



CONCOURS "SEMENCES GENIES SCIENCES ET TECHNOLOGIES"
"BRAIN BOXES IN SCIENCE AND TECHNOLOGY" COMPETITIVE EXAM

PARTIE 1 : QUESTIONS A CHOIX MULTIPLES (20 points)

Ecrire la lettre correspondant à la bonne réponse.

- 1) Durant la période de forte sécheresse, les animaux sauvages de soif.
A) mourus B) mourûtes C) mourûmes D) moururent
- 2) La déforestation contribue énormément à
A) la protection de l'environnement B) la désertification C) la pollution de la mer D) le recyclage.
- 3) Il y a eu des événements à la suite le gouvernement a pris des mesures pour protéger la faune locale.
A) desquelles B) desquels C) auxquelles D) de laquelle
- 4) Léa téléphone souvent à sa sœur. Elle parle presque tous les jours. .
A) le B) la C) lui D) y
- 5) "Un vent violent souffle" à la forme impersonnelle devient.....
A) un vent violent a soufflé B) il a soufflé un vent violent C) il souffle un vent violent D) il soufflait un vent violent.
- 6) Il faut limiter l'utilisation des combustibles fossiles pour réduire
A) la pollution de la mer B) les gaz à effet de serre C) la déforestation D) la désertification.
- 7) Après leur mariage, Armel et Belinda ont choisi la ville de Limbé pour leur.....
A) noces B) fiançailles C) lune de miel D) publication des bans
- 8) Le père de Fanta a **32** ans. Le nombre écrit en lettres est
A) trente-deux B) trente et deux C) trant et deux D) trant deux
- 9) Ils longtemps en France
A) sont vécus B) ont vécues C) ont vécu D) ont vécus
- 10) Quel est la liaison correcte pour les mots "Les amis"?
A) les-z-amis B) le-z-amis C) les-z-amis D) lez-amis
- 11) Michel son dessert
A) as fini B) a fini C) a finit D) sont finis
- 12) Le maire de la ville a organisé un débat sur la protection de l'environnement. J' suis allé.
A) lui B) en C) y D) leur
- 13) Autour de tante Dada, il y a beaucoup d'amis qui sont venus la féliciter pour son succès.
A) maintenant B) hier C) demain D) jadis
- 14) Lors la Journée Mondiale de la Terre, nous à la rencontre des spécialistes des questions liées à l'environnement.
A) allames B) allèrent C) allâmes D) allâtes
- 15) Le procureur de la ville a prononcé entre dame Ngassa et monsieur Tanjo. Ils ne s'entendaient plus dans leur mariage et bagarraient chaque jour.
A) l'union B) le divorce C) l'alliance D) les témoignages
- 16) Les raisons pour nous sommes parties sont confidentielles.
A) lequel B) laquelle C) lesquelles D) lesquels
- 17) Vois-tu encore Julien et Anissa? Oui, je ai vus hier.
A) les B) leur C) en D) leurs

18) Je m'appelle Collins. Le mois passé, dénoncer les braconniers de mon village chez le sous-préfet.

A) je suis allée

B) j'ai allé

C) je suis allé

D) j'ai alle

19) Vous voulez comment, votre viande? Bien cuite?

A) en

B) leur

C) le

D) la

20) Le personnel de l'Hôpital Général de Bafoussam était dans notre école la semaine passée. Ils nous parler des gestes simples qui peuvent sauver une vie en cas d'urgence.

A) sont venus

B) sommes venus

C) ont venus

D) sont venues.

COMPREHENSION DE TEXTE (10 points)

LA CATASTROPHE NATURELLE DU LAC NYOS

Le 21 août 1986, le Cameroun a été frappé par la pire catastrophe naturelle de son histoire. Ce jour-là, une explosion de gaz dans le lac Nyos au Nord-Ouest du pays a fait environ 1800 morts, tuant également de milliers d'animaux.

Quelques jours après la catastrophe, un médecin camerounais s'est rendu aux abords du Lac Nyos pour secourir les victimes. Au micro de RFI, il témoignait: " Presque 36 heures après la catastrophe, le spectacle était absolument insupportable. Il y avait des corps nus partout, aussi bien dans les maisons que dans les champs, aussi bien des enfants que les adultes, femmes, hommes. Il y en avait partout. "

À l'époque, le gouvernement camerounais a interdit aux survivants de revenir aux bords du lac. Les rescapés ont été accueillis dans des camps à une centaine de kilomètres de la région.

La plupart des experts s'accordent à dire que c'est le dioxyde de carbon qui a tué la population sur place. Le gaz carbonique n'est pas un poison mais il provoque une ventilation mécanique. François Le Guern, chercheur français au CNRS, expliquait ce phénomène au micro de RFI: " Quand cette bulle est sortie, elle a provoqué une petite explosion. Une vague qui a détruit toute la végétation sur le pourtour du cratère. Et cette bulle de gaz, qui est probablement faite de CO₂, s'est promenée dans la campagne environnante en asphyxiant la population, qui n'a pas eu le temps de partir".

Deux ans plutôt en 1984, une autre irruption de lac, appelée irruption limnique dans le jargon scientifique, avait tué 37 personnes à Monoun dans le département du Noun.

Le risque d'explosion semble aujourd'hui écarté. Une opération de dégazage du Lac Nyos a été menée par une équipe de scientifiques afin d'éviter un nouveau drame. Pour prévenir une nouvelle explosion, cette équipe a installé des colonnes dans le lac pour le dégazifier. Ces colonnes ont pour rôle de contenir les jets de gaz qui sortent du lac et peuvent exploser à nouveau avec la pression. Le scientifique français Michel Hablwachs a mené ces opérations qui ont démarré en 1987: " En 2001, il y avait au milieu du Lac Nyos un jet naturel qui montait à 50 mètres du haut. Lors des dernières mesures qu'on a faites en avril 2016, on était passé à deux mètres de haut. On doit être à 90% du gaz qui a disparu. Il n'y a plus aucun risque que ça explose dans l'état actuel. "

Article publié le 21 août 2016 par Rfi.

Réponds aux questions suivantes:

1. Quand a eu lieu la catastrophe du Lac Nyos? (1point)

2. Combien de personnes a-t-elle tuées? (1point)

3. Pourquoi les rescapés ont-ils été accueillis dans des camps? **(1 point)**

4. Qu'est-ce qui s'était passé deux ans auparavant? **(2 points)**

5. Le Lac Nyos peut-il encore exploser de nos jours? Pourquoi? **(2 points)**

6. En dehors de la catastrophe du Lac Nyos et de celle du Lac Monoun, cite une autre catastrophe qui a eu lieu au Cameroun ou ailleurs. **(1 point)**

7. Selon toi, est-il possible de prévenir les catastrophes? Justifie ta réponse. **(2 points)**

TRADUCTION (10 points)

INSTRUCTION : Traduis les phrases suivantes en français.

1- Before my arrival, she had bought another uniform for the parade.

2- All the phones that we imported last week have the same characteristics.

3- At such a price, it is really expensive.

4- Her eyes sparkled when the good news was announced.

5- We trust in nobody here.

**CONCOURS SEMENCES GENIES SCIENCES ET TECHNOLOGIES
CORRIGE FRENCH UPPER-SIXTH SCIENCES**

QUESTIONS A CHOIX MULTIPLES (1x20=20 POINTS)

1- D	6-B	11-B	16-C
2. B	7-C	12-C	17-A
3- B	8-A	13-A	18-C
4-C	9-C	14-C	19-D
5-C	10-B	15-B	20-A

COMPREHENSION DE TEXTE

- 1- La catastrophe du Lac Nyos a eu lieu le 21 aout 1986.
- 2- Environ 1800 personnes ont été tuées.
- 3- Les rescapés ont été accueillis dans les camps parce que le gouvernement camerounais a interdit aux survivants de revenir aux bords du lac.
- 4- Une autre irruption de lac appelé irruption limnique avait tué 37 personnes à Monoun dans le département du Noun.
- 5- Non, il ne peut plus exploser de nos jours parce qu'il a été dégazifié.
- 6- Glissement de terre à Gouache- Bafoussam en 2019
 - Eruption du Mont Cameroun en 2000
 - Glissement de terre à Damas-Yaounde en 2024
 - Séisme et tsunami de 2004 dans l'océan indien, etc

NB-Toute réponse juste du candidat vaut 1pt

7 – OUI/NON +JUSTIFICATION DU CANDIDAT (2 points)

TRADUCTION (2×5 =10 points)

- 1- Avant mon arrivée, elle avait acheté un autre uniforme/une autre tenue pour le défilé.
- 2- Tous les téléphones que nous avons importés la semaine dernière présentent/ont les mêmes caractéristiques.
- 3- A un tel prix, il est vraiment cher/c'est vraiment chère/cher.
- 4- Ses yeux ont brillé mille feux à l'annonce de la bonne nouvelle.
- 5- Nous ne faisons confiance à personne ici.



CONCOURS "SEMENCES GENIES SCIENCES ET TECHNOLOGIES"
"BRAIN BOXES IN SCIENCE AND TECHNOLOGY" COMPETITIVE EXAM

Subject: **MATHEMATICS** Classe : **Form 1/ Form 1 Technical** Duration: **2 hours**

Answer all the questions

Part A: 40%

Copy the question number and the letter that corresponds to the correct answer.

If you change your mind on the chosen answer, circle the letter and make a different choice.

Each question carries a mark.

1. The value of $3^5 \div 3^2$ is [A] 3 [B] 9 [C] 27 [D] 81
2. Which of the following statements is true?
[A] $-2 > -5$ [B] $-3 > 2$ [C] $-2 < -5$ [D] $-3 > -2$
3. The number $23 \cdot 57$ written to one decimal place is ;
[A] $23 \cdot 6$ [B] $2 \cdot 357$ [C] $235 \cdot 7$ [D] $23 \cdot 5$
4. The next number in the number sequence 1, 3, 6, 10, ... is
[A] 12 [B] 16 [C] 11 [D] 15
5. 20% of a number is 8. What is the number? [A] 40 [B] 32 [C] 160 [D] 30
6. A student has $\frac{3}{5}$ in a quiz. The teacher converts it on 20. What is his new mark?
[A] $\frac{6}{20}$ [B] $\frac{12}{20}$ [C] $\frac{15}{20}$ [D] $\frac{10}{20}$
7. The next number in base five after 44_{five} is; [A] 45 [B] 100 [C] 10 [D] 50
8. The time from 100BC to 300AD is? [A] 200 years [B] 400 years [C] 3 years [D] 30,000 years
9. An apple is divided into 5 equal slices. The mass of one slice is 36g. What is the mass of $\frac{2}{5}$ of apple?
[A] 72g [B] 18g [C] 180g [D] $7 \cdot 2g$
10. A basket contains 50_{eight} oranges. How many oranges are in the basket?
[A] Forty [B] Fifty [C] Fifty eight [D] Sixty two
11. 40% of babies in a maternity ward are females. Given that there are 30 babies in the ward, how many babies are female? [A] 20 [B] 12 [C] 10 [D] 15
12. A bottle of juice contains 20 glasses of juice. To how many persons can you serve equal number of glasses without any left over? [A] 3 [B] 4 [C] 6 [D] 8

13. A sitting platform is triangular. Which of these number of chairs can be arranged on this platform in lines orderly? [A] 20 [B] 32 [C] 45 [D] 50
14. Two quantities A and B varies as shown in the table given. What is the constant of proportionality?

A	2	3	4	5	...
B	10	15	20	25	...

- [A] 20 [B] 2 [C] 5 [D] 10
15. The number of edges of a cuboid is [A] 12 [B] 4 [C] 6 [D] 8
16. At what point is the angle denoted $\angle RTM$ formed?
[A] R [B] T [C] O [D] M
17. $80m + 500cm =$ [A] $508m$ [B] $80 \cdot 5m$ [C] $85m$ [D] $850m$
18. The product of the base and the height of a triangle is $15cm^2$. Its area is:
[A] $30cm^2$ [B] $7 \cdot 5cm^2$ [C] $60cm^2$ [D] $20cm^2$
19. Given that M is the midpoint of [CD], which of the statements is true?
A [MC] = [MD] B [CM] = [CD] C $[CD] = \frac{1}{2}[CM]$ D [MD] = 2[CD]
20. Two girls are standing on two different points on a circle throwing and catching a ball. The distance between them is called; [A] *Diameter* [B] *Arc* [C] *Radius* [D] *Chord*

Part B: 60%

Each question carries 3 marks.

Show all your working and present your work orderly

- Glory is sick and has to take a particular medicine; 3 tablets in the morning, and 3 in the evening for 8 days.
 - How many tablets does she take in 8 days?
 - How many packets does she take for her treatment given that each packet contains 8 tablets??
- The given table shows the lengths of time a number of students take to clean a hall.

Number of students	20	15	10	...
Time(minutes)	30	40	60	...

- How long would it take 12 students to clean the hall
- How many students are required to clean the hall for 15 minutes?

3. Prizes were awarded to the best 3 Mathematics students in form 3 of a school; Nfor, Tamfu and Kanjo in the ratio 5 : 3 : 2 respectively.

Given that Tamfu had 27,000FCFA, what is the total amount of money for the prizes?

4. A bottle contains 20cl of medicine. How many doses of 5ml can be obtained from it?

5. Nina's account in the bank shows $-50,000FCFA$ and Brian's $-30,000FCFA$.

a) Who has a more positive balance than the other?

b) They are each given 60,000FCFA, Calculate the new readings of their accounts.

6. A group of students are divided equally into 5 different sub groups.

a) Find the number of students in each sub group.?

b) How many students are in 3 sub-groups?

7. Tanto opened a packet of sweets, shared equally to a group of students and 15 sweets were remaining.

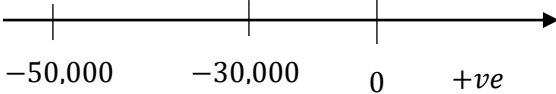
Given that he shared $\frac{3}{4}$ of the packet, how many sweets were in the packets?

8. The map of a garden is drawn to the scale 1 : 100 . Given that the width of a bed is 0.6cm on the map, calculate its actual width.

9. A rectangular floor of dimensions 6m by 4m is to be covered with square tiles of dimensions 20cm by 20cm. How many tiles are required for the floor?

10. The mean age of three friends; Marcus, Tim and Rene is 42. Bong joins the three friends and the mean age of the four becomes 40. How old is Bong?

MARKING GUIDE FORM 1			
Section	Number	Solutions	Mks
A	1	C	01
	2	A	01
	3	A	01
	4	D	01
	5	A	01
	6	B	01
	7	B	01
	8	B	01
	9	A	01
	10	A	01
	11	B	01
	12	B	01
	13	C	01
	14	C	01
	15	A	01
	16	B	01
	17	C	01
	18	B	01
	19	A	01
	20	D	01
B	1	a) No. of tablets for 8 days = 6×8 = 48	A2
		b) No. of tablets per packet = $\frac{48}{8}$ = 6	A1
	2	a) Inverse proportion: Product of each pair of values = 600 Time for 12 students to clean = $\frac{600}{12}$ = 50 minutes	A1
		b) No. of students to clean the for 15 mins = $\frac{600}{15}$ = 3	A2
	3	Nfor :Tamfu: Kanjo = 5:3:2 Tamfu = 27,000FCFA Total amount for the prizes = $\frac{27,000}{3} \times 10 = \mathbf{90,000FCFA}$	A3

	4	Vol. of medicine in bottle = 20cl $20\text{cl} = 20 \times 10\text{ml}$ $= 200\text{ml}$ One dose = 5ml Number of doses from bottle = $\frac{200}{5}$ $= \mathbf{40 \text{ doses}}$	A2
	5	a)  Miriam has a more positive account	A1
		b) Tata's new reading = $-50,000 + 60,000$ $= \mathbf{10,000\text{FCFA}}$ Miriam's new reading = $-30,000 + 60,000$ $= \mathbf{30,000\text{FCFA}}$	A2
	6	a) No. in a sub group = $\frac{30}{5}$ $= \mathbf{6 \text{ students}}$ b) No. in 3 sub-groups = 6×3 $= \mathbf{18 \text{ students}}$	A1 A2
	7	Fraction of packet left = $1 - \frac{3}{4}$ $= \frac{1}{4}$ $\frac{1}{4}$ of pack of sweets = 15 $\Rightarrow 1 \text{ pack} = 15 \times 4 = \mathbf{60 \text{ sweets}}$	A3
	8	Scale = 1 : 100 Width of bed on map = 0.6cm Actual width = $0.6\text{cm} \times 100$ $= \mathbf{60\text{cm}}$	A3

	9	Area of floor = $600cm \times 400cm$ $= 240,000cm^2$ Area of floor = $20cm \times 20cm$ $= 400cm^2$ Number of tiles = $\frac{240000}{400}$ $= \mathbf{600}$	A3
	10	Mean age of 3 children = 42 $\Rightarrow$ sum of their ages = 42×3 $= 126$ Mean age of 4 children = 40 $\Rightarrow$ sum of their ages = 40×4 $= 160$ Bong's age $= 160 - 126$ $= \mathbf{34yrs}$	A3



CONCOURS "SEMENCES GENIES SCIENCES ET TECHNOLOGIES"
"BRAIN BOXES IN SCIENCE AND TECHNOLOGY" COMPETITIVE EXAM

Subject: **MATHEMATICS** Classe : **Upper six science** Duration: **4 hours**

Answer all the questions

Part 1: (40%)

Write down the letter corresponding to the most appropriate answer against the question number on your answer sheet.

1. Given that the function f is periodic with period 5. Where $f(x) = \begin{cases} -x^2 + x + 6, & \text{for } 0 \leq x < 3 \\ ax - 5, & \text{for } 3 \leq x \leq 5 \end{cases}$
 - i. The value of 'a' for which f is continuous is
[A] $\frac{13}{3}$ [B] $\frac{-5}{3}$ [C] $\frac{5}{3}$ [D] $\frac{23}{3}$
 - ii. The value of $f(-1.5)$ is
 - iii. [A] 2 [B] $\frac{10}{3}$ [C] 0 [D] $\frac{5}{6}$
2. The events A and Q are such that $P(A) = \frac{2}{5}$, $P(A \cap Q) = \frac{2}{7}$ and $P(A/Q) = \frac{4}{7}$
 - i. then $P(Q)$ is
[A] $\frac{1}{2}$ [B] $\frac{2}{7}$ [C] $\frac{3}{5}$ [D] $\frac{3}{7}$
 - ii. The value of $P(Q/A)$ is
[A] $\frac{3}{7}$ [B] $\frac{1}{7}$ [C] $\frac{5}{7}$ [D] $\frac{4}{7}$
 - iii. Write True or False as the case maybe : A and Q are independent
3. Given that $f(x) = \frac{\ln x}{x-1}$
 - a) the domain of f is
[A] $x \neq 1$ [B] $\{x \neq 0, x \neq 1\}$ [C] $\{x \neq 0, x \neq 1\}$ [D] $\{x > 0, x \neq 1\}$
 - b) $\lim_{x \rightarrow 1} f(x)$ is
[A] 0 [B] ∞ [C] 1 [D] -1
4. The equation $|z - 1| = |z + 2|$ is
[A] a line : $x = \frac{1}{2}$ [B] a line : $x = -\frac{1}{2}$ [C] a circle, radius $r = -\frac{1}{2}$ [D] a circle, radius $r = \frac{1}{2}$

Part 2 (60%) Show full working, presenting your work orderly and in good English.

5.

- i. The sum of the n terms of a series is given by $9\left(1 - \frac{1}{3^n}\right)$.

Find a) the n^{th} term

b) the sum of the infinity of the series

- ii. A woodman stocks $(8k+15)$ logs of wood in a pile so that the pile contains k horizontal layers.

The top layer contains 8 logs. each layer contains one log more than the layer immediately above.

Find c) the value of k

d) the total number of logs in the stock.

(8,6)

6.

- i. Given the matrix represented by $T = \begin{pmatrix} 1 & -1 & 1 \\ 2 & -1 & -4 \\ 3 & -2 & -2 \end{pmatrix}$

a) Find the inverse T^{-1} of T .

b) Hence or otherwise solve the system of equations
$$\begin{cases} x - y + z = 4 \\ 2x - y - 4z = 3 \\ 3x - 2y - 2z = 2 \end{cases}$$

c) Find the image of the plane $\Pi : 3x - 2y - 2z = 2$ under the transformation of T . (8 marks)

- ii. Relative to an origin, the points A, B, C D and E, shown in the diagram, have position vectors $i+11j$, $2i+8j$, $-i+7j$, $-2i+8j$ and $-4i+6j$ respectively.

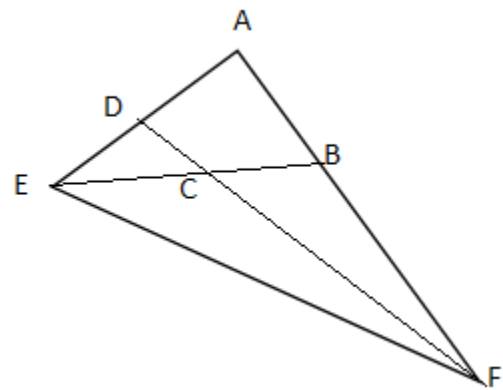
The lines AB and DC intersect at F. Calculate:

a) The vector equations of the lines AB and DC

b) The position vector of the point F

c) Show that FD is perpendicular to EA.

(9 marks)



7.

- i. Given that $\arctan 4 - \arctan 2 = \arctan x$, find x .

- ii. Prove the identity : $\frac{1}{1-\sin y} + \frac{1}{1+\sin y} = 2\sec^2 y$.

- iii. Given $f(\theta) = \sqrt{3}\cos\theta - \sin\theta$

Express $f(\theta)$ in the form $R\cos(\theta + \lambda)$ where $R > 0$ and λ is acute in radians.

hence find all values of θ in the interval $-2\pi \leq \theta \leq 2\pi$ for which $\frac{1}{f(\theta)+4}$ attains

a) its maximum

b) its minimum

(4,3,9)

- 8.
- i. The engine of a car of mass 400kg works at a constant rate of 15Kw. A non-gravitational resistance to the motion of the car is constant and the maximum speed of the car on level ground is 8m/s.
- a) Find the acceleration of the car when it is travelling at 4m/s directly up a road inclined at α° to the horizontal where $\sin \alpha = \frac{1}{10}$.
- Given that the car covers 20m up the road
- b) Calculate the the work done by the engine.
- ii. A particle of mass 0.5kg moves on the inside surface of a smooth spherical bowl of radius 40cm, describing a horizontal circle at a distance 20cm below the centre of the bowl with uniform speed.
- Find :
- c) the speed of the particle
- d) the force acting towards the centre of the circle described. (6,7)

CONCOURS "SEMENCES GENIES SCIENCES ET TECHNOLOGIES"
"BRAIN BOXES IN SCIENCE AND TECHNOLOGY" COMPETITIVE EXAM

Subject: Physics Class: Form 5 Duration : 4 hours coef: 4

INSTRUCTIONS: Answer all questions

SECTION A: Multiple choice questions

1. A body is taken from the equator to the North Pole.
A) Its mass decreases and its weight remains constant
B) Its mass remains constant but its weight increases
C) Its mass increases and its weight remains constant
D) Its mass and weight both remain constant
2. A ball is thrown downward at 5ms^{-1} from a roof 10 m high. Its velocity when it reaches the ground is
A) 13ms^{-1}
B) 14ms^{-1}
C) 15ms^{-1}
D) 20ms^{-1}
3. Which of the following energy sources are all renewable sources?
A) Wood, wave, animal waste
B) Sun, uranium, tides
C) Geothermal, coal, wind
D) Petrol, flowing water, sun
4. A stone of mass 0.05 kg is moving with a velocity of 20ms^{-1} . How much kinetic energy does the stone possess?
A) 2 J
B) 4 J
C) 20 J
D) 40 J
5. When a trumpet and a guitar are used to play the same musical note a difference is noticed. This difference is due to the
A) Fundamental
B) Overtones
C) Frequency
D) Pitch
6. An object is placed at a point beyond 2F from a converging lens, the image formed is:
A) Real, diminished, inverted
B) Real, magnified, erect
C) Virtual, magnified, erect
D) Real, same size, inverted
7. The primary coil of a transformer is often wound on the secondary coil so as to prevent:
A) High resistance losses
B) Hysteresis losses
C) Flux linkage losses
D) Eddy current losses
8. The numerical value of absolute zero in degree Celsius is:
A) 273
B) 100
C) 0
D) -273
9. A cellulose acetate rod rubbed with cloth:
A) Gains protons and becomes positively charged
B) Gains electrons and becomes negatively charged
C) Losses protons and becomes negatively charged
D) Losses electrons and becomes positively charged
10. A 2400 W electric iron is used at maximum output for 6 hours in a month. If the cost of a unit (1kWh) of electricity is 60 FCFA, how much will the user pay as electricity bill for that month?
A) 8640 FCFA
B) 1440 FCFA
C) 864 FCFA
D) 360 FCFA
11. The best reason why aluminium is often preferred to steel in the construction of aircraft is that aluminium:
A) Does not rust

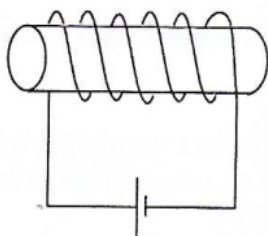
- B) Has a lower density
C) Has a shiny appearance
D) Has a higher mass per unit length
12. Which of the following determines the loudness of sound?
A) Wavelength
B) Frequency
C) Overtones
D) Amplitude
13. The critical angle for a ray of light incident in water at a water-air boundary is 47.8° . The refractive index of water is
A) 0.7
B) 1.0
C) 1.3
D) 1.9
14. It is not possible to predict which atom of a particular radioactive sample will decay. This is because
A) Radioactive decay is random process
B) Radioactive decay is a spontaneous process
C) During radioactive decay the mass of the radioactive isotope reduces
D) The half-life of a particular radioisotope is constant
15. One material that cannot be picked up by an electromagnet is
A) Silver
B) Iron
C) Steel
D) Cobalt
16. When evaporation takes place the temperature of the remaining liquid drops because
A) The slowest molecules are escaping
B) The fastest molecules are escaping
C) The pressure on the liquid is decreasing
D) The pressure on the liquid is increasing
17. In a velocity-time graph the area between the graph and the time axis gives:
A) Total momentum
B) Total distance covered
C) Total acceleration
D) Total work done
18. A bimetallic strip curves when heated. This is because the two metals:
A) Resist expansion
B) Resist contraction
C) Expand by different amounts
D) Contract by different amounts
19. A current of 8 A flows in a wire for 12 s. Given that the charge on an electron is 1.6×10^{-19} C, the number of electrons that pass a point in the wire during this time is
A) 9.6×10^{10}
B) 6.0×10^{10}
C) 9.6×10^{20}
D) 6.0×10^{20}
20. The electrical resistance of a certain material decreases when its temperature is increased. This material must be:
A) Silicon
B) Iron
C) Copper
D) Tungsten
21. Which of the following is not true about magnetic field lines?
A) They go from the North to the South pole of the magnet
B) The field lines repel each other
C) They never cross each other
D) The closer the field lines the weaker the field
22. The relationship between the frequency (f) of a vibrating string and its vibrating length (l) is:
A) $f \propto l$
B) $f \propto \frac{1}{l}$
C) $f \propto \sqrt{l}$
D) $f \propto \frac{1}{\sqrt{l}}$
23. Drinking glasses will not easily break when they are packed and transported in spongy material. Which law explains this?
A) Newton's First law
B) Newton's Second Law
C) Newton's Third law
D) Law of conservation of Linear Momentum

24. In a vacuum, all electromagnetic waves have the same
 - A) Amplitude
 - B) Frequency
 - C) Speed
 - D) Wavelength
25. The electrical resistance of a metallic conductor is inversely proportional to its:
 - A) Cross-sectional area
 - B) Length
 - C) Resistivity
 - D) Temperature
26. Alternating current is preferred to direct current is preferred to direct current for transmission of electrical power because:
 - A) It can easily be stepped up and stepped down
 - B) It is easily generated
 - C) Thinner conducting wires can be used
 - D) It can easily be changed to direct current
27. The kWh is the unit of:
 - A) Energy
 - B) Potential
 - C) Power
 - D) Resistance
28. Which of the following electrical devices operates effectively using a soft magnetic material?
 - A) Loud speaker
 - B) TV set
 - C) Radio set
 - D) Electric bell
29. The heat supplied to a substance during change of state goes to increase:
 - A) The temperature of the substance
 - B) The kinetic energy of the substance
 - C) The mass of the substance
 - D) The potential energy of the substance
30. Two forces of magnitude 3N and 4N are acting on a body. The maximum resultant force that can be obtained is:
 - A) 1N
 - B) 5N
 - C) 7N
 - D) 12N
31. The principle on which a hydraulic machine functions is based on
 - A) Equal transmission of force
 - B) Equal transmission of pressure
 - C) Equal transmission of energy
 - D) Equal transmission of oil
32. An object is charged by bringing a charged object close to but not touching it. This process can be described as:
 - A) Charging by friction
 - B) Charging by rubbing
 - C) Charging by induction
 - D) Charging by transfer
33. A builder raises a bag of cement of mass 50 kg onto a platform which is 3 m high. The work done by the builder in joules is:
 - A) 1500
 - B) 500
 - C) 250
 - D) 150
34. Which of the following is not a contact force?
 - A) Friction
 - B) Weight
 - C) Tension
 - D) Upthrust
35. Which of the following is true about a p-type semiconductor?
 - A) It has a net positive charge
 - B) It has more conduction electrons than holes
 - C) It has more holes than conduction electrons
 - D) It has an equal number of holes and conduction electrons

36. A thermometer can read a minimum temperature of -10°C and a maximum temperature of 130°C . The temperature range of this thermometer is:
- A) 140°C
 - B) 120°C
 - C) 100°C
 - D) 90°C
37. An electric circuit is made up of a $20\ \Omega$ resistor connected in parallel to a $30\ \Omega$ resistor. The effective resistance of the circuit is:
- A) $10\ \Omega$
 - B) $12\ \Omega$
 - C) $50\ \Omega$
 - D) $60\ \Omega$
38. Light travels in straight lines. This property of light is called
- A) Diffraction
 - B) Rectilinear propagation
 - C) Refraction
 - D) Reflection
39. Sound waves from a ship are sent towards the bottom of the sea floor. The waves return 2s later. What is the depth of the sea at that point given that the speed of sound in water $1500\ \text{m/s}$?
- A) 750 m
 - B) 1500 m
 - C) 3000 m
 - D) 30 m
40. A rainbow is an example of
- A) A Pure spectrum
 - B) An impure spectrum
 - C) An effect of reflection
 - D) An effect of total internal reflection

SECTION B: Structural and essay questions

1. 1a) a) i) State the First law of Magnetism 1mk
 ii) What do you understand by a hard magnetic material? 1mk
 iii) Give one example of a hard magnetic material 1mk
 iv) Name one device that makes use of a hard magnetic material. 1mk
 b) The figure below shows a current-carrying coil carrying a current, I , wound round a soft iron core.



- ii) Copy and complete the diagram, showing the direction of current, magnetic poles of the iron core and the magnetic field lines. 3mks
 iii) State two factors that will determine the magnetic field strength 2mks
 iv) Name a device which makes use of this setup. 1mk
2. a) The table below shows the three kinds of radiation emitted during a radioactive decay.

Radiation	Range in air	Deflection in an electric field	Minimum stopping material
Alpha		Towards the negative plate	
Beta	Few metres		
Gamma			Thick sheet of lead

- i) Define radioactive decay 2mks
 ii) Copy and complete the table above concerning different forms of radiation 3mks
- b) The count rate of a sample of carbon-14, $^{14}_6\text{C}$, drops from 1000 counts min^{-1} to 250 counts min^{-1} in 11600 years.
- i) Define half-life. 2mk
 Determine:
 ii) the half-life of the sample 2mks
 iii) the number of protons and neutrons in the carbon nucleus. 2mks
 iv) the neutron to proton ratio of $^{14}_6\text{C}$ and state if it is stable or not. 2mks
 v) State an instrument that can be used to detect the presence of radioactivity in the environment. 1mk