higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NON-NATIONAL CERTIFICATE

SPECIALISED ELECTRICAL INSTALLATION CODES

(First paper)

(8080654)

26 July 2021 (X-paper)
09:00–12:00

This question paper consists of 5 pages and an information sheet of 3 pages.

038Q1G2126

Copyright reserved

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NON-NATIONAL CERTIFICATE
SPECIALISED ELECTRICAL INSTALLATION CODES
(First paper)
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each question on a new page.
5. Only use a black or blue pen.
6. Write neatly and legibly.

Copyright reserved

QUESTION 1: OCCUPATIONAL HEALTH AND SAFETY ACT 85 OF 1993 – ELECTRICAL INSTALLATION REGULATIONS

Define the following:

1.1 Master installation electrician (6)

1.2 Electrical installation (5)

1.3 Certificate of compliance (3)

1.4 Registered person (2)

1.5 Fill in the missing words in the statements below by writing only the answers next to the letters (1.5.1–1.5.4) in the ANSWER BOOK.

Specialised electrical installations refers to electrical installations in:

1.5.1 … as contemplated in SANS 10086-1

1.5.2 The … as contemplated in SANS 10089-2

1.5.3 Hazardous locations as contemplated in SANS …

1.5.4 … as contemplated in SANS 10142-1, published by Standards South Africa (4)

[20]

QUESTION 2: SANS 60079-10-1: 2016 EXPLOSIVE GAS ATMOSPHERES

2.1 What is area classification? (3)

2.2 Draw THREE free-hand sketches used to indicate Zone 0, Zone 1 and Zone 2 locations respectively. (3 × 2) (6)

2.3 Name the THREE grades of release in their order of decreasing frequency of occurrence. (3)

[12]

QUESTION 3: SANS 60079-10-2: 2018 EXPLOSIVE DUST ATMOSPHERES

3.1 Name the THREE zones that are used in explosive dust environments. (3)

3.2 Describe the THREE steps (steps ONE to THREE) that are considered when doing area classification for explosive dust environments. (10)

3.3 When should area classification reviews be done? (5)

[18]

Copyright reserved

QUESTION 4: SANS 60079-0: 2019 EXPLOSIVE ATMOSPHERES GENERAL REQUIREMENTS

4.1 Choose an item from COLUMN B that matches a description from COLUMN A. Write only the letter (A–J) next to the question number (4.1.1–4.1.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.1.1	Flameproof	A	Ex-i
4.1.2	Special protection	B	Ex-d
4.1.3	Dust (protection by enclosure)	C	Ex-o
4.1.4	Powder/Sand filled	D	Ex-p
4.1.5	Non-sparking	E	Ex-q
4.1.6	Pressurisation	F	Ex-m
4.1.7	Increased safety	G	Ex-s
4.1.8	Oil immersion	H	Ex-n(nA)
4.1.9	Intrinsic safety	I	Ex-“t”
4.1.10	Encapsulation	J	Ex-e

(10 × 1) **[10]**

QUESTION 5: SANS 10123: 2014 THE CONTROL OF UNDESIRABLE STATIC ELECTRICITY

5.1 Dissipation of static from equipment.

State the factors and describe what should be observed for the safe dissipation of static from the following:

5.1.1 Outlet nozzles in flammable dust environments (2)

5.1.2 Objects in dust streams (2)

5.1.3 Sampling devices (1)

5.1.4 Bags for collecting and transporting dusts (2)

5.1.5 Safety guards for conveyor belts (2)

5.2 To reduce the danger of electrocution to personnel, how much should the resistance to earth of an antistatic or conductive floor be? (1)

[10]

Copyright reserved

QUESTION 6: SANS 10108: 2017 THE CLASSIFICATION OF HAZARDOUS LOCATIONS AND THE SELECTION OF EQUIPMENT FOR USE IN SUCH LOCATIONS

6.1 When should area classification be carried out? (2)

6.2 What is the responsibility of the employer with regard to area classification? (3)

6.3 Who should carry out the area classification of hazardous areas or locations? (3)

6.4 Define a competent person according to this standard. (3)
[11]

QUESTION 7: GENERAL: EXPLOSION PROTECTED EQUIPMENT SELECTION AND USE IN HAZARDOUS LOCATIONS

7.1 Explain the following equipment marking: Ex e IIA T3 Gb

What does each section of this marking indicate? (5)

7.2 Use the chemical properties Table A.1 (pg.1 and 2) (attached) to answer the questions about the gas group and the temperature class for the equipment indicated in Table A (Equipment selection and verification for hazardous locations) (attached).

Write only the answers (a)–(d) next to the question number (7.2.1–7.2.4) in the ANSWER BOOK. Follow the example given at the start of Table A. (14)
[19]

TOTAL: 100

Copyright reserved

INFORMATION SHEET

Table A

Equipment selection and verification for hazardous locations

Equipment		Hazardous Location Information								Yes/No?	
		Classification		Chemical	Gas Group		Temperature Class				
Example:											
Ex nA IIB T2		Zone 1	(a)	Illuminating Paraffin	IIA	(b)	T3 (210)	(c)		(d)	
Question:		Can Ex-nA be used in Zone 1?			Can a Gas Group IIB equipment be used in a Gas Group IIA environment?		Can a T2 equipment be used in an environment where chemical ignites at T3?			Can this equipment be used in the hazardous location?	
Answers		(a)	**No**		(b)	**Yes**	(c)	**No**		(d)	**No**
Temperature in ºC T1 = 450 T2 = 300 T3 = 200 T4 = 135 T5 = 100 T6 = 85											
7.2.1	Ex e IIA T1	Zone 1	(a)	Butane	IIA	(b)	T2 (430)	(c)		(d)	
7.2.2	Ex p IIB T2	Zone 1	**Yes**	Ethylene	IIB	(a)	T2 (450)	(b)		(c)	
7.2.3	Ex ib IIB T6	Zone 1	(a)	Decane	IIA	(b)	T3 (250)	(c)		(d)	
7.2.4	Ex ic IIB T3	Zone 2	(a)	Propane	IIA	**Yes**	T1 (465)	(b)		(c)	

Copyright reserved

Table A.1 – Properties of certain flammable industrial gases and vapours

1	2	3	4	5	6
Gas (substance)	**Ignition temperature** °C	**Explosive limit in air** % (volume fraction)		**Typical flash point** °C	**Relative density** (air = 1)
		Upper	**Lower**		
Group I					
Methane	537	15,0	5,0	-188	0,55
Methane and coal dust	150	15,0	5,0	-	0,55
Flammable gas[8] (methane and other hydrocarbon mixtures)	-	22,0b	4,5b	-	-
Subgroup IIA					
Blast-furnace gas	-	70,0	28,0	-	-
Propane	465	9,5	2,0	< -6,7	1,5
Petrol	560	8,0	1,2	-45	2,8
Diesel	257	7,5	0,6	> 55	> 1
Illuminating paraffin or kerosene	210	8,9	1,4	95	> 1
Power kerosene	-	< 5,0	> 0,7	> 38	> 1
Butane	430	8,5	1,5	< -6,7	2,0
Pentane	309	7,5	1,5	< -51,0	2,5
Hexane	260	7,0	1,0	< -29,0	3,0
Heptane	233	6,0	1,0	-1,1	3,5
iso-Octane	530	3,5	0,5	-12,2	3,9
Decane	250	-	0,5	46,0	4,9
Benzene	538	8,0	2,0	-11,1	2,7
Xylene	482	6,0	1,0	25,0	-
Cyclohexane	285	8,5	1,0	0	2,9
Acetone	538	13,0	3,0	-9,4	2,0
Ethyl-methyl ketone	515	12,0	2,0	1,7	2,5
Methyl acetate	454	15,5	3,0	-10,0	2,5
Ethyl acetate	427	11,5	2,0	7,2	3,0
n-Propyl acetate	450	8,0	1,5	4,5	3,5
n-Butyl acetate	421	-	1,5	40,5	4,0
Amyl acetate	398	-	1,0	34,4	4,5
Chloroethylene	413	16,0	6,2	13,3	3,4
Methanol	464	36,5	5,5	18,3	1,1
Ethanol	423	19,0	2,5	18,3	1,6
Butanol	-	-	-	23,9	2,6
iso-Butanol	427	-	1,5	27,8	2,6
n-Butanol	343	-	1,5	28,9	2,6
Amyl alcohol	371	-	1,0	52,8	3,0
Ethyl nitrite	90	50,0	3,0	-35,0	2,6
Ammonia	651	27,0	15,0	-	0,59

[a] Group I: electrical apparatus for mines susceptible to flammable gas.

[b] Group II: electrical apparatus for places with a potentially explosive atmosphere, other than mines susceptible to flammable gas.

Copyright reserved

Table A.1 *(concluded)*

1	2	3	4	5	6
Gas (substance)	**Ignition temperature** °C	**Explosive limit in air** % (volume fraction)		**Typical flash point** °C	**Relative density** (air=1)
		Upper	**Lower**		
Subgroup IIB					
Ethylene	**450**	**35,0**	**2,5**	**< -6,7**	**0,97**
Diethyl-ether	**180**	**48,0**	**1,5**	**-40,0**	**2,6**
Ethylene oxide	**429**	**80,0**	**3,0**	**< -17,8**	**1,5**
Carbon monoxide	**651**	**75,0**	**12,0**	-	**0,96**
	450	**12,0**	**2,0**	-	**1,9**
Buta-1:3-diene					-
Coal gas (town gas)ct	**649**			-	-
Coke-oven gas	-	**31,0**	**5,5**	-	
		34,0	**4,4**		
Subgroup IIC					
Acetylene	**337**	**82,0**	**2,5**	-	**0,90**
Carbon disulfide	**100**	**50,0**	**1,0**	**-30,0**	**2,6**
Hydrogen	**585**	**74,0**	**4,0**	-	**0,07**
Water gas	-	**70,0**	**6,0**	-	-
	-	-	**3,0**	**10,0**	**3,1**
Ethyl nitrate					

[a] Group I: electrical apparatus for mines susceptible to flammable gas.

[b] Group II: electrical apparatus for places with a potentially explosive atmosphere, other than mines susceptible to flammable gas

[c] The use of group 11B apparatus is indicated when a mixture of carbon monoxide with air is saturated with moisture, or when small quantities of hydrocarbons appear in the mixture (worst case).

[d] Town gas and coke-oven gas are mixtures of hydrogen, carbon monoxide and methane. If the sum of the concentrations of hydrogen and carbon monoxide is less than a volume fraction of 75 % of the total, then flameproof apparatus of group 11B is recommended, otherwise apparatus of group IIC is recommended. For all concentrations, group IIC intrinsically safe apparatus is recommended.

Copyright reserved