$

$$z = \frac{4x+1}{9} + 1 = \frac{180+9}{9} = \frac{189}{9} = 21 \quad (\text{c})$$

52) $2A = 35 \text{ students} \quad \text{Mean (A)} = 60$
 $2B = 40 \text{ students} \quad \text{Mean (B)} = 52.5$

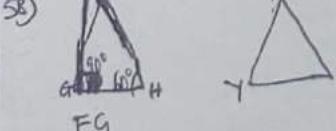
$$A \rightarrow 60 = \frac{x}{35} \quad \therefore x = 60 \times 35 = 2100$$

$$B \rightarrow 40 = \frac{x}{52.5} \quad x = 40 \times 52.5 = 2100$$

$$\text{Combined Mean} = \frac{4200}{75} = 56.0 \quad (\text{b})$$

53) Total = 130 items

$$\frac{26}{130} \times 360 = 72^\circ \quad (\text{d})$$



54) $4x + 60 = 540^\circ$
 $4x = 540^\circ - 60^\circ$
 $4x = 480^\circ$
 $x = 480^\circ / 4 = 120^\circ$

55)

56) $Kx^2 - 4x + 1$

Substitute $K = 4$, $4x^2 - 4x + 1 = 0$

Equal roots $b^2 = 4ac$

$$a = K, b = -4, c = 1$$

$$(-4)^2 = 4K + K^2$$

$$16 = 4K$$

$$K = 16/4 = 4 \quad (\text{c})$$

57) $5^{x+1} + 5^x = 150$, then $x = 2$

$$5^{2+1} + 5^2 = 150$$

$$5^3 + 5^2 = 125 + 25 = 150$$

$$\begin{aligned} 5^{x+1} + 5^x &= 150 \\ 5(5^x) + 5^x &= 150 \\ 5^x(5+1) &= 150 \\ 6 \cdot 5^x &= 150 \\ 5^x &= 150/6 \\ 5^x &= 25 \end{aligned}$$

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63) $2^{x+y} = 32 \quad \text{--- (1)}$
 $3^{y-x} = 27 \quad \text{--- (ii)}$
 From Laws of Indices
 $2^{x+y} = 2^5 \quad \text{--- (iii)}$
 $3^{y-x} = 3^3 \quad \text{--- (iv)}$
 $x+y = 5 \quad \text{--- (v)}$
 $y-x = 3 \quad \text{--- (vi)}$

From eqtn (v)
 $x = 5-y$

Substitute $x = 5-y$ into eqtn (vi)

$$y - (5-y) = 3$$

$$y - 5 + y = 3$$

$$2y = 3 + 5$$

$$y = \frac{8}{2} = 4$$

Substitute $y = 4$ into eqtn (v)

$$x+4 = 5$$

$$x = 5-4$$

$$x = 1$$

$$\therefore x = 1 \text{ and } y = 4 \quad (\text{A})$$

64) $\sqrt{\frac{1-\cos x}{1+\cos x}}$

65) $r = 6 \text{ cm}$ $h = 8 \text{ cm}$
 Slant height $= \sqrt{r^2+h^2}$
 $= \sqrt{6^2+8^2}$
 $= \sqrt{36+64} = \sqrt{100} = 10$



$$\text{C.S.A} = \pi r l$$

$$= \frac{22}{7} \times 6 \times 10$$

$$= \frac{1320}{7} = 188.57 \text{ cm}^2 \quad (\text{B})$$

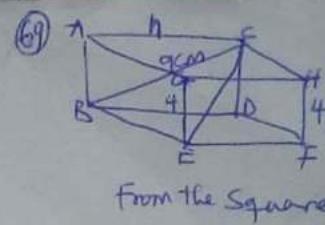
66)

67) $f(x+1) = 3x^2 - x + 4$
 $\therefore f(0) = f(-1)$
 that is $0 = -1 + 1$
 $x = -1$
 Substitute $x = -1$ into $3x^2 - x + 4$
 $= 3(-1)^2 - (-1) + 4$
 $= 3 + 1 + 4$
 $= 8 \quad (\text{D})$

68)
 $D = 10$
 $R = \frac{10}{2} = 5$
 $t = 2 \text{ cm}$
 $r = R-t = 5-2 = 3 \text{ cm}$
 $Vd = \pi(R^2 - t^2)h$
 $= \frac{22}{7}(5^2 - 3^2) \times 6$

BLESSED ACADEMY TUTORIALS / FUTA PQ / MATHEMATICS

$$\begin{aligned} &= \frac{-22}{7} \times (25-9) \times 12 \\ &= \frac{22}{7} \times (16) \times 12 \\ &= \frac{4224}{7} \text{ cm}^3 \end{aligned}$$

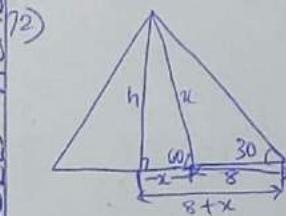


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70) $x \propto y, y = \sqrt{z}, z \propto \frac{1}{w^2}$
 Simplify $\alpha =$
 $x = \frac{1}{\sqrt{z}} \quad z = \frac{1}{\sqrt{w^2}} \quad x = \frac{1}{\sqrt{\frac{1}{w^2}}} = \frac{1}{\sqrt{1}} = 1$
 $z = \sqrt{w^2}$
 $z \propto w^2$

71) $\frac{\sin^2 x}{1+\cos x} + \frac{\sin^2 x}{1-\cos x}$
 $\frac{\sin^2 x (1-(\cos x)) + \sin^2 x ((1+\cos x))}{(1+(\cos x))(1-(\cos x))}$
 $= \frac{\sin^2 x (1-\cos x + 1+\cos x)}{1-\cos^2 x}$
 $= \frac{2\sin^2 x}{\sin^2 x}$
 $= 2 \quad (\text{A})$

Recall that $1-\cos^2 x = \sin^2 x$



$$\tan 60 = \frac{h}{x}$$

$$x = \frac{h}{\tan 60}$$

$$x = \frac{h}{\sqrt{3}}$$

$$\tan 30 = \frac{h}{x+8}$$

$$x+8 = \frac{h}{\tan 30}$$

$$x = \frac{h}{\tan 30} - 8$$

$$x = \frac{h}{\frac{1}{\sqrt{3}}} - 8$$

$$x = h\sqrt{3} - 8$$

Equating the x's
 $\frac{h\sqrt{3}}{3} = h\sqrt{3} - 8$
 $\frac{h\sqrt{3}}{3} - h\sqrt{3} = 8$
 ~~$\cancel{h\sqrt{3}} \cancel{h} = -8$~~
 $\frac{2\sqrt{3}h}{3} = -8$
 $h = -8 \times \frac{3}{2\sqrt{3}}$
 $(h = \frac{12\sqrt{3}}{3} = 4\sqrt{3}) \quad (\text{C})$

73) $N(\text{oranges}) = 4$
 $N(\text{Apples}) = 3$
 $N(\text{Bananas}) = 3$
 $\frac{10}{10} \text{ fruits} = \frac{3}{10} \times \frac{3}{9}$
 @ Selection of banana = $\frac{3}{10} = \frac{1}{10} \quad (\text{C})$
 @ Selection of apple = $\frac{3}{9}$

$$\begin{aligned}
 79) \frac{n!}{n! P_{r-1}} &= \frac{n!}{(n-r)!} = \frac{(n-1)!}{(n-1-(r-1))!} \\
 &= \frac{n!}{(n-r)!} \cdot \frac{(n-1)!}{(n-1-r+1)!} = \frac{n!}{(n-r)!} = \frac{(n-1)!}{(n-r)!} \\
 &= \frac{n!}{(n-r)!} \times \frac{(n-r)!}{(n-1)!} \\
 &= \frac{n!}{(n-1)!} \\
 &= \frac{n(n-1)!}{(n-1)!} = n \quad (A)
 \end{aligned}$$

$$80) X = \frac{1}{2}, Y = \frac{2}{3}, Z = \frac{1}{4}$$

$$X' = 1 - \frac{1}{2} = \frac{1}{2}$$

Y and Z are not X and Y and Z

$$= X' \times Y \times Z$$

$$= \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{1}{4}$$

$$= \frac{1}{12} \quad (C)$$

$$76) P = \begin{pmatrix} 2 & -1 \\ 3 & 3 \end{pmatrix}$$

$$|P| = [3 \cdot 2] - [3 \cdot (-1)]$$

$$= 6 + 3$$

$$= 9$$

$$P^{-1} = \frac{1}{9} \begin{pmatrix} 3 & -1 \\ 3 & 2 \end{pmatrix}$$

$$= \begin{pmatrix} \frac{3}{9} & -\frac{1}{9} \\ \frac{3}{9} & \frac{2}{9} \end{pmatrix} = \begin{pmatrix} \frac{1}{3} & \frac{1}{9} \\ \frac{1}{3} & \frac{2}{9} \end{pmatrix} \quad (B)$$

$$77) x + 20 + 2x - 45 + x - 15 + 2x + 10 = 360$$

$$x + 2x + x + 2x + 20 + 10 - 45 - 15 = 360$$

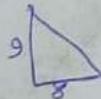
$$6x - 30 = 360$$

$$6x = 360 + 30$$

$$x = \frac{390}{6} = 65^\circ \quad (A)$$

$$78) A = \frac{1}{2} b \times h$$

$$= \frac{1}{2} \times 8 \times 9$$



$$= 36 \text{ cm}^2$$

$$(C)$$

$$79) \theta' = 60^\circ, r = 6 \text{ cm}$$

$$\text{Area of Sector} = \frac{\theta}{360} \pi r^2$$

$$= \frac{60}{360} \times \frac{22}{7} \times 6^2$$

$$= \frac{6}{7} \times \frac{22 \times 6}{7}$$

$$= \frac{132}{7} = 18.8 \quad (A)$$

$$80) T.S.A = C.S.A + \text{Area of One Circular End}$$

$$= 2\pi rh + \pi r^2$$

$$= 2\pi \times 5 \times 40 + \pi \times 7^2$$

$$= 560\pi + 49\pi$$

$$= 609\pi \quad (A)$$

81) Since it is from Midpoint

$$M = \frac{P+Q}{2}$$

$$M = \left(\frac{1+2}{2}, \frac{4+5}{2} \right)$$

$$M = \left(\frac{3}{2}, \frac{9}{2} \right)$$

$$M_1 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-4}{2-1} = \frac{1}{1} = 1$$

$M_2 = -\frac{1}{M_1}$ [since locus equidistant from point $P \neq Q$]
is a line perpendicular to PQ

$$M_2 = -\frac{1}{1}$$

$$= -1$$

$$M_2 = \frac{y - y_m}{x - x_m} = -1 = \frac{y - 4}{x - 1.5} = \frac{y - 4.5}{x - 1.5}$$

$$= 1(x - 1.5) = y - 4.5$$

$$-x + 1.5 = y - 4.5$$

$$y = -x + 1.5 + 4.5$$

$$y = -x + 6 \quad (D)$$

$$\begin{aligned}
 82) D &= \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2} \\
 &= \sqrt{\left(\frac{-1}{3} - \frac{2}{3}\right)^2 + \left(\frac{1}{3} - \frac{2}{3}\right)^2} \\
 &= \sqrt{(-1)^2 + (-1)^2} \\
 &= \sqrt{1+1} = \sqrt{2} \quad (D)
 \end{aligned}$$

$$83) M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-2}{2-1} = 3 \quad (A)$$

84)

$$85) \cot \theta = \frac{7}{15}$$

$$\tan \theta = \frac{1}{\cot \theta} = \frac{1}{\frac{7}{15}} = \frac{15}{7} \quad (B)$$

$$86) y = (2x - 1)^3$$

$$\frac{dy}{dx} = 3 \cdot 2(2x-1)^{3-1} = 6(2x-1)^2 \quad (C)$$

$$87) y = x \cos x$$

$$\text{Let } U = x \quad V = \cos x$$

$$\frac{du}{dx} = 1 \quad \frac{dv}{dx} = -\sin x$$

$$\begin{aligned}
 \frac{dy}{dx} &= \sqrt{\frac{du}{dx} + U \frac{dv}{dx}} \quad \text{Product Rule} \\
 &= \cos x \cdot 1 + x(-\sin x) \\
 &= \cos x - x \sin x \quad (B)
 \end{aligned}$$

$$88) \int_0^3 (x^3 - x^2) dx$$

$$\left[\frac{x^{3+1}}{3+1} - \frac{x^{2+1}}{2+1} \right]_0^3$$

$$\left[\frac{x^4}{4} - \frac{x^3}{3} \right]_0^3$$

$$\left[\frac{3^4}{4} - \frac{3^3}{3} \right] - \left[\frac{0^4}{4} - \frac{0^3}{3} \right]$$

$$\left(\frac{81}{4} - \frac{27}{3}\right)$$

$$= \frac{81}{4} - 9 \\ = 11\frac{1}{4}$$

(D)

90) $\int (\cos x + 2) dx$

$$\sin x + 2x + C$$

91) Students who failed the test scored 2, 3, 4 whose frequencies are 4 + 2 + 5 = 11 (C)

92) Possible Outcomes

HHH HHT HTH HTT
THH THT TTH TTT

No of Outcomes = 8

$$\therefore P(\text{all are tails}) = \frac{1}{8}$$

93) Committee = ${}^6C_4 + {}^5C_3$

$$= \frac{6!}{(6-4)!4!} + \frac{5!}{(5-3)!3!} \\ = \frac{6!}{2!4!} + \frac{5!}{2!3!} \\ = \frac{6 \times 5 \times 4!}{2 \times 4!} + \frac{5 \times 4 \times 3!}{2 \times 3!} \\ = 15 + 10 = 25$$

(B)

94) S.D. of 2, 4, 5 and 6

$$\bar{x} = \frac{\sum fx}{n} = \frac{2+4+5+6}{4} = \frac{17}{4} = 4.25$$

x	$x - \bar{x}$	$(x - \bar{x})^2$
2	-2.25	5.0625
4	-0.25	0.0625
5	0.25	0.5625
6	1.25	3.0625
	= 8.75	

$$S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

$$= \sqrt{\frac{8.75}{4}} = \sqrt{\frac{35}{4}} = \sqrt{\frac{35}{16}} = \frac{\sqrt{35}}{4}$$

No Option

95) $y = -3x + 2$

From $y = mx + c$

$$\therefore m = -3$$

Since H is parallel

$$m_1 = m_2$$

$$m_2 = -3$$

$$m_3 = \frac{y - y_1}{x - x_1} = \frac{y - 3}{x - 1} = -3$$

$$-3(x - 1) = y - 3$$

$$-3x + 3 = y - 3$$

$$y = -3x + 3 + 3$$

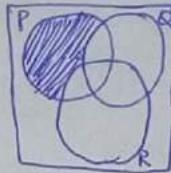
$$y = -3x + 6$$

\therefore The Eqtn become $y + 3x - 6 = 0$

(A)

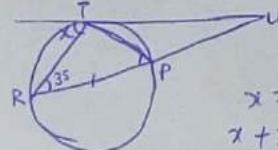
96) $P(Q' \cap R')$

Since Q' and R' are complement, the we are to get Set of P only



(B)

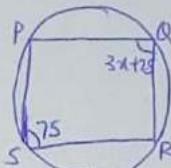
97)



$$x = \hat{TQR} \\ x + 35 = 90 \\ x = 90 - 35 \\ = 55^\circ$$

(A)

98)



$$75 + 3x + 25 = 180 \quad (\text{supplementary angles})$$

$$3x + 100 = 180$$

$$3x = 80$$

$$x = 80/3$$

$$= 26.67^\circ$$

No options

99) $x^2 - 5x + 7 = 0$

$$a=1 \quad b=-5 \quad c=7$$

$$d+\bar{P} = -\frac{b}{a} = -\frac{(-5)}{1} = \frac{5}{1} = 5$$

$$xP = \frac{c}{a} = \frac{7}{1} = 7$$

$$x^2 + P^2 = (x + P)^2 - 2xP$$

$$= (5)^2 - 2(7)$$

$$= 25 - 14$$

$$= 11$$

(A)

100) $\sqrt{41830} = 204.52$

$$= 205 \rightarrow 3S.F \quad (\text{A})$$

101) $12^4 - 5^4 = (12^2)^2 - (5^2)^2$

$$= (12-5)(12+5)^2$$

$$= (144-25)(144+25)$$

$$= (119)(169)$$

17 is a factor of 119

13 and 169 are factors of 169

\therefore 49 is not a factor of any

(D)

102) $SP = 81 \quad CP = x$

$$\text{Profit} = 8\%$$

$$\%P = \frac{SP - CP}{CP} \times 100\%$$

$$8 = \frac{81-x}{x} \times 100$$

$$8x = (81-x)100$$

$$8x = 8100 - 100x$$

$$8x + 100x = 8100$$

$$108x = 8100$$

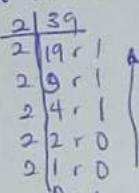
$$x = \frac{8100}{108} = 75$$

(D)

103) 4, 9, 4, 1, 3, 7, 14, 10, 17

Rearranging 4, 4, 7, 3, 10, 13, 14, 17

$$\text{Median} = \frac{9+10}{2} = \frac{19}{2} = 9.5 \quad (\text{A})$$

- | | | |
|-----|--|-----|
| 104 | Same as Question 51
$A = 36\pi \text{ cm}^2$ $\Rightarrow r = 3\text{cm}$
Since the cylinder is closed
$A = 2\pi rh + 2\pi r^2$
$= 2\pi rh + 2\pi r^2$
$36\pi = 2\pi \times 3 \times h + 2\pi \times 3^2$
$= 6\pi h + 18\pi$
$6\pi h = 36\pi - 18\pi$
$6\pi h = 18\pi$
$h = \frac{18\pi}{6\pi} = 3\text{cm}$ | (D) |
| 105 | Same as Question 54 (A) | |
| 107 | $0.0052048 \approx 0.00520$ to 3 S.F (D) | |
| 108 | Same as Question 53 (H184) (C) | |
| 109 | Same as Question 59 (120°) (A) | |
| 110 | Same as Question 62 ($x=2$) (D) | |
| 111 | Same as Question 64 ($\frac{1-\cos x}{\sin x}$) (A) | |
| 112 | 39 ₁₀ to base 2

$39_{10} = 100111_2$ (B) | |
| 113 | $\sqrt{252} = \sqrt{36 \times 7} = 6\sqrt{7}$ | |
| 114 | To make 252 a perfect square, multiply by 7
$\frac{2}{3}$ and Reciprocal = $\frac{\frac{1}{2} + \frac{1}{3}}{\frac{2}{3}} = \frac{\frac{3+2}{6}}{\frac{2}{3}} = \frac{5}{6} = \frac{5 \times \frac{3}{2}}{6} = \frac{5}{4}$ (B) | (C) |
| 115 | LCM of 48, 64 and 80 = 960
HCF = 16
$\frac{\text{LCM}}{\text{HCF}} = \frac{960}{16} = 60$ (A) | |
| 116 | $x-y=6$ --- *
$xy=187$ --- **
From eqtn *
$x=6+y$ --- (i)
Substitute i into **
$(6+y)y=187$
$6y+y^2=187$
$y^2+6y-187=0$
$y^2-11y+17y-187=0$
$y(y-11)+17(y-11)=0$
$(y+17)(y-11)=0$
$y+17=0$ or $y-11=0$
$y=-17$ or $y=11$
Picking the positive age i.e 11
Substitute into (i)
$x-11=6$
$x=6+11$
$x=17$
$1 \times [x, y] = (17, 11)$ (D) | |
| 117 | $5x+2y=5$
$4x+3y=16$
$5x+2y=5$ --- (i)
$4x+3y=16$ --- (ii)
From eqtn (i)
$x=1-2y$
Substitute $x=1-2y$ into eqtn (ii)
$(1-2y)+3y=2$
$1-2y+3y=2$
$1+y=2$
$y=2-1$
$y=1$
Substitute $y=1$ into eqtn (i)
$x+2(1)=1$
$x+2=1$
$x=1-2$
$x=-1$
Now $3^{x+y} = 3^{-1+1} = 3^0 = 1$ (A) | |
| 118 | $16^x - 5 \cdot 4^x + 4 = 0$
Making $16^x = (4^2)^x$ or $(4^x)^2$
Then $(4^x)^2 - 5 \cdot 4^x + 4 = 0$
Let $4^x = k$
$k^2 - 5k + 4 = 0$
$k^2 - 4k - k + 4 = 0$
$k(k-4) - 1(k-4) = 0$
$(k-1)(k-4) = 0$
$k-1=0$ or $k-4=0$
$k=1$ or $k=4$
Now $4^x=1$, $4^x=4$
$4^x=4^0$, $4^x=4^1$
$x=0$ and $x=1$ (D) | |
| 119 | $x^2 + 2ax + ax + 2x$
$x^2 + ax + 2a + 2x$
$x(x+a) + 2(a+x)$
$(x+2)(x+a)$ (D) | |
| 120 | TSA for cuboid (open) =
$(6b+2bh+2lh) (= 4, b=3 \text{ and } h=4)$
$4 \cdot 3 + 2 \cdot 3 \cdot 4 + 2 \cdot 4 \cdot 4$
$= 12 + 24 + 32$
$= 68 \text{ cm}^2$
Total Cost = $2 \times T \cdot SA$
$= 2 \times 68$
$= \$136$ (D) | |
| 121 | $x \propto y^3$
$x = Ky^3$
$K = \frac{x}{y^3}$
When $x=2$ and $y=1$
$K = \frac{2}{1^3} = \frac{2}{1} = 2$
$x = 2y^3$
When $y=5$
$x = 2(5)^3$
$= 2 \times 125$
$= 250$ (D) | |
| 122 | $2, 1, 2, 3$
$- 2, 1, 3, 3$
\hline
$0, 2, 1, 3$
$+ 2, 2, 2, 3$
\hline
$1, 0, 2, 0, 3$ (C) | |
| 123 | 0.0324×0.00064
0.48×0.012
$= 3.24 \times 10^{-4} \times 64 \times 10^{-5}$
$48 \times 10^{-2} \times 12 \times 10^{-3}$
$= 324 \times 64 \times 10^{-4.5}$
$48 \times 12 \times 10^{-2.3}$
$= 2073 \times 10^{-9}$
576×10^{-3}
$= 36 \times 10^{-9.5}$
$= 36 \times 10^{-4}$ (A) | |
| 124 | $\log_2 4 + \log_2 7 - \log_2 1 = 1$
$\log_2 \left(\frac{4 \times 7}{1}\right) = \log_2 2^1$
$\frac{4 \times 7}{1} = 2^1$
$4 \times 7 = 2^n$
$4 \times 7 = 2n$
$28 = 2n$
$n = \frac{28}{2}$
$n = 14$ (D) | |

128 $y = 2x+1$ and intersect the curve $y = 2x^2 + 5x - 1$
Intersection occurs when the y 's are equal
 $y = 2x+1 = 2x^2 + 5x - 1 \Rightarrow 2x^2 + 3x - 2 = 0$
 $\therefore a=2, b=3, c=-2$

$$= -3 + \frac{\sqrt{4ac+b^2}}{2x^2} = -3 + \frac{\sqrt{25}}{2x^2} = -3 + \frac{5}{2}$$

$$= \frac{-3+5}{4} \text{ or } \frac{-3-5}{4}$$

$$= \frac{2}{4} \text{ or } -\frac{8}{4}$$

$$= \frac{1}{2} \text{ or } -2$$

When $x = 0.5 \text{ or } -2$

$$y = 2(\frac{1}{2}) + 1 = 2$$

$$= 2$$

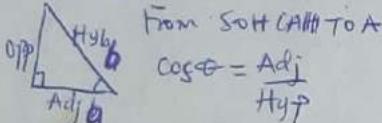
(0.5, 2) (-2, -3)

When $x = -2$

$$y = 2(-2) + 1 = -4 + 1 = -3$$

(-2, -3)

127) If $\cos \theta = \frac{a}{b}$. Find $1 + \tan^2 \theta$



$$\text{Hyp}^2 = \text{Adj}^2 + \text{Opp}^2$$

$$b^2 = a^2 + c^2$$

$$c^2 = b^2 - a^2$$

$$c = \sqrt{b^2 - a^2}$$

$$\tan \theta = \frac{c}{a} = \frac{\sqrt{b^2 - a^2}}{a}$$

$$\tan^2 \theta = \left(\frac{\sqrt{b^2 - a^2}}{a} \right)^2$$

$$\tan^2 \theta = \frac{b^2 - a^2}{a^2}$$

$$1 + \tan^2 \theta = 1 + \frac{b^2 - a^2}{a^2}$$

$$= 1 + \frac{b^2}{a^2} - \frac{a^2}{a^2}$$

$$= 1 + \frac{b^2}{a^2} - 1$$

$$= \frac{b^2}{a^2} \quad (\text{A})$$

30) $P=18, Q=21, R=-6 \Rightarrow S=-4$

$$\frac{(P-Q)^2}{R^3} + S^2 = \frac{(18-21)^2}{(-6)^3} + (-4)^2$$

$$= \frac{(-3)^2}{(-6)^3} + 16$$

$$= \frac{9}{-216} + 16$$

$$\frac{1}{216} + \frac{16}{1}$$

$$\frac{3}{24} + \frac{16}{1}$$

$$\frac{3+384}{24} = \frac{387}{24} = 16\frac{3}{24} = 16\frac{1}{8}$$

131) $P=150, R=? \quad T=5, I=55$

$$R = \frac{100I}{PT}$$

$$= \frac{100 \times 55}{150 \times 5} = \frac{5500}{750}$$

$$= 7.33\% \quad (\text{D})$$

$$132) \text{ Gradient} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - (-2)} = \frac{4}{2} = -2 \quad (\text{B})$$

$$133) y = x^2 - 2x - 3$$

$$\frac{dy}{dx} = 2x - 2$$

@ turning points, $\frac{dy}{dx} = 0$

$$\therefore 2x - 2 = 0$$

$$x = \frac{2}{2} = 1 \quad (\text{D})$$

$$134) (x-2)(x-3) = 12$$

$$x^2 - 3x - 2x + 6 = 12$$

$$x^2 - 5x + 6 = 12$$

$$x(x-6) + 1(x-6) = 0$$

$$(x+1)(x-6) = 0$$

$$x+1 = 0 \text{ or } x-6 = 0$$

$$x = -1 \text{ or } x = 6 \quad (\text{C})$$

$$135) 3x+y=8 \quad \dots \quad (1)$$

$$x^2 + xy = 6 \quad \dots \quad (2)$$

From (1)

$$3x = 8 - y$$

$$x = \frac{8-y}{3} \quad \dots \quad (1')$$

$$y = 8 - 3x \quad \dots \quad (1'')$$

Substitute (1'') into (1')

$$x^2 + x(8-3x) = 6$$

$$x^2 + 8x - 3x^2 = 6$$

$$-2x^2 + 8x - 6 = 0$$

Divide through by -2

$$\frac{-2x^2}{-2} + \frac{8x}{-2} - \frac{6}{-2} = 0$$

$$x^2 - 4x + 3 = 0$$

$$x = 1 \text{ and } x = 3$$

When $x = 1$ When $x = 3$

$$y = 8 - 3(1)$$

$$= 8 - 3$$

$$= 5$$

$$y = 8 - 3(3)$$

$$= 8 - 9$$

$$= -1$$

$$(-1 \text{ and } 5) \quad (\text{D})$$

136) $n=20, a=7, d=117$

$$S_{20} = \frac{n}{2}(a+l)$$

$$= \frac{20}{2}(7+117)$$

$$= 10(124)$$

$$= 1240 \quad (\text{B})$$

137) All angles = 360

$$5x - 30 + 4x + 60 + 60 - x + 3x + 6$$

$$= 360$$

$$5x + 4x + 3x - x + 60 + 61 - 30 + 60$$

$$= 360$$

$$11x + 151 = 360$$

$$11x = 360 - 151$$

$$x = \frac{209}{11} = 19$$

To determine the smallest long

$$5x - 30 = 5(19) - 30 = 65$$

$$4x + 60 = 4(19) + 60 = 136$$

$$60 - x = 60 - 19 = 41$$

$$3x + 61 = 3(19) + 61 = 118$$

Since the smallest is 41,
the smallest angle is $60 - x$ (A)

138) If $g(x) = x^2 + 3x + 4$

$$g(x+1) - g(x) = ?$$

$$g(x+1) = (x+1)^2 + 3(x+1) + 4$$

$$g(x) = x^2 + 3x + 4$$

$$\therefore g(x+1) - g(x) =$$

$$(x+1)^2 + 3(x+1) + 4 - (x^2 + 3x + 4)$$

$$= x^2 - x^2 + 2x + 3x - 3x + 1 + 3 + 4 - 4$$

$$= 2x + 4$$

$$= 2(x+2) \quad (\text{D})$$

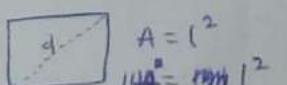
$$139) 3n^2 = 12n$$

Divide through by 3n

$$\frac{3n^2}{3n} = \frac{12n}{3n}$$

$$n = 4 \quad (\text{B})$$

140)



$$d^2 = l^2 + l^2$$

$$d^2 = 2l^2$$

$$d = l\sqrt{2}$$

$$d = 12\sqrt{2} \text{ cm} \quad (\text{A})$$

$$\frac{\sqrt{12} - \sqrt{3}}{\sqrt{12} + \sqrt{3}}$$

By rationalizing

$$\frac{\sqrt{12} - \sqrt{3}}{\sqrt{12} + \sqrt{3}} \times \frac{\sqrt{12} - \sqrt{3}}{\sqrt{12} - \sqrt{3}}$$

$$\frac{(\sqrt{12} - \sqrt{3})^2}{12 - 3} = \frac{12 - 2\sqrt{36} + 3}{9} = \frac{12 - 24 + 3}{9} = \frac{3}{9} = \frac{1}{3}$$

$$= \frac{1}{3} = \frac{1}{3} \quad (\text{B})$$

142 $S = (x : x^2 = 9, x > 4)$ then S is equal to
 $x^2 = 9$
 $x = \sqrt{9} = \pm 3$
 $\therefore S = \emptyset$

143 $0.0014 \times 0.011 = \frac{77}{5000000} = 1.54 \times 10^{-5}$ (A)

144 $4x^2 - 18xy + 9$
 $a = 4, b = -18y, c = 9$
 To obtain a Perfect Square
 $g = \frac{b^2}{4a} = \frac{(-18y)^2}{4 \cdot 4} = \frac{81y^2}{4}$ (C)

145 $x * y = x + y - xy$, Find $(x * 2) + (x * 3) = 68$
 $x * 2 = x + 2 - x^2$
 $x * 3 = x + 3 - x^3$
 $\therefore x + 2 - x^2 + x + 3 - x^3 = 68$
 ~~$2x - 3x + 2 + 3 = 68$~~
 $-3x = 68 - 5$
 $-3x = 63$
 $x = \frac{63}{-3} = -21$ (A)

146 $\begin{pmatrix} 2 & -3 \\ -1 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$
 Multiplying
 $\begin{pmatrix} 2x - 3y \\ -x + 4y \end{pmatrix} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$
 $2x - 3y = -1 \quad \dots \text{(1)}$
 $-x + 4y = 8 \quad \dots \text{(ii)}$
 From eqtn (i) $\Rightarrow y = \frac{8+x}{4}$ or $\frac{8+x}{4} = 2 + \frac{x}{4}$
 Substitute $y = 2 + \frac{x}{4}$ into eqtn (i)
 $2x - 3\left(2 + \frac{x}{4}\right) = -1$
 $2x - \left[\frac{6}{1} - \frac{3x}{4}\right] = -1$
 ~~$2x - \frac{24}{4} - \frac{3x}{4} = -4$~~
 $-6 + 4 = 3x$
 $-2 = x$
 $2x - \frac{6}{1} - \frac{3x}{4}$
 $8x - 24 - 3x = -1$
 $-24 + 5x = -4$
 $5x = -4 + 24$
 $5x = 20$
 $x = 4$

Substitute $x = 4$ into eqtn (ii)
 $-4 + 4y = 8$
 $4y = 8 + 4$
 $4y = 12$
 $y = 12/4 = 3$
 $\therefore x + y = 4 + 3 = 7$ (C)

147 $y = x^2 - 3x + 2$
 $\frac{dy}{dx} = 2x - 3$
 $x = \frac{3}{2} = 1.5$ @ turning point
 $y = x^2 - 3x + 2$
 $= \left(\frac{3}{2}\right)^2 - 3\left(\frac{3}{2}\right) + 2$
 $= 2.25 - 4.5 + 2$
 $y = -0.25$ (C)

148 $f(x) = x^3 + 2x^2 + Qx - 6$ is divisible by $x+1$
 $Q = ?$
 If $x+1$ is a factor
 $x = -1$
 $f(x) \neq x^3 + 2x^2 + Qx - 6$
 $f(-1) = (-1)^3 + 2(-1)^2 + Q(-1) - 6$
 $= -1 + 2 - Q - 6 = 0$
 $-5 - Q = 0$
 $-5 = Q$ (A)

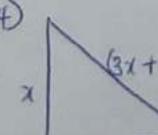
149 $y = 2x(x-3)$
 $\frac{dy}{dx} = 4x^2 - 6$
 @ $x = 1$
 $\frac{dy}{dx} = 4(1) - 6$
 $= 4 - 6$
 $= -2$ (B)

150 $\int \frac{1}{x} + \cos x$
 $= \ln x + \sin x + C$ (A)

151 $\frac{k}{\sqrt{3}} = \sqrt{3}$
 $k = \sqrt{3} \cdot \sqrt{3}$
 $= \sqrt{9}$
 $= 3$ (A)

152 $\frac{6!}{6P_r} = \frac{1}{6}$
 $\frac{6!}{(6-r)!r!} \div \frac{6!}{(6-r)!} = \frac{1}{6}$
 $\frac{6!}{(6-r)!r!} \times \frac{(6-r)!}{6!} = \frac{1}{6}$
 $\frac{1}{r!} = \frac{1}{6}$
 $r! = 6$
 $r! = 3!$
 $r = 3$ (B)

153 The possible number begins with
 10, 11, 12, 13
 20, 21, 22, 23
 30, 31, 32, 33
 $n = 12$ (D)

154
 
 $\text{Hyp}^2 = \text{Opp}^2 + \text{Adj}^2$
 $(3x+1)^2 = x^2 + (3x-1)^2$
 $9x^2 + 6x + 1 = x^2 + 9x^2 - 6x + 1$
 $9x^2 - 9x^2 + 6x + 6x + 1 - 1 = 0$
 $-x^2 + 12x + 0 = 0$
 $-x^2 + 12x = 0$
 $x(x + 12) = 0$

BUILDING POTENTIALS WITH INTEGRITY
 COMPILED BY: _____

155 $y = x \sin x$
 $\frac{dy}{dx} = \sqrt{\frac{du}{dx}} + U \frac{dv}{dx}$
 let $U = x, V = \sin x$
 $\frac{du}{dx} = 1, \frac{dv}{dx} = \cos x$
 $\sin x + x \cos x$
 @ $x = \frac{\pi}{2}$
 $= \sin \frac{\pi}{2} + \frac{\pi}{2} \cos \frac{\pi}{2}$
 $= 1 + \frac{\pi}{2}(0)$
 $= 1 + 0$
 $= 1$

156 $PQ^2 = (6 - (-6))^2 + (6 - 1)^2$
 $PQ^2 = 12^2 + 5^2$
 $= 144 + 25$
 $= 169$
 $PQ = \sqrt{169}$
 $= 13$
 PQ = Diameter
 radius = $\frac{D}{2}$
 $= \frac{13}{2} = 6.5$ (C)

157 $V = \frac{4}{3} \pi r^3$
 $\frac{dV}{dr} = 3 \cdot \frac{4}{3} \pi r^2$
 $= 4\pi r^2$
 When $r = 1$
 $\frac{dV}{dr} = 4\pi(1)^2$
 $= 4\pi$ NO option

158 $6P_r = 6$ Find $6P_{r+1}$
 $\frac{6!}{(6-r)!} = 6$
 $6! = 6(6-r)!$
 $\frac{6!}{6} = (6-r)!$
 $\frac{6 \times 5!}{6} = (6-r)!$
 $5! = (6-r)!$
 $5 = 6-r$
 $r = 6-5$
 $6P_{r+1} = \frac{r+1}{6P_r} = \frac{6!}{(6-2)!}$
 $= \frac{6!}{4!}$
 $= \frac{6 \times 5 \times 4}{4!}$
 $= 30$ (B)

159 Team A and Team B
The Possible Outcome
* Victory (Win)
* Lose (Defeat)
* Draw
 $\Pr(\text{of a draw}) = \frac{1}{3}$ No option

160 Range = largest - lowest
= $k+6 - (k-5)$
= $k+6 - k+5$
= $6+5 = 11$ (B)

161 $A = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$
 $A^2 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$
= $\begin{pmatrix} 4-3 & 2+0 \\ -6+0 & -3+0 \end{pmatrix}$
= $\begin{pmatrix} 1 & 2 \\ -6 & -3 \end{pmatrix}$
 $2A = 2 \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} = \begin{pmatrix} 4 & 2 \\ -6 & 0 \end{pmatrix}$

$I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \therefore 4I = \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$

$A^2 - 2A + 4I$
= $\begin{pmatrix} 1 & 2 \\ -6 & -3 \end{pmatrix} - \begin{pmatrix} 4 & 2 \\ -6 & 0 \end{pmatrix} + \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$
= $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ (A)

162 $T_9 = 5(a+4d)$
 $a+8d = 5a+20d$
 ~~$2a+8d=2a+8d$~~
= $5a-9+20d-8d$
= $4a+12d$
 $0 = a+3d$ (D)

163 $y = 1-2x-3x^2$
 $\frac{dy}{dx} = -2-6x$
= $-2-6x = 0 @ \frac{dy}{dx} = 0$
 $-2 = 6x$
 $x = \frac{-2}{6} = -\frac{1}{3}$

$y = 1-2x-3x^2$
When $x = -\frac{1}{3}$
 $y = 1 - 2\left(-\frac{1}{3}\right) - 3\left(-\frac{1}{3}\right)^2$
= $1 + \frac{2}{3} - \frac{1}{3}$
= $\frac{4}{3}$ (A)

164 $P \times Q = P \times Q + P + Q$
 $3 \times 4 = 3 \times 4 + 3 + 4$
= $12+7$
= 19

$$2 \times (3 \times 4) = 2 \times 12 = 24$$

$$= 2 \times 12 + 2 + 12 = 36 + 2 + 12 = 50$$

165 $Q = \begin{pmatrix} 6 & 0 \\ 4 & 5 \end{pmatrix}$ $Q+P = \begin{pmatrix} 7 & -2 \\ 6 & 8 \end{pmatrix}$
 $P = (Q+P)-Q = \begin{pmatrix} 7 & -2 \\ 6 & 8 \end{pmatrix} - \begin{pmatrix} 6 & 0 \\ 4 & 5 \end{pmatrix}$
= $\begin{pmatrix} 7-6 & -2-0 \\ 6-4 & 8-5 \end{pmatrix}$
 $P = \begin{pmatrix} 1 & -2 \\ 2 & 3 \end{pmatrix}$

$$2P = 2 \begin{pmatrix} 1 & -2 \\ 2 & 3 \end{pmatrix} = \begin{pmatrix} 2 & -4 \\ 4 & 6 \end{pmatrix}$$

$$Q-2P = \begin{pmatrix} 6 & 0 \\ 4 & 5 \end{pmatrix} + \begin{pmatrix} 2 & -4 \\ 4 & 6 \end{pmatrix}$$

$$= \begin{pmatrix} 6+2 & 0-4 \\ 4+4 & 5+6 \end{pmatrix}$$

$$= \begin{pmatrix} 8 & -4 \\ 8 & 11 \end{pmatrix}$$

$$|Q+2P| = \begin{pmatrix} 8 & -4 \\ 8 & 11 \end{pmatrix}$$

$$= 8 \times 11 - (8 \times -4)$$

$$= 88 - (-32)$$

$$= 88+32 = 120$$
 (A)

166 $2x+y=3$
 $y = -2x+3$
 $m_1 = -2$ From $y = mx+c$
 $3x-2y=5$
 $-2y = -3x+5$
 $y = \frac{-3}{2}x + \frac{5}{2}$
= $\frac{3}{2}x - \frac{5}{2}$
 $y = \frac{3}{2}x - \frac{5}{2}$

$M_2 = \frac{3}{2}$ or 1.5
 $\tan = \frac{m_1 - m_2}{1 + m_1 m_2}$
= $\frac{-2 - \frac{3}{2}}{1 + -2 \cdot \frac{3}{2}} = \frac{-2 - 1.5}{1 + (1.5 \times -2)}$

$$= \frac{-3.5}{1(-3)} = \frac{-3.5}{-3}$$

$$= \frac{3.5}{3}$$

$$= -1.75$$
 (D)

167 $y = 1+hx-3x^2 = 13$

$$\frac{dy}{dx} = h-6x$$

@ turning point $\frac{dy}{dx} = 0$

$$0 = h-6x$$

$$h = 6x$$

$$x = \frac{h}{6}$$

$$@ y = 1+hx-3x^2 = 13$$

$$= 1+h\left(\frac{h}{6}\right) - 3\left(\frac{h}{6}\right)^2 = 13$$

$$= 1 + \frac{h^2}{6} - \frac{3h^2}{36} = 13$$

$$1 + \frac{h^2}{6} - \frac{h^2}{12} = 13$$

$$1 + \frac{h^2}{12} = 13$$

$$\cancel{1+}\frac{h^2}{12} = 13-1$$

$$\frac{h^2}{12} = 12$$

$$h^2 = 12 \times 12$$

$$h^2 = 144$$

$$h^2 = \sqrt{144}$$

$$h = 12 \quad (\text{A})$$

168 D

$$(169) \int_{-2}^1 (n-1)^2 dx = \int_{-2}^1 (n^2 - 2n + 1) dx$$

$$= \left[\frac{x^{2+1}}{2+1} - \frac{2x^{1+1}}{1+1} + x + C \right]_{-2}^{1}$$

$$= \left[\frac{x^3}{3} - \frac{2x^2}{2} + x + C \right]_{-2}^1$$

$$= \left[\frac{x^3}{3} - x^2 + x + C \right]_{-2}^1$$

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

$$= \left(\frac{1}{3} - 1 + 1 \right) - \left(-\frac{8}{3} - 4 - 2 \right)$$

$$= \frac{1}{3} - \frac{26}{3}$$

$$= \frac{1+26}{3} = \frac{27}{3} = 9 \quad (\text{B})$$

170 $y = x(2-x)$

$$= 2x - x^2$$

$$\int y = \int_0^2 2x - x^2 dx$$

$$= \left[\frac{2x^{1+1}}{1+1} - \frac{x^{2+1}}{2+1} \right]_0^2$$

$$= \left[\frac{2x^2}{2} - \frac{x^3}{3} \right]_0^2$$

$$= \left[\frac{x^2}{3} - \frac{x^3}{3} \right]_0^2$$

$$= \left[\frac{2^2 - 2^3}{3} \right] - \left[\frac{4 - 8}{3} \right] = \frac{4}{3} = 1.33 \text{ units}$$

$$171 P = 10x - x^2$$

$$\frac{dP}{dx} = 10 - 2x$$

$$2x = 10$$

$$x = \frac{10}{2} = 5 \text{ bags (D)}$$

$$172 a \text{ and } b \text{ are roots of } 3x^2 + 5x - 2 = 0$$

$$a = 3, b = -5, c = -2$$

$$a + \beta = -\frac{b}{a} = -\frac{5}{3}$$

$$\alpha \beta = \frac{c}{a} = -\frac{2}{3}$$

$$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\beta + \alpha}{\alpha \beta} = \frac{-5}{-\frac{2}{3}} = \frac{15}{2} = 7.5 \text{ (D)}$$

$$173 \text{ If } PB4P_6 - 23P2_6 = 2PP2_6 \\ P \times 6^3 + 3 \times 4^2 + 4 \times 6^1 + 4 \times 6^0 - [2 \times 6^3 + 3 \times 6^2 + P \times 6^1 + 2 \times 6^0] = [2 \times 6^3 + P \times 6^2 + P \times 6^1 + 2 \times 6^0] \\ 216P + 108 + 24 + 4 - [2 \times 216 + 3 \times 36 + 6P + 2] = [2 \times 216 + 36P + 6P + 2] \\ 216P + 136 - [432 + 108 + 6P + 2] = 434 + 42P$$

$$216P - 136 - 432 - 108 - 6P - 2 = 434 + 42P$$

$$216P - 6P + 406 = 434 + 42P$$

$$210P - 42P = 434 + 406 \\ 168P = 840 \\ P = \frac{840}{168} = 5 \text{ (B)}$$

$$174 f(\theta) = \frac{2}{3 - \cos \theta} \text{ for } 0 < \theta \leq 2\pi$$

$$y = \frac{2}{3 - \cos \theta}$$

$$\text{Let } u = 2, v = 3 - \cos \theta$$

$$\frac{du}{d\theta} = 0, \frac{dv}{d\theta} = \sin \theta$$

$$\frac{dy}{d\theta} = \frac{\sqrt{u} \frac{du}{d\theta} - u \frac{dv}{d\theta}}{v^2} = \frac{(3 - \cos \theta) \cdot 0 - 2(\sin \theta)}{(3 - \cos \theta)^2} = -\frac{2(\sin \theta)}{(3 - \cos \theta)^2}$$

(@ turning Point, $\frac{dy}{d\theta} = 0$)

$$-\frac{2(\sin \theta)}{(3 - \cos \theta)^2} = 0$$

$$-2 \sin \theta = 0$$

$$\sin \theta = 0$$

$$\sin \theta = 0$$

$$\sin^{-1}(0) = 0$$

Substitute in y

$$y = \frac{2}{3 - \cos 0}$$

$$\text{or } y = \frac{2}{3 - \cos 180}$$

$$\text{or } y = \frac{2}{3 - \cos 360}$$

$$y = \frac{2}{3 - 1} \text{ or } \frac{2}{3 - 1} = \frac{3}{3 - 1}$$

$$y = \frac{2}{2} \text{ or } \frac{2}{4} \text{ or } \frac{2}{2}$$

$$y = 1 \text{ or } 0.5 \quad (\text{A})$$

$$175) X \text{ or } Y = P(X \cup Y) = 0.7$$

$$P_r(X) = 0.4$$

$$X \text{ and } Y = P(X \cap Y) = 0$$

$$P_r(Y) = ?$$

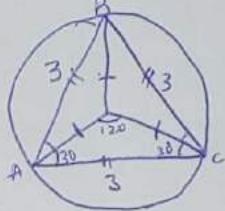
$$P(X \cap Y) = P(X) + P(Y) - P(X \cup Y)$$

$$0 = 0.4 + P(Y) - 0.7$$

$$0 = -0.3 + P(Y)$$

$$P(Y) = 0.3 \quad (\text{D})$$

176)



$$\frac{3x + x3}{\sin 120} = \frac{r}{\sin 30}$$

$$r = \frac{3x \sin 30}{\sin 120}$$

$$r = 1.73 \text{ cm}$$

177)

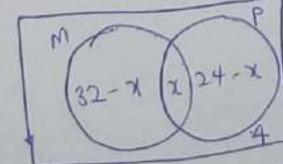
$$M = 40$$

$$n(M) = 32$$

$$n(P) = 24$$

$$n(P \cap M) = 4$$

$$n(P \cup M) = 71$$



$$32 - x + 24 - x + 4 = 71$$

$$-x + 60 = 71$$

$$-x = 71 - 60$$

$$x = 10$$

$$(D) 32 - x = 32 - 10 = 22$$

$$24 - x = 24 - 10 = 14$$

$$4 = 4$$

$$4x - 2 = 3x - 3$$

$$4x - 3x = -3 + 2$$

$$x = -1$$

NO option

$$178) \begin{cases} x^2 = 1 \\ 4x - 1 = 0 \end{cases}$$

$$-x - (4x - 1) = -15 - (12 \cdot x)$$

$$-x - 8x = -15 - 12x$$

$$-x - 8x + 12x = -15$$

$$-9x + 12x = -15$$

$$3x = -15$$

$$x = -5 \quad (\text{D})$$

180) Let the certain number = x

$$n(\text{Children}) = 22.5\%$$

$$n(\text{Men}) = 47.5\%$$

$$\% \text{ of Women} = 100 - (22.5 + 47.5)$$

$$= 100 - 70$$

$$= 30\% \quad (\text{B})$$

$$\text{no of women} = 84$$

$$\frac{30}{100} \text{ of } x = 84$$

$$\frac{30}{100} \times \frac{x}{1} = 84$$

$$\frac{30x}{100} = 84$$

$$30x = 8400$$

$$x = \frac{8400}{30} = 280 \text{ people}$$

$$\text{no of men} = 47.5\% \text{ of } x$$

$$= \frac{47.5}{100} \times 280$$

$$= 133 \text{ people}$$

$$181) 2y + 8x - 17 = 0$$

$$2y = 17 - 8x$$

$$y = -\frac{8x}{2} + \frac{17}{2}$$

$$y = -4x + \frac{17}{2}$$

$$\therefore M_1 = -4$$

Parallelism

$$M_1 = M_2$$

$$M_2 = -4$$

$$M_2 = \frac{2 - (-P)}{-2P - (-1)}$$

$$-4 = \frac{2 + P}{-2P + 1}$$

$$2 + P = -4(-2P + 1)$$

$$2 + P = +8P - 4$$

$$8P - P = 2 + 4$$

$$7P = 6$$

$$P = \frac{6}{7} \quad (\text{B})$$

$$182) \theta = 30^\circ, r = 21 \text{ cm}$$

$$l = \frac{30}{360} \times 2 \times \frac{22}{7} \times 21 = \frac{\frac{\pi}{6} \times 22 \times 21}{7}$$

$$= 11 \text{ cm} \quad (\text{A})$$

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183) $y = 3x^3 + 5x^2 - 11x + 4$ is divided by $x+3$.

$$x+3 = 0$$

$$\begin{aligned} x &= -3 \\ \text{Substitute } x &= -3 \text{ into } y \\ 3(-3)^3 + 5(-3)^2 - 11(-3) + 4 &= -81 + 45 + 33 + 4 \\ &= -81 + 82 \\ &= 1 \end{aligned}$$

(D)

184) $Q_n = 3 \times 2^{n-2}$

$$U_m = 3 \times 2^{2m-3}$$

Find $Q_2 \times U_2$
Let $n=2$ and $m=2$

$$Q_2 = 3 \cdot 2^{2-2}$$

$$= 3 \cdot 2^0$$

$$= 3$$

$$U_m = 3 \times 2^{2(2)-3}$$

$$= 3 \times 2^4-3$$

$$= 3 \times 2^1$$

$$= 6$$

$$\therefore Q_2 \times U_2 = 3 \times 6 = 18 \quad (\text{A})$$

185) $P \times Q = \sqrt{PQ}$

$$4 \times (8 \times 3^2)$$

$$8 \times 3^2 = \sqrt{8 \times 3^2}$$

$$= \sqrt{256}$$

$$= 16$$

$$4 \times 16 = \sqrt{4 \times 16}$$

$$= \sqrt{64}$$

$$= 8$$

(B)

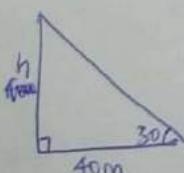
186) $S_{\infty} = \frac{a}{1-r}$

$$a = \frac{1}{2} \quad \frac{\frac{1}{2}}{1-\frac{1}{3}} = \frac{1}{2} \times \frac{3}{2}$$

$$r = \frac{1}{3} \quad \frac{\frac{1}{2}}{1-\frac{1}{3}} = \frac{3}{4}$$

$$= 0.75 \quad (\text{C})$$

187)

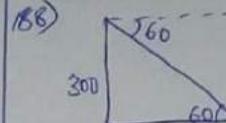


$$\tan 30 = \frac{h}{40}$$

$$40 \tan 30 = h$$

$$40 \times \frac{\sqrt{3}}{3} = h$$

$$h = \frac{40\sqrt{3}}{3} \text{ m} \quad (\text{A})$$



$$\tan 60^\circ = \frac{300}{w}$$

$$w \tan 60^\circ = 300$$

$$w = \frac{300}{\tan 60^\circ}$$

$$w = \frac{300}{\sqrt{3}}$$

$$w = \frac{300}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{300\sqrt{3}}{3}$$

$$= 100\sqrt{3} \text{ m (C)}$$

188) $\bar{x}_6 = 60 \quad \bar{x}_5 = 50$

$$\cdot n = 6 \quad n = 5$$

$$\bar{x}_6 = \frac{\sum f x_6}{n}$$

$$\bar{x}_5 = \frac{\sum f x_5}{n}$$

$$60 \times 6 = \sum f x_6$$

$$50 \times 5 = \sum f x_5$$

$$360 = \sum f x_6$$

$$250 = \sum f x_5$$

$$360 = \sum f x_6 - \sum f x_5$$

$$= 360 - 250$$

$$= 110 \quad (\text{D})$$

$$189) \frac{ar}{a+r} = \frac{a}{r}$$

$$a(a+r) = xr$$

$$a^2 + ar = xr$$

$$a^2 = xr - ar$$

$$a^2 = r(x-a)$$

$$\frac{a^2}{(x-a)} = r \quad (\text{B})$$

$$190) f(x) = 3x + 4$$

$$y = 3x + 4$$

$$y - 4 = 3x$$

$$x = \frac{y-4}{3}$$

$$f^{-1}(x) = \frac{x-4}{3} \quad (\text{A})$$

$$191) \frac{dy}{dx} = 2x - 3$$

$$dy = 2x - 3 dx$$

$$\int dy = \int (2x - 3) dx$$

$$y = \frac{2x^2}{2} - 3x + C$$

$$= x^2 - 3x$$

$$\text{When } x = 0, y = 3$$

$$3 = 0^2 - 3(0) + C$$

$$C = 3$$

$$\therefore y = x^2 - 3x + 3 \quad (\text{B})$$

193) $r = 5 \text{ cm}$

$$A = \pi r^2$$

$$\frac{dr}{dt} = 0.2 \text{ cm/s}$$

$$\frac{dA}{dr} = 2\pi r$$

$$\frac{dA}{dt} = \frac{dr}{dt} \times \frac{dA}{dr}$$

$$= 0.2 \pi \times 0.2$$

$$= 0.4\pi \text{ cm/s}$$

$$\text{Given } r = 5 \\ = 0.4(\pi)5 \\ = 2\pi \quad (\text{C})$$

194) $\frac{x+2}{4} - \frac{2x-3}{3} < 4$

$$3(x+2) - 4(2x-3) < 48$$

$$3x+6 - 8x+12 < 48$$

$$-5x < 48 - 18$$

$$-5x < 30$$

$$x > -6$$

$$x > -6 \quad (\text{D})$$

195) $2x+1-3c = 2c+3x-7$

$$2x-3x+1+7 = 2c+3c$$

$$-x+8 = 5c$$

$$\text{When } x = -2$$

$$-(-2)+8 = 5c$$

$$2+8 = 5c$$

$$10 = 5c$$

$$c = 10/5 = 2 \quad (\text{A})$$

196) $(n-2)180 = 1800$

$$n-2 = \frac{1800}{180}$$

$$n-2 = 10$$

$$n = 10+2$$

$$n = 12$$

$$\text{Ext Angle} = \frac{360}{n} = \frac{360}{12} = 30^\circ \quad (\text{C})$$

197) $P=1000, T=3, A=1240$

$$I = A - P = 1240 - 1000$$

$$= 240$$

$$R = \frac{100I}{PT} = \frac{100 \times 240}{1000 \times 3}$$

$$= \frac{24000}{3000}$$

$$= 8\% \quad (\text{A})$$

198) k, l, m are consecutive numbers

$$k = l-1$$

$$l = m+1$$

$$l^2 = 3(k+m)$$

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BONDING POTENTIALS WITH INTEGRITY

$$l^1 = 3(l-1) + (++)$$

$$l^2 = 3(2l)$$

$$\frac{l^2}{l} = \frac{6l}{l}$$

$$l = 6$$

$$m = l+1$$

$$= 6+1$$

$$= 7$$

(D)

$$199) \frac{\sqrt{2}}{x+\sqrt{2}} = \frac{1}{x-\sqrt{2}}$$

$$(x+\sqrt{2}) = \sqrt{2}(x-\sqrt{2})$$

$$x+\sqrt{2} = x\sqrt{2} - 2$$

$$x-\sqrt{2} = -2 - \sqrt{2}$$

$$x(x-\sqrt{2}) = -2-\sqrt{2}$$

$$x = \frac{-2-\sqrt{2}}{(1-\sqrt{2})}$$

Rationalizing

$$x = \frac{-2-\sqrt{2}}{1-\sqrt{2}} \times \frac{1+\sqrt{2}}{1+\sqrt{2}}$$

$$= \frac{-2-\sqrt{2}(1+\sqrt{2})}{1-2}$$

$$= \frac{-2-2\sqrt{2}-1\cdot\sqrt{2}+2}{-1}$$

$$= \frac{-4-3\sqrt{2}}{-1}$$

$$= \frac{-(4+3\sqrt{2})}{-1} = 4+3\sqrt{2}$$

(B)

$$200) 9x^2+bx+c=5$$

$$\textcircled{1} \quad x=1, y=5$$

$$9(1)^2+b(1)+c=5$$

$$a+b+c=5 \quad \text{--- } \textcircled{1}$$

$$\frac{dy}{dx} = 2ax+b$$

$$\frac{dy}{dx} = 2x+1$$

$$2ax+b = 2x+1$$

$$a=1 \text{ and } b=1$$

$$\therefore a+b+c=5$$

$$1+1+c=5$$

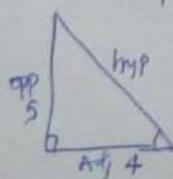
$$2+c=5$$

$$c=5-2$$

$$= 3$$

$$\therefore a, b, c = 1, 1, 3 \quad (\text{C})$$

$$201) \tan \theta = \frac{5}{4}, \text{ Find } \sin^2 \theta - \cos^2 \theta$$



SIDE CANT TO A
Using Pythagoras
 $Hyp^2 = Adj^2 + Opp^2$
 $= 4^2 + 5^2$
 $= 16 + 25$
 $= 41$

$$\begin{aligned} Hyp^2 &= 41 \\ Hyp &= \sqrt{41} \\ \sin \theta &= \frac{Opp}{hyp} = \frac{5}{\sqrt{41}} \\ \sin^2 \theta &= \left(\frac{5}{\sqrt{41}}\right)^2 = \frac{25}{41} \\ \cos^2 \theta &= \left(\frac{4}{\sqrt{41}}\right)^2 = \frac{16}{41} \\ \sin^2 \theta - \cos^2 \theta &= \frac{25}{41} - \frac{16}{41} \\ &= \frac{9}{41} \quad (\text{C}) \end{aligned}$$

$$\begin{aligned} 202) 2Q35 &= 78 \\ 2K5+Q \times 5 + 3 \times 5^0 &= 7 \times 8 + 7 \times 8^0 \\ 50 + 5Q + 3 &= 7 \times 8 + 7 \times 1 \\ 5Q + 53 &= 56 + 7 \\ 5Q &= 63 - 53 \\ 5Q &= 10 \\ Q &= 10/5 = 2 \quad (\text{C}) \end{aligned}$$

$$\begin{aligned} 203) \frac{\frac{3}{2} \times \frac{5}{6} \times \frac{2}{3}}{\frac{11}{15} \times \frac{3}{4} \times \frac{2}{27}} &= \frac{\frac{11}{3} \times \frac{5}{6} \times \frac{1}{3}}{\frac{11}{15} \times \frac{2}{4} \times \frac{2}{27}} \\ &= \frac{55}{27} \div \frac{11}{90} \\ &= \frac{55}{27} \times \frac{90}{11} \quad (\text{C}) \\ &= 50 \quad (\text{A}) \end{aligned}$$

$$\begin{aligned} 204) P &= \$8000 \quad R = 4\% \\ T &= 9 \text{ months} = \frac{9}{12} \text{ years} = 0.75 \text{ years} \\ I &= \frac{PRT}{100} = \frac{8000 \times 4 \times 0.75}{100} \\ &= 200 \times 0.75 \\ &= \$150 \quad (\text{C}) \end{aligned}$$

$$\begin{aligned} 205) M:N:Q &= 5:4:3 \\ \frac{2N-Q}{M} &= \frac{2(4)-3}{5} \\ &= \frac{8-3}{5} = \frac{5}{5} \quad (\text{A}) \end{aligned}$$

$$\begin{aligned} 206) \frac{\left(\frac{16}{81}\right)^{1/4}}{\left(\frac{4}{3^4}\right)^{1/4}} &\div \left(\frac{2}{16}\right)^{-1/2} = 1 \quad (\text{A}) \\ &= \frac{\frac{2}{3} \div \left(\frac{3}{4}\right)^{-1}}{\frac{2}{3} \div \left(\frac{3}{4}\right)^{2x-1/2}} \\ &= \frac{\frac{2}{3} \div \left(\frac{3}{4}\right)^{-1}}{\frac{2}{3} \div \left(\frac{3}{4}\right)^{2x-1/2}} \\ &= \frac{\frac{2}{3} \div \left(\frac{3}{4}\right)^{-1}}{\frac{2}{3} \div \left(\frac{3}{4}\right)^{2x-1/2}} \\ &= \frac{\frac{2}{3} \times \frac{4}{3}}{\frac{2}{3} \div \left(\frac{3}{4}\right)^{2x-1/2}} = \frac{8}{9} \quad (\text{C}) \end{aligned}$$

$$\begin{aligned} 207) \log_3 18 + \log_3 3 - \log_3 x &= 3 \\ \log_3 \left(\frac{18 \times 3}{x}\right) &= \log_3 3^3 \\ \frac{18 \times 3}{x} &= 27 \\ 54 &= 27x \\ x &= \frac{54}{27} = 2 \quad (\text{A}) \end{aligned}$$

$$208) \frac{2-\sqrt{5}}{3-\sqrt{5}}$$

$$\frac{2-\sqrt{5}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}}$$

$$\frac{2-\sqrt{5}}{2\sqrt{5}(3+\sqrt{5})}$$

$$\frac{4}{6+2\sqrt{5}-\sqrt{5}-5}$$

$$= \frac{1-\sqrt{5}}{4} \quad (\text{D})$$

$$209) \left(\sqrt{2} + \frac{1}{\sqrt{3}}\right) \left(\sqrt{2} - \frac{1}{\sqrt{3}}\right)$$

$$(\sqrt{2})^2 - \frac{\sqrt{2} \cdot 1}{\sqrt{3}} + \frac{\sqrt{2}}{3} - \left(\frac{1}{\sqrt{3}}\right)^2$$

$$= \frac{2}{3} - \frac{1}{3} = \frac{1}{3} \quad (\text{B})$$

$$210) \text{Rahasia has 7 different posters per room.} \\ = 7C_1.$$

$$\text{Since } n = \text{number of rooms} \\ n = 7C_1 + 7C_2 + 7C_3$$

$$= 3 \cdot 7C_1$$

$$= 3 \times \frac{7!}{(7-1)!1!}$$

$$= 3 \times \frac{7!}{6!1!}$$

$$= 3 \times \frac{7 \times 6!}{6!1!}$$

$$= 21 \text{ ways} \quad (\text{D})$$

$$21)$$

$$\begin{aligned} &\frac{x-2}{x^2+2x^2+3x-3} \\ &\frac{x^3+0x^2+x}{-2x^2-2x-3} \\ &\frac{-2x^2-0x-2}{2x-1} \\ &\therefore \text{Remainder} = 2x-1 \quad (\text{B}) \end{aligned}$$

$$212) 9y^2 - 16x^2 \\ (3y)^2 - (4x)^2 \\ (3y - 4x)(3y + 4x) \quad (D)$$

$$213) -2x - 5y = 3 \quad \dots \quad ① \\ x + 3y = 0 \quad \dots \quad ② \\ \text{From eqtn (ii)} \\ x = 0 - 3y$$

$$x = 0 - 3y \\ x = -3y$$

$$\text{Substitute } x = -3y \text{ into (i)} \\ -2(-3y) - 5(y) = 3$$

$$6y - 5y = 3$$

$$1y = 3$$

$$y = 3$$

$$\text{Substitute } y = 3 \text{ into (ii)} \\ x + 3(3) = 0$$

$$x + 9 = 0$$

$$x = -9$$

$$x = -9 \text{ and } y = 3$$

$$(-9, 3) \quad (A)$$

$$214) \cancel{x} \cancel{y} \quad x \propto \sqrt{y} \\ \cancel{x} \cancel{y} \quad y = k\sqrt{y}$$

$$\text{When } x = 81 \text{ and } y = 9$$

$$81 = k\sqrt{9}$$

$$81 = 3k$$

$$k = 27$$

$$x = 27\sqrt{y}$$

$$\text{When } y = 1/9$$

$$x = 27\sqrt{\frac{16}{9}}$$

$$= \frac{9}{3} \times \frac{4}{3}$$

$$= 36 \quad (C)$$

$$215) -6(x+3) \leq 4(x-2) \\ -6x - 18 \leq 4x - 8 \\ -6x - 4x \leq -8 + 18 \\ -10x \leq 10 \\ x \leq -1 \\ x \geq -1 \quad (D)$$

$$T \propto \frac{1}{R^3}$$

$$T = \frac{k}{R^3}$$

$$\frac{2}{81} = \frac{k}{3^3}$$

$$\frac{2}{81} = \frac{k}{27} \quad *$$

$$K = \frac{54}{81}$$

$$\text{When } R = 2$$

$$T = \frac{54}{\frac{81}{2^3}} \\ T = \frac{54}{81} \times \frac{1}{\frac{1}{8}} \\ = \frac{54}{3} \times \frac{1}{\frac{1}{8}} \\ = \frac{1}{12} \quad (B)$$

$$216) -6(x+3) \leq 4(x-2) \\ -6x - 18 \leq 4x - 8 \\ -6x - 4x \leq -8 + 18 \\ -10x \leq 10 \\ x \geq \frac{10}{-10} \\ x \geq -1 \quad (D)$$

$$217) x^2 + 2x > 15 \\ x^2 + 2x - 15 > 0 \\ x^2 + 3x - 5x - 15 > 0 \\ x(x+3) - 5(x+3) > 0 \\ (x-5)(x+3) > 0$$

$$x-5 > 0 \text{ or } x+3 > 0 \\ x > 5 \quad x < -3 \quad (B)$$

$$218) n = 18, a = 3, d = 6 - 3 = 3$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{18} = \frac{18}{2} [2 \times 3 + (18-1)3]$$

$$= 9(6 + 51)$$

$$= 9(57)$$

$$= 513 \quad (A)$$

$$219) T_2 = ar = 4 \quad \dots \quad ①$$

$$T_4 = ar^3 = 16 \quad \dots \quad ②$$

divide eqtn ii by ①

$$\frac{ar^3}{ar} = \frac{16}{4}$$

$$r^2 = 4$$

$$r = \sqrt{4} = 2$$

Substitute $r = 2$ into ①

$$a(2) = 4$$

$$a = \frac{4}{2}$$

$$a = 2$$

$$S_n = a(r^n - 1)$$

$$S_5 = 2(2^5 - 1)$$

$$= 2 \frac{(32-1)}{1} = 2(31) \\ = 62 \quad (D)$$

$$220) x * y = xy + x + y$$

$$3 * \frac{-2}{3} = 3 * \frac{-2}{3} + 3 - \frac{2}{3} \\ = -2 + 3 - \frac{2}{3}$$

$$1 - \frac{2}{3} = \frac{1}{3} \quad (B)$$

$$221) \begin{vmatrix} 1 & 3 \\ 5 & 3x \end{vmatrix} = \begin{vmatrix} 4 & 1 \\ 3 & 2x \end{vmatrix}$$

$$(2 \cdot 3x - 5 \cdot 3) = (2x \cdot 4 - 3 \cdot 1)$$

$$6x - 15 = 8x - 3$$

$$8x - 6x = +3 \leftarrow 15$$

$$2x = -12$$

$$x = -\frac{12}{2}$$

$$x = -6 \quad (A)$$

$$222) \begin{vmatrix} 4 & 2 & -1 \\ 2 & 3 & -1 \\ -1 & 1 & 3 \end{vmatrix}$$

$$4 \begin{vmatrix} 3 & -1 \\ 1 & 3 \end{vmatrix} - 2 \begin{vmatrix} 2 & -1 \\ -1 & 3 \end{vmatrix} - 1 \begin{vmatrix} 2 & 3 \\ -1 & 1 \end{vmatrix}$$

$$= 4(3 \cdot 3 - (-1 \cdot 1)) - 2(3 \cdot 2 - (-1 \cdot -1)) - 1(2 \cdot 3 - (-1 \cdot 1))$$

$$= 4(9 + 1) - 2(6 - 1) - 1(2 + 3)$$

$$= 4(10) - 2(5) - 1(5)$$

$$= 40 - 10 - 5$$

$$= 25 \quad (D)$$

$$223) N = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$$

$$|N| = (2 \cdot 4 - 1 \cdot 3)$$

$$= 8 - 3$$

$$= 5$$

$$N^{-1} = \frac{1}{5} \begin{pmatrix} 4 & -3 \\ -1 & 2 \end{pmatrix} \quad (B)$$

$$224) \text{Int Angle} = \frac{(n-2)180}{n}$$

$$\text{When } n = 12$$

$$= \frac{(12-2)180}{12}$$

$$= \frac{10(180)}{12}$$

$$= 150^\circ \quad (B)$$

$$225) C = 28 \text{ cm}$$

Perimeter = Perimeter of Square
of Circle

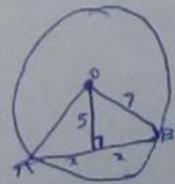
$$C = 4l$$

$$28 = 4l$$

$$l = \frac{28}{4} = 7$$

$$\text{Area} = l^2 = 7^2 = 49 \text{ cm}^2 \quad (G)$$

$$226)$$



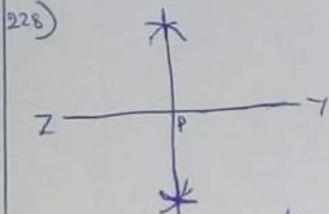
$$OB^2 = OD^2 + DB^2 \\ 7^2 = 5^2 + x^2 \\ 49 = 25 + x^2 \\ x^2 = 49 - 25 \\ x^2 = 24 \\ x = \sqrt{24} \\ x = 2\sqrt{6}$$

$$\begin{aligned} AB &= 2OB \\ &= 2 \times 2\sqrt{6} \\ &= 4\sqrt{6} \quad (\text{A}) \end{aligned}$$

$$227) \text{ Volume of Cube} = l^3 = 3^3 = 27 \text{ cm}^3$$

$$\text{Volume of tank} = l \cdot b \cdot h = 3 \times 4 \times 5 = 60 \text{ cm}^3$$

$$\begin{aligned} \text{Vol. of water} &= \text{Vol. of tank} - \text{Vol. of cube} \\ &= 60 - 27 = 33 \text{ cm}^3 \quad (\text{B}) \end{aligned}$$



P is the perpendicular bisector of X and Y and it is equidistant from X and Y i.e.
 $ZP = PY$ (\text{D})

$$229) P(x, y) \quad Q = (8, 6)$$

$$\text{Midpoint} = (5, 8)$$

$$M = \frac{P+Q}{2}$$

$$5 = \frac{x+8}{2} \quad 8 = \frac{y+6}{2}$$

$$5x+2 = x+8 \quad 8x+2 = y+6$$

$$10 = x+8$$

$$16 = y+6$$

$$x = 10-8$$

$$y = 16-6$$

$$x = 2$$

$$y = 10$$

$$= (2, 10) \quad (\text{A})$$

$$2y = 5x + 4$$

$$y = \frac{5}{2}x + \frac{4}{2}$$

$$= \frac{5}{2}x + 2$$

$$m_1 = \frac{5}{2}$$

$$\text{Perpendicular}\\ m_1 m_2 = -1$$

$$m_2 = \frac{-1}{m_1} = \frac{-1}{\frac{5}{2}} = -\frac{2}{5}$$

$$m_2 = \frac{y-y_1}{x-x_1}$$

$$-\frac{2}{5} = \frac{y-2}{x-4}$$

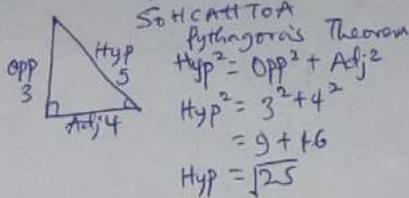
$$-2(x-4) = 5(y-2)$$

$$-2x+8 = 5y-10$$

$$0 = 5y+2x-18 \quad (\text{B})$$

$$0 = 5y+2x-18 \quad (\text{B})$$

$$231) \tan \theta = 3/4$$



So HCATOA
Pythagoras Theorem
 $\text{Hyp}^2 = \text{Opp}^2 + \text{Adj}^2$
 $\text{Hyp}^2 = 3^2 + 4^2$

$$= 9 + 16$$

$$= 25$$

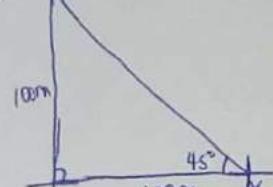
$$\text{Hyp} = \sqrt{25}$$

$$\text{Hyp} = 5$$

$$\sin \theta = \frac{\text{Opp}}{\text{Hyp}} = \frac{3}{5} - \frac{3}{5}$$

$$= \frac{3}{5} = \frac{1}{5} \quad (\text{C})$$

$$232) ?$$



$$\tan \theta = \frac{\text{Opp}}{\text{Adj}} = \frac{100}{100} = 1$$

$$\tan \theta = 1 \quad \theta = \tan^{-1}(1)$$

$$= 45^\circ$$

Bearing of X from Z

$$= 90^\circ + 45^\circ$$

$$= 135^\circ \quad (\text{B})$$

$$233) y = (2n+2)(3n+1)$$

$$= 6x^2 + 2x + 3x + 1$$

$$= 6x^2 + 5x + 1$$

$$\frac{dy}{dx} = 12x + 5 \quad (\text{D})$$

$$234) y = x^3 + x^2 - x + 1$$

$$\frac{dy}{dx} = 3x^2 + 2x - 1 = 0$$

$$\text{at turning point } 3x^2 + 2x - 1 = 0$$

$$3x + 3x - x - 1 = 0$$

$$3x(x+1) - 1(x+1) = 0$$

$$(3x-1)(x+1) = 0$$

$$3x = 1 \quad x = -1$$

$$x = \frac{1}{3} \text{ or } -1$$

$$\frac{d^2y}{dx^2} = 6x + 2$$

$$\text{When } x = \frac{1}{3}$$

$$\frac{d^2y}{dx^2} = 6\left(\frac{1}{3}\right) + 2$$

$$= 2 + 2$$

$$= 4$$

$$\left[\min \right] \frac{d^2y}{dx^2} > 0$$

$$\frac{d^2y}{dx^2} < 0 \quad (\text{Max})$$

$$\therefore x = \frac{1}{3} \text{ @ Minimum point (A)}$$

$$235) \int \cos 4x dx$$

$$\text{Let } u = 4x$$

$$\frac{du}{dx} = 4$$

$$du = 4dx$$

$$dx = \frac{du}{4}$$

$$\int \cos 4x dx = \int \cos u \frac{du}{4}$$

$$= \int \cos u \cdot \frac{du}{4}$$

$$= \frac{1}{4} \int \cos u du$$

$$= \frac{1}{4} (-\sin u) + K$$

$$= \frac{1}{4} (-\sin 4x) + K \quad (\text{B})$$

$$236) \text{Let the 4 consecutive numbers be}$$

$$x, x+1, x+2, x+3$$

$$x+x+1+x+2+x+3 = 34$$

$$4x + 6 = 34$$

$$4x = 28$$

$$x = 7 \quad (\text{C})$$

No	0	1	2	3	4	5
Freq	1	4	3	8	2	5

$$n = \sum f = 23$$

$$\text{Median} = \frac{23}{2} = 11.5$$

$$\text{Median} = 12 \text{th term} = 8$$

$$\text{Range} = \text{Highest frequency} - \text{lowest frequency}$$

$$= 8 - 1$$

$$= 7$$

$$\text{Answer} = (8, 5) \quad (\text{A})$$

Class Interval	0-2	2-4	4-6	6-8	8-11
Frequency	1	4	3	8	

Midode = Mid class interval of modal class

$$= \frac{9+11}{2} = \frac{20}{2} = 10 \quad (\text{C})$$

Int	x	f	fx	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x)\bar{x}$
3-5	4	2	8	-3	9	72
6-8	7	2	14	0	0	0
9-11	10	2	20	3	9	90
Σ	21	6	42			162

$$\bar{x} = \frac{\sum fx}{n} = \frac{42}{6} = 7$$

$$S = \sqrt{\frac{\sum f(x-\bar{x})^2}{n}}$$

$$S = \sqrt{\frac{162}{6}} = \sqrt{27} = 3\sqrt{3}$$

No optimum

241 ELATION : 7 letter without repetition

$$\text{No of arrangement} = 7! \quad (\text{D})$$

242) Circular arrangement
= $(n-1)!$

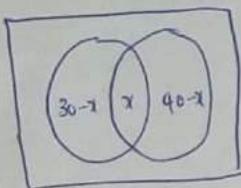
$$= (5-1)!$$

$$= 4! = 24 \quad (\text{B})$$

- 243) {44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60}

$$\text{Pr. of Prime numbers} = \frac{4}{18} = \frac{2}{9} \quad (\text{B})$$

244



$$\begin{aligned} n &= 60 \\ n(P) &= 30 \\ n(C) &= 40 \\ n(P \cap C) &= x \end{aligned}$$

$$60 = 30 + 40 - x \Rightarrow x = 10$$

$$60 = 70 - x$$

$$60 - 70 = -x$$

$$-10 = -x$$

$$x = 10$$

$$P_r(P \cap C) = \frac{n(P \cap C)}{n(U)} = \frac{10}{60} = \frac{1}{6} \quad (\text{D})$$

$$245) 72_6 = 7 \times 6 + 2 \times 6^0$$

$$= 7 \times 6 + 2 \times 1$$

$$= 42 + 2 = 44_{10}$$

$$\begin{array}{r} 3 | 44 \\ 3 | 14 \quad 2 \\ 3 | 4 \quad 2 \\ 3 | 1 \quad 1 \\ 0 \quad 1 \end{array}$$

$$\underline{\underline{1122}}_3 = 72_6$$

(D)

$$\begin{array}{r} 2 \frac{2}{3} \times 1 \frac{1}{2} \\ \cdot 4 \frac{4}{5} \\ \hline \end{array} = \frac{\frac{8}{3} \times \frac{3}{2}}{\frac{24}{5}} = \frac{24}{5}$$

$$= \frac{1}{\frac{8}{3}} \times \frac{8}{2} \times \frac{5}{24} = \frac{5}{6}$$

$$= \frac{5}{6} \quad (\text{C})$$

$$247) \frac{21}{9} = \frac{7}{3} = 2.3333$$

$\underline{\underline{2.3333}}$ to 3 S.F

(D)

$$248) \text{Income} = 3500$$

Children = 15% of Income

$$= \frac{15}{100} \times 3500$$

$$= 525$$

Additional Expenses = 1950

$$\begin{aligned} \text{Total} \quad " &= 525 + 1950 \\ &= 2475 \end{aligned}$$

$$\begin{aligned} \text{Change} &= 3500 - 2475 \\ &= 1025 \quad (\text{B}) \end{aligned}$$

$$\begin{aligned} 249) 27^{x+2} \div 9^{x+1} &= 3^{2x} \\ 3^{3(x+2)} \div 3^{2(x+1)} &= 3^{2x} \\ 3^{3x+6-2x-2} &= 3^{2x} \\ 3^x = 3^{2x} &= 3^{2x} \\ 3x+6-2x-2 &= 2x \\ -x &= -4 \\ x &= 4 \end{aligned} \quad (\text{B})$$

$$250) \log_3 x^2 = -8$$

$$x^2 = 3^{-8}$$

$$x^2 = (3^{-4})^2$$

$$x = 3^{-4}$$

$$x = \frac{1}{3^4} = \frac{1}{81}$$

$$\text{or } \log_3 x^2 = \log_3 3^{-8}$$

$$x^2 = 3^{-8}$$

$$x^2 = \frac{1}{3^8}$$

$$x = \sqrt{\frac{1}{6561}} = \frac{1}{81}$$

$$251) (\sqrt{6}+2)^3 - (\sqrt{6}-2)^3$$

$$= (\sqrt{6}+2) - (\sqrt{6}-2)^2 ((\sqrt{6}+2) + (\sqrt{6}-2))$$

$$= (\sqrt{6}+2)(\sqrt{6}-2)(\sqrt{6}+2+\sqrt{6}-2)$$

$$= 4(\sqrt{6})(2\sqrt{6})$$

$$= 8\sqrt{6} \quad (\text{C})$$

$$252) P = \{2, 3, 5\}$$

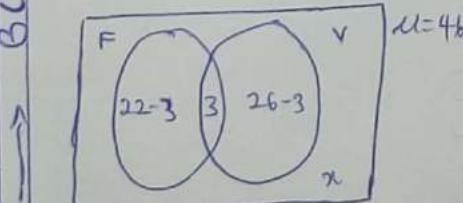
$$Q = \{2, 3, 6, 9\}$$

$$P \cap Q = \{2, 3\} \quad (\text{B})$$

253)

$$M = 46 \quad n(F) = 22 \quad n(V) = 26$$

$$n(F \cap V) = 3 \quad n(F \cup V)' = x$$



$$46 = 19 + 3 + 53 + x$$

$$46 = 45 + x$$

$$x = 46 - 45$$

$$x = 1 \quad (\text{A})$$

$$254) W = \underline{V(2+cn)}$$

$$W(1-cn) = V(2+cn)$$

$$W-Wcn = 2V+Vcn$$

$$W-2V = Vcn+Wcn$$

$$W-2V = n(Vc+Wc)$$

$$n = \frac{W-2V}{(Vc+Wc)}$$

$$n = \frac{W-2V}{C(v+w)} \text{ or } \frac{1}{C} \left(\frac{W-2V}{v+w} \right) \quad (\text{A})$$

$$255) 2x^3 - 11x^2 + 18x - 1$$

divisor is $x+3$

$$\text{Let } x+3 = 0$$

$$x = -3$$

$$2(-3)^3 - 11(-3)^2 + 18(-3) - 1$$

$$= 2(-27) - 11(9) + 18(-3) - 1$$

$$= -54 - 99 - 54 - 1$$

$$= -208$$

$$\text{or } 2x^2 - 17x + 69$$

$$x+3 \left| \begin{array}{r} 2x^3 - 11x^2 + 18x - 1 \\ 2x^3 + 6x^2 + 0x - 1 \\ \hline -17x^2 + 18x - 1 \end{array} \right.$$

$$-17x^2 + 51x + 0$$

$$-69x - 1$$

$$-69x + 207$$

No option

$$256) x^2 - y^2 = 4 \quad \dots \text{(I)}$$

$$x+y = 2 \quad \dots \text{(II)}$$

From (II)

$$x = 2-y$$

~~$$\begin{array}{r} x+y=2 \\ x=2-y \\ \hline 2-y+y=2 \\ 2=2 \end{array}$$~~

From (I)

$$(x-y)(x+y) = 4$$

Since $x+y = 2$

$$(2-y)y = 4$$

$$y = \frac{4}{2} = 2$$

$$\therefore x-y = 2 \quad \dots \text{(III)}$$

$$x+y + x-y = 2+2$$

$$2x = 4$$

$$x = \frac{4}{2} = 2$$

Substitute $x=2$ into (II)

$$2+y = 2$$

$$y = 2-2 = 0$$

$$\therefore x=2 \text{ and } y=0 \quad (\text{C})$$

$$257) y \propto \sqrt{n}$$

$$y = k\sqrt{n}$$

When $y=4$ and $n=4$

$$4 = k\sqrt{4}$$

$$k = \frac{4}{2} = 2$$

$$y = 2\sqrt{n}$$

$$@ n = 17/9 = \frac{16}{9}$$

$$y = 2\sqrt{\frac{16}{9}} = 2\left(\frac{4}{3}\right) = \frac{8}{3} \quad (\text{C})$$

$$4k = \frac{1}{\sqrt{3}}$$

$$4 = \frac{k}{\sqrt{3}}$$

$$k = 4\sqrt{3}$$

When $k=81$, $V=2$

$$k = 81 \cdot 2^3$$

$$= 81 \cdot 8$$

$$k = 648$$

$$\therefore U = \frac{648}{\sqrt{3}}$$

@ $V=3$

$$U = \frac{648}{3} = \frac{648}{27} = 24 \quad (\text{A})$$

$$268) \frac{1}{5}y + \frac{1}{5} < \frac{1}{2}y + \frac{2}{5}$$

$$\frac{1}{5}y - \frac{1}{2}y < \frac{2}{5} - \frac{1}{5}$$

$$-\frac{3}{10}y < \frac{1}{5}$$

$$y > \frac{1}{5} \times \frac{-10}{3}$$

$$y > -\frac{2}{3} \quad (\text{C})$$

$$269) (m-3)(m-4) < 0$$

$$m-3 > 0$$

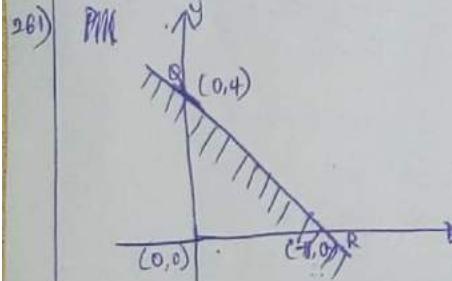
$$m-4 < 0$$

$$m > 3$$

$$m < 4$$

$$= 3 < m < 4$$

$$(\text{C})$$



$$R(1,0) \quad Q = (0,4)$$

$$\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$$

$$\frac{y-0}{x-1} = \frac{4-0}{0-1}$$

$$\frac{y}{x-1} = \frac{4}{-1}$$

$$xy = -4(x-1)$$

$$y = -4x + 4$$

$$\therefore y < -4x + 4$$

$$(\text{C})$$

$$270) n^{\text{th}} = n^2 - 6n - 4$$

$$3^{\text{rd}} = 3^2 - 6(3) - 4$$

$$= 9 - 18 - 4$$

$$= -13$$

$$4^{\text{th}} = 4^2 - 6(4) - 4$$

$$= 16 - 24 - 4$$

$$= -12$$

$$3^{\text{rd}} + 4^{\text{th}} = -13 - 12 \\ = -25 \quad (\text{D})$$

$$263) S_{\infty} = \frac{q}{1-r}$$

$$\frac{q}{S_{\infty}} = 1-r$$

$$r = 1 - \frac{q}{S_{\infty}}$$

$$r = 1 - \frac{(-\frac{1}{8})}{(-\frac{1}{10})}$$

$$= 1 - \left[\frac{-\frac{1}{8} \times \frac{10}{10}}{-1} \right]$$

$$= \frac{1}{1} - \frac{5}{4} = \frac{4-5}{4} = -\frac{1}{4} \quad (\text{B})$$

$$264) P \times Q = PQ + P - Q$$

$$3 \times 4 = 3 \times 4 + 3 - 4$$

$$= 12 + 3 - 4 = 11$$

$$2 \times (3 \times 4) = 2 \times 11$$

$$= 2 \times 11 + 2 - 11$$

$$= 22 + 2 - 11$$

$$= 13 \quad (\text{B})$$

$$265) M * n = \frac{mn}{2}$$

$$m * m^{-1} = e$$

$$-5 * m^{-1} = 2$$

$$\frac{5m^{-1}}{2} = 2$$

$$5m^{-1} = 4$$

$$m^{-1} = \frac{4}{5}$$

$$\text{or } M = -\frac{4}{5}$$

$$266) \begin{vmatrix} 5 & 3 \\ x & 2 \end{vmatrix} = \begin{vmatrix} 3 & 5 \\ 4 & 5 \end{vmatrix}$$

$$10 - 3x = 15 - 20$$

$$10 - 3x = -5$$

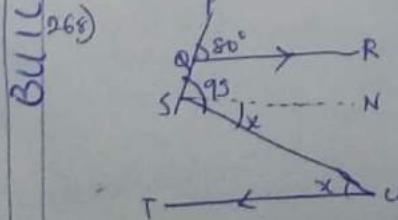
$$-3x = -5 - 10$$

$$-3x = -15$$

$$x = 5 \quad (\text{C})$$

$$267) I_3 = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

The ~~determinant~~ of an identity matrix of any order is 1. (C)



$$N\hat{S}U = S\hat{U}T - x \quad (\text{alternate angles})$$

$$P\hat{Q}R = P\hat{S}N \quad (\text{corresponding angles})$$

$$= 80^\circ$$

$$PSU = P\hat{S}N + N\hat{S}U$$

$$95 = 80 + x$$

$$x = 95 - 80$$

$$= 15^\circ \quad (\text{A})$$

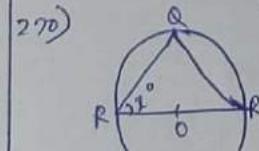
$$268) n = 5 \text{ sides}$$

$$x + 2x + 3x + 4x + 5x = (n-2)180$$

$$15x = (5-2)180$$

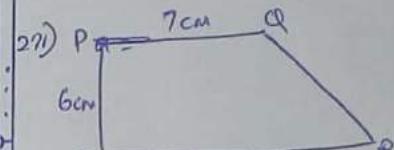
$$15x = 8(180)$$

$$x = \frac{540}{15} = 36^\circ \quad (\text{D})$$



$$P\hat{Q}R = 90^\circ \quad [\text{angle subtending a semi-circle}]$$

$$Q\hat{R}P = (90-x)^\circ \quad [\text{complementary with } Q\hat{P}R]$$



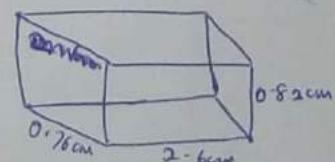
$$A = \frac{1}{2}(a+b)h$$

$$= \frac{1}{2}(7+13)6$$

$$= 20(3)$$

$$= 60 \text{ cm}^2 \quad (\text{C})$$

$$273) \text{Volume of Cuboid} = 166$$



$$V = 0.76 \times 2.6 \times 0.82$$

$$= 1.62 \text{ cm}^3 \quad (\text{D})$$

$$274) \theta = 150^\circ \quad r = 12 \text{ cm}$$

$$\text{Area of a Sector} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{150}{360} \times \pi \times 12^2$$

$$= \frac{150}{360} \times 144\pi$$

$$= 60\pi \text{ cm}^2 \quad (\text{B})$$

$$275)$$

$$M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - (-7)}{-2 - 5} = \frac{-3 + 7}{-7} = \frac{4}{7} \quad (\text{C})$$

276 $y = 2x + 4$ $y = 7 - x$
 The point of intersection =
 $y = 2x + 4 = 7 - x$
 $2x + x = 7 - 4$
 $3x = 3$
 $x = \frac{3}{3} = 1$

$$\begin{aligned}y &= 7 - x \\&= 7 - 1 \\&= 6\end{aligned}$$

Point of intersection = 1, 6

$$\begin{aligned}\text{Distance} &= \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2} \\&= \sqrt{(6 - 3)^2 + (1 - 4)^2} \\&= \sqrt{(3)^2 + (-3)^2} \\&= \sqrt{9+9} \\&= \sqrt{18} \quad \text{or } 3\sqrt{2} \quad (\text{B})\end{aligned}$$

277 A(-2, 1) B(-1/2, 4)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m(x - x_2) = (y - y_1)$$

$$\text{Where } m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - y_1}{x_1 - x_2}$$

$$\frac{4 - 1}{-\frac{1}{2} - (-2)} = \frac{y - 1}{x - (-2)}$$

$$\frac{\frac{3}{2}}{-\frac{1}{2} + 2} = \frac{y - 1}{x + 2}$$

$$\frac{-1 - 4}{2} = \frac{y - 1}{2x + 2}$$

$$\frac{-5}{2} = \frac{y - 1}{x - 2}$$

$$\frac{6}{-5} = \frac{y - 1}{x - 2}$$

$$\begin{aligned}y &= 3x + 7.5 \\1.5 &= 1.5 \\&= 2x + 5\end{aligned}$$

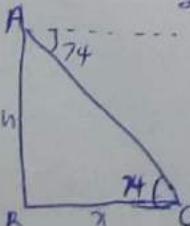
278 $\theta = 135^\circ$ $\therefore \cos \theta = -\cos(180 - \theta)$
 $\cos 135 = -\cos(180 - 135)$

$$= -\cos 45$$

$$\text{Recall that } \cos 45 = \frac{\sqrt{2}}{2}$$

$$= -\frac{\sqrt{2}}{2} \quad (\text{C})$$

279 $\tan 74 = \frac{150}{2}$
 $x = \frac{150}{\tan 74}$
 $= \frac{150}{3.4874}$
 $= 43.01 \text{ cm}$
 $\approx 43 \text{ cm}$

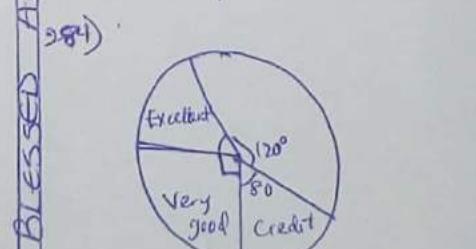


280 $y = x^2 - \frac{1}{x}$
 $y = x^2 - x^{-1}$
 $y = 2x + x^{-2}$
 $y = 2x + \frac{1}{x^2} \quad (\text{B})$

281 $y = \cos x$
 $\frac{dy}{dx} = -\sin x \quad (\text{B})$

282 $\int_1^2 \frac{2x^2 - 4x}{x^2 + 1} dx$
 $\left[\frac{2x^3 - 4x^2}{3} - \frac{4x^2 + 1}{1+1} \right]_1^2$
 $\left[\frac{2^3 - 4 \cdot 2^2}{3} - \frac{(1)^3 - 4(1)^2}{1+1} \right]$
 $\left[\frac{8 - 16}{3} - \left(\frac{1}{3} - \frac{2}{1} \right) \right]$
 $= -\frac{8}{3} - \left(-\frac{5}{3} \right)$
 $= -\frac{16}{3} + \frac{5}{3} = -\frac{11}{3} \quad (\text{D})$

283 $\int_0^{\pi/4} \sec^2 \theta d\theta$
 $\left[\tan \theta \right]_0^{\pi/4}$
 $\tan \frac{\pi}{4} - \tan 0$
 $= 1 - 0$
 $= 1 \quad (\text{A})$



BLESSED ACADEMY TUTORIALS
 Angle of Excellent =
 $m 360 = (120 + 80 + 90)$

$$= 360 - 290$$

$$= 70^\circ$$

$$\text{No. of students} = \frac{70}{360} \times 360$$

$$= 7 \text{ students} \quad (\text{D})$$

285 Total No. of students
 $2 + 3 + 4 + 6 + 5 + 4 + 6 + 5 + 1 + 3 + 1$
 $= 40$
 No. of students that failed
 $= \text{No. of students below 5}$

286 Mean of 1st 7 numbers =
 $\bar{x}_7 = 96 \quad \therefore n = 7$
 8th term = x
 $\bar{x} = 112 \quad \therefore n = 8$
 $\bar{x} = \frac{\sum f x}{n}$
 Mean = $\frac{\text{Total}}{n}$
 Total = Total $\times n$
 $\sum f x_7 = 96 \times 7 = 672$
 $\bar{x}_8 = \frac{\sum f x_8}{n_8}$
 $\therefore 112 = \frac{672 + x}{8}$
 $672 + x = 896$
 $x = 896 - 672$
 $= 224 \quad (\text{D})$

287 Rearranging
 $2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5,$
 $7, 8, 9, 9.$

Total = 16
 Median = $\frac{16}{2} = 8$

$$\text{Median} = \frac{8^{\text{th}} + 9^{\text{th}}}{2} = \frac{4+4}{2} = 4 \quad (\text{D})$$

288 Range = highest - least
 $= 11 - 2$
 $= 9 \quad (\text{B})$

289 $\bar{x} = \frac{2+3+8+10+12}{5} = \frac{35}{5} = 7$

$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

x	x - \bar{x}	(x - $\bar{x})^2$
2	-5	25
3	-4	16
8	-1	1
10	3	9
12	5	25

$$\sum (x - \bar{x})^2 = 76$$

$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{\frac{76}{5}} = 3.9 \quad (\text{A})$$

$$290) \begin{aligned} n+1 &= C_{n-2} \\ n &= 15 \\ 15+1 &= C_{15-2} \\ {}^{16}G_3 &= \frac{16!}{(16-3)!3!} \\ &= \frac{16!}{13!3!} = \frac{16!}{3!13!} \\ &= \frac{16 \times 15 \times 14 \times 13!}{3 \times 2 \times 1 \times 13!} \\ &= \frac{1}{16 \times 15 \times 7} \\ &= 560 \quad (\text{D}) \end{aligned}$$

291) TOTALITY = 8 letters

$T = 3$ times

$$n = \frac{8!}{3!} = \frac{8 \times 7 \times 6 \times 5 \times 4 \times 3!}{3!} \\ = 6720 \quad (\text{A})$$

292) $P_r(\text{pass}) = \frac{2}{3}$

$$P_r(\text{fail}) = 1 - \frac{2}{3} = \frac{1}{3}$$

$$P_r(\text{Passing two test}) =$$

3 (Probability of 2 passes & fails)

= 3 ($P_r(\text{Pass})$ and $P_r(\text{Pass})$) and $P_r(\text{fail})$)

= 3 ($P_r(\text{Pass}) \times P_r(\text{Pass}) \times P_r(\text{fail})$)

$$= 3 \left(\frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} \right)$$

$$= 3 \left(\frac{4}{27} \right) = \frac{4}{9} \quad (\text{A})$$

293) Prob [A man & his wife for 80 yrs]

$$= \frac{2}{3} \text{ and } \frac{3}{5}$$

$$P_r(\text{One of them living}) =$$

$P_r(\text{man lives and wife dies})$ or

(wife lives and man dies)

(both lives)

$$P_r(\text{man}) = \frac{2}{3} \quad (\text{lives})$$

$$P_r(\text{man})' = 1 - \frac{2}{3} \quad (\text{dies})$$

$$P_r(\text{woman}) = \frac{3}{5} \quad (\text{lives})$$

$$P_r(\text{woman})' = 1 - \frac{3}{5} \quad (\text{dies})$$

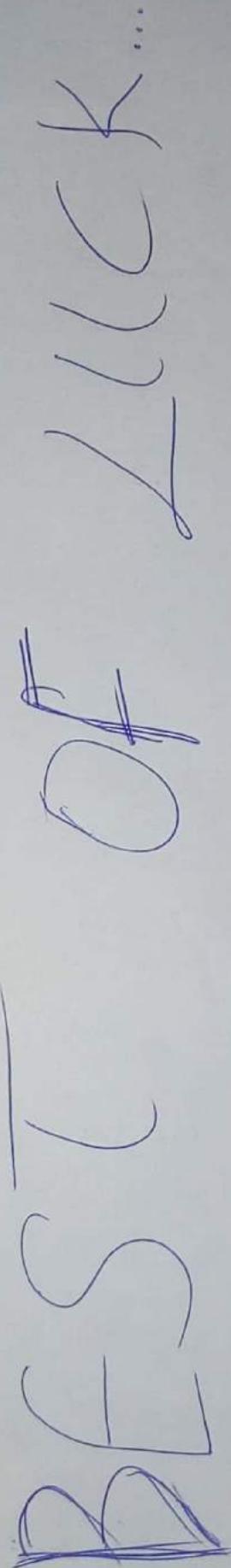
$$P_i = P_r(\text{man}) * P_r(\text{wife}) +$$

$$P_r(\text{man})' * P_r(\text{wife}) +$$

$$P_r(\text{man}) * P_r(\text{man})'$$

$$P_i = \frac{2}{3} \times \frac{2}{5} + \frac{1}{3} \times \frac{3}{5} + \frac{2}{3} \times \frac{3}{5}$$

$$= \frac{4}{15} + \frac{1}{5} + \frac{2}{5} = \frac{13}{15} \quad (\text{D})$$



FROM: BLESSED ACADEMY TUTORIALS

BUILDING POTENTIALS WITH INTEGRITY.

BIOLOGY

COMPILED BY ➡ BLESSED ACADEMY TUTORIALS.

① **D** (Homeostasis)

- Diuresis talks more about excretion of excess urine in the body at the kidney. Which is a sub-unit of homeostasis.
- Plasmolysis talks more of shrinking of the cytoplasm away from the wall of a living cell due to outward osmotic flow of water i.e. the outer environment is hypertonic in concentration.
- Endosmosis is irrelevant in that it ~~will~~ implies that; the movement of fluids through a osmotic gradient provided ~~an~~.
- Semi-permeable membrane is ~~present~~ Present within the cell.
- Homeostasis is the regulation of ~~the~~ constant internal and ~~the~~ external environment of an organism. This includes: the regulation of ^{by 1} Skin, Kidney, liver. etc.

② **B** (Symbiosis)

- Parasitism is an association between 2 organisms (usually between Host and a parasite). Where the Host derive nothing other than being harmed.
- Commensalism is an association between organisms where one derives benefit (commensal) but constitute no harm to its host e.g. Remora fish & shark.
- Saprophytism talks more of decaying of dead materials or matter by decomposers.
- Symbiosis is a relationship also mutualistic association where there is reciprocating help rendered to each organism in association.

③ **B** (It has high humus content).

Presence of humus in proportional quantities in each soil differs between soils. (i.e. sandy, clay, and loamy). Which is high in Loamy soil.

④ **A**

Relational similarities between organisms especially at ~~the~~ Chordata (Phylum level) is highly analogous at the Embryological level of Comparism - classification, anatomy and fossil record only draws a line of comparism in terms of differences.

⑤ **D**

As Organism with only one cell is only bounded to presence of organelles as mode to carry out all life processes of a living organism. Cell membranes, cytoplasm are all examples of organelle.

⑥

Plant's cell is distinct from Animal's due to presence of chlorophyll in the chloroplast that functions for carrying out photosynthetic processes. And presence of cellulose cell wall that brings about the body-shape conformity.

- Mitochondrion is the power house of a cell. i.e. where cellular respiration takes place.
- Cytoplasm is the fluid part of the cell where other organelles are placed aside the cell wall and membrane.

⑦ Diffusion is only effective and efficient for organisms with less body conformity and complexity that can therefore by simplicity termed as large surface area to volume ratio — C

⑧ D

Pulse can be defined as the regular, rhythmical beating of heart during processes of pumping of blood. This usually takes place by action of muscles (cardiac muscles) within the heart.

⑨ B

Retina functions ^{as} the sensitive tissue at the back of the eye that receives images and sends signals to the brain about the seen or observation which is analogous to cochlea of the ear that's part of the inner ear that contains the nerve endings that carries information of or about sounds to the brain.

⑩ A

Xylem functions for the transportation or conduction of water and mineral materials from the root of a plant through series of channels and sub-unit to the leaves of the plants where they are needed. This takes place through series of activities which include: Root pressure, transpiration pull, Capillary actions etc.

— Translocation is the movement of manufactured food materials from the leaves through to every parts of the plant. The vessel or mechanism responsible is the phloem.

⑪ A → pH of the soil.

In Aquatic habitat pH of the soil does not affect it because it never a terrestrial habitat. Unlike

- Light penetration that affects aquatic plants for photosynthesis.
- Rainfall helps to maintain the water level and capacity. And
- Temperature will affect the dispersion of animal in the aquatic habitat.

⑫ Petroleum is a natural resource that when combusted or burns in oxygen gives Carbon dioxide and water which can never be converted back to petroleum. Therefore, once used it can never be regained. Unlike the soil, wildlife and water.

— D

⑬ Greenhouse gases are gases that depicts the ozone layer (O_3), i.e. an allotrope of Oxygen.

— A

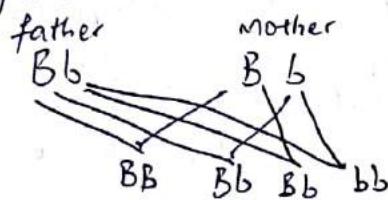
⑭ Even distribution of facilities in both regions helps to reduce Rural-Urban migration because, migration is basically for the search of food, money, and greener pastures.

— D

⑮ Size, weight, height and colour varies which could be as a result of genetic influence, environment and availability of food and resources. However, these characters ^{differences} _{varies} among species, which will always be. — C

⑯ C — No two people have the same finger prints.

- (17) Assume b denotes albino gene
And, B denotes Normal skin colour gene
If the father and mother are heterozygous



Phenotypically = 3 : 1
∴ Normal skin : \uparrow albino

$$\text{Probability of albino} = \frac{1}{4} - \boxed{B}$$

- (18) \boxed{A} — This is as a result of mixed breeding taking place.

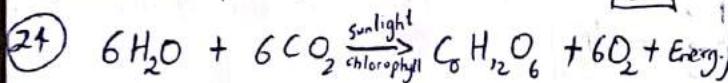
- (19) \boxed{D} — The differences was based or centered on structures.

- (20) A valve separates an auricle from a ventricle. The valve at the left side of the heart is called bicuspid valve and tricuspid valve for the right. — \boxed{A}

- (21) \boxed{D} — function for skin colouration.

- (22) \boxed{C} — Central nervous system.

- (23) The neurone is of many parts and functions for transferring of impulses. The receptors are the parts that detect impulses which include: touch, pressure, pain, heat, etc. — \boxed{B}



In the reaction above, Sunlight is absorbed through the chlorophyll which helps in the splitting of water and form a combined series of reactant to form Glucose and Oxygen gas. The substrate (reactants) are Water and Carbon dioxide respectively. — \boxed{B} .

- (25) The major pigments in plant is chlorophyll aside other pigment that helps in coloured parts like xanthophylls & carotene. Melanin only occurs in the chordates — \boxed{B} .

- (26) \boxed{C} — Iron.

- (27) \boxed{D} — Also termed warm blooded animals includes the mammals, Aves. i.e they have a fairly constant body temperature a contrast occurs in Poikilotherms termed cold blood animals which includes Pisces & Amphibians.

- (28) \boxed{D} — Antigens produces antibodies which are capable of fighting against foreign bodies. !

- (29) A DNA (Deoxyribonucleic acid) is always denoted by a three properties, which includes:
* A Nitrogenous base (which are 4 in numbers, which includes:
— Adenine
— Guanine
— Cytosine
— Thymine ..

- * A pentose sugar that differentiates a DNA from RNA by differences in OH group at the carbon 3.

- * A phosphate group attached to the pentose sugar. — \boxed{D}

- (30) \boxed{C} — Resemble each other and can interbreed freely.

- (31) At the chordates, i.e. the likes of
— Pisces (fishes)
— Amphibian
— Reptilia
— Aves
— Mammals

are all arranged according to their complexities i.e from the fishes to the mammals. — \boxed{A}

- (32) The leaf as an organ has specialized tissues for the function of photosynthesis. The leaf is of two layers namely:

- spongy mesophyll
— Palisade mesophyll. — \boxed{B}

FUN
TUTORIALS

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B2

33) C - Hydra

34) D - A capsule

35) B - Increasing the population of the natural enemies of the pest

36) A - Conservation

37) B - Vaccination is the preventive measure where a weak causative organism is injected for the immune of the body to build a defence against such disease.

38) C - Chickens do not really show social behaviour but definitely exhibit instinctual behaviours. Other options shows both instinctual and social behaviour.

39) D - In the theory ~~of~~ to show that cell is the unit or basis of life.

40) C - The fact that a culture of bacterial in an agar plate was grown, doesn't mean there are different colonies of different colours.

41) C - Hydra is never a plant (i.e it exhibit heterotrophic mode of nutrition.)

42) C - Proteins digested and absorbed by the small intestine is transported to the liver for deamination into urea. This urea is transported to kidney for egestion through the blood stream.

43) B - In sexual reproduction of paramecium known as conjugation requires 2 paramecium organisms (conjugant) for exchange of genetic materials.

BIOLOGY

INTEGRITY

DIVERSITY

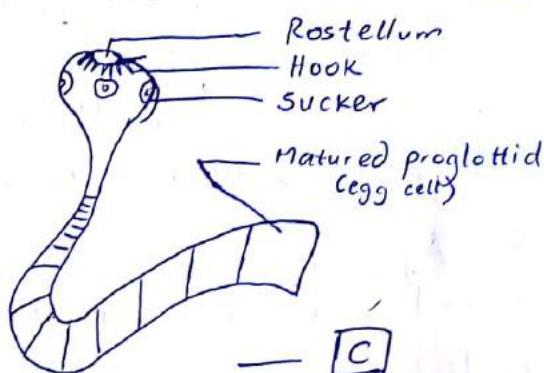
POTENTIALS

BASED

44) A - All parts of the earth where life exists.

45) food web basically show inter-relationship between organisms for continuous existence through feeding or inter dependence. — D

46)



47) B

- Evolution is or could be a change or improvement in ~~a~~ particular species which could never be a permanent change.

- Succession is improvement of series of faunal (animals) and floral (plants) from a primitive to an advanced ones.

48) Sex-linked gene's expression and inheritance patterns differs between males and females. Albinism, blood group and sickle-cell anaemia expresses itself in males and females the same way. — D

49) D - Physiological variation.

50) B - Darwin.

51) In a successive meiotic division, the paternal (father) and maternal (mother) ~~of~~ has a contribution in ~~both~~ the total chromosome of their offspring. — B

(52) Expression of gene is usually affected by the environment and the genetic make-up. However, expression of gene is termed phenotype which is the physical expression that can be seen.

— [A]

(64) ATP (Adenosine triphosphate) is the energy currency recognised by the body for ~~met~~ maintenance which is gotten from the successive oxidation of glucose molecule.

Some ATP are used for tissue maintenance while the remaining are used or conserved to do work.

— [D] Production of water is only a chemical reaction that needs no ATP to proceed the reaction.

(65) Plasmolysis is the shrinking of the cytoplasm or cell content away towards the outer environment due to hypertonic solution of the environment. The cell wall being rigid will not deform but the cell content will only shrink away from the cell wall. — [C]

(67) Edaphic factors are the non-living factors that affects the environment. e.g. Rainfall, humidity, temperature, soil etc.

However, ~~not all~~ edaphic factors will affect aquatic habitats e.g. soil. — [D]

(68) Ptyalin is only the secretion of the salivary glands which have their locations ~~at~~ in the mouth region. The saliva helps to entail the ptyalin that acts on starch and this could be due to the basic environment prepared by the saliva. — [D]

(69) This experiment is mainly for the test of gaseous exchange in the leaf and the regulations of the guard cells causes an opening which is termed stomata. — [B]

(70) [A] — Reproduction in Higher Organism is characterised by fertilisation which involves the fusion of sperm and egg nuclei to form a zygote.

(71) The question is only correct if EXCEPT was added. — [D]

(72) [B] — A tissue is characterised by ~~or~~ specialisation of cells performing similar function.

The ~~skin~~ mammalian skin is an organ that has many tissues. e.g. — Epidermal tissue stratum which contains or consists of 5 different cells that perform similar functions.

(73) [C] — Solvent molecules are more tiny or smaller than solute molecules.

(74) [C] — i.e. the support created due to turgor pressure.

(75) [B] — Ventricles pump blood to longer distances.

(76) [B] — Rhizopus.

(77) [A] — Gaseous exchange.

(78) [B] — Mapping the area.

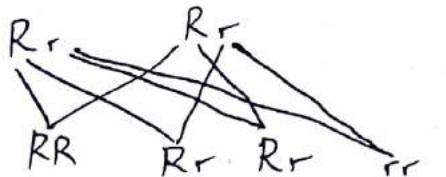
(79) [C] — This is due to the following:

An excretory product is characterised by passage through the blood stream. faeces only passes from the small intestine (after digestion and absorption of wanted materials) into the large intestine for egestion through the anus.

80) C - which is the theory of use and disuse.

81) see question 17.

self fertilisation of heterozygous red (Rr) will give:



Phenotypically: 3:1

meaning RR — All red
 rr — All white

Rr — Shows red but it is heterozygous.

$\therefore \frac{3}{4}$ — red and $\frac{1}{4}$ — white.

— C

Recipient	O	A	B	AB
Donor	/	/	/	/
O	/	/	/	/
A	X	/	X	X
B	X	X	/	X
AB	X	X	X	/

/ — means compatibility

X — means not compatible.

O — Is termed universal donor

AB — Is termed Universal recipient.

— D

83) D

- Cholera is spread by Housefly
- Malaria is spread by mosquito
- Trypanosomiasis is spread by Tsetsefly

84) A - This brings about differences between individuals of same species.

85) Water weed is an aquatic plant, tap-minnows is a fish that feeds on herbivores, tadpole is the larval stage of toad / frog which feeds only on plants and Heron is a tertiary consumer that feeds on fishes (i.e. tap-minnows). — B

86) D - Spiracle and trachea, aveoli & lungs, stomata and lenticels all are respiratory unit and site of insects, mammals and plants respectively. While chloroplast and plastids are unit and site of photosynthesis.

87) A - This is termed stimulus that will elicit a response after which the sensory nerves must ~~not~~ transmit it to the Central nervous system for effector to respond to such a change.

88) C - species

89) B - carbon dioxide

90) A - focus the object under high power.

91) C
 The arteries are blood vessels that transports oxygenated ^{blood} from the heart (except the pulmonary artery which transports the deoxygenated blood from the heart to the lungs) to the body. However, the heart serves as a pumping mechanism and a regulator of blood to the artery. While the veins only carry deoxygenated blood to the heart from the body (except pulmonary vein that carries oxygenated blood to the heart from the lungs).

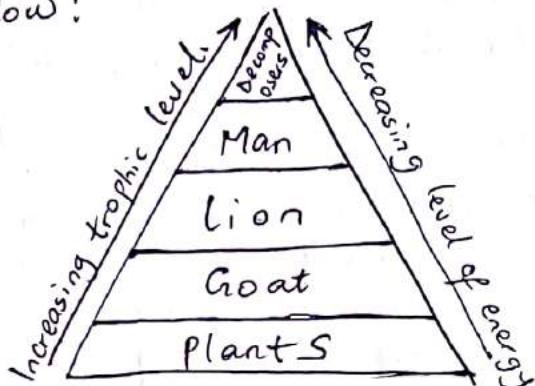
However, the veins have no regulatory or pumping mechanism, so has ~~no~~ valves which helps to disallow the back flow of blood.

92) D - Reproduction.

93) From 2nd law of thermodynamics, it states energy ~~gradually~~ is lost at every feeding level is not 100% (Percent).

because, at every feeding / trophic level, energy is being lost (for continuous maintenance, for physical activities etc).

∴ More energy is conserved at lower trophic level which is shown by the pyramid of energy below:



— [C]

94) Proteases are protein digestive enzymes which breaks off peptide bonds of amino acids to form their basic units.

— Sucrase is an enzyme (digestive) that only digest or convert sucrose (a disaccharide) to its basic units (i.e Glucose and fructose).

— Pepsin is a protein digestive enzyme located at the stomach

— Trypsin and chymotrypsin are proteases with effect at the duodenum of the small intestine.

— [A]

95) Though ATP is produced by two cycle. i.e Glycolysis and Krebs cycle. But basically, the Glycolysis only produces a net ATP of 2 while the Krebs cycle produces 36 ATPs with

their site of effect at cytoplasm and mitochondria respectively. Thus the main site of ATP (Adenosine triphosphate) production is the Mitochondria. — [D]

96) Boiling of the leaf is meant for the ~~order~~ softening of the leaf by breaking the cell walls. While alcohol is added to decolourise the leaf. — [D]

97) The White blood cells (WBC) which are also known as ~~leucocytes~~ the leukocyte are known for their phagocytic character. ~~as~~ that helps to engulf foreign bodies. They are large and have nucleus unlike the Red blood cells that are small and non-nucleated. — [D]

98) [B] - Soldier.

99) A gene/character that over expresses itself over its allele is termed dominant while the allele is recessive.

A case where the two characters / gene expresses themselves the same way (i.e 50% - 50%) is termed co-dominance. — [C]

100) Plasmodium is a vector of malaria carried by mosquito it causes malaria disease when a carrier transmits it into the blood streams of human etc. The other organisms, i.e Paramecium, Euglena, and chlamydomonas are free living organisms usually found in ponds, streams and rivers.

— [A]

101) The phenotype in other words is known as the physical expression or character, expressed by an organism.

Phenotype = Genotype + Environmental factors — [B]

102) [C] - Tongue rolling ability.

103) Chlorofluorocarbons are known for depletion of the ozone layer as its the constituent of the green house gases. — [B]

104) [A] — This is basically due to advancing order of complexity of characters.

105) Option [A] talks more about the theory of use and disuse by postulated by Jean Larmark and as well other options considered the character as relating to physical effect. But, Option [C] could only occur due to species that differs between mosquitoes.

— [C]

106) Regulating the size of nets causes a catch of varying sizes that can result to conservation of smaller fishes. While fishing throughout the year means a constant decrease of fishes in the pond irrespective of the size. — [C]

107) Spirogyra are known for holophytic (photosynthesis) mode of nutrition which will only proceed when there is availability of sunlight or any light source. However, Dark cupboard makes shade, causing a denial of food and eventually die. — [A]

108) Newly weathered soils contains less organic matter which is the major composition of humus

Soil. — [C]

109) Progesterone is a ^{Sexual} hormone that helps in the stimulation of the endometrial secretion and also the preparation of uterus for implantation in the female.

[C] thyroxine is a growth hormone

— Insulin is a hormone produced by the β -Islet of the pancreas that helps in the conversion of excess glucose to glycogen.

— Acetylcholine is an hormone that only facilitate the transmission of impulse across a synapse of the nervous system. — [D]

110) The hierarchy of classification of organisms includes:

Kingdom → Phylum → Class → Order

Species ← Genus ← family

— [D]

111) [B]

The ribs protects the delicate visceral organs (i.e lungs, heart etc) while the skull protects the brain and the pelvis protects the pelvic region and joints located at that part.

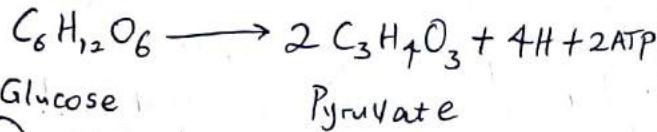
112) [B]

Adrenaline functions for fear and fight by promoting unconscious/reflex actions and responses. These responses may lead to a secretion or stimulation of Glucose to be converted to ATP's (energy currency of the body) and may require the heart beat rate to increase for effective transportation of glucose to target cells. But Constriction of the Pupils is only a function of light.

(113) The pancreas produces the insulin that controls the regulation of blood sugar that will finally be transported to the kidney for the urine formation. — [A]

(114) Chitin, cartilage and bone forms the skeletal system in the arthropodes and ~~annelida~~ chordates while the muscle is just a means or mode of attachment. — [D]

(115) [B]



(116) [C]

The plant cell lacks cell membrane and hence, the cytoplasm coordinates the eflux and influx of materials.

(117) See question 1 — [C]

While mutation of gene refers to error in the coding by the DNA for the production of certain proteins by the Ribosome.

(118) [D] — The filtration of urea from the blood is only the function of the kidney not the liver.

(119) [A] — Aestivation is also termed hibernation which is usually due to lacking in energy and water which eventually causes organism to become dormant.

(120) [B] — As osmosis is the movement of water molecules from a region lower concentrate to a region of higher concentrate through a semi-permeable membrane. The root content is more concentrated than the environment, however, water keeps moving into the plant root of the plant.

(121) Pyruvic acid is produced from a molecule of glucose anaerobically or aerobically. At the presence of Oxygen gas, the pyruvic acid will undergo Krebs cycle (the citric acid cycle). Hence, it will be converted to lactic acid in the muscle cells while in the plant cell it becomes alcohol. — [B]

(122) [A]

(123) See question 121, the Krebs cycle takes places at the mitochondria while the production of Pyruvate (pyruvic acid) takes place at the cytoplasm. — [B]

(124) [B] — see question 1.

(125) [B] — see question 2.

(126) [D] — See question 4 & 105.

(127) A fruit is a fertilized mature ovary which while a seed is evolved from a fertilized ovule. A fruit can contain more than one seed as seen in Berry and may also developed from the receptacle. — [C]

(128) Cercariae is a usually tadpole-shaped larvae trematode worm that develops in a molluscan host from a redia. — [D]

(129) The haploid number refers to meiosis which is usually half of the total chromosome (and the total chromosome in man is 46). Therefore, the haploid number is 23. — [A]

(130) [B]

(131) [B] — See question 117
The DNA is never changed as the DNA itself is making the error

in coding the sequences.

132 D - see question 32

133 Secretion of Islet of Langerhans is at the pancreas whose secretions are Insulin and Glucagon that functions for the regulation of glucose in the body. and its interconversion ~~into~~ into glycogen and vice versa. —

134 Haemoglobin is found in the Red blood cell which is a constituent of the blood. It is an iron compound that have a great affinity for Oxygen. —

135 Villi are finger-like projections at the small intestine that functions for the absorption of digested food materials. They are usually rich in supply of lymph and blood vessels with a thin-wall to allow for an effective diffusion of materials. —

136 C - see question 10.

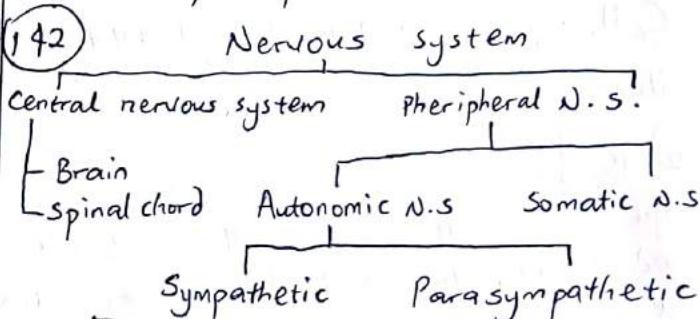
137 B - Increasing the population of the natural enemies of the pest.

138 All non-living factors that affect the characters of an habitat is term abiotic or edaphic factors. While the living factors are known as biotic factors. —

139 Mitosis is splitting of a cell to give rise to daughter cells which a 100% character as that of the parent. Whereas meiosis only occurs between two organism, where the offspring produced gets a total of half character from the father as well as the mother. —

140 B - Rhizobium are organisms found at the root nodules of leguminous plant.

141 Ganglia are nerve cells that transmits impulses at the peripheral nervous system. While dendrites are nerve processes. Synapses however, are spaces between neurons through which impulses cross by means of chemical reactions. And Axons are nerve cells that transmits electric currents of impulses. —



—

143 B - term the father of cell.

144 A - see question 24.

Photosynthesis only uses CO_2 as one of its substrate.

145 C - see question 40.

146 C - Binary fission.

147 The skeleton is the structural framework of the body on which other parts of the body are suspended. This gave the body conformation and provides attachment for muscles. Muscles here contracts and relax to bring about movement of the skeleton. —

148 B - see question 74.

149 A - malleability applies only to iron and not plant.

150 D - The movement of the diaphragm and the intercostal muscles happens intermittently.

(151) A - Vasodilation

(152) C

- Million's test, molisch are used to detect the presence of a carbohydrate. While Benedict and fehling solution test are used to test for a reducing sugar and iodine solution test is to check for the presence of starch which shows a blue black colouration confirming the presence of starch.

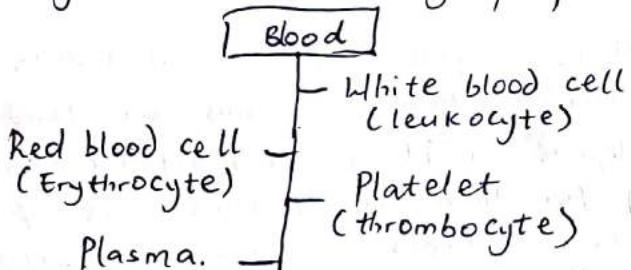
- Biuret and xanthoproteic tests are used to test for proteins.
- Solubility and paper test are also used to test for fats and oil.

(153) B - see question 93.

A pyramid only show the flow of a thing either energy levels, biomass etc.

(154) C

The Blood is a complex tissue with many cell. below is a group of it:



- White blood cell helps to fight foreign bodies.
- Red blood cell helps to transmit oxygen due to its high content of haemoglobin.
- Platelet (helps for clotting of blood)
- Plasma - is the liquid/fluid part of the blood contents.

(155) B - Genotype

(156) A - That's a direct description of a cypsela. example of plant ~~that~~ as example includes tridax.

(157) D

Abundance of food and other needs negates survival of the fittest which ~~can't~~ will never be.

(158) B

flippers are used for swimming while arms are used for grasping

(159) B - Contractile vacuole

(160) A

The filament of Spirogyra are made of many cells which are joined together only by a cytoplasmic strand.

(161) D

An attachment between bone and a muscle is referred to as a tendon while bone to another bone is called a ligament. While the contraction and relaxation of this muscle brings about movement.

(162) The heart is made up the left and right ventricle and auricle. These however regulate the inflow and outflow of blood. The auricle usually receives blood into the heart by the help of veins (that carries deoxygenated blood except pulmonary veins that carries oxygenated blood) while the blood flows from the auricles into the ventricles which finally pumps out the blood into the arteries to the other part of the body (the arteries carries oxygenated blood except pulmonary artery that carries deoxygenated blood). The left auricle and ventricle are divided by a bicuspid valve while a tricuspid valve splits that of the right.

Blood flows from the body (deoxygenated blood) into the heart through the Vena cava and pumped into the lungs for purification by the pulmonary artery, the

Pulmonary veins carries the purified (i.e. the oxygenated blood) blood from the lungs into the left auricle while the left ventricle pumps this blood out of the heart to the other parts of the body through the aorta (the largest artery in the body). — B

(163) S - larynx

164 In a seedling, the plumule becomes the shoot while the radicle becomes the root. Root are however known for growing away from the sun down into the earth / soil. — [A]

165 [B] - see question 109.

166 [A] - see question 142.

The brain a sub-division of the Central nervous system has different parts that functions differently.

- Cerebrum (responsible for the control of voluntary actions.)
- cerebellum functions for the coordination of voluntary muscular action or activities such as eating, talking, running, and walking.
- Medulla oblongata control reflex actions such as breathing, swallowing, vomiting, blinking of the eyelids. etc.
- Thalamus is a relay station and important integrating centre for sensory inputs.

167 [D] - The cambium only functions for secondary growth i.e. increase in girth, size and thickening of bark.

168 [D] - see question 152.

169 [C] - In a natural selection, some organisms get established over another due to some unique certain and surviving features while in an artificial selection, only a particular trait or character is found or seen.

170 [C] - This is the muscular part of the avian digestive tract that contains few set of little stones that help in grinding of seeds - etc.

171 [C] - They are usually exposed to grazing animals.

172 The nucleus of a cell consists of the following:-
- Nuclear pore
- Nucleolus

- Nuclear membrane (Nucleoplasm)
- Chromatid / chromosome.

They functions for us:

- Passage of materials into the Nucleus
 - Rich in proteins and other materials for the proper functioning of the Nucleus
 - Regulation of the nuclear pore
 - Contains the DNA that helps to preserve and transmit hereditary characters from parent to daughter cells.
- Respectively. — [B]

173 [B] - see question 105.

174 [B] - see question 6.

The chlorophyll also gives the green colouration in plants.

175 [D] - Attracting pollinating insects

176 [D] - yellow spot

177 [D] - see question 138.

178 Heterotrophic mode of nutrition is a nutrition when organisms are tend to depend on plants directly or indirectly for their food. This mode of nutrition includes Symbiosis, parasitism, mutualism, saprophytism. etc.

While Holophytism is a nutrition where organism is meant to produce its own food through the absorption of sunlight in presence of certain conditions like; chlorophyll, water, carbon dioxide - etc. — [A]

179 [A] - Broad leaves with numerous stomata.

180 [B] - destroys the organic part of the soil.

181 [B] - see question 82

182 [A] - see question 129.

183 [C] - see question 172.

184 The type of finger prints are 4 in numbers namely: Loop, Whorl, Arch and Compound. — [D]

185 [C] - Eye spot

- 186 B - see question 113 and 133
 Excessive glucose in the blood leads to diabetes mellitus.
- 187 D - See question 118.
- 188 A - see question 118.
- 189 D - Nigerian Red Cross society
- 190 A - see question 24.
- 191 C - This is due to high capacity of holding / retaining water as a result of little particles that makes up the soil.
- 192 B - When pure strains and interbreeding is used, it is only possible due to interaction of genes by ~~all~~ individuals.
- 193 D - Rhesus factors of the donor and Recipient.
- 194 D
 A condition where a fertilized egg splits into two, an identical twins results while a case where the two set of ovaries produces eggs individually and are fertilized by different sperm cell, a fraternal (non-identical) twins results.
- 195 A - see question 104.
- 196 C - See question 105.
- 197 B - produce enzymes to digest cellulose.
- 198 D - while the first name is known as the generic name.
- 199 A - Presence of cilia does not make paramecium higher than amoeba as amoeba has an analogous structure for movement - i.e Pseudopodium.
- 200 A - The meristematic tissues allows for primary growth in plants.
- TUTORIALS / PRACTICE QUESTIONS
 ECOLOGY
 BLESSED
 COMPLEX BLOOMING
- 201 B - see question 109
- 202 B - see question 111
- 203 Pieces of bones and insects suggest that the animal is a carnivore i.e animal feeds on flesh and the presence of seeds and ~~roughage~~ roughage shows it also exhibit the characteristics of ~~a~~ herbivore. With these information the animal can be said to be an omnivorous animal. — A
- 204 C - See question 107
- 205 A - see question 205
 The centre of consideration is plant.
- 206 B - This will only aggravate the situation.
- 207 B - see question 37
- 208 C - see question 152
- 209 D - sporophyte
- 210 A - see question 141
- 211 C - Operculum shows and help for the passage of ~~oxygen~~ water, that acts as opening plate, that as well covers and protect the gills.
 - Muscular tail serve for swimming.
 - Internal gills for respiration.
 - And Long coiled intestine ~~functions~~ for effective digestion of plants.
- 212 - See question 82
 The possible blood group out is O and A.
- Probability of blood group O

$$= \frac{1}{4} \times \frac{100}{1} = 50\% - \boxed{B}$$
- 213
- This case is shown graphically by a curve known as Skewed curve. — B

214) The mitochondria is the site (mainly) for energy production, but this production occurs in the cristae a fold-like structure situated in the mitochondria. — [D]

215) [A] — see question 74.

216) [D] — see question 86.

217) [B] — see question 76.

218) [C] — The like of turbidity, tide, salinity and all are abiotic factors that only affects the aquatic habitat. — [C].

219) [A] — see question 84.

220) [D] — see question 178.

221) [B] — The typanum also known as the ear drum helps to detect sound waves for transmission to the central nervous system.

222) [B] — see question 110

223) [A] — see question 194

224) [D] — As that character is only found in ~~seed~~ ~~pollen~~ plants whose seed is dispersed by insects and birds.

225) [C] — Amoeba, paramecium exhibit heterotrophic mode of nutrition, though Nostoc and plasmodium's heterotrophic nutrition is expressed parasitically while Rhizopus' is a decomposer.

226) [D] — see question 120.

227) Syphilis is a bacterial disease chronic contagious usually venereal and often congenital disease caused by a spirochete (*Treponema pallidum*) which can result in ulcers in

and gummas under the skin and commonly by involvement of the skeletal, cardiovascular and nervous system when it reaches the tertiary stage.

+ *Mycobacterium tuberculosis* causes tuberculosis.

+ *Bordetella pertussis* causes whooping cough.

+ *White clostridium tetani* causes tetanus. All these diseases are all bacterial infection.

228) [C]

The normal human temperature is 37°C. above this temperature, the blood vessels increases in width (Vasodilation) and sweating follows.

229) [D] — see question 29.

230) [B] — see question 48.

The female can only be carrier of such gene (*Haemophilia*) but mainly afflicts the male offspring.

231) Fat and oils quantitatively make up the largest fraction of lipids in most food materials and are characterized by their high-energy value.

Fats produces more energy than proteins and proteins produces more energy than carbohydrates.

Of course 1 gramme of a typical fat yields about 9.45 kcal of heat (energy) when completely combusted, compared with about 4.1 kcal for a typical carbohydrate) — [C]

232) [C]

Ribosomes are known for synthesis of proteins and gets its codings from the DNA, while the RNA helps in the translation of such.

Ribosomes can be found freely in the cytoplasm and also bounded to endoplasmic reticulum.

(233) - Nuclear materials

(234) - This only occurs during respiration but Carbon dioxide is also used as a substrate by plants during photosynthesis.

(235) - Alveoli (singular) is the site for gaseous exchange and diffusion in ~~the~~ mammal. And this is due to rich supply of blood and surface area.

(236) - see question 227.

(237) - Green plants, algae, and bryophytes photosynthesises which only takes place within the organisms as well as digestion. While moulds is a decomposer. which secretes digestive enzymes on the dead matter, while absorbing the digested (i.e decay) materials into the body.

(238) - As heights varies among organisms of the same species.

(239) - Landsteiner and Lavine.

(240) - see question 117.

(241) The glomerulus contains mixture of solutions from the liver and blood cells (as it the main medium of transportation). The glomerular filtrates contains water, urea and blood cells, with several albumin etc. While glucose is already removed at the liver for storage. —

(242) - Though the sickle cell is a type of genetic aberration (i.e. mutation) but due to lack of proper medical care for sickle, the mutated gene keeps on transferring to offspring of affected animal / organisms.

(243) - through diffusion of air into ~~its~~ its body.

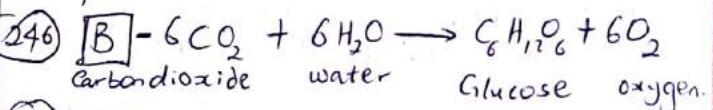
(244) - Amoeba.

(245) Pancreas has a relationship to keep with liver as it produces insulin and glucagon whose effects are at the liver.

* The gall bladder also helps to store ^{excess} bile produced by the liver. However there is a constant touch kept.

* ~~Stomach~~ Duodenum the first segment of the small intestine also keeps constant touch with the liver as the liver helps to produce bile which are transported to the duodenum by liver ducts for digestion processes.

NOTE: There is no suitable answer to the question.



(247) - Biosphere is the part of the earth crust that support life growth.
* Hydrosphere is the region occupied by water in the earth segment.

* Atmosphere is the part of which is constituted of only gases, clouds etc.

* lithosphere is the solid part of earth surface composed of rocks essentially like that exposed at the surface.

(248) - This is the ability to go down into the earth ~~by~~ burrowing holes to prevent dehydration as its skin flexible and succulent.

(249) - see question 82.

(250) - As chloroplast is associated with photosynthesis not respiration.

(251) - measures the turbidity of water.

(252) - See question 67.

(253) - A well cultivated land only allows or meets the condition of a particular species of organism.

254 C - Brooding is the act of applying heat to egg for warmth so that the egg will hatch.

* Brooder - are the hatched organisms of a particular species.

In fish, the brooders will only return to their parents' mouth for protection as they are susceptible to danger.

255 B - see question 121

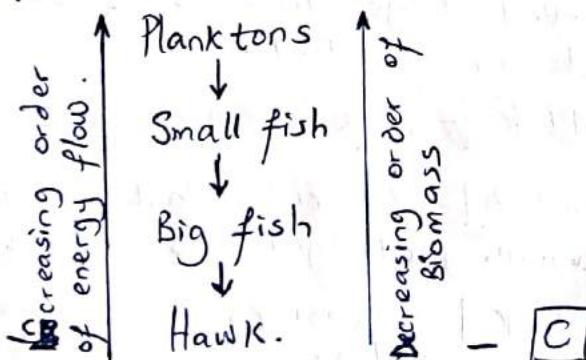
256 B - As epithelial tissues only help for lining of body organs which serves for a protective functions.

* Adipose tissues are contents of fat deposits which are due to excessive fats in the body & for storage.

* Connective tissues only help / functions for attachment - examples includes the bone, cartilage, chitin - etc.

257 A - See question 119

258 Biomass means the amount of living matter (as in a unit area of habitat or volume of habitat). However using the diagram at question number 98, we see the highest level of trophic level is Hawk which will feed on Big fish.

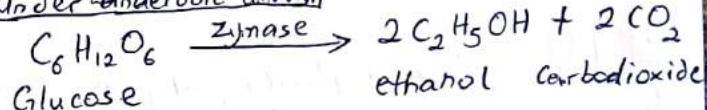


REVIEW QUESTIONS
259 C - see question 10.

260 A - see question 166.

261 B - The fermentation process of starch / glucose is known generally to yield alcohol. As yeast acts as an enzyme / catalyst and contains a collection of enzymes known as Zymase responsible for the fermentation of sugars into ethanol (ethyl alcohol) and carbon dioxide shown in the reaction below.

Under anaerobic condition



262 D - Viviparity has to do with organisms that give birth to their young ones alive e.g man.

* Oviparity ~~are~~ animal that lays eggs which later hatch into their young ones ~~through~~ after incubation / brooding periods - examples are birds and some reptiles.

* Ovoviparity lays eggs and swallow by back the eggs for hatching inside the body and later gives birth to them alive - examples includes some snakes.

263 C

As veins are associated with taking blood back from organs to the heart.

Best of LUCK...

259 D - As this constitute the exchange or blending of characters b/w the opposite chromosomes. This is usually termed CHIASMATA.