

1- I t h o I "V h o I { e t h o k p o x h d j . k

I j k o i ' u

i ' u - 1½ [k k y h y f n ? k k R r j h i ' u k p h m R r j f y g k -

1½ v k f n d n d h o n ' ; d n d h i ' k h p h o f ' k " V ; f y g k o R ; k p h m n k g j . k
f y g k -

m R r j % v½ v k f n d n d h i ' k h & T ; k i ' k h P ; k e / ; L i " V f n l . k k j d n d
v k f . k i ' k h v x d u l r k r R ; k i ' k h u k v k f n d n d h i ' k h E g . k r k r -

v k f n d n d h i ' k h p h o f ' k " V ; % &

1½ v k f n d n d h i ' k h v k d j k u [k i y g k u v l u R ; k 1 & 10 μ m
v k d j k P ; k v l r k r - ; k i ' k h i n 0 ; i V y] i ' k h n 0 ; o d n d n 0 ; ; k
? k V d k u h c u y Y ; k v l r k r -

2½ ; k i ' k h r h y d n d k y k v k o j . k u l r E g . k t p i ' k h n 0 ; o d n d n 0 ;
, d = p v l r k r -

3½ ; k i ' k h e / ; , d p x . k l = k p h t k M h v l r j r l p D N A p k j . k
d n d k P ; k v L i " V H k k x k r v l r k - ; k v L i " V H k k x k y k d n d l n ' ; v l
E g . k r k r - m n k - & t h o k . k] v k f d ; k] e k ; d k l y k ÷ e k] l k ; u k c D V f j ; k b -

c½ n ' ; d n d h i ' k h &

^ T ; k i ' k h e / ; L i " V f n l . k k j d n d v k f . k i ' k h v x d v l r k r R ; k
i ' k h u k n ' ; d n d h i ' k h E g . k r k r * .

n';dndh i'khph of'k"V;%&

1½ n';dndh i'kh vdkjku ekB;k vlrr- %5&100µm%

2½ ;k i'khe/; Li"V fnl.kkj dnd vkf.k R;ke/; dndh o dndn0;
vlr.

3½ ;ke/; x.kl=kP;k vud tkM;k vlu DNA, RNA P;k J[kyk
vlrr ;k i'kh vfr'k; fodflr vlu R;k ouLirh o ik.;ke/;
vk<Grkr-mnk- & 'koky] ;fxyuk] vehck] Lik;jkxk;jk] dod] ouLirh
o ik.kh b-

2½ thok.kp egRo fygk l

mRrj % dkgh thok.k g mi;Dr vlrr-

1½ mn;kx/kn;k r fd.ou ifØ;r thok.kpk mi;kx djrr-
l{ethokP;k lkgk;ku cjp ifrtfod r;kj dj.;kr vkyh-

mnk-&v%LVIVkek;flu&LVIVkek;fll xk;fll]

c½ifuflyhu & ifuflyve Øk;lkue

2½ QeV'ku %vkco.k½ifØ;u fofo/k lnh; vkEykP;k fuferhe/;
thok.kpk mi;kx dyk tkrk-mnk- vlvhd vkEy
%f0guxj%&vflVkcDVj vlvh

3½ ngh] rkd] ri] fpt]Jh[kM rlp bMyh] <kdGk] ftych o uku
r;kj dj.;klkBh yDVkcflyk; thok.kpk okij djrr-

5½ ipu lLFkP;k dk;kr fc?kkM >Y;k l yDVkcflyk; o brj l{etho ,df=ri.k jkX;k l nAu mipkj djrr-

6½ ifulyhu ;k ifrtfodkpk mi;kx LVfQykdkd;] DykLVhfMve ;k thok.kP;k l lxkoj mipkjl kBh grrk-

7½ ck;kx l fuferh fofok l{ethokpk leko'k vlrk- ;k l kBh feFkukdd l vkf.k feFkukcflyl ;k thok.kpk mi;kx grrk-

8½ rck[k] pgk o Vkcdek ;kP;k ikuke/; thok.keG Lokn fuek.k grrk-cflyl exFkfj;e

9½ dkrMh deorkuk thok.kpk mi;kx grrk-

10½ L;Mkekuk l thok.k ryxGrh fdok iVkfye inkFkpk fo?kVu djrr-

3½ dodkp vkfFkd egRo fygk-

mRrj% 1½cM o e| cufo.;k l kBh fd.o %;hLV½ fdok l Økek;f l l f j 0gh l h pk okij cdjh mRiknu gyd h o l fPNn cufo.;k l kBh dyk trrk-

2½ fd.okr ^ch* thoulRo foiy iek.kkr vk<Gr- R;keG vk"kl/ke/; R;kpk okij djrr-

3½ cj'khiklu ekB;k iek.kkr ifrtfodkph fuferh dyh trk-mnk-iful fyve ukVVeiklu ifulyhuph fuferh djrr-

4½ ek;dkjk;>k ukokP;k cj'khp okij u= fLFkjhdj.kkr dyk trrk-

5½ xukMek ukokph cj'kh ekB;k iek.kkoj vk"kl/fuferr okijyh
tkr- tfod iu#RFkkukr inf"kr >kyyh ifjILFkk LoPN dj.;klkBh
dkgh cj'khp okij dyk tkrk-

6½ dkgh HkN=kpk [kk] Eg.ku mi;kx dyk tkrk- mnk- 0gkbV cVu
e'k#e] iMh LVk e'k#e] vkbLVj e'k#e

7½ dUMhMk vkf.k lØkek;fll l jf0glh lkj[;k dodkpk ifFku iklr
dj.;klkBh okij dyk tkrk-

4½ 'kokyp egRo Li"V dj-

mRrj % 1½ckÅu 'koky] cgnk lenkP;k ik.;kr vk<Gr- ;k 'kokykr
ikVf'kve DyjkbM vlr- yeufj;k] fl;dl vkf.k vDydfu;k ;klkj[k
ckÅu 'koky vk;kfMu r;kj djrrk- ;kry dkgh 'kokykp mi;kx
vUu Eg.ku dyk tkrk- mnk- l jxkle] fl;dl] Ykfeufj;k] ikjQk;jk]
vYok] ukLVkd b-

2½ uk;Vyk vkf.k djjk ;k 'kokykp mi;kx eyfj;kP;k fueyukl kBh
gkrk-

3½ DykjYYkk ;k 'kokykp mi;kx vrjkGfojkuk vodk'k;kukr
vkfDl tu vkf.k vUuinkFkkpk L=kr Eg.ku gkrk-

4½ djktuhu ;k yky 'kokykp mi;kx tyh] pkydyV] vkbLØhe b-
e/; gkrk-

5½ fyVel iij jklyk fVDVkfj;k ukokP;k yk;du ikl u cuorkr-

5% I"Vh ekujk ph y{k.k I kxu R;kph mnkgj.k fygk-

mRrj % 1%ekujk I"Vhr vkfndndh i'kh vlu Li"V fnl.kkj dnd
rlp i'khvxd ulrr-

2% R;k vR;r uktd o l{e vlrr- dndke/; dndkoj.k] dndh]
dndn0;] fgLVku ifFku rlp iR;{k fdok [kjh x.kl= ulrr ijr
xkydkj DNA ek= vlrr-

3% dkgh thok.kuk gypkyhkBh jked fdok d'kkfHkd vlrr rj
dkgh vpy vlrr-

4% i'khfHkRrdk n< vlu iVhMkXy;du ik lu cuyyh vlrr- ;kuk
iFohojhy lkr ikphu ltho Eg.krr-

5% lo ltho ,di'kh; vlu Lok;ik"kh fdok ijik"kh vlrr- rlp
i'khe/; gjhryod o rrdf.kdk ulr-

6% ituu vfyxh fdok fyxh i/nrhu gkr- mnk&thok.k] fo"kk.k

6% I"Vh ikfVLVkph y{k.k I kxu R;kp oxhdj.k FkkMD;k fygk-

mRrj % 1% ;k I"Vhrhy ltho ,di'kh; vlu dkgh Lo;ik"kh rj
dkgh ijik"kh vlrr- dkgh ijthoh rj dkgh erithoh vlrr-
cgrd oGk ik.;kr rj dkgh tfeuhoj vk<Grkr-

2% gypkyhkBh Nneikn rj dkgh lthokP;k 'kjhkoj jked fdok
d'kkfHkd vlrr- ;kP;k i'khe/; rrdf.kdk] gjhryod]
vkrjn0;tfydk] XkkYxhldy vlrr-

3½ dndkr dndn0;] dndh Ifiykdj DNA, fgLVku ifFkukiklu
r;kj >kyx.kl= vlrrk-

4½ Xyk;dktu o enkP;k Lo#ikr vUulp; dyk trk-

ikfVLVkp oxhdj.k pkj xVkr dy tr-

v½ ouLirh In'; ikVhLVk& g ltho Lo;ik"kh vlu ;kph
i'khfHkRrhdK IY;ykt iklur rlp fi"Ve; inkFkkP;k Lo#ikr
vUu lBorkr- Mk;VeP;k fHkRrhdry L=ko ØkeVxxkQh] xkG.k rlp
ikfyf'kx ifØ;el; okijyk trk-mnk & Mk;Ve] MfLeM

c½ ik.kh In'; ikVhLVk& g ltho ijiik"kh vlu ;kuk fHkRrdk ulr-
rlp Xyk;dktuP;k Lo#ikr vUu lBorkr-mnk- vfeck] ijkef'kve

d½ dodIn'; ikVhLVk& g ltho erkitthoh vlu ;kuk fHkRrdk
ulr- mnk&cj'kh%Lykbe ekYM%

M½ ;fxuykbMI& g idk"kl'y"kh typj ltho vlu idk"k Åtk
uly rj ijiik"kh Eg.ku txrr-mnk- Lo;ik"kh&;fxuyk] OgkY0gkDI]
ijik"kh & vfeck] lykLekfMve

7½ minoh l{ethokph FkkMD;krekfgrh fygk-

mRrj % 1½okrkoy.kke/; l{e vdkjpk dod fctk.k vlrrk- 2½
yk.kp] ejkc] tEl ;klkj[;k vUinkFkkRrhdK dodkP;k fofok itkrhph
ok< grk- o g dod ;k vUinkFkkRrhY ik"kdn0; 'kk"ku ?kou Lor%
ik"k.k djrrk- ijr ;k ifØ;r ek;dkVkd>hu g fo"kkjh jlk;u r;kj
gkÅu vUinkFk fo"kkjh currk-

2½ DykfLVfMve ;k thok.keG vUukru fo"ckk/kk gkr] ek l kph uk l kMh
DykfLVfMve ckV;fyue ;k foukkDIh thok.keG gkrk-

3% lkyekuyk ;k thok.kP;k lIxkeG ek l fo"kkjh curkr-

4% thok.keG ouLirhuk rck[kojhy foYV] dki l kP;k ikukojhy dG
fBid] cVv o Hkkthiky IM.k] fyckojhy l k;VI ddj g jkx
gkrkr-dkch dGiV iMu dtrk-

5% thok.keG ekuoyk i<hy jkx gkrkr v½ lkyekuyk V k;Qh ;k
thok.keG fo"keToj gkrk o f0gfc;k dkyjh ;k thok.keG iVdh jkx
gkrk-

c% cflyl ;k thok.keG gxok gkr o ek;dkcDVfjve V;cjD;yh
;k thok.keG {k; gkrk-

8% cj'kph y{k.k l xur R;kp mi;kx fygk-

mRrj % y{k.k&1%cj'kh fg ,di'kh; fdok cgi'kh; vlrkr- rlp
ijik'kh vkf.k dndh i'kh vlrkr-

2% cj'kh fg fyxh] vfyxh o 'kkL=h; i/nrhu ituu djr-

3% i'khfHkfRrdk gh dk;Vhuph cuyyh vlr- rlp R;kP;ke/;
gfjryod ulrkr-

4% cj'kh vUu X;k;dktu o vkbyP;k Lo#ikr l kBor-

cj'khp mi;kx & 1% tfodiu#RFkkukr in"kh r >yyh ifj l LFkk
LoPN dj.;k l kBh dkgh cj'khp okij dyk trk- xukMek ukokph

cj'^{kh} **ekB**;**k** **iek.kkoj** **vk"**^{k/k} **fuferr** **okijy^h** **tkr-2½ifuflyhu**
lkj[;**k** **ifrtfodkP**;**k** **mRiknukrg^h** **cj'**^{khpk} **okij** **gkrk-**

i'u 2½ fVik fygk-

1½ fd.o (Yeast) -

mRrj % 1½fd.okp **'kkL=h**; **uko lØkek;fll** **lfjfglh** **vk^g** **rlp**
fd.o g vkcf.;**kP**;**k** **ifØ**;**r** **okijy** **tkr-**

2½ cdj^h **mRiknuk^r** **o e|** **fuferr** ;**kpk** **okij** **gkrk-**

3½ fd.o g ,di'^{kh}; **l{edk**; **dodox^h**; **oulir^h** **vk^g** ;**kph** **ok<**
'kdjk;**Dr** **QGkoj** **mRre** **gkr-**

4½ i'^{khfHkFR}**rdk** **dk**;**Vhup^h** **cuyy^h** **vlr-** **rlp** ;**kp** **iu#Riknu**
'kkdh; **i/nrhu** **gkr-**

5½ fd.okrhy **iu#RiknukP**;**k** **lk[kG^h** **i/nrh** **l^edyk**;**u*** **Eg.krkr-**

6½ ÅlP;**k** **eGhiklu** **vYdkgy** **r**;**kj** **dj.**;**klkB^h** **fd.o** **okijrkr-**
rlp **fd.o** **i'khiklu** **l^ch*** **thoulRo** **r**;**kj** **dy** **tkr-**

2½ fo"kk.kph y{k.k fygk-

mRrj % 1½fo"kk.k **g ltho&fuftokP**;**k** **lhekj"kr** **/kjy** **tkrkr** **r**
vkdkjku **lk/kkj.kr%** **10nm** **r** **100nm** **brD**;**k** **l{erp** **vlrkr-** **R**;**keG**
fo"kk.k **g doG** **byDVku** **l{en'kdP**;**k** **lkgk,**;**ku** **n"Vh** **l iMrkr-**

2½ fo"kk.kph **ok<** **gkr** **ulu** **r vUuxg.k** **rlp** **'olu** **n[khy** **djr**
ukghr- **dkgh** **fo"kk.k** **NkV**;**k** **thok.kP**;**k** **vkdkj****k** **n[khy** **vlrkr**

3½ fo"kk.ke/khy i tuu{kereG r l tho Hkk l rkr.

4½ ik.;ke/khy fo"kk.k xkydkj rj ouLirhe/; r cg/kk nMxkydkj vlrr.

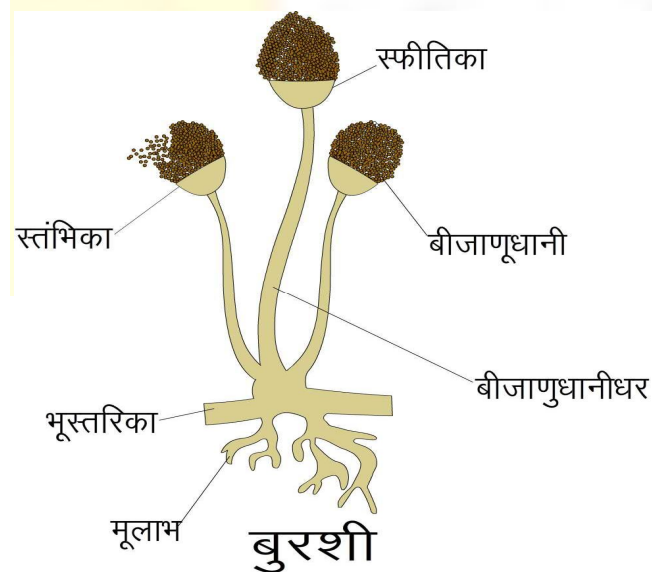
5½ DNAfdok RNA ;k nkUghidh dk.kr rjh ,d dndkEy vlrr- fo"kk.k ijthoh vlrr R;kp ituu QDr l tho i'khe/;p ?kMu ;r-

6½ thoi'khP;k ckgj r Lor=i.k tx 'kdr ukgh- fo"kk.k R;kP;k r vlyy jk;ck>kEl vkf.k fodj ;kPk mi;x ituukP;koGh ifFku l'y"kk.kkBh djrr.

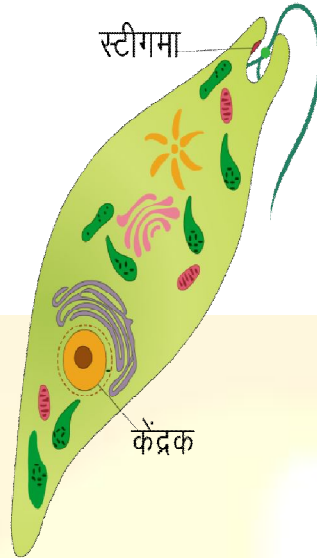
7½ cjpl fo"kk.k truk'kd rlp ifrdy Hkkfrd ifjLFkrhyk ifrjk/kd vlrr.

i'u 3½ vpd vkdR;k dk<u uko n;k-

1½ cj'kh



2½ ;Xy^huk



i'u- 4½ ,dk okD;kr mRrj fygk-

1½ dk.kr fo"kk.k thok.koj gYyk djrkr \

mRrj % cDVfjvkQkt g fo"kk.k thok.koj gYyk djrkr-

2½ 'kokykuk Lok; ik"kh vI dk Eg.krkr \

mRrj % 'koy Lorp vUu Lorp r;kj djrkr Eg.ku R;kuk Lo; ik"kh
Eg.krkr-

3½ thok.kp vdkj kul kj dk.kr idkj iMrkr-

mRrj % xkydkj thok.kI xkyk.k dkdIj nMkdrh thok.kI n.Mk.k
cflyIjI fyydkj thok.kI fLijhykj Dokek 'ki thok.kI
LoYifojkedrh fOgfcvk vI idkj iMrkr-

4½ ;cDVfj;k ;k thok.kph fhkRrhdK d'kkiklu cuyyh vlr.

mRrj %;cDVfj;k ;k thok.kph fhkfrdk iVhMkXyk;duph cuyyh vlr.

5'koky viyk vUu lp; dlk djrr\

mRrj % 'koky LVkp %fi"Ve; inkFk½] yfeufju LVkp] efuVky fdok
fYkfjMhu LVkp ;k Lo#ikr vUu lp; djrr.

6½ dk.kr thok.keG vUukru fo"ck/kk gkr.

mRrj % DykfLVfMve ;k thok.keG vUukru fo"ck/kk gkr.

i'u 5½ vkG[kk ikg eh dk.k \

1½ eh vxnh ygku dkMh lkj[kk l{etho.

mRrj % yDVkcflyk; thok.k

2½ eh vfu;fer vdkjpk l{etho gypky djr vlrk.

mRrj % vfeck

i'u 6½ dkj.k fygk.

1½ ;Xyhuk gk Lo; ik"kh vkg.

mRrj % ;Xyhuk ;k vkfnt hoke/; gfjrn0; vIY;ku fgj0;k
ouLirhieK.k rk Lor%p vUu Lor%p r;kj djrk Eg.kup ;Xyhuk gk
Lo; ik"kh vkg.

2½ **dodkuk erki thoh Eg.krkr **

mRrj % **dod g dtyY;k dkcu h inkFkkp fo?kVu d#u R;koj**
txrkr Eg.kup R;kuk erki thoh vI Eg.krkr-

i'u 7½ **IR; fd vIR; r fygk-**

1½ **;Xyhuk i'khr gfjryod vI rkr-**

mRrj % **IR;**

2½ **vkfnt hokp ituu fno[kMu i/nrhu gkr-**

mRrj % **IR;**

3½ **'koky g iji k"kh I tho vkgr-**

mRrj % **vIR; %'koky g Lo;i k"kh I tho vkg-%**

i'u- 8½ **t kM;k yok-**

ifrt fod	I{et hokp uko
1½ ifufl yhu	v½ LVIVkek;fI I 0gu>,y
2½ LVIVkek;flu	c½ LVIVkek;fI I ,fjFk I
3½ Dykjkek; I Vhu	d½ LVIVkek;fI I xkfI I
4½ ,fjFkke;flu	M½ ifufl fyve Øk; I kftue

mRrj %

ifr tfod	l{et hokp uko
1½ ifufl yhu	M½ ifufl fyve Øk; l kftue
2½ LVIVkek;flu	d½ LVIVkek;fll xkfll
3½ Dykjkek; lVhu	v½ LVIVkek;fll 0gu>,y
4½ ,fjFkke;flu	c½ LVIVkek;fll ,fjFk l

i'u- 9½ fjdkE;k t kxh ; kX; 'kCn fygk-

1½ dodkph ----- dk;Vhu ;k tVhy 'kdjik lu cuyyh vlr-

2½ ekujk l"Vhrhy ltho g ----- vlrkr-

3½ E;dj g -----dod vkg-

4½ 2011 P;k t.kxuulkj iFohojhy tehu o len ;ke/khy lo
ltho feGu lekj -----tkrh Kkr vkgr-

5½ lthokp xV o mixV cufo.;kP;k ifØ;yk -----Eg.krrkr-

6½ ikfVLVk l"Vhrhy ltho ,di'kh; vlu i'khr -----dnd vlr-

mRrj % 1½ i'khfHkfRrdk 2½ ,di'kh; 3½ erkithoh 4½ 87n'ky{k 5½ tfod
oxhdj.k 6½ iVyc/n
